

Appendix F

Supplementary data for Chapter 2 - Pulsatile cavity flow

F.1 13 Hz

F.1.1 Velocity field data at 13 Hz

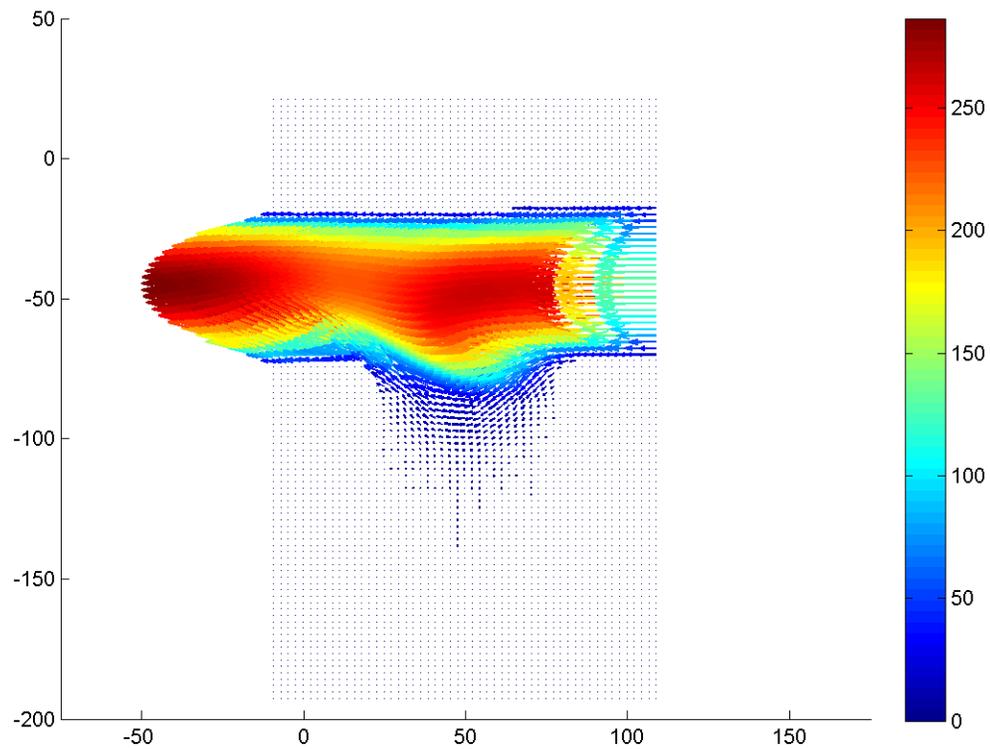


Figure F.1: Velocity field during phase increment 1 at 13 Hz with a Re of 0.1.

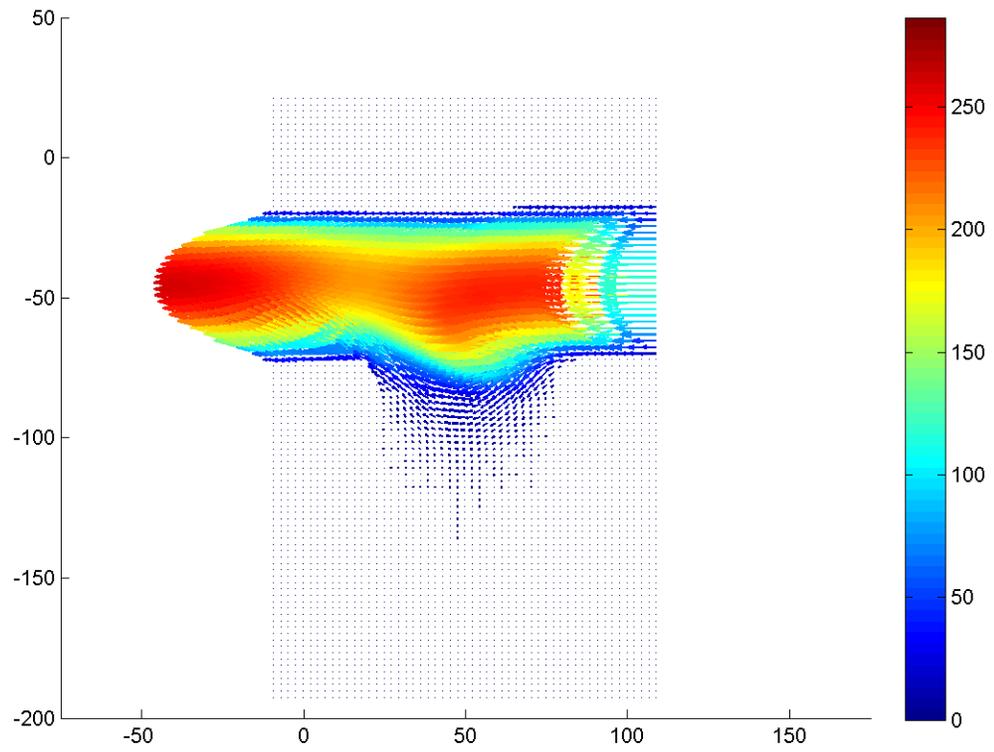


Figure F.2: Velocity field during phase increment 2 at 13 Hz with a Re of 0.1.

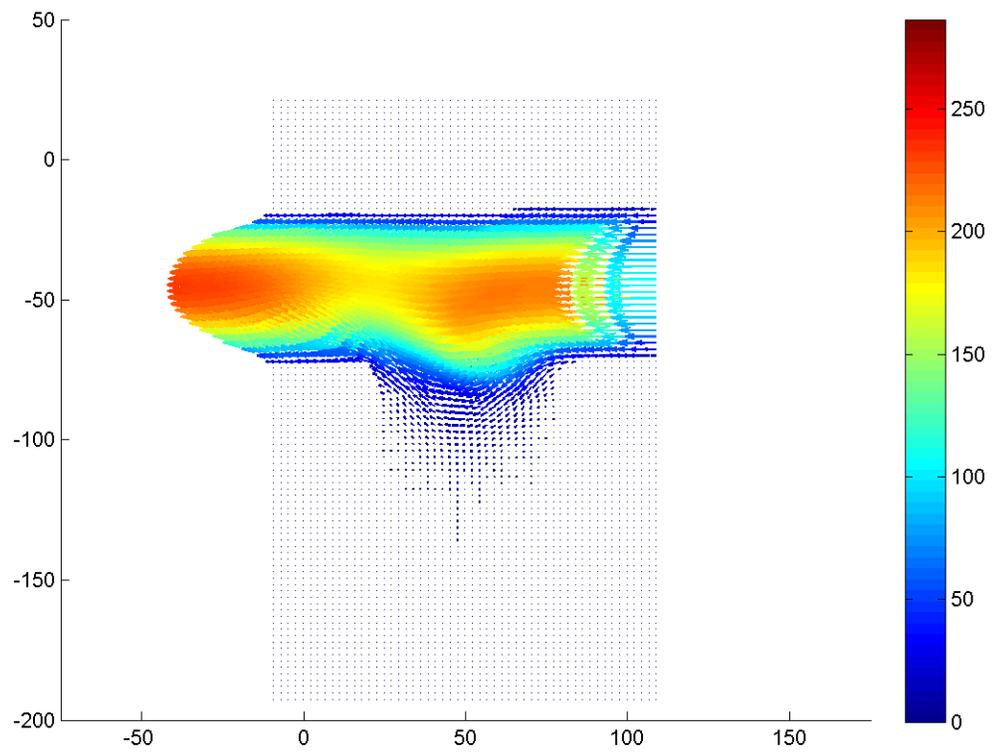


Figure F.3: Velocity field during phase increment 3 at 13 Hz with a Re of 0.1.

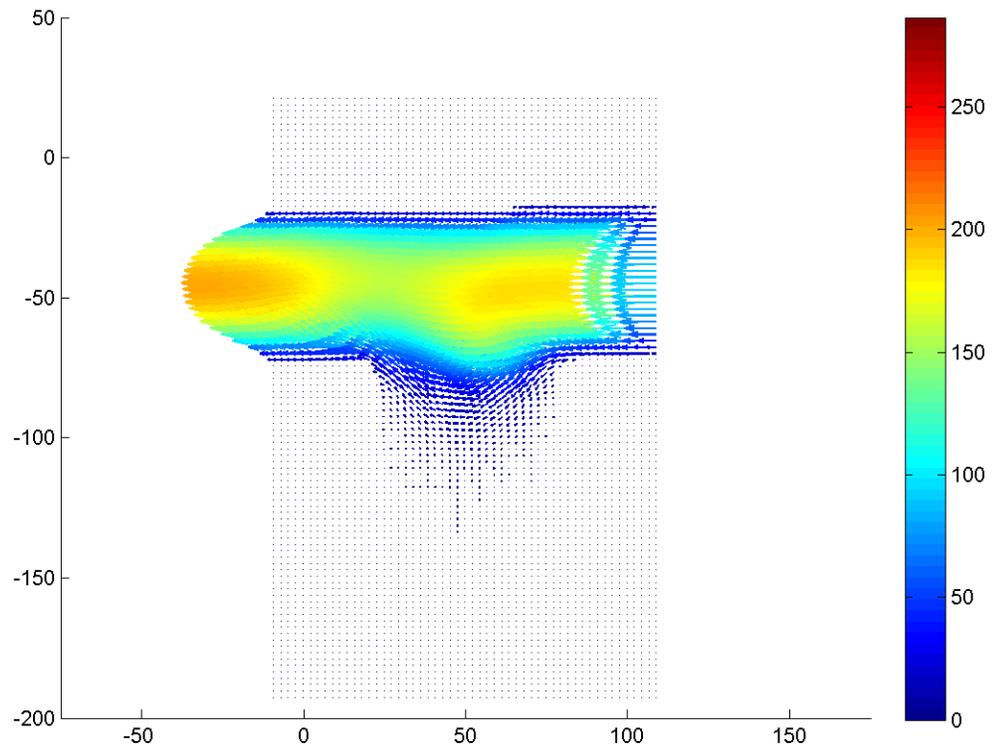


Figure F.4: Velocity field during phase increment 4 at 13 Hz with a Re of 0.1.

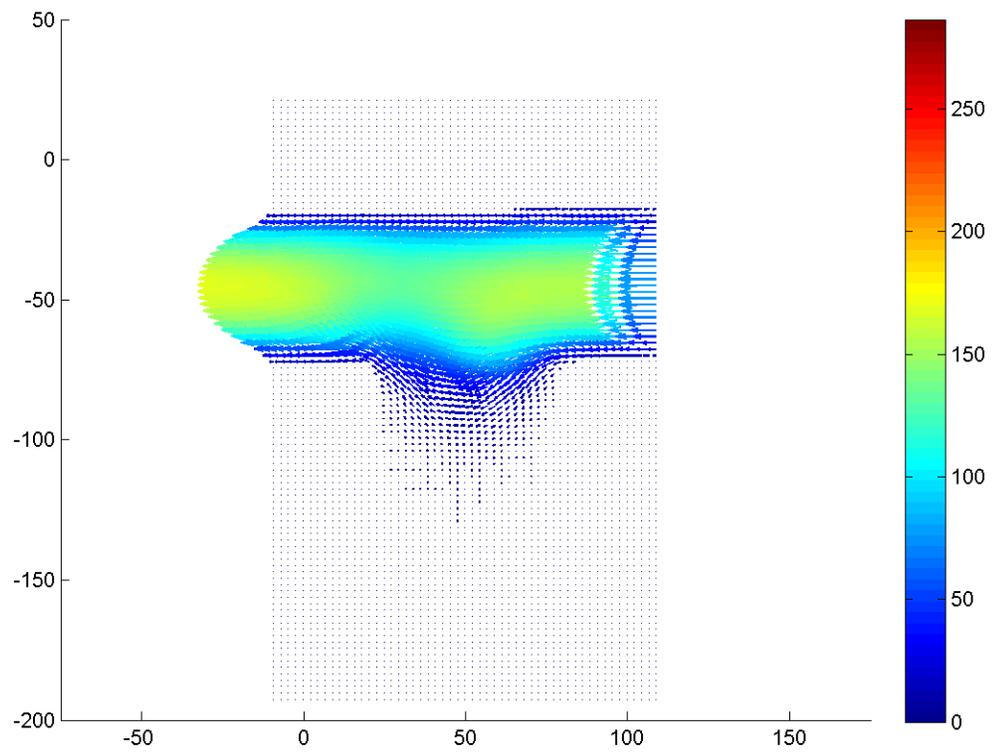


Figure F.5: Velocity field during phase increment 5 at 13 Hz with a Re of 0.1.

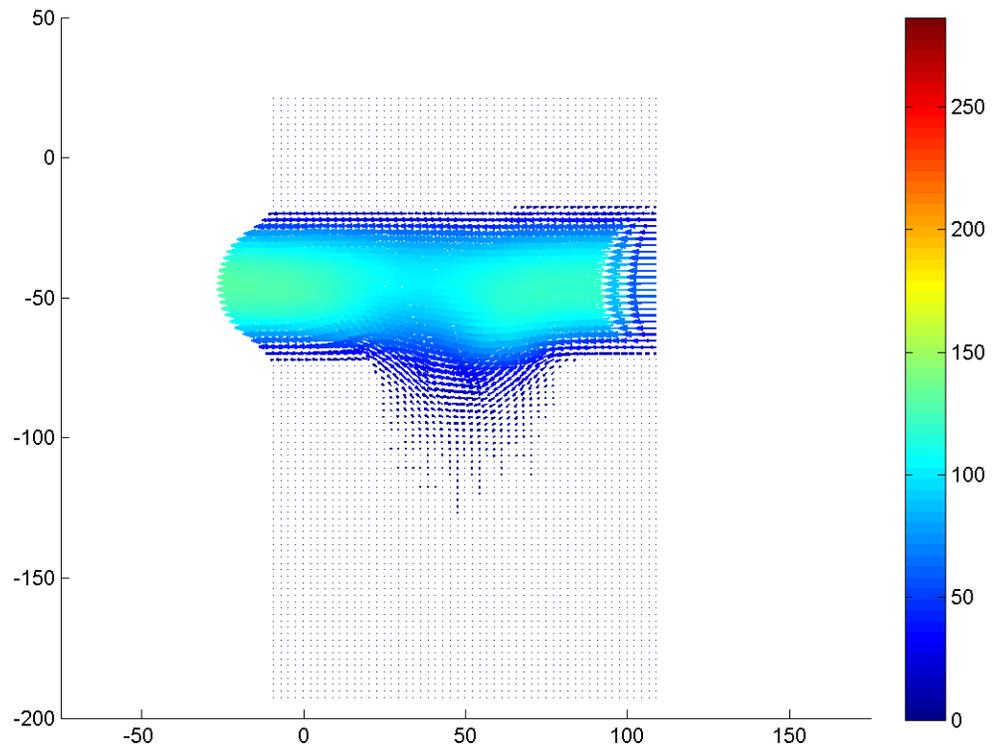


Figure F.6: Velocity field during phase increment 6 at 13 Hz with a Re of 0.1.

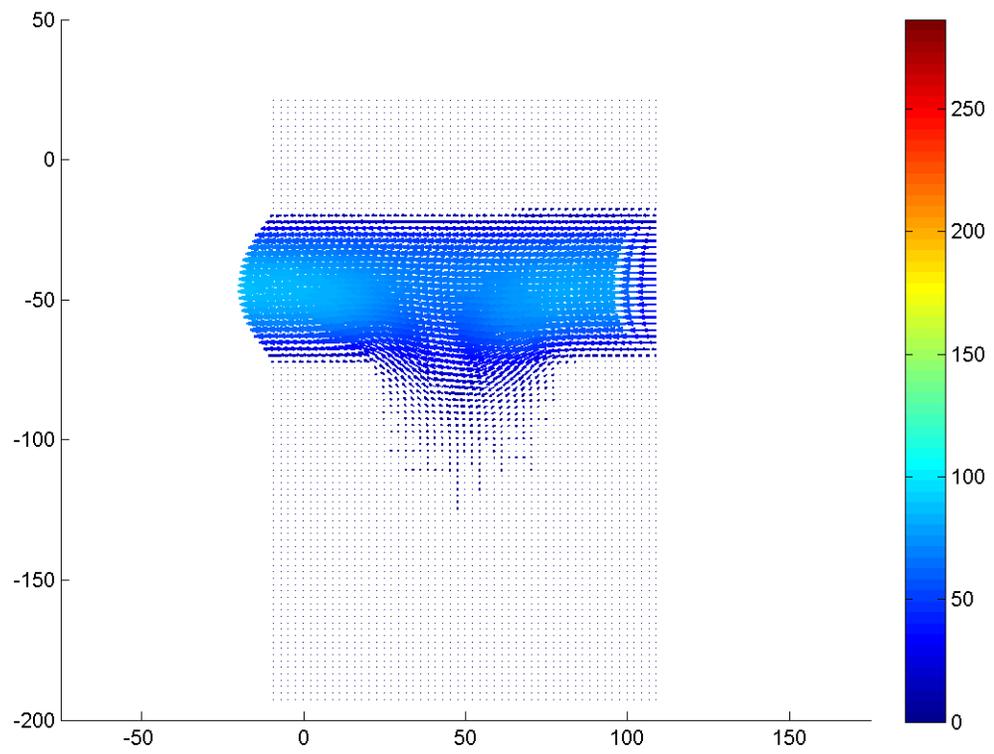


Figure F.7: Velocity field during phase increment 7 at 13 Hz with a Re of 0.1.

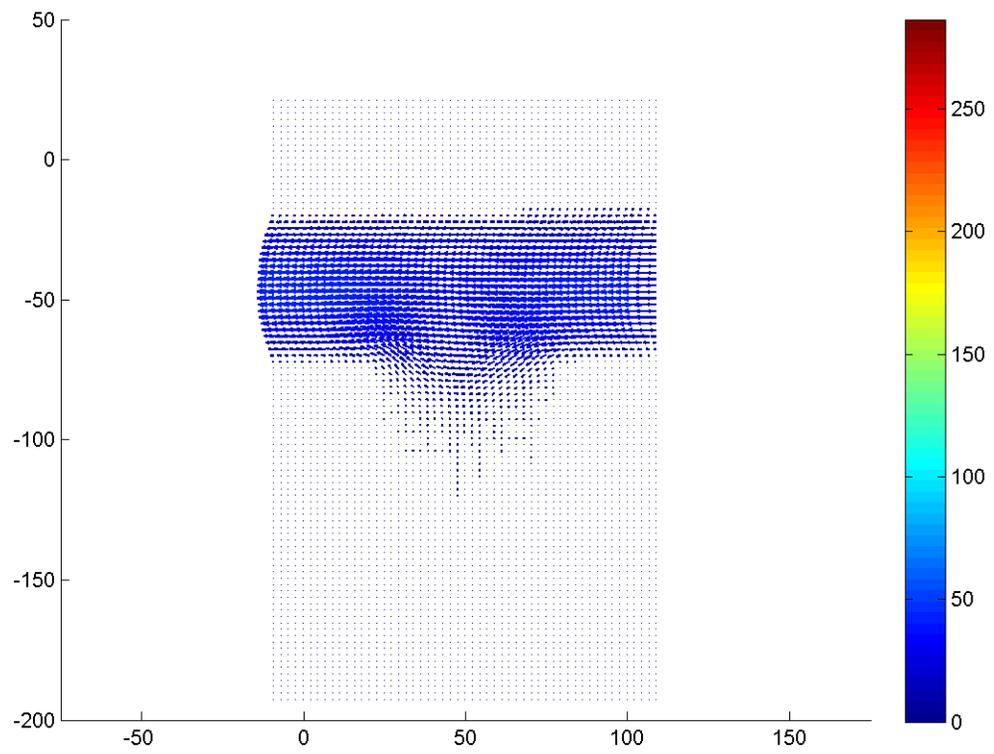


Figure F.8: Velocity field during phase increment 8 at 13 Hz with a Re of 0.1.

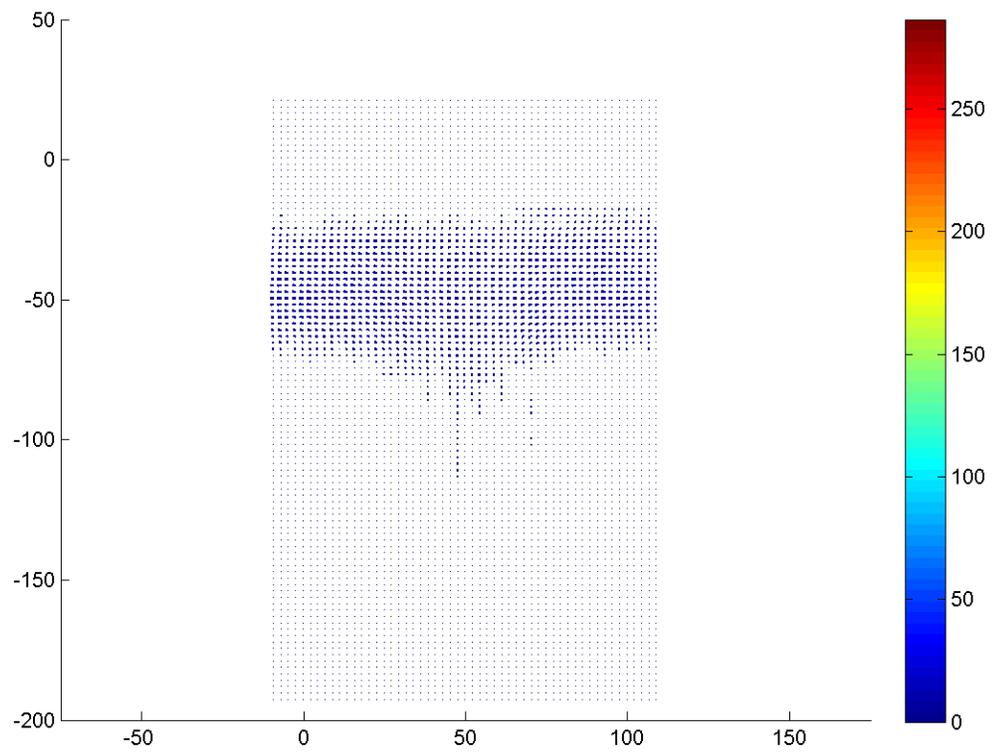


Figure F.9: Velocity field during phase increment 9 at 13 Hz with a Re of 0.1.

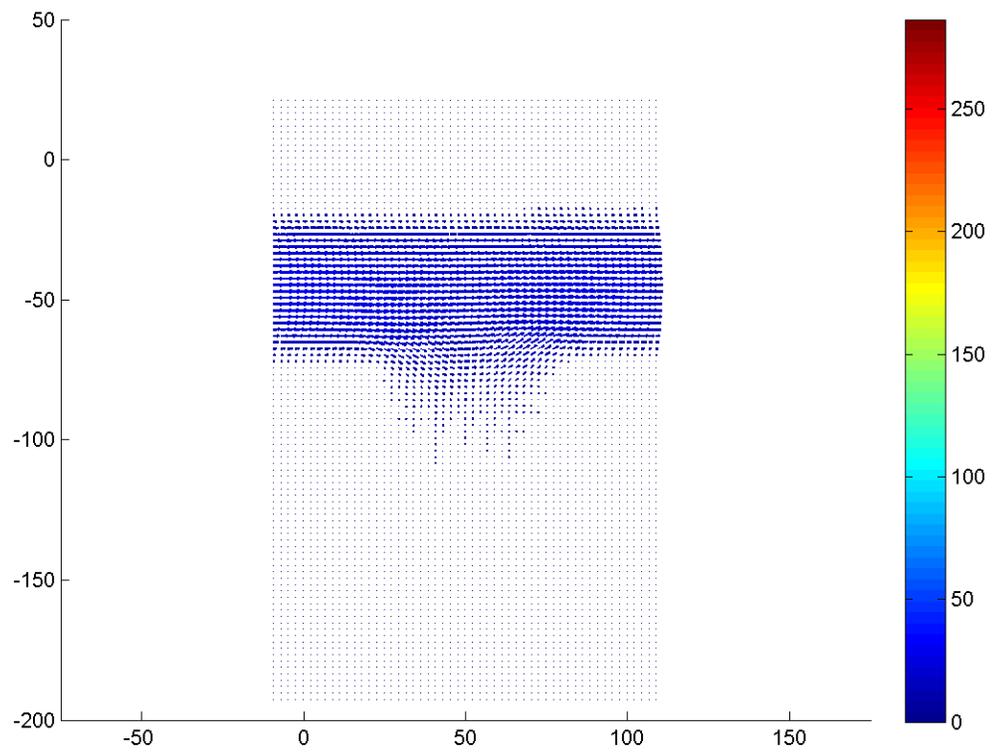


Figure F.10: Velocity field during phase increment 10 at 13 Hz with a Re of 0.1.

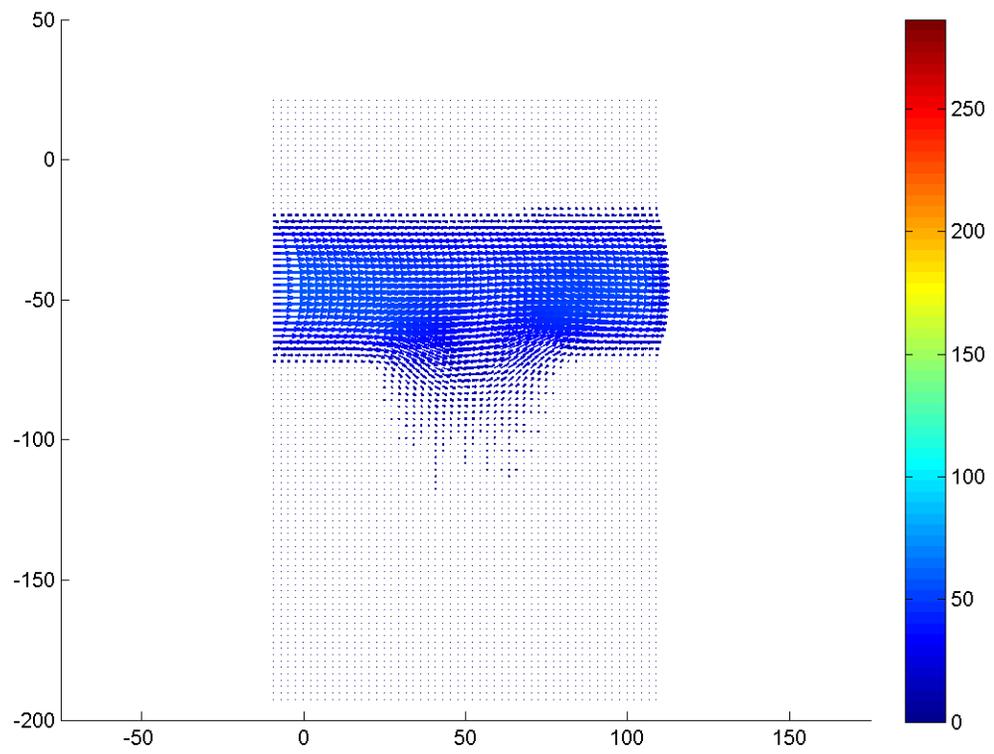


Figure F.11: Velocity field during phase increment 11 at 13 Hz with a Re of 0.1.

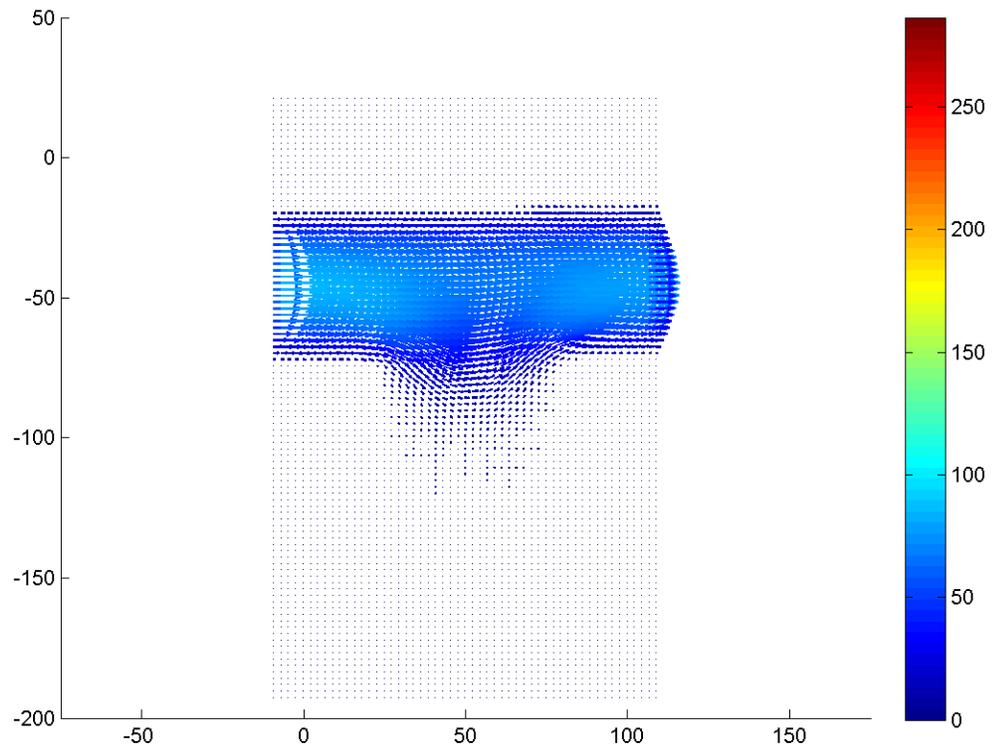


Figure F.12: Velocity field during phase increment 12 at 13 Hz with a Re of 0.1.

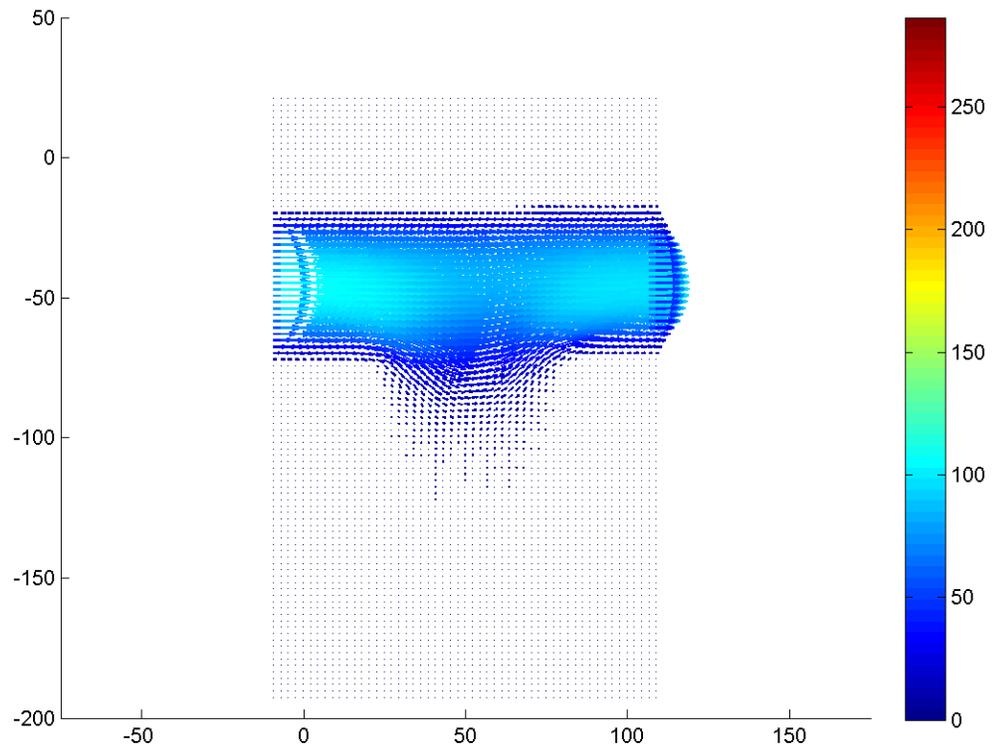


Figure F.13: Velocity field during phase increment 13 at 13 Hz with a Re of 0.1.

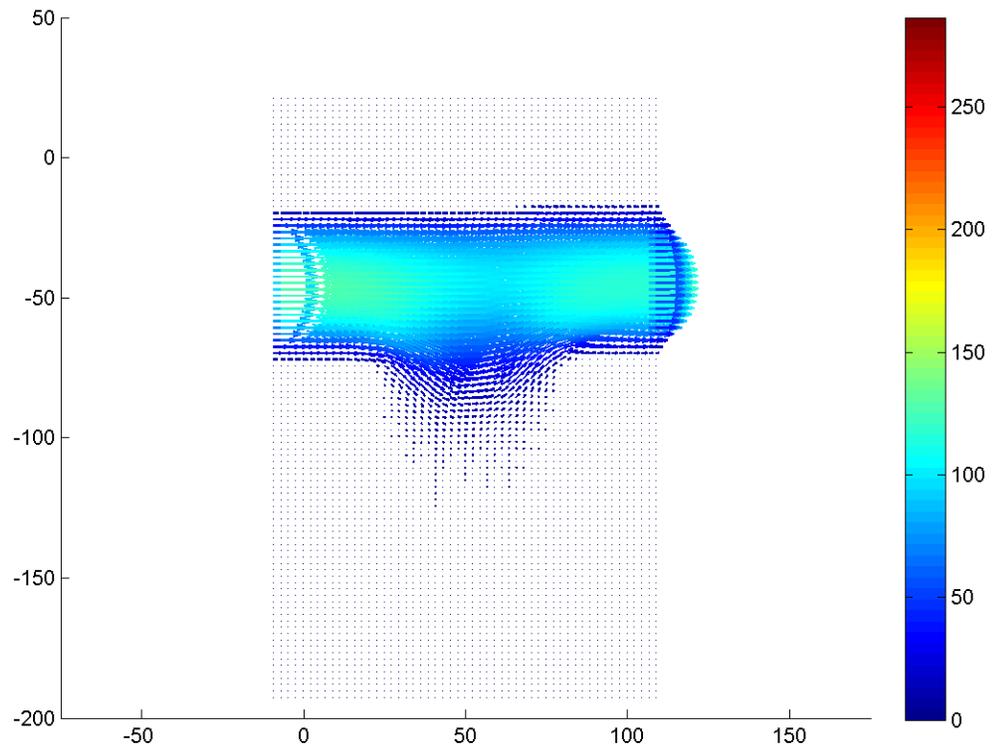


Figure F.14: Velocity field during phase increment 14 at 13 Hz with a Re of 0.1.

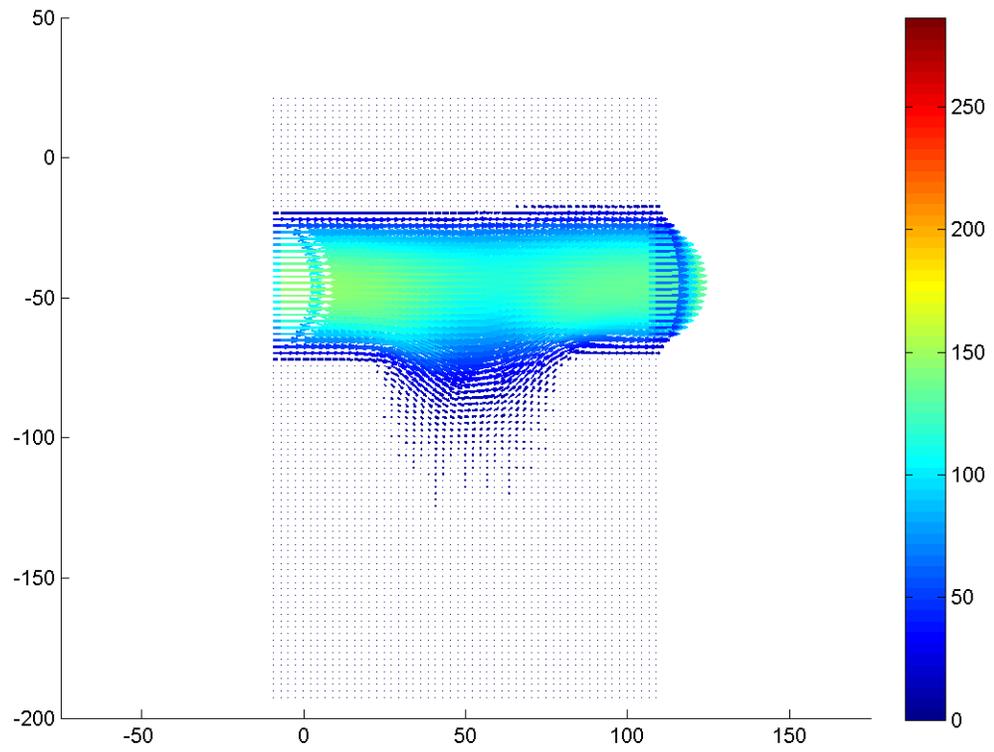


Figure F.15: Velocity field during phase increment 15 at 13 Hz with a Re of 0.1.

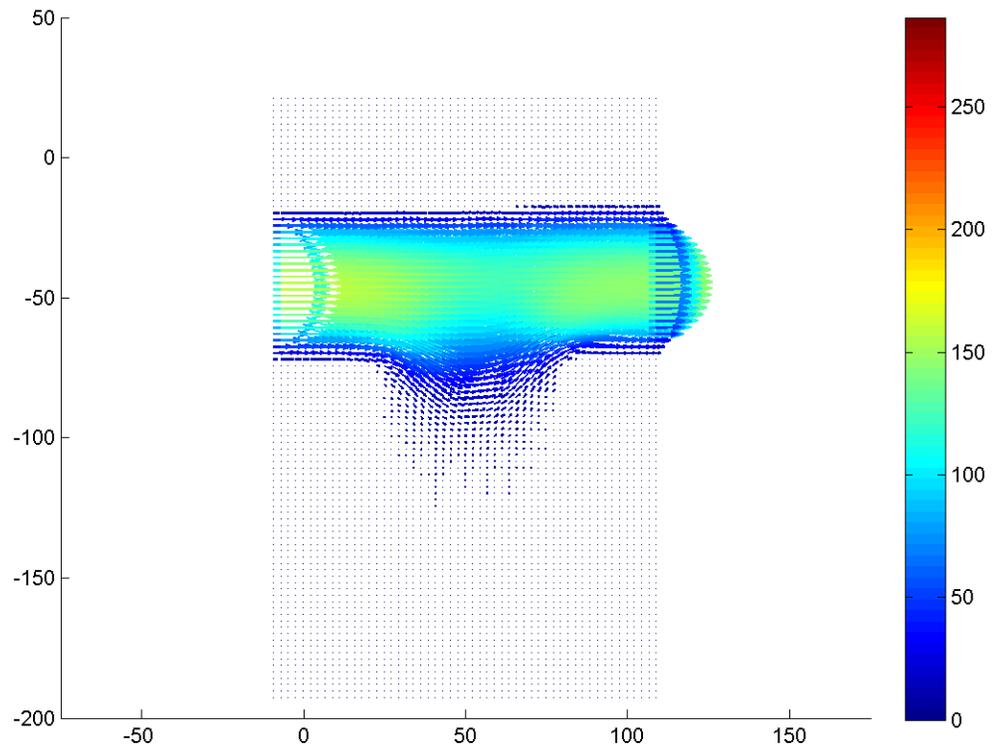


Figure F.16: Velocity field during phase increment 16 at 13 Hz with a Re of 0.1.

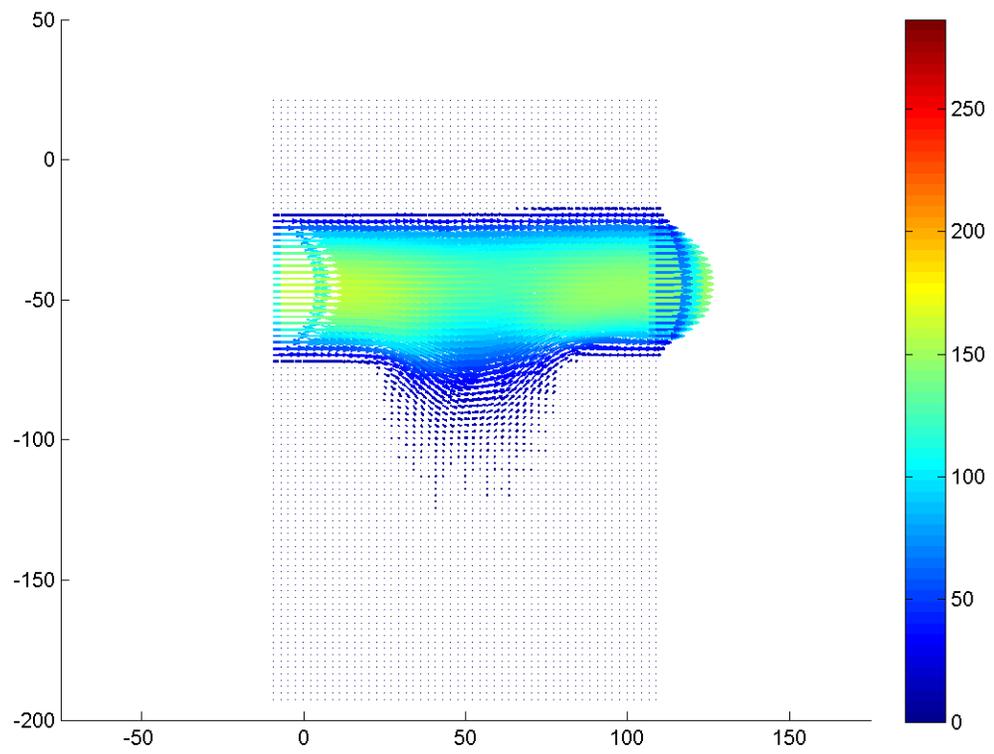


Figure F.17: Velocity field during phase increment 17 at 13 Hz with a Re of 0.1.

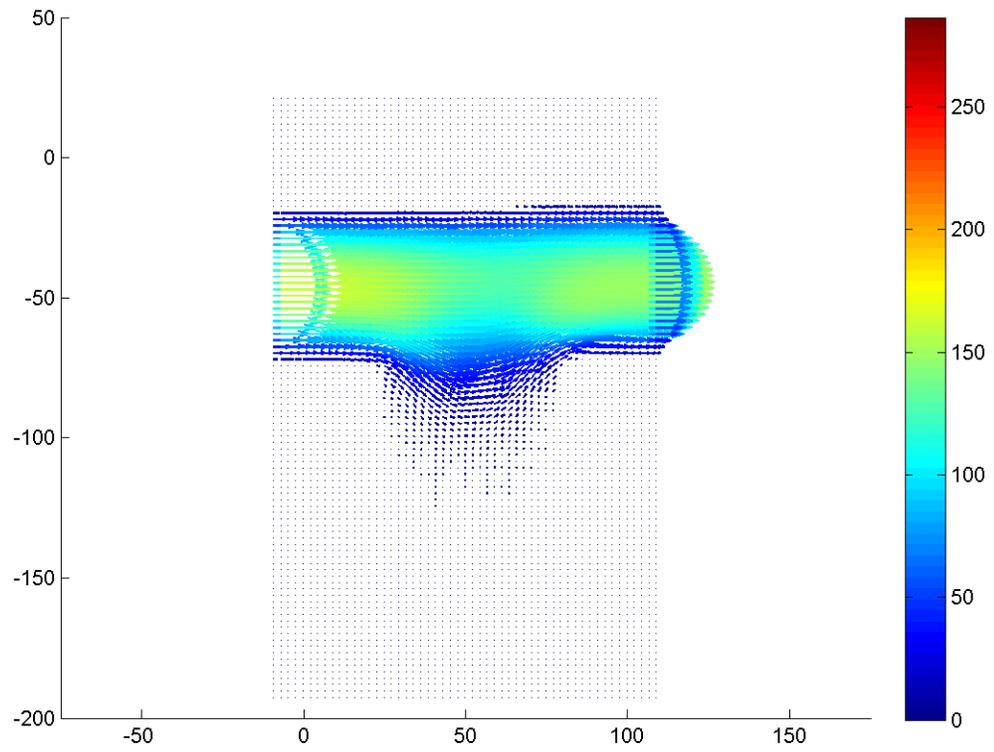


Figure F.18: Velocity field during phase increment 18 at 13 Hz with a Re of 0.1.

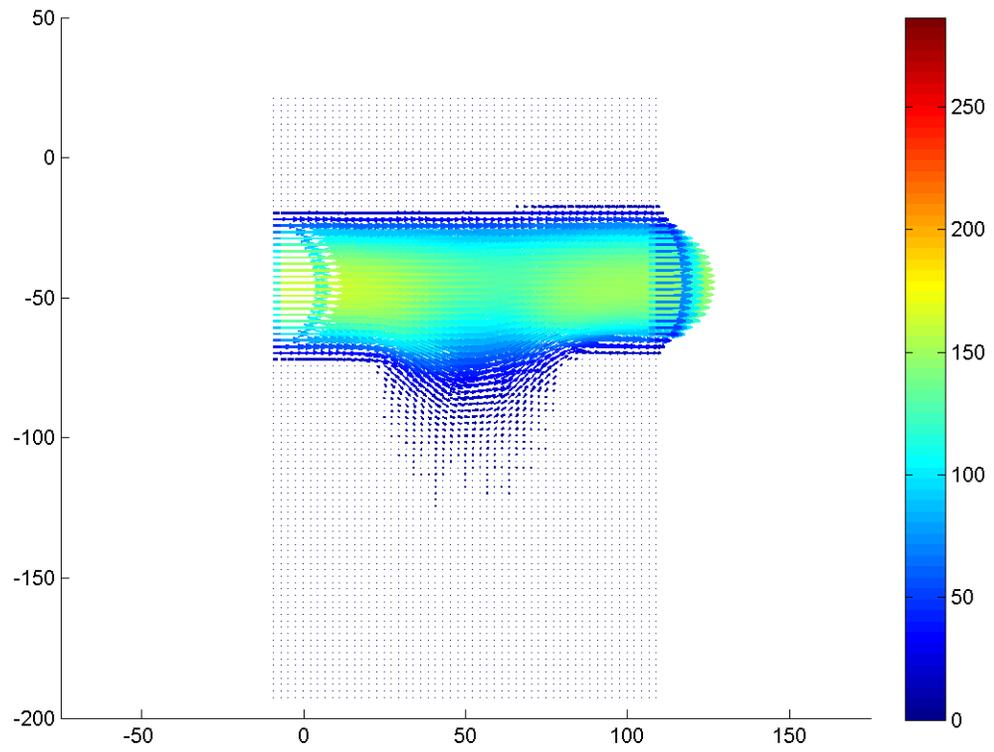


Figure F.19: Velocity field during phase increment 18 at 13 Hz with a Re of 0.1.

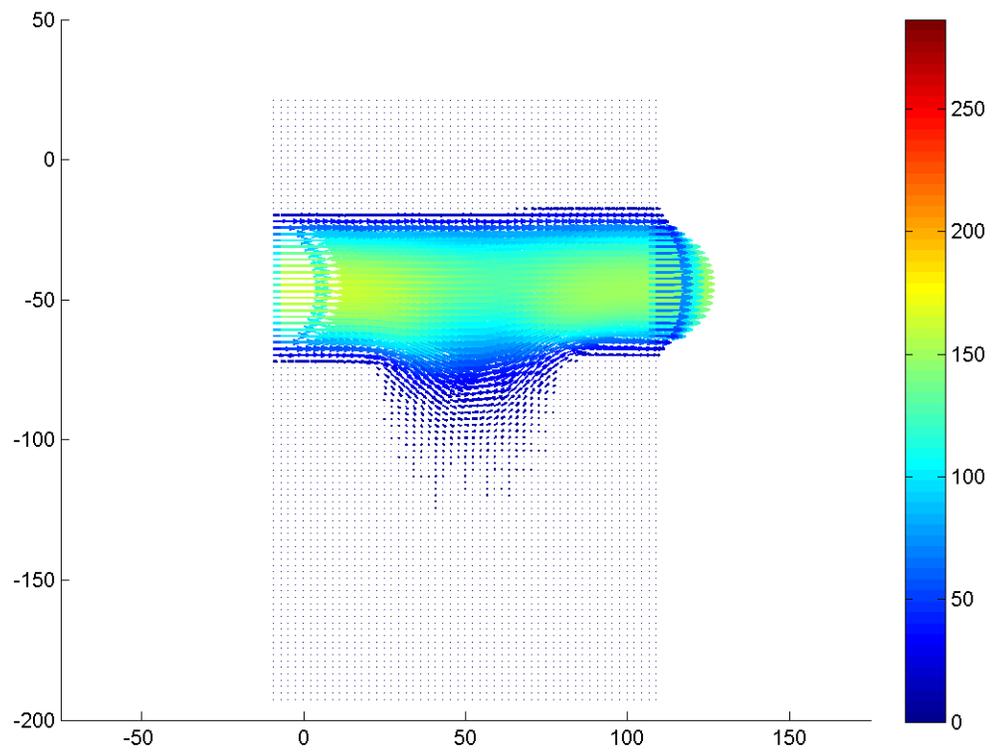


Figure F.20: Velocity field during phase increment 20 at 13 Hz with a Re of 0.1.

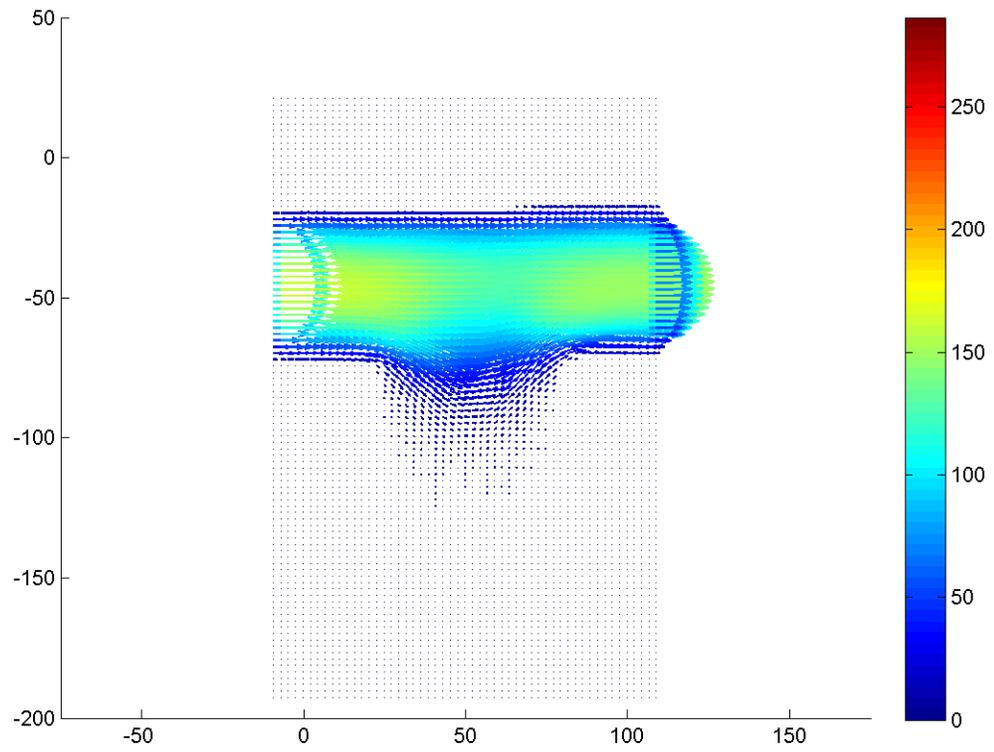


Figure F.21: Velocity field during phase increment 21 at 13 Hz with a Re of 0.1.

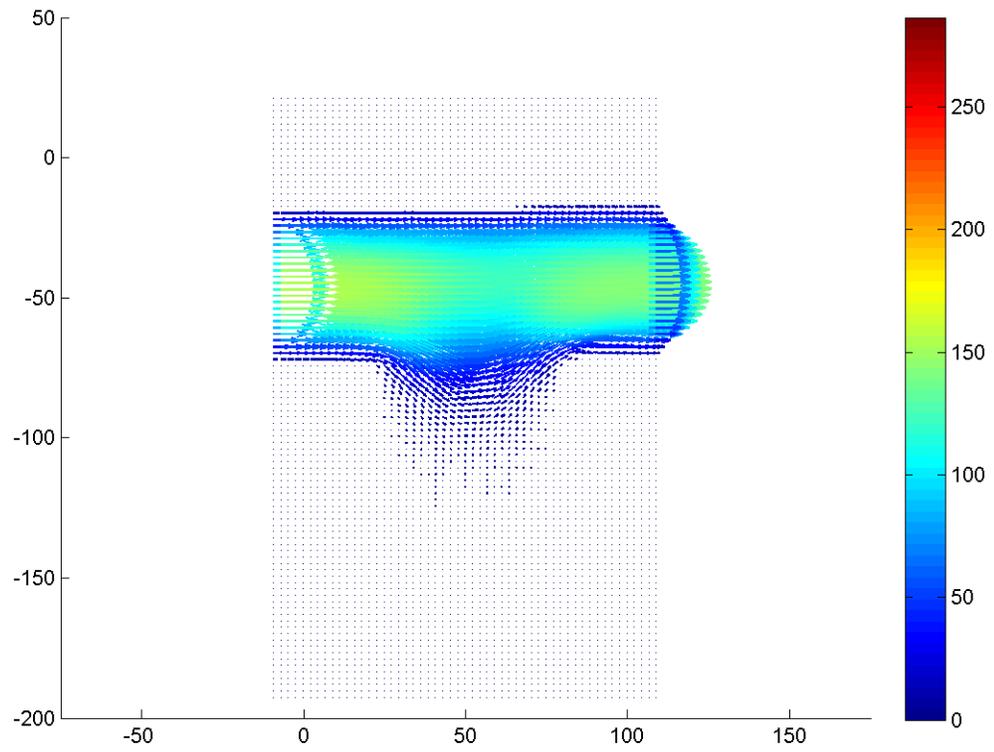


Figure F.22: Velocity field during phase increment 22 at 13 Hz with a Re of 0.1.

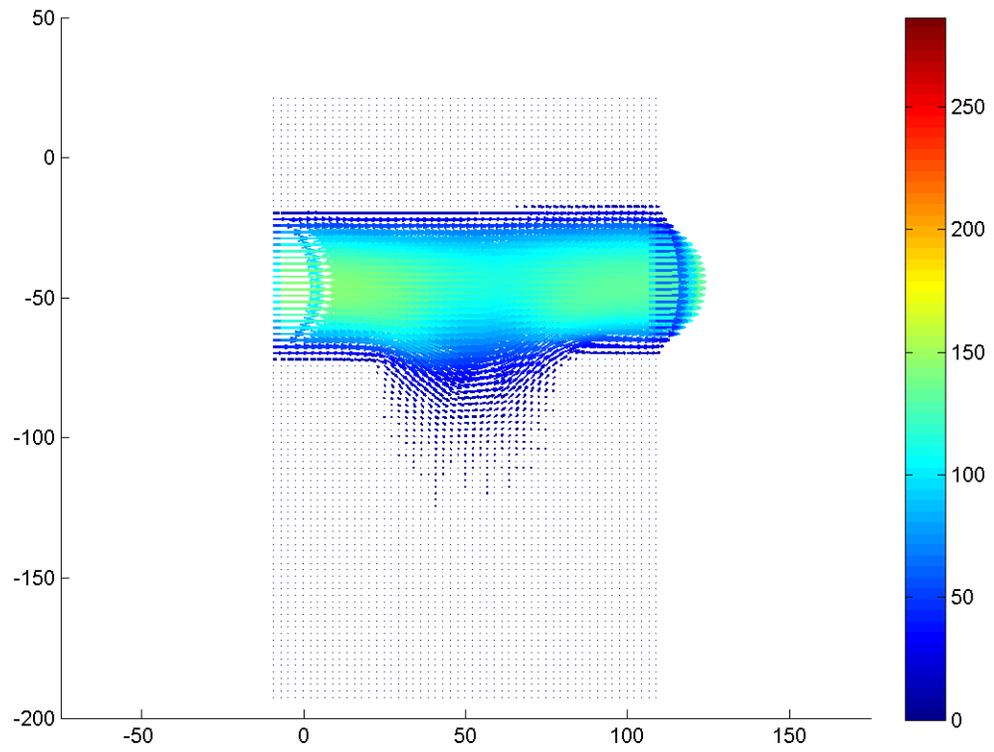


Figure F.23: Velocity field during phase increment 23 at 13 Hz with a Re of 0.1.

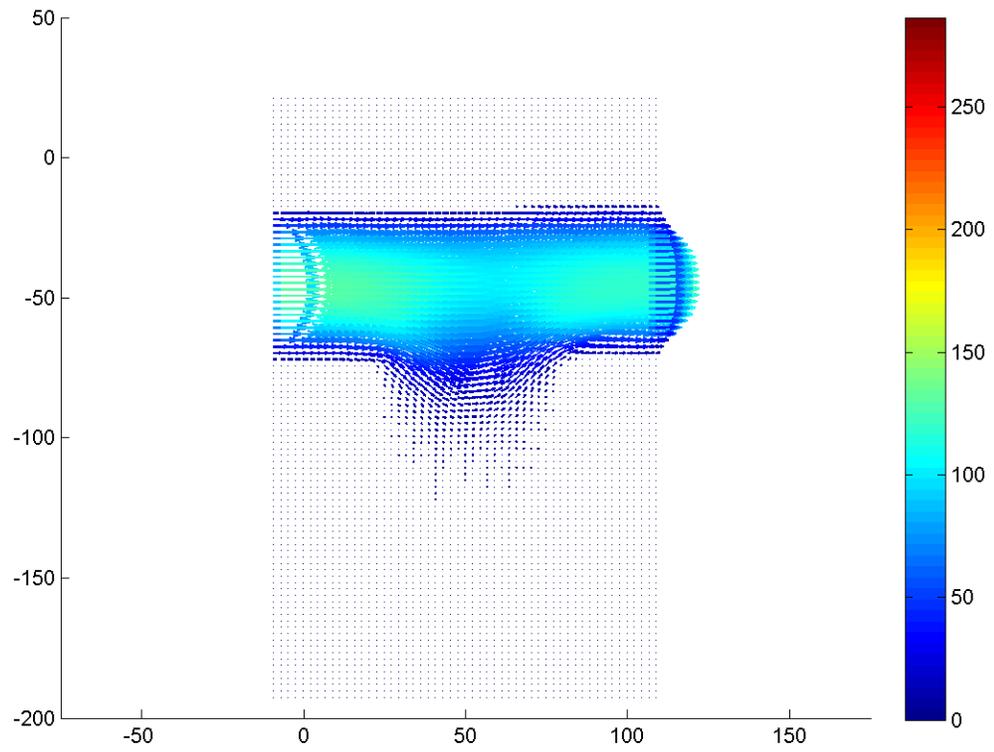


Figure F.24: Velocity field during phase increment 24 at 13 Hz with a Re of 0.1.

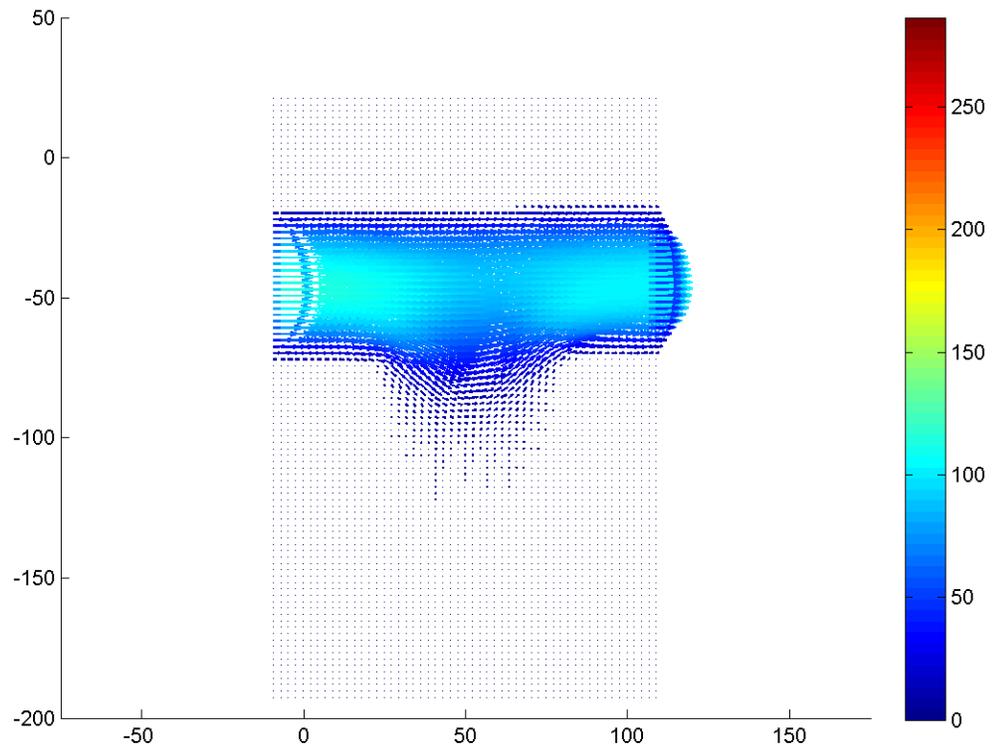


Figure F.25: Velocity field during phase increment 25 at 13 Hz with a Re of 0.1.

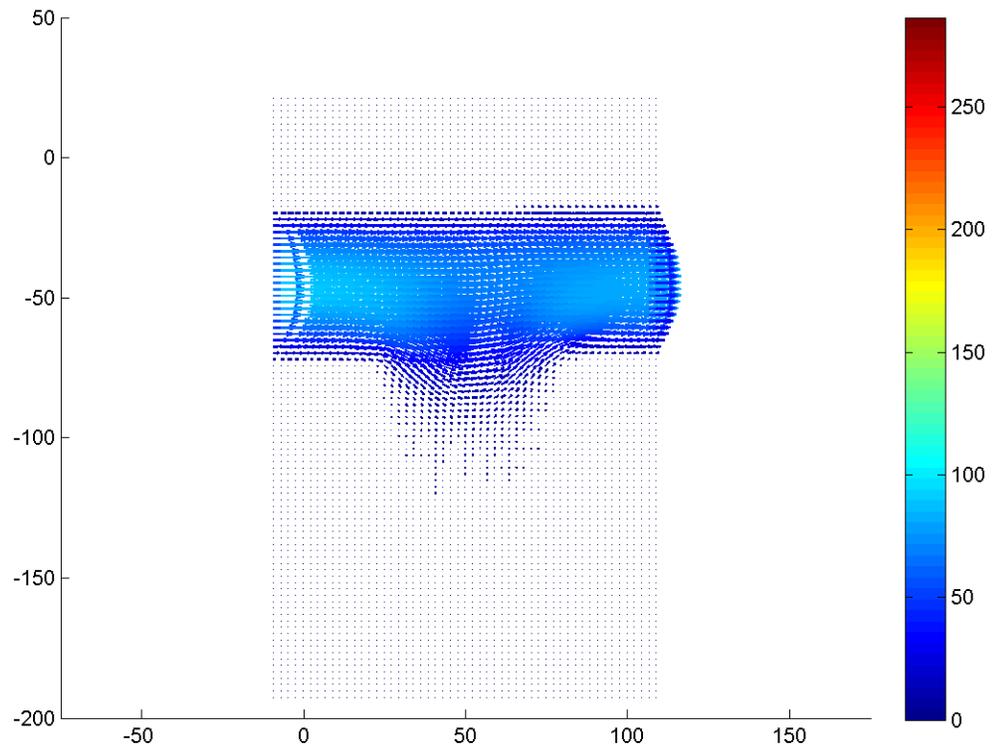


Figure F.26: Velocity field during phase increment 26 at 13 Hz with a Re of 0.1.

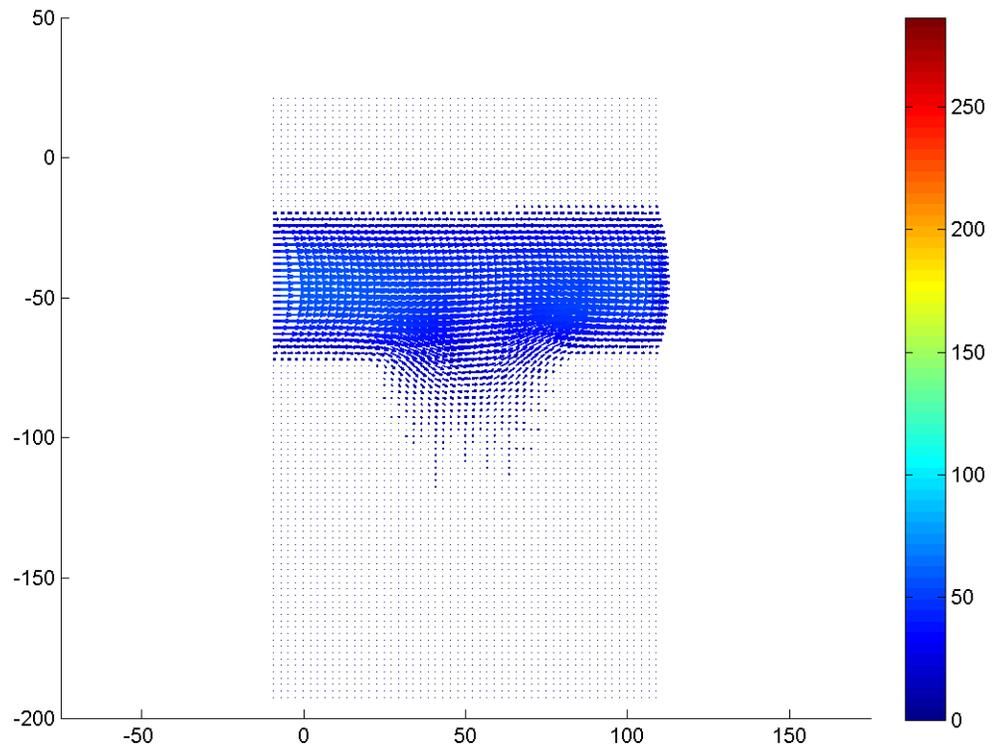


Figure F.27: Velocity field during phase increment 27 at 13 Hz with a Re of 0.1.

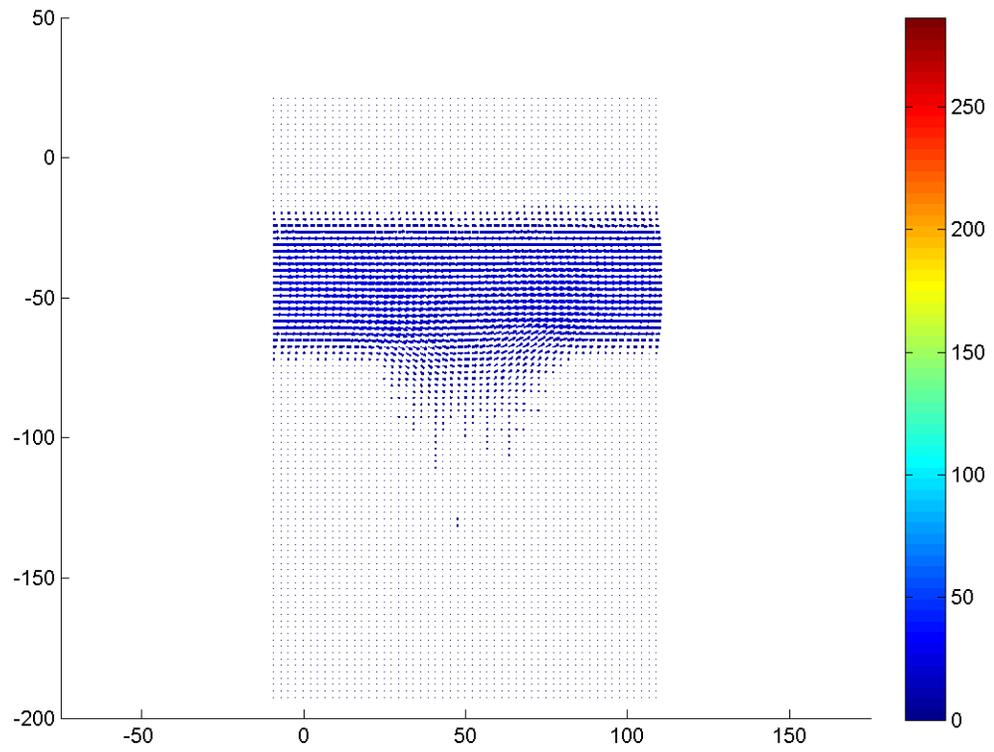


Figure F.28: Velocity field during phase increment 28 at 13 Hz with a Re of 0.1.

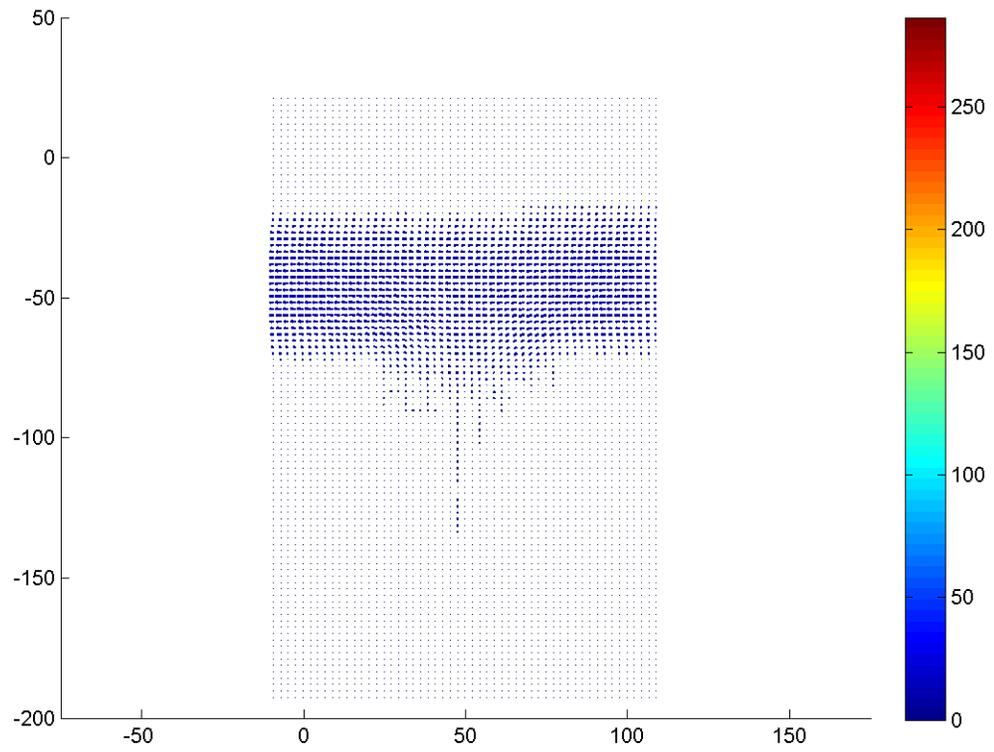


Figure F.29: Velocity field during phase increment 29 at 13 Hz with a Re of 0.1.

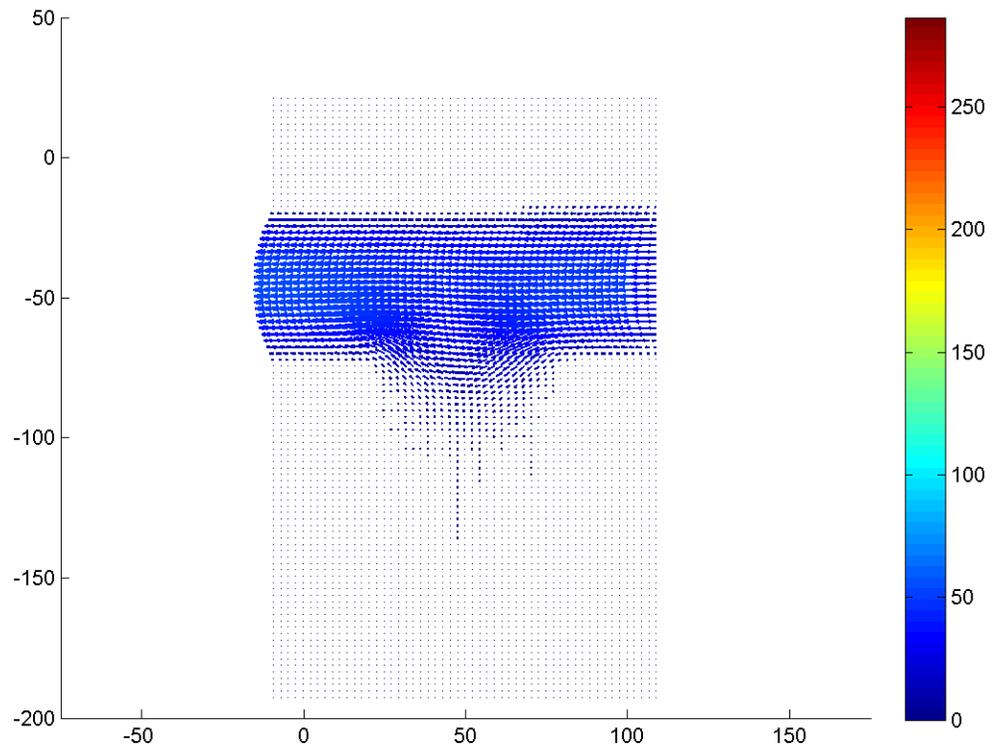


Figure F.30: Velocity field during phase increment 30 at 13 Hz with a Re of 0.1.

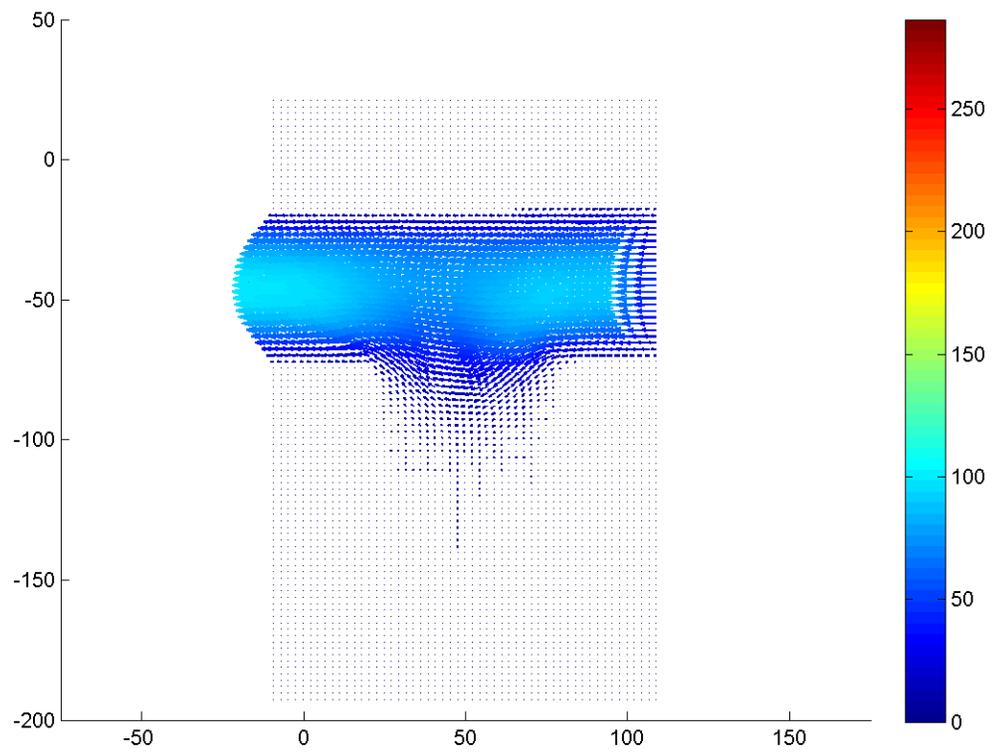


Figure F.31: Velocity field during phase increment 31 at 13 Hz with a Re of 0.1.

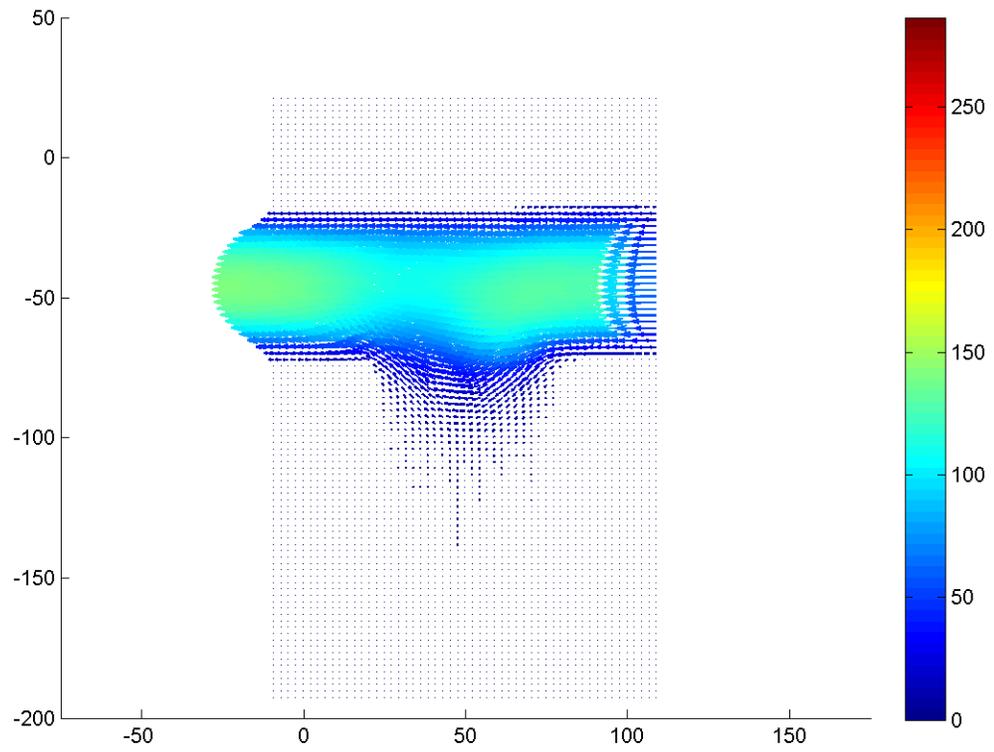


Figure F.32: Velocity field during phase increment 32 at 13 Hz with a Re of 0.1.

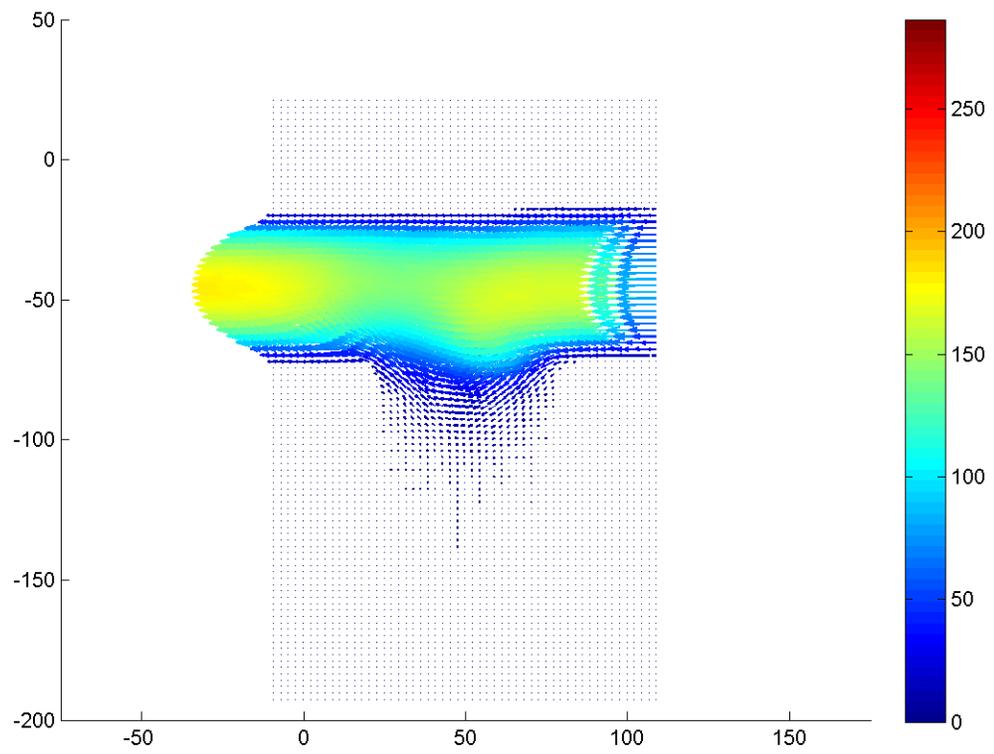


Figure F.33: Velocity field during phase increment 33 at 13 Hz with a Re of 0.1.

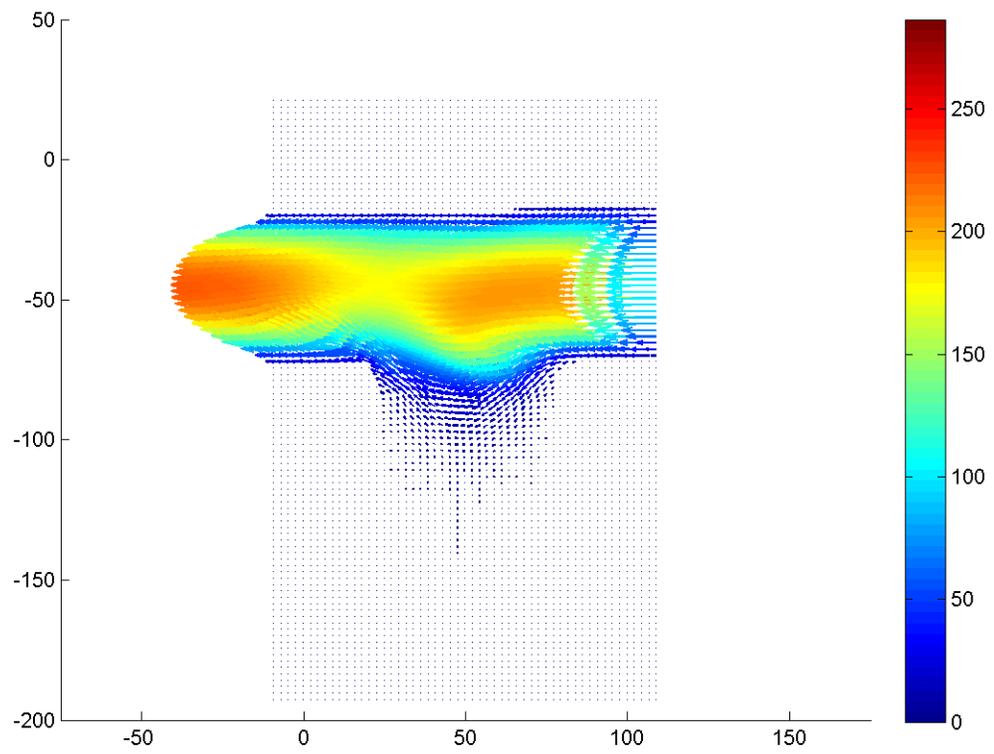


Figure F.34: Velocity field during phase increment 34 at 13 Hz with a Re of 0.1.

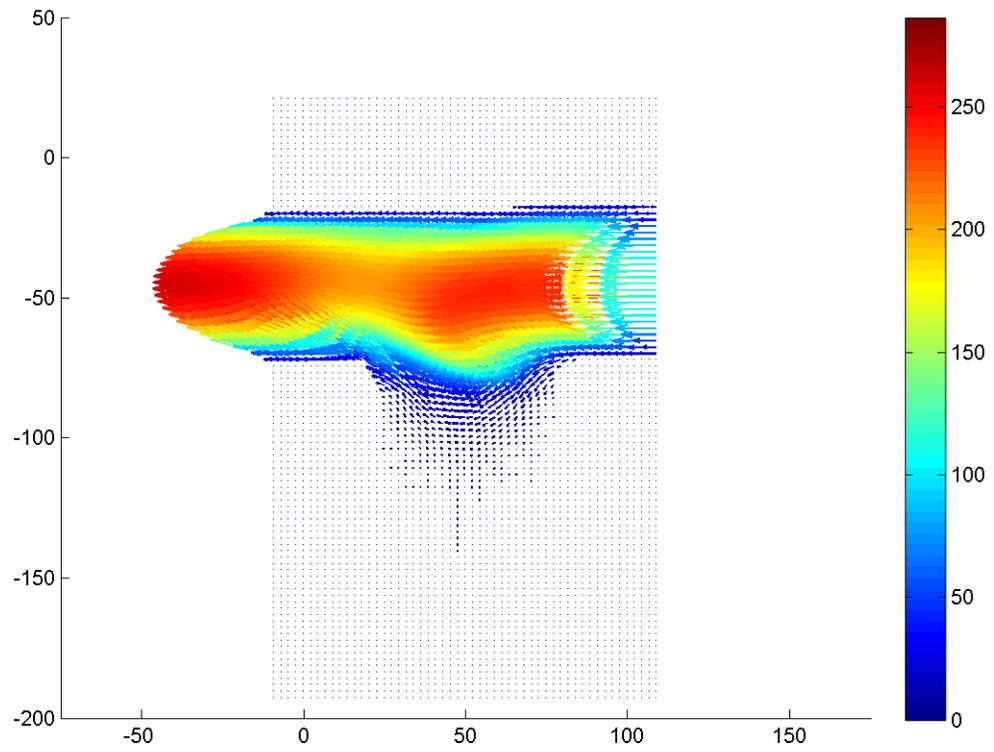


Figure F.35: Velocity field during phase increment 35 at 13 Hz with a Re of 0.1.

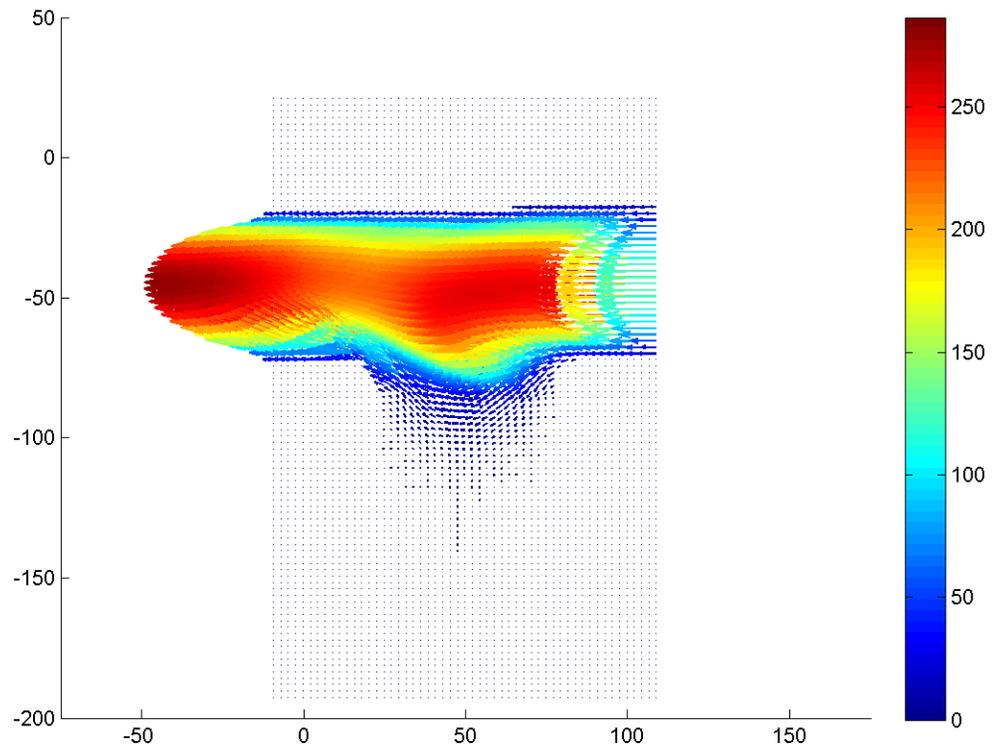


Figure F.36: Velocity field during phase increment 36 at 13 Hz with a Re of 0.1.

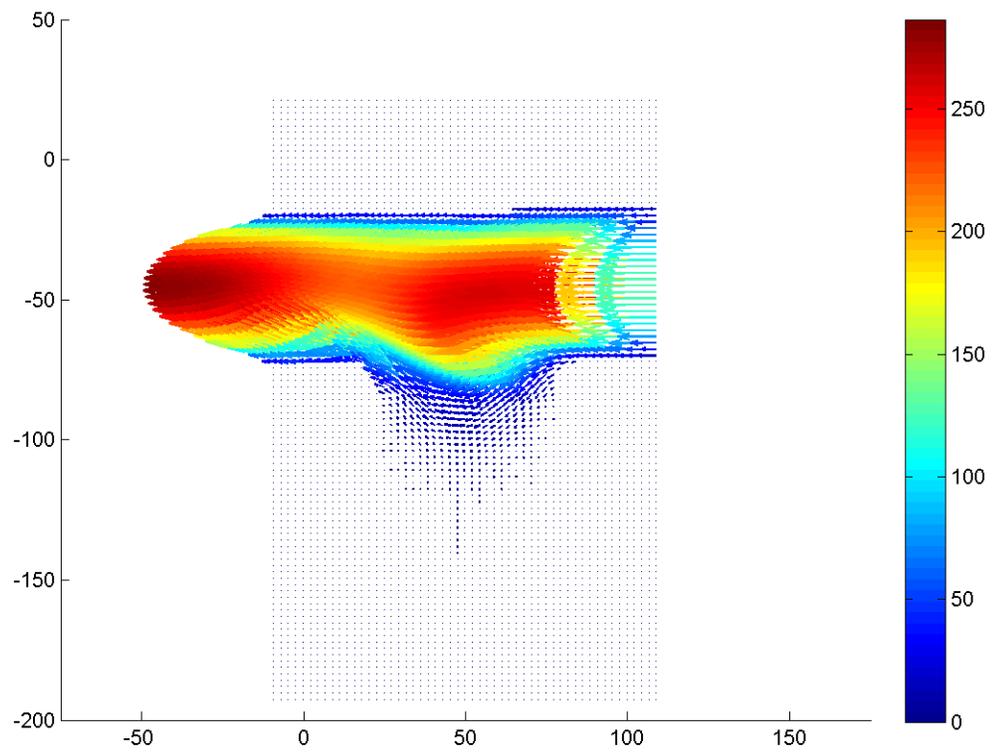


Figure F.37: Velocity field during phase increment 37 at 13 Hz with a Re of 0.1.

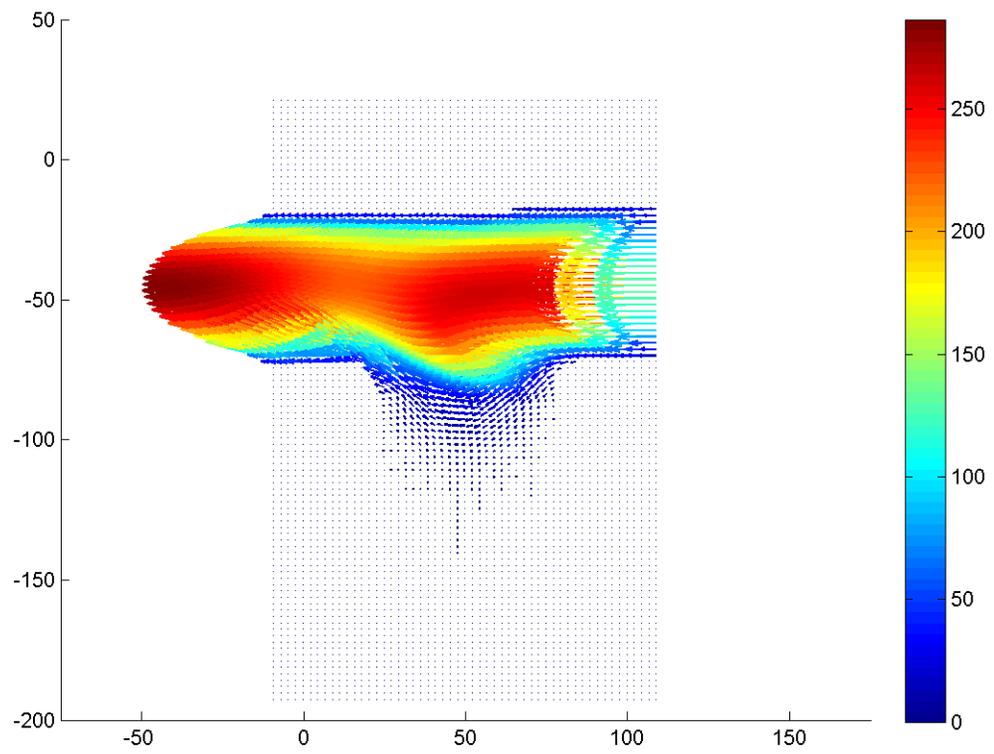


Figure F.38: Velocity field during phase increment 38 at 13 Hz with a Re of 0.1.

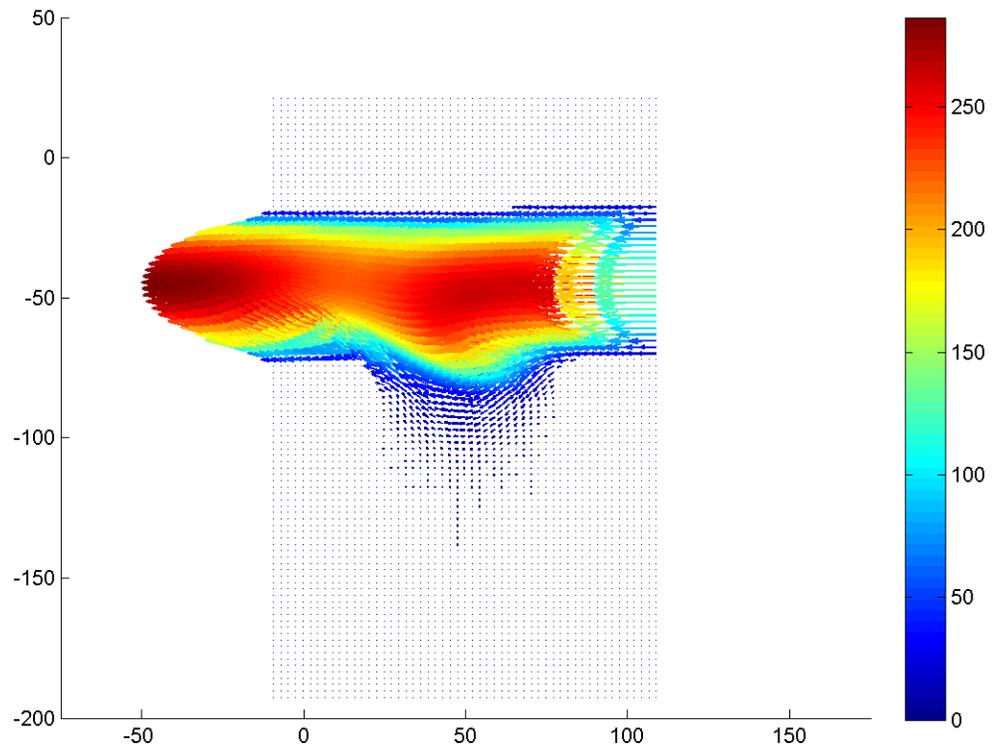


Figure F.39: Velocity field during phase increment 39 at 13 Hz with a Re of 0.1.

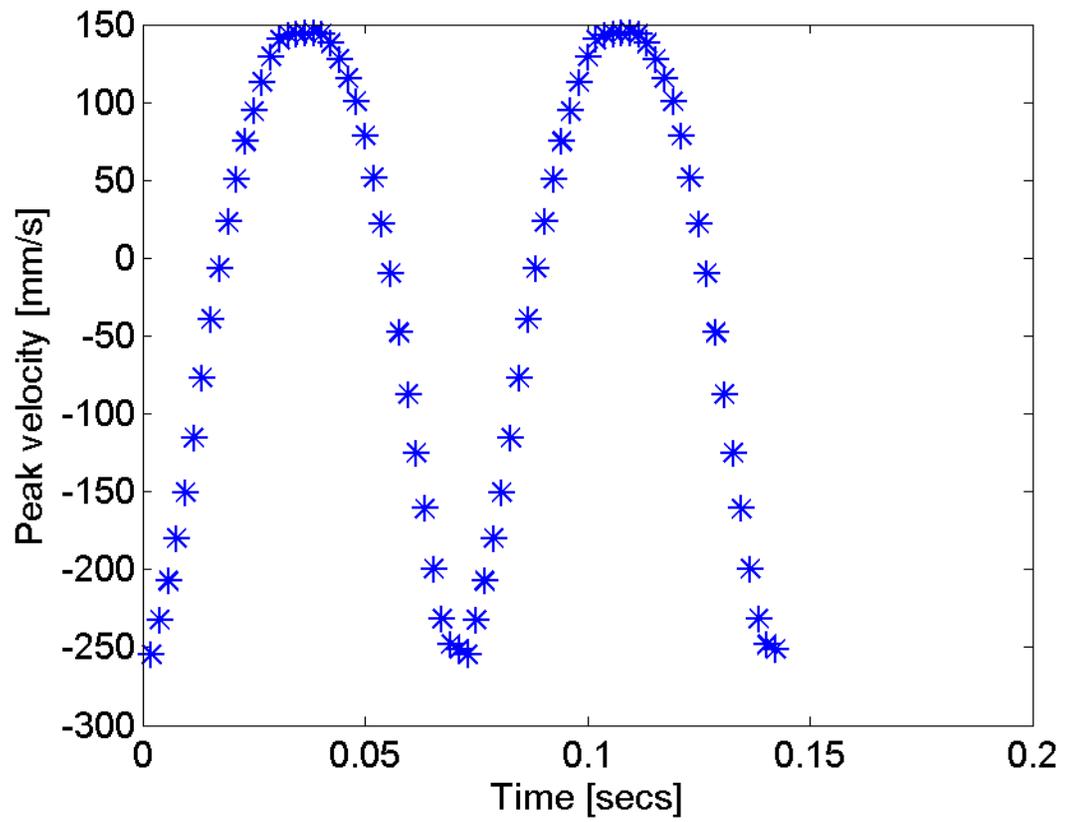


Figure F.40: The peak velocity in the free stream region in time at 13 Hz.

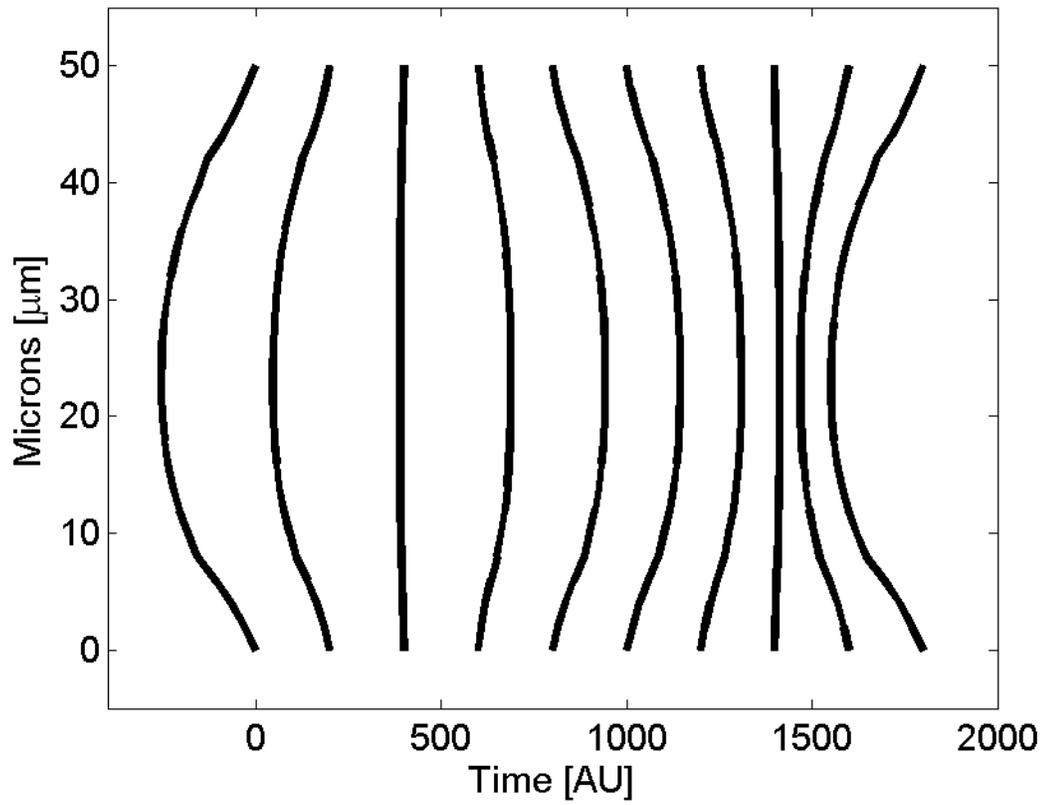


Figure F.41: The velocity profile in the free stream versus time at 13 Hz.

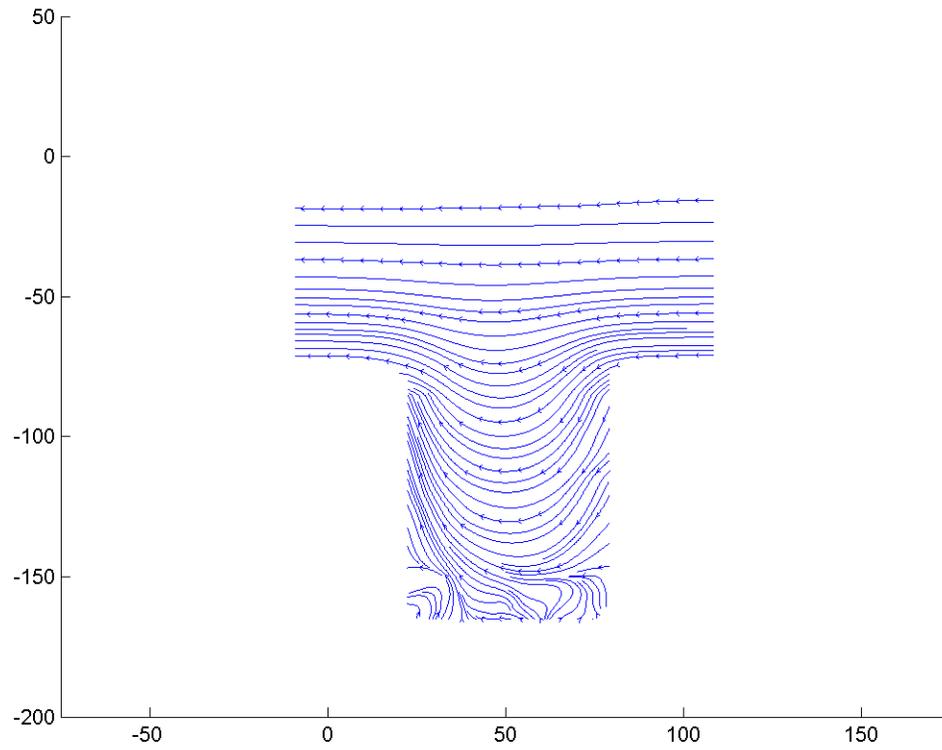
F.1.2 Streamline images at 13 Hz

Figure F.42: Streamline image during phase increment 1 at 13 Hz and a Re of 0.1.

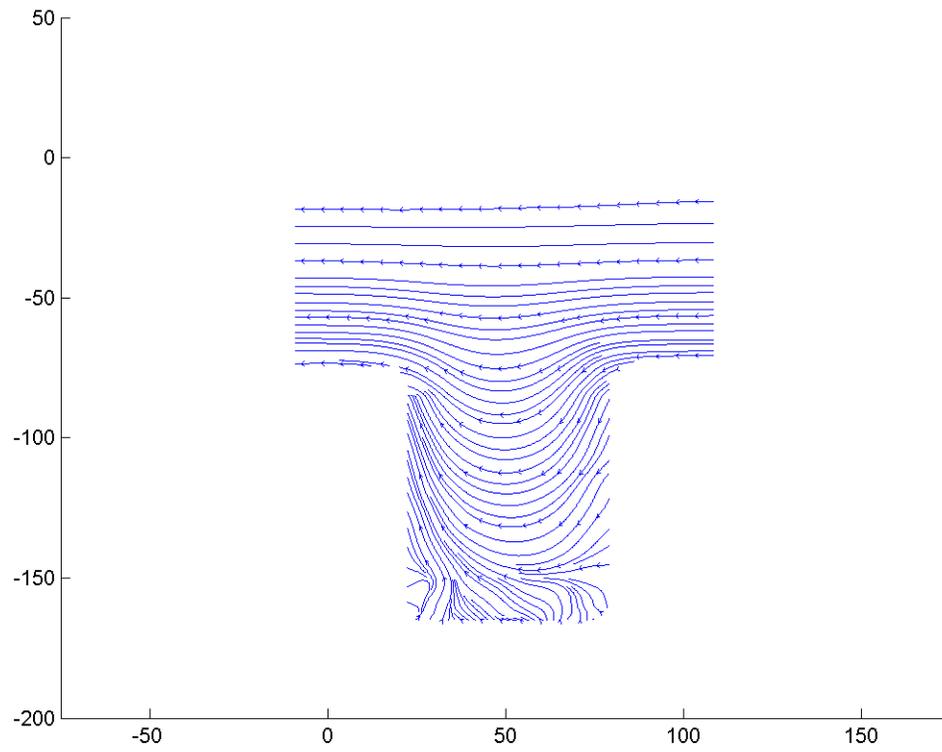


Figure F.43: Streamline image during phase increment 2 at 13 Hz and a Re of 0.1.

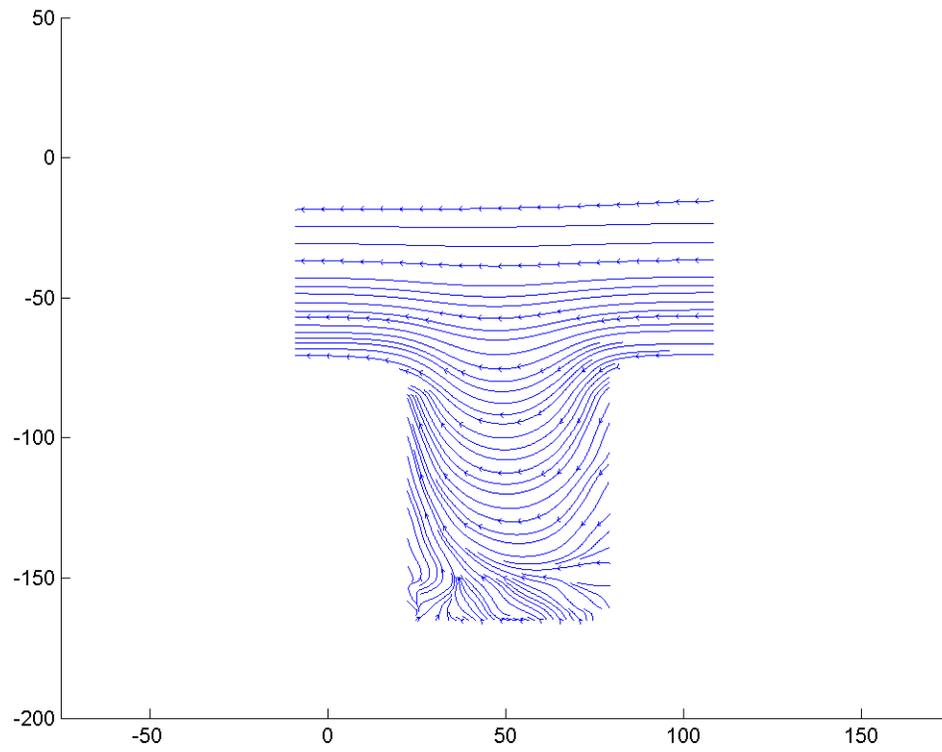


Figure F.44: Streamline image during phase increment 3 at 13 Hz and a Re of 0.1.

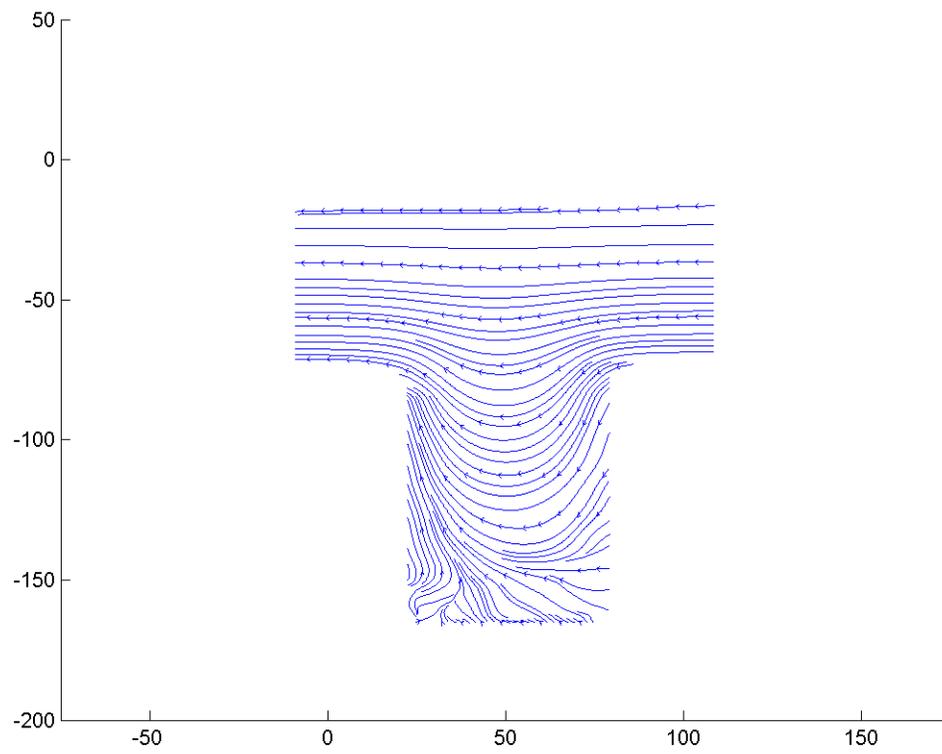


Figure F.45: Streamline image during phase increment 4 at 13 Hz and a Re of 0.1.

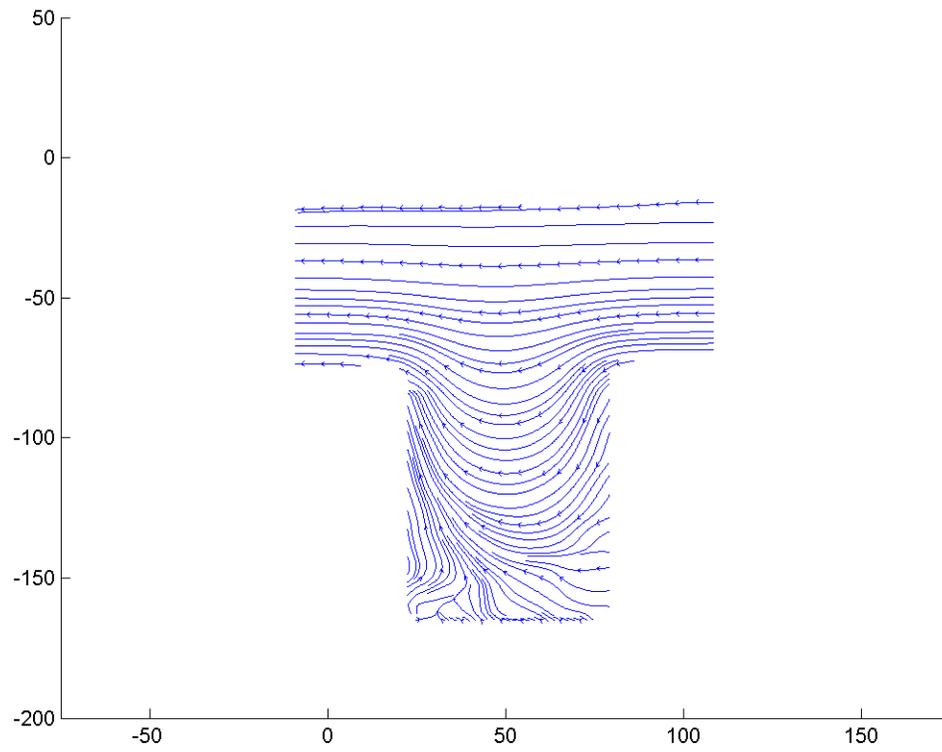


Figure F.46: Streamline image during phase increment 5 at 13 Hz and a Re of 0.1.

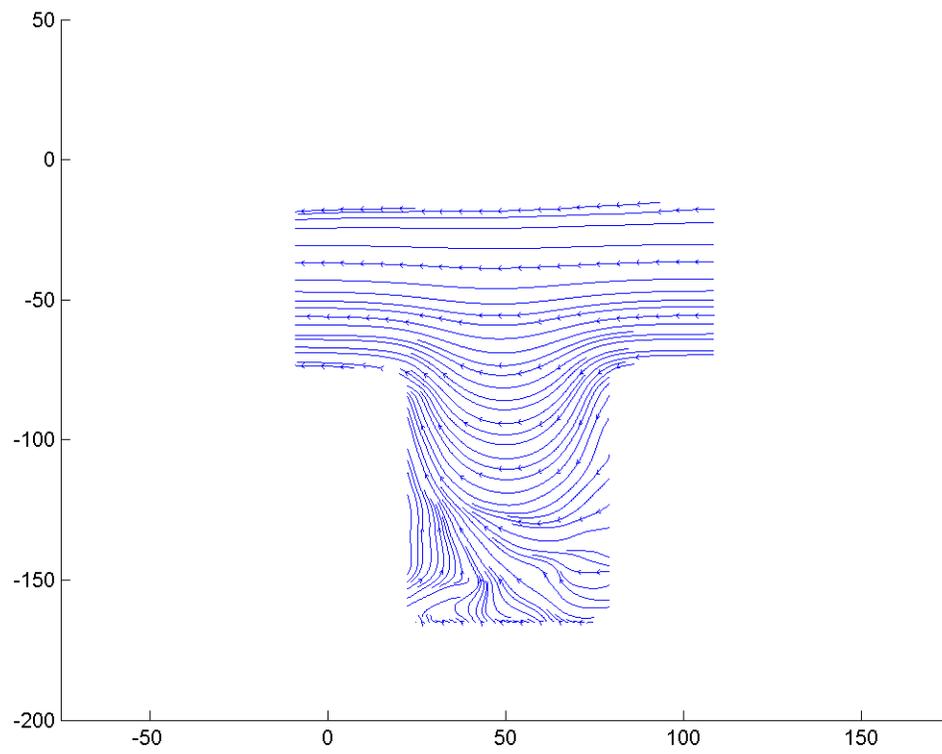


Figure F.47: Streamline image during phase increment 6 at 13 Hz and a Re of 0.1.

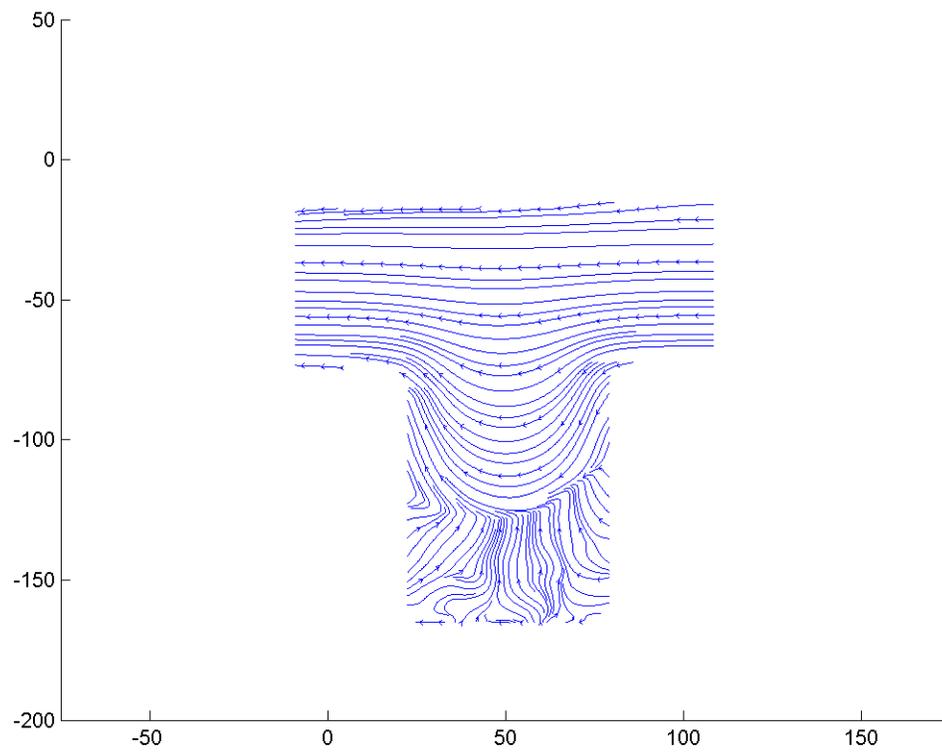


Figure F.48: Streamline image during phase increment 7 at 13 Hz and a Re of 0.1.

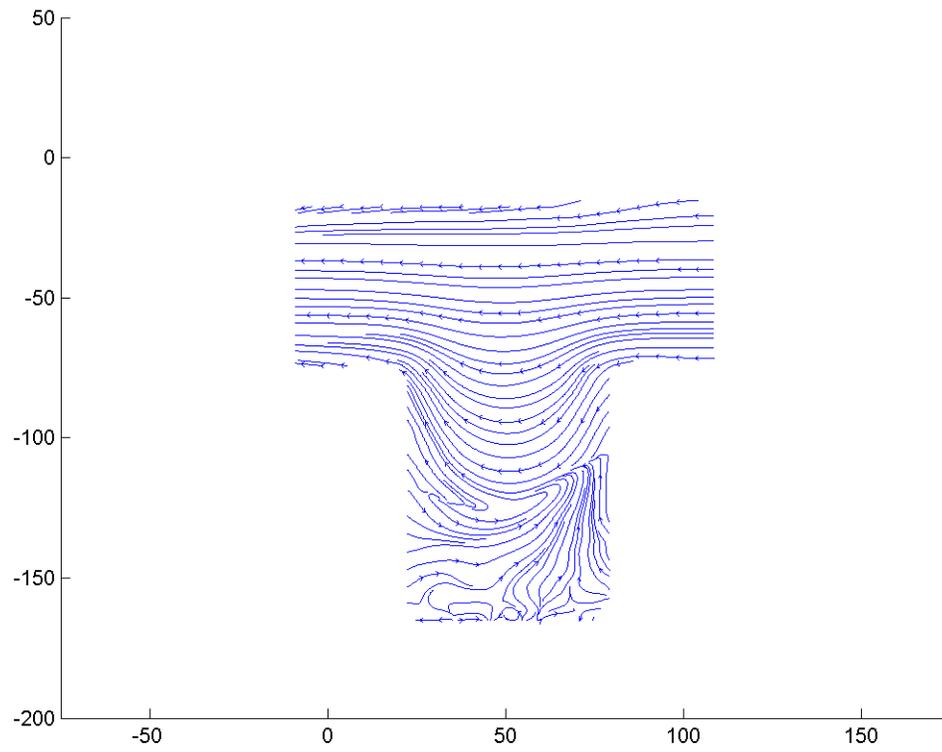


Figure F.49: Streamline image during phase increment 8 at 13 Hz and a Re of 0.1.

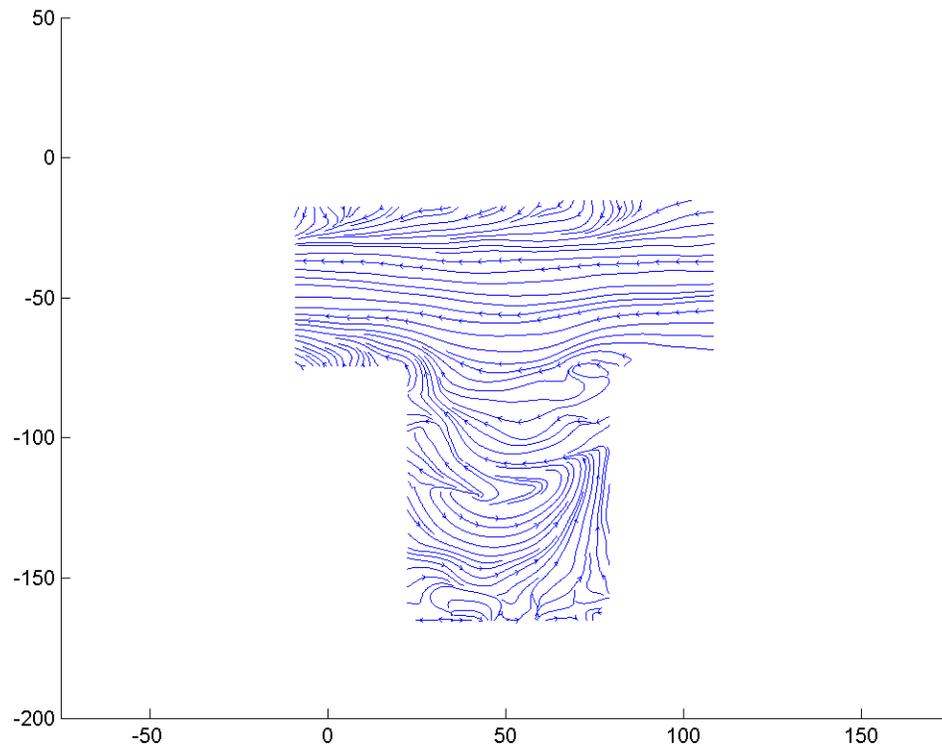


Figure F.50: Streamline image during phase increment 9 at 13 Hz and a Re of 0.1.

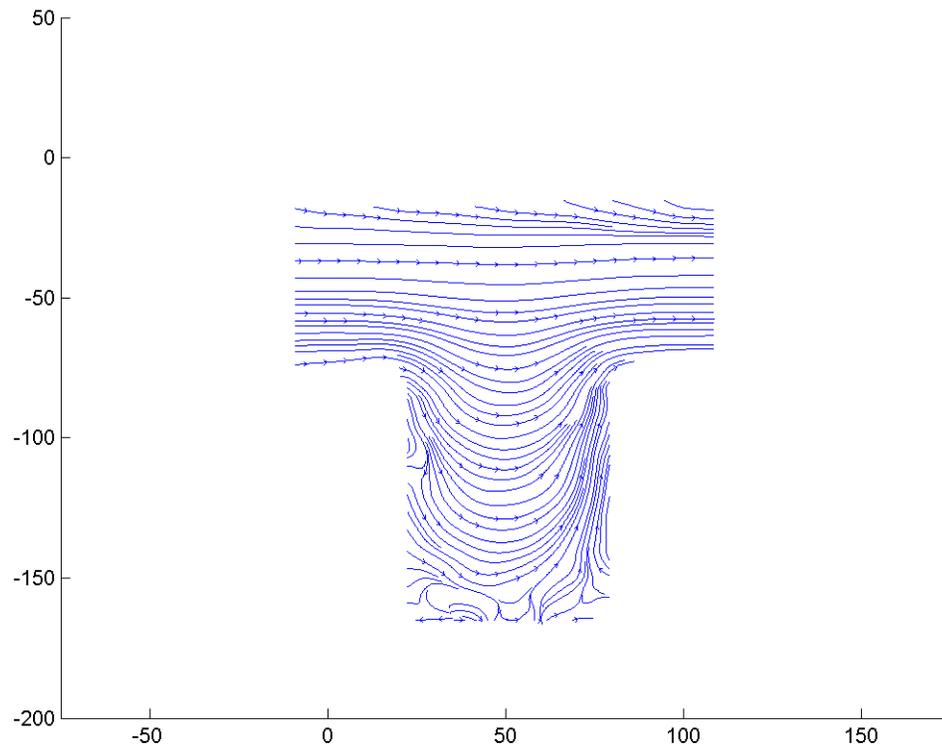


Figure F.51: Streamline image during phase increment 10 at 13 Hz and a Re of 0.1.

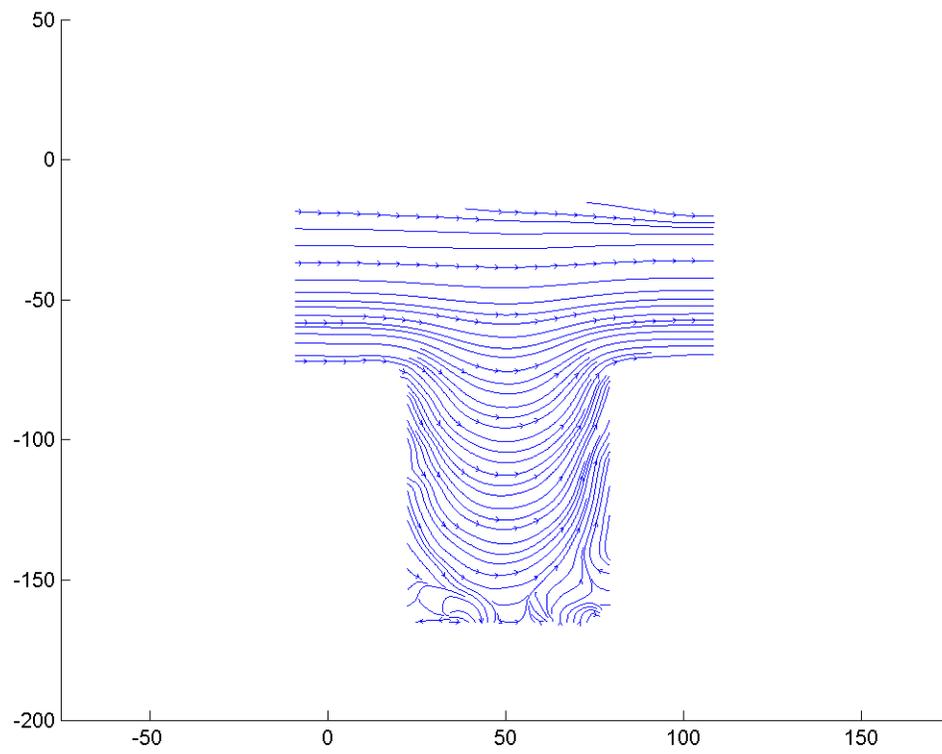


Figure F.52: Streamline image during phase increment 11 at 13 Hz and a Re of 0.1.

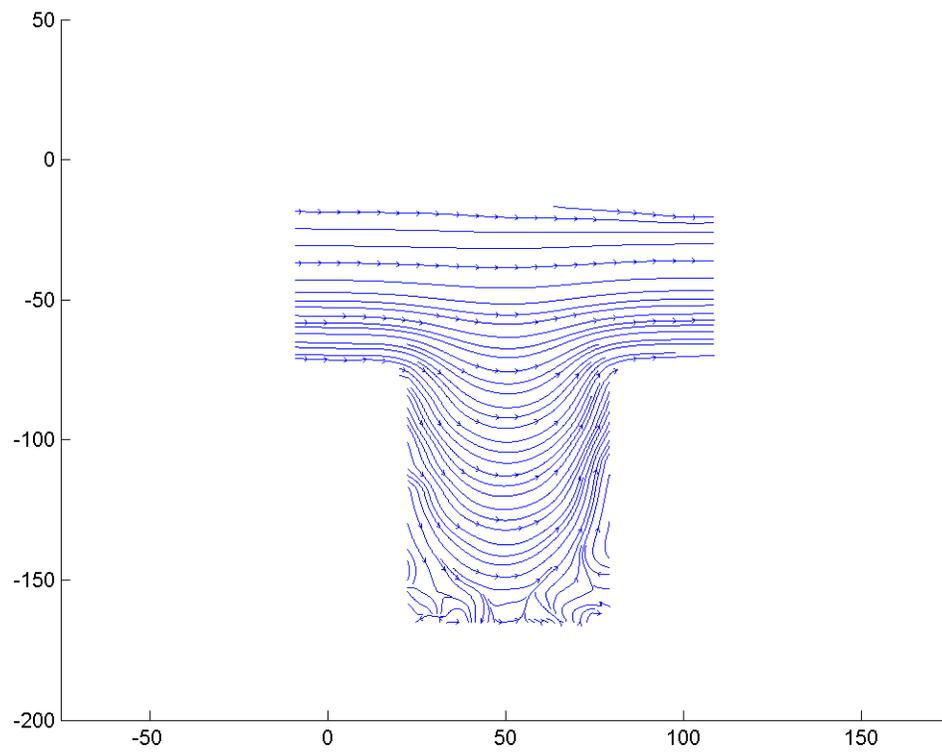


Figure F.53: Streamline image during phase increment 12 at 13 Hz and a Re of 0.1.

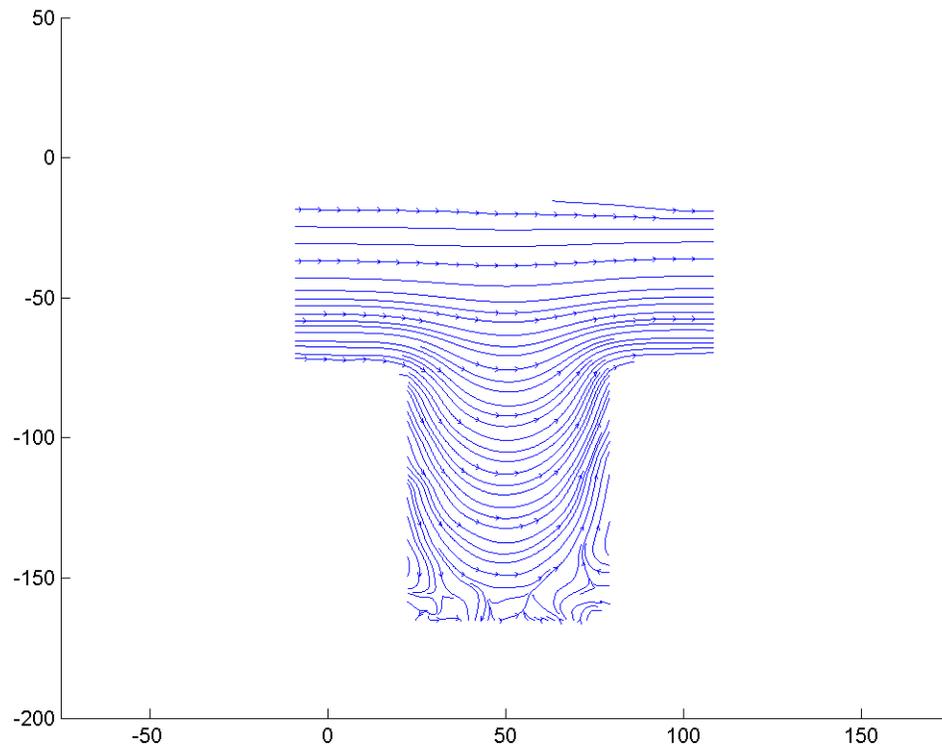


Figure F.54: Streamline image during phase increment 13 at 13 Hz and a Re of 0.1.

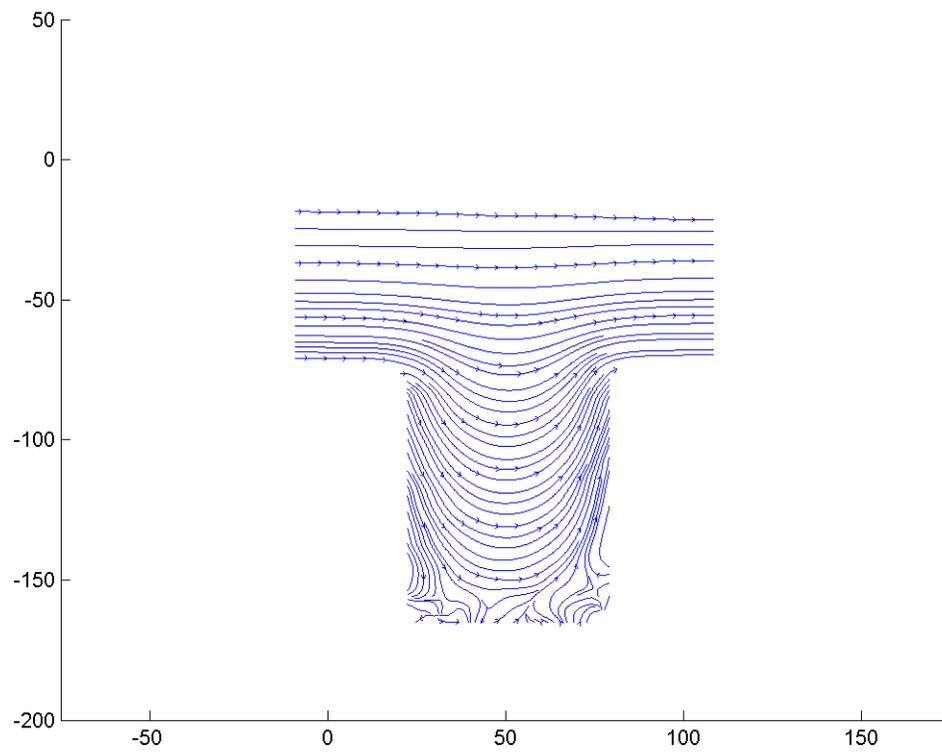


Figure F.55: Streamline image during phase increment 14 at 13 Hz and a Re of 0.1.

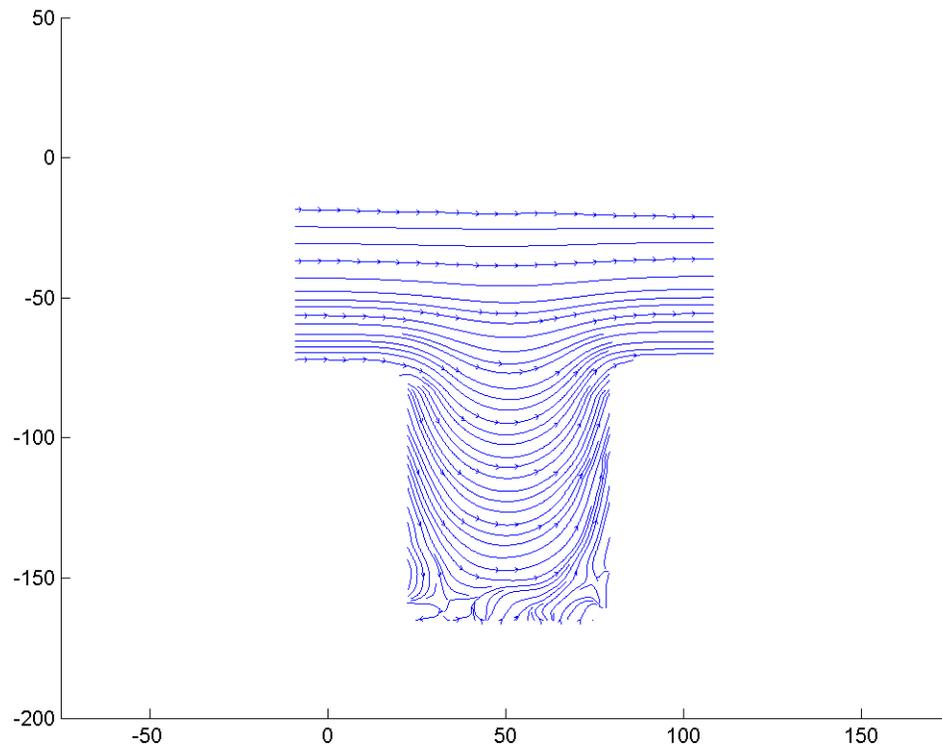


Figure F.56: Streamline image during phase increment 15 at 13 Hz and a Re of 0.1.

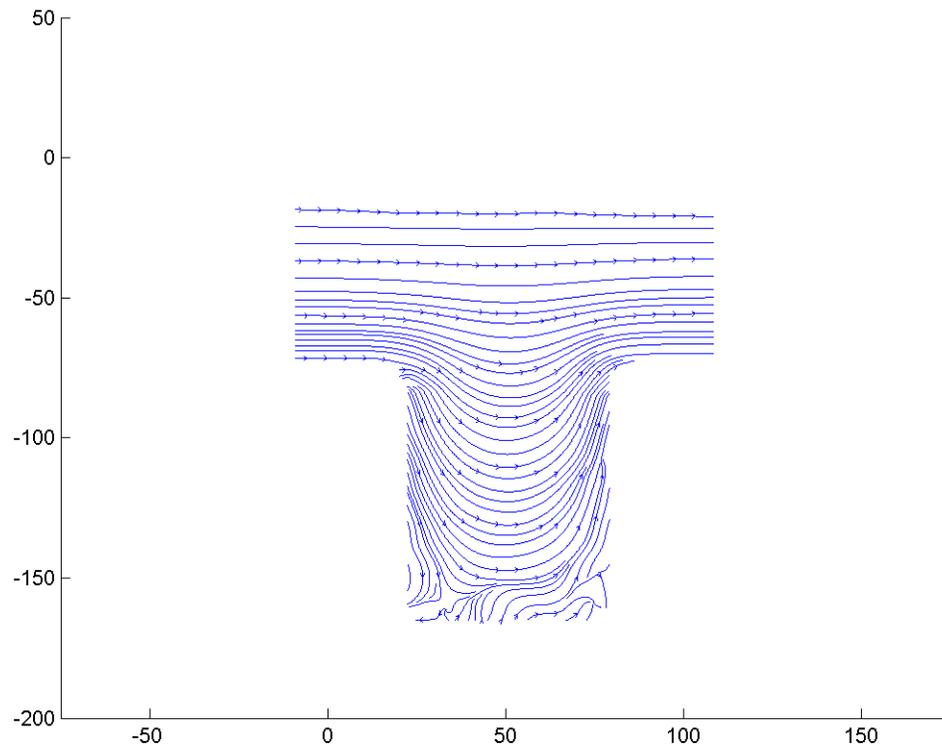


Figure F.57: Streamline image during phase increment 16 at 13 Hz and a Re of 0.1.

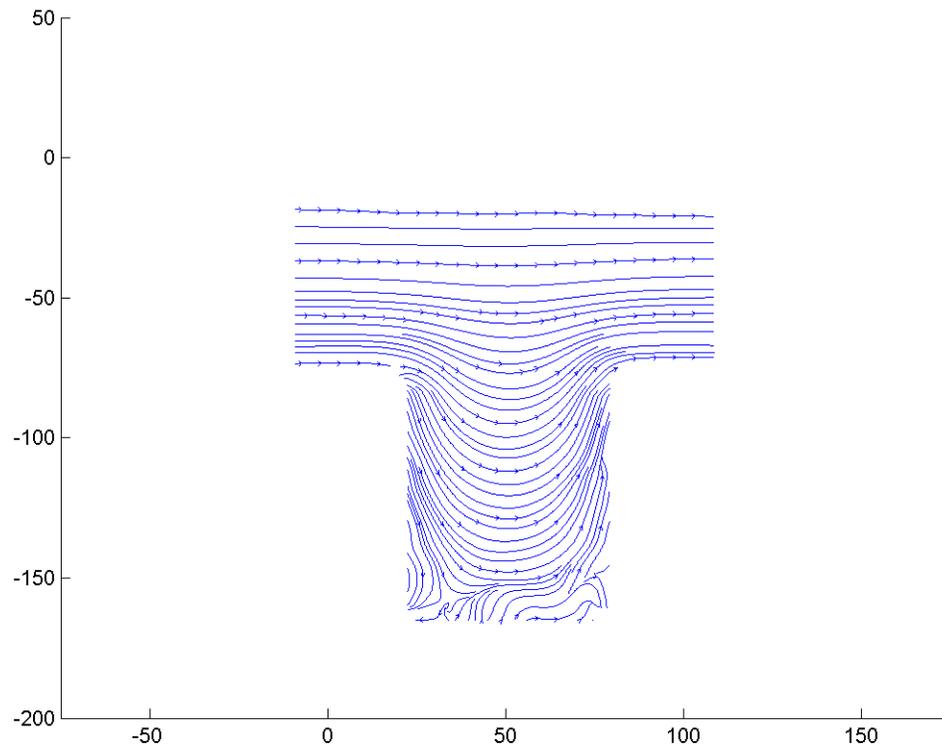


Figure F.58: Streamline image during phase increment 17 at 13 Hz and a Re of 0.1.

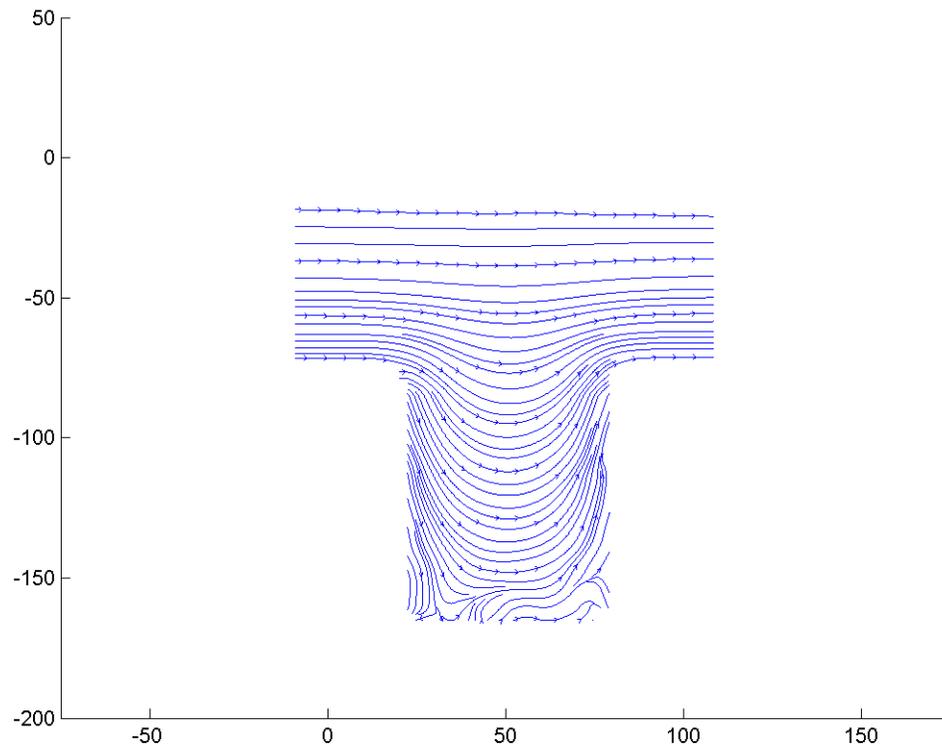


Figure F.59: Streamline image during phase increment 18 at 13 Hz and a Re of 0.1.

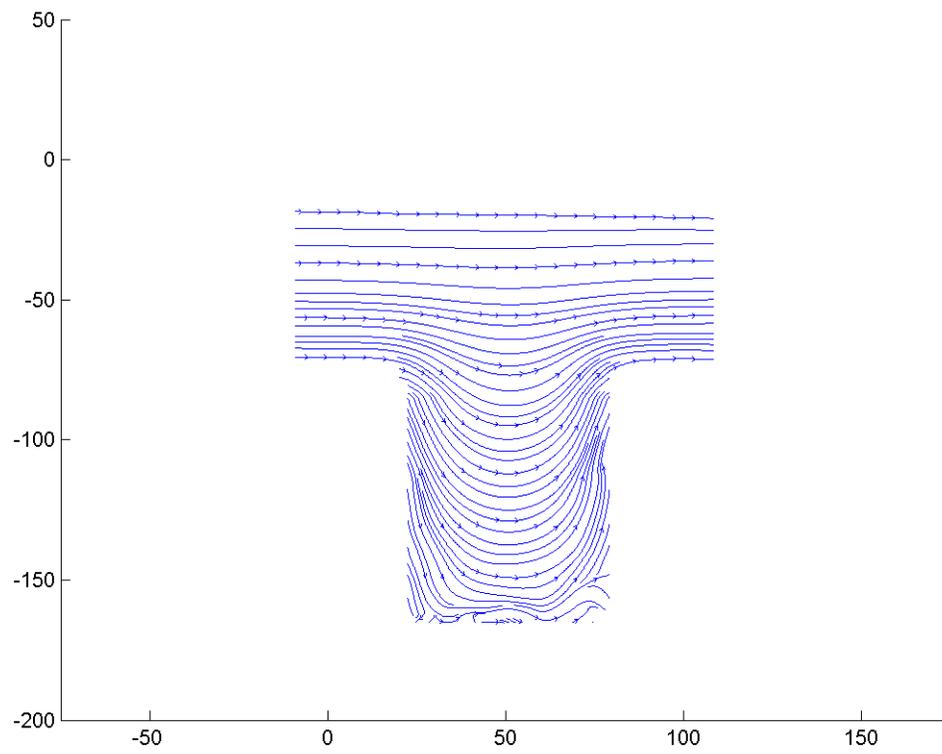


Figure F.60: Streamline image during phase increment 18 at 13 Hz and a Re of 0.1.

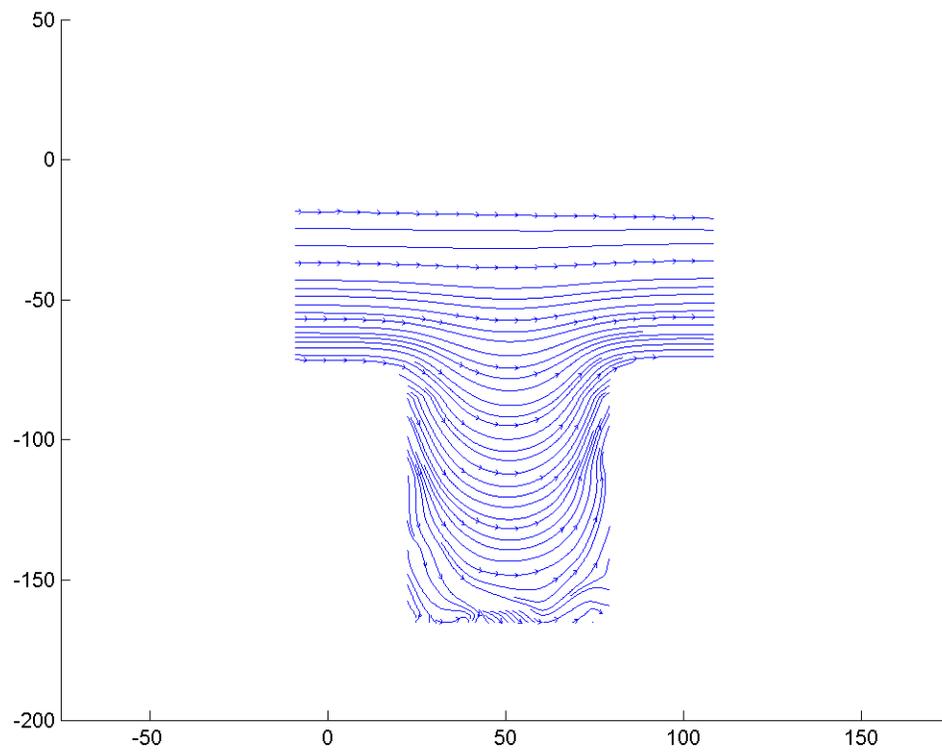


Figure F.61: Streamline image during phase increment 20 at 13 Hz and a Re of 0.1.

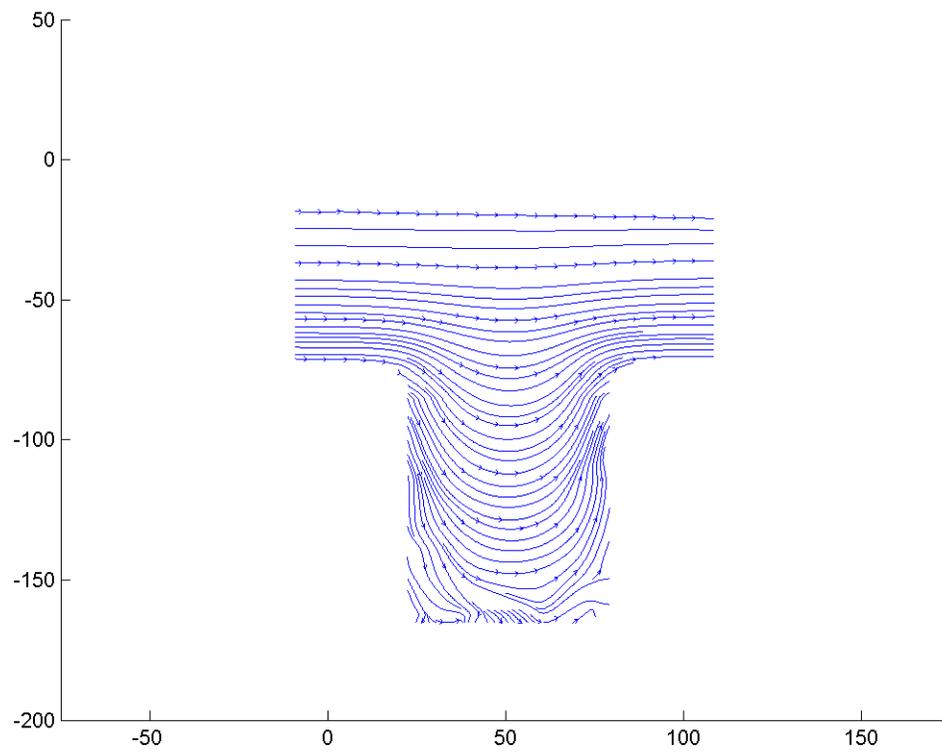


Figure F.62: Streamline image during phase increment 21 at 13 Hz and a Re of 0.1.

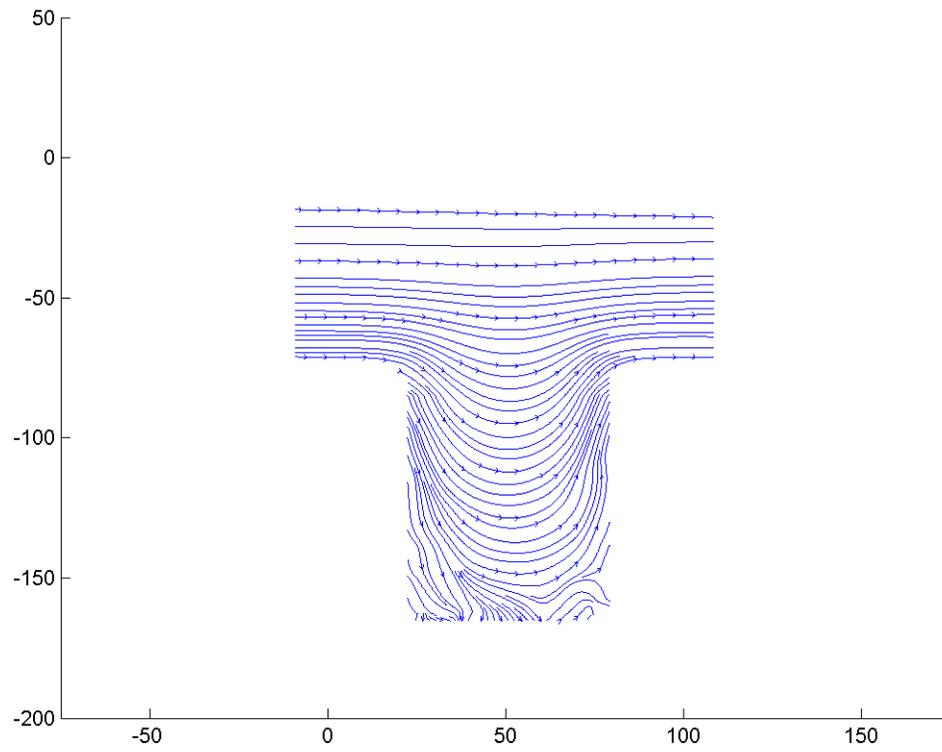


Figure F.63: Streamline image during phase increment 22 at 13 Hz and a Re of 0.1.

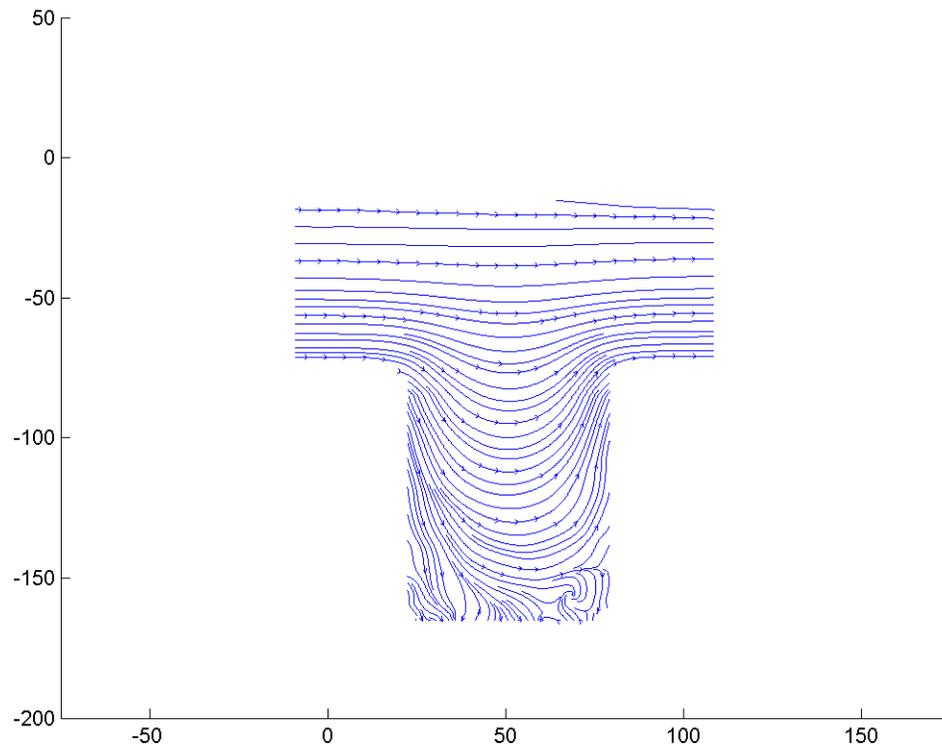


Figure F.64: Streamline image during phase increment 23 at 13 Hz and a Re of 0.1.

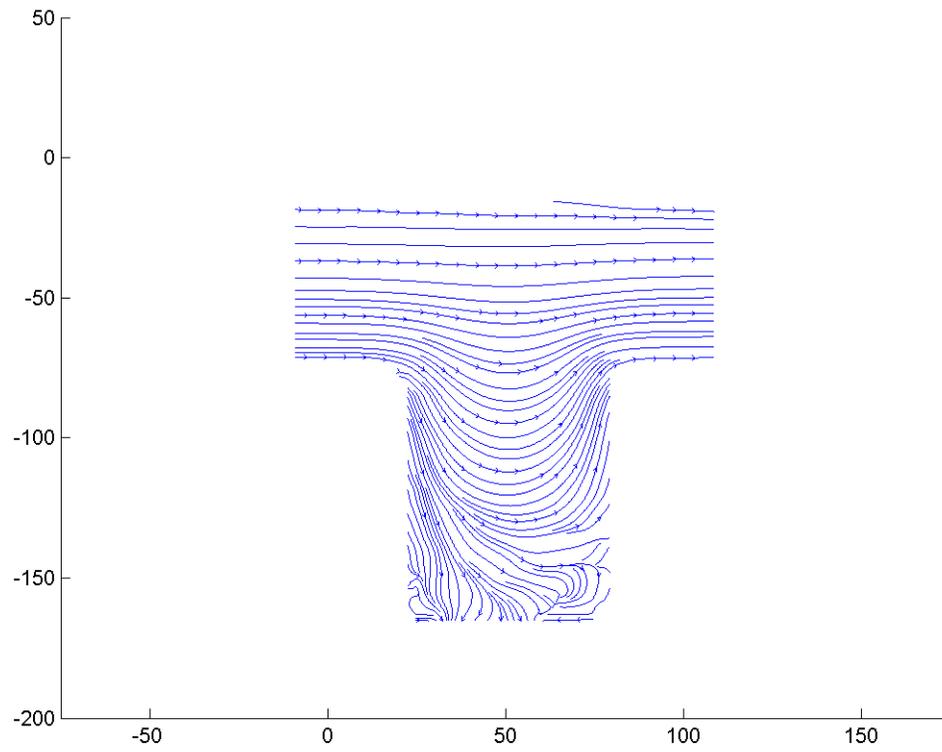


Figure F.65: Streamline image during phase increment 24 at 13 Hz and a Re of 0.1.

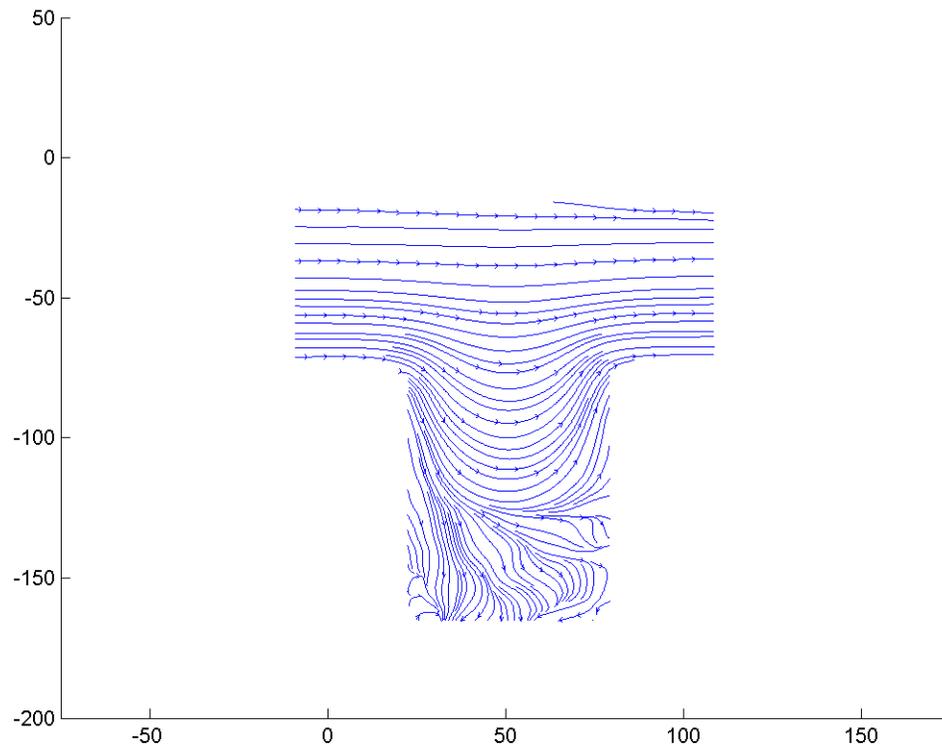


Figure F.66: Streamline image during phase increment 25 at 13 Hz and a Re of 0.1.

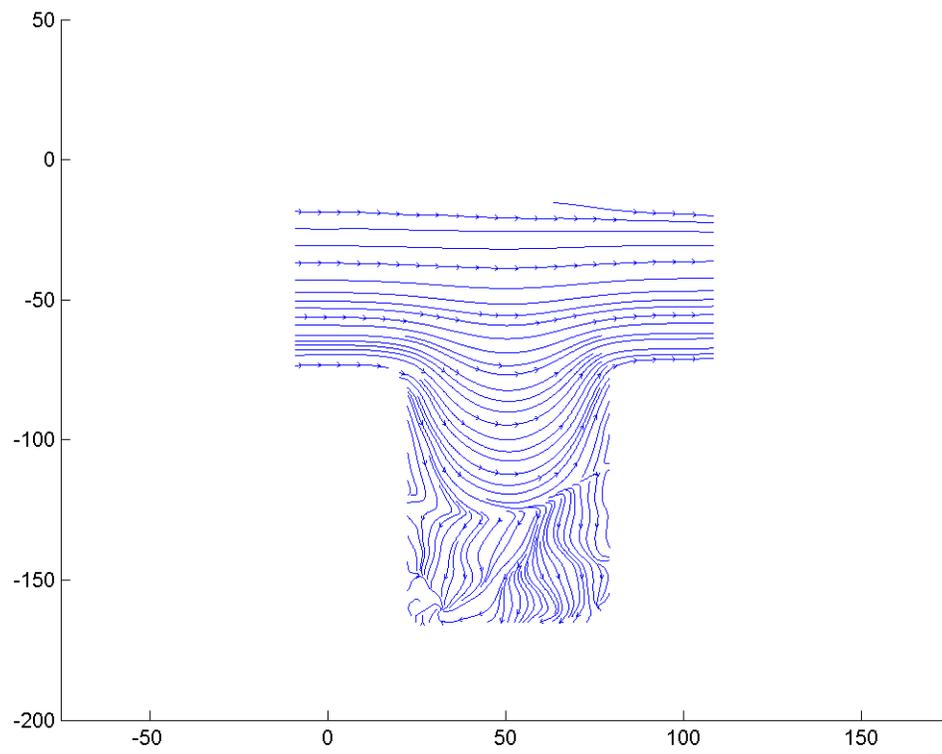


Figure F.67: Streamline image during phase increment 26 at 13 Hz and a Re of 0.1.

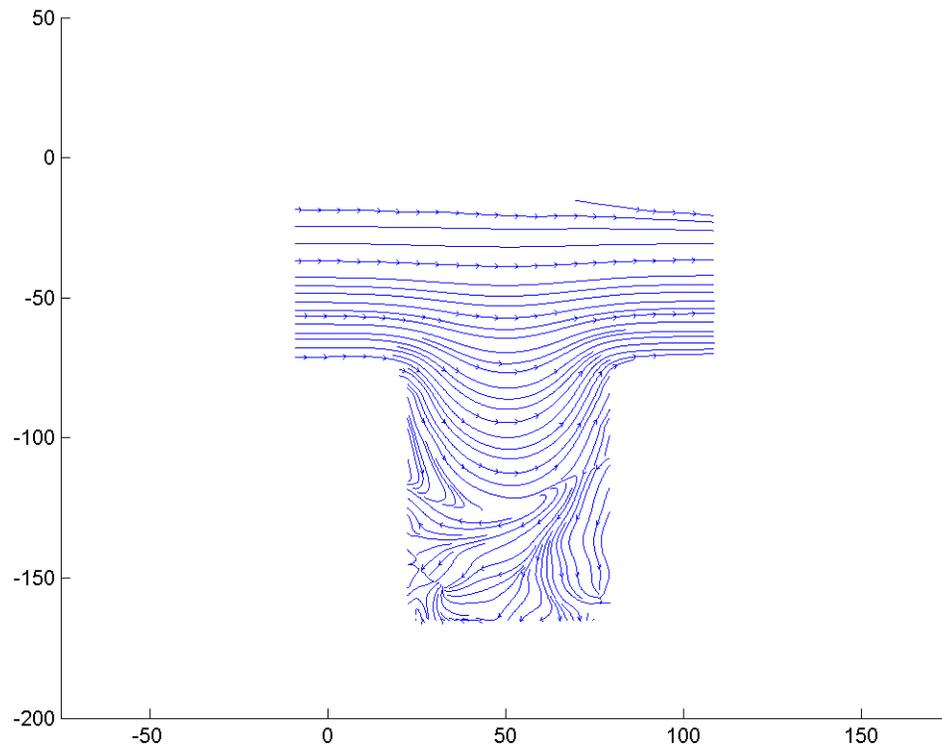


Figure F.68: Streamline image during phase increment 27 at 13 Hz and a Re of 0.1.

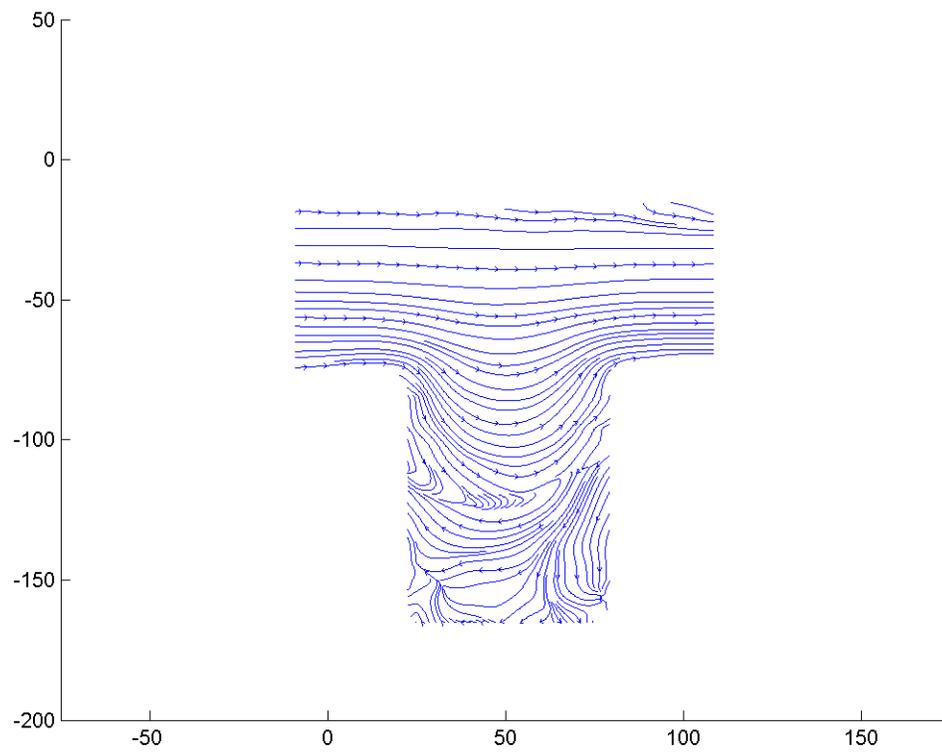


Figure F.69: Streamline image during phase increment 28 at 13 Hz and a Re of 0.1.

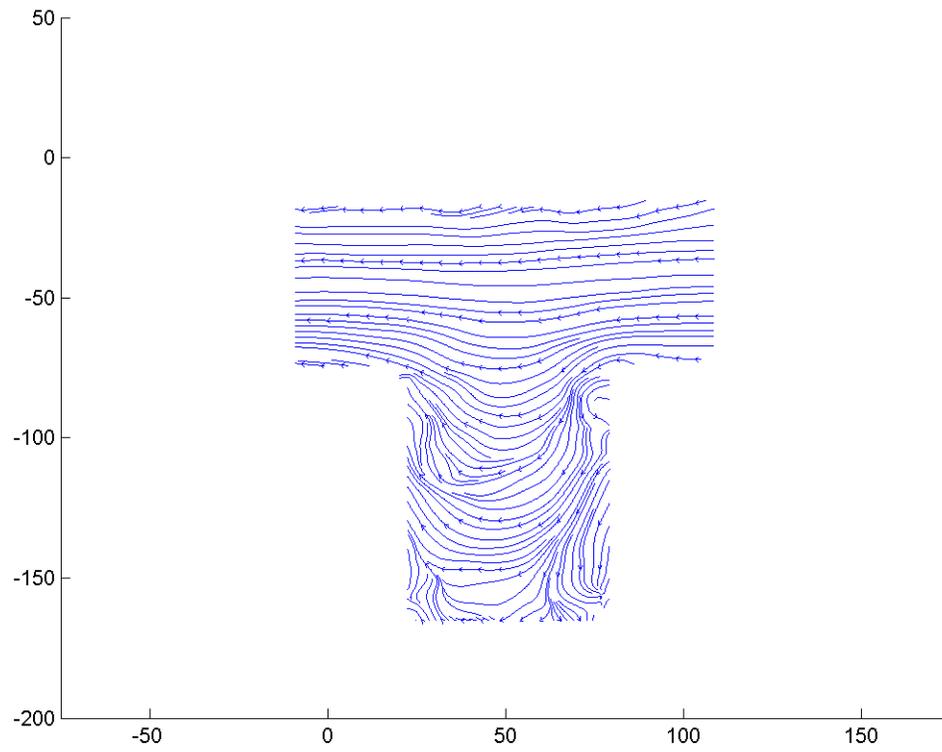


Figure F.70: Streamline image during phase increment 29 at 13 Hz and a Re of 0.1.

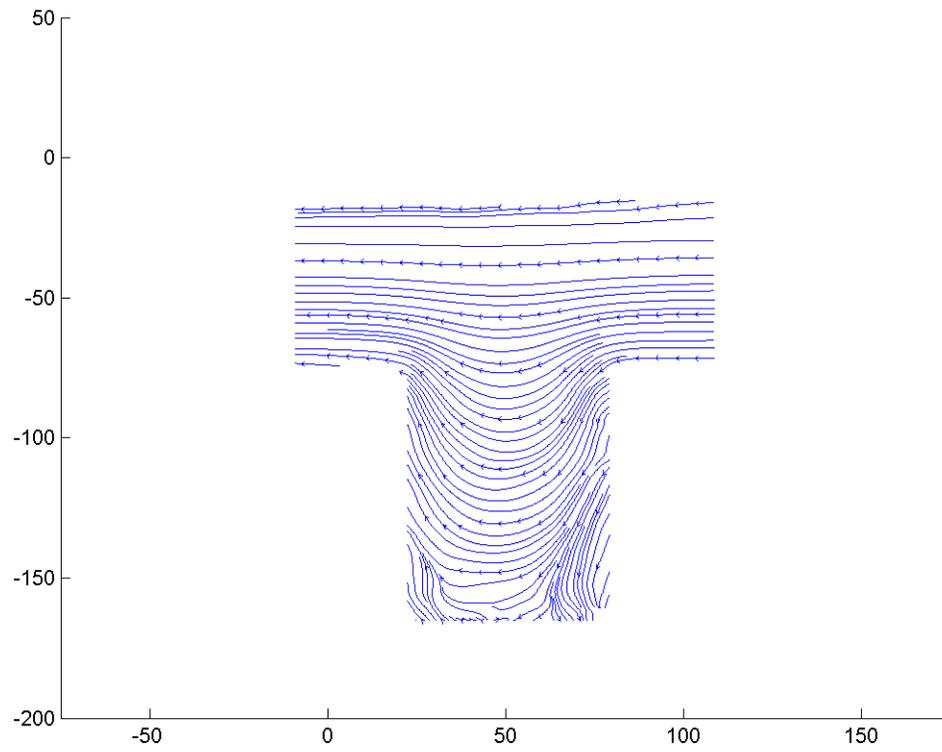


Figure F.71: Streamline image during phase increment 30 at 13 Hz and a Re of 0.1.

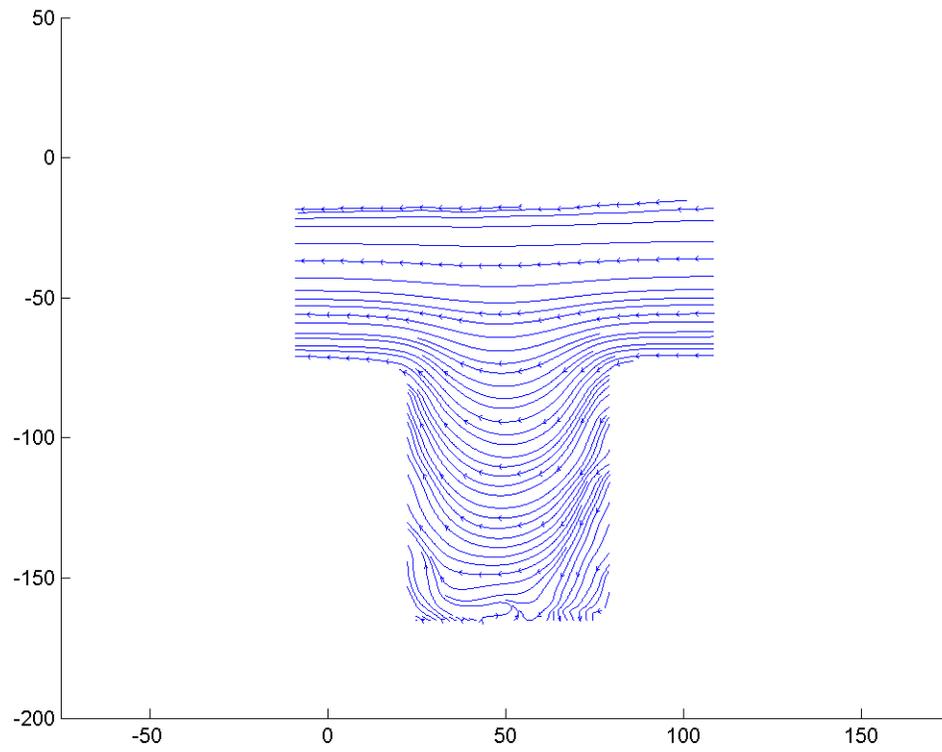


Figure F.72: Streamline image during phase increment 31 at 13 Hz and a Re of 0.1.

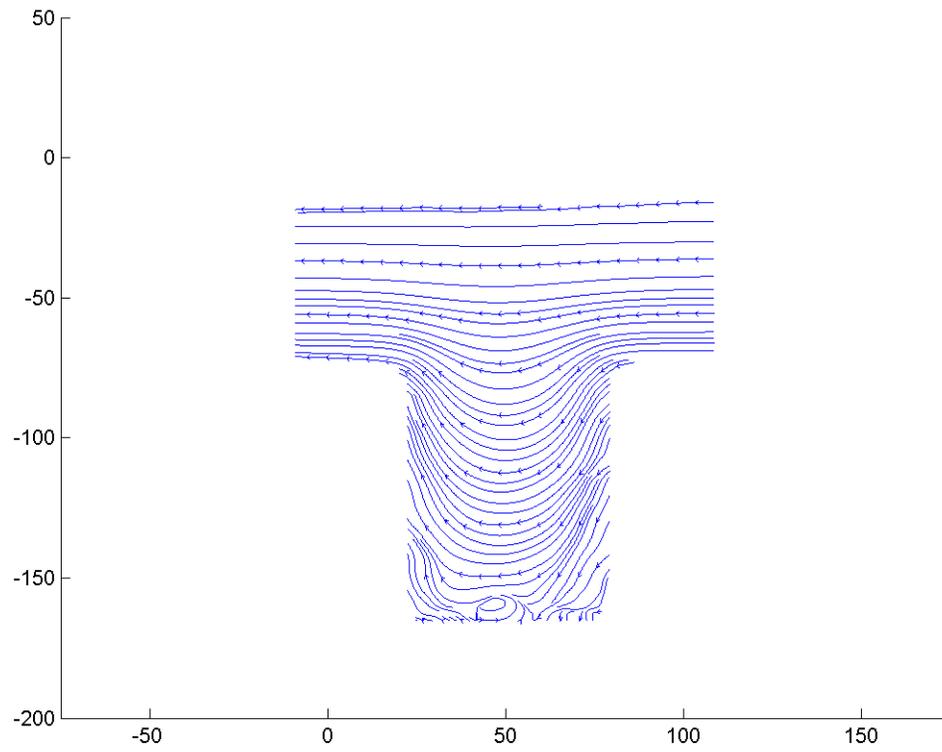


Figure F.73: Streamline image during phase increment 32 at 13 Hz and a Re of 0.1.

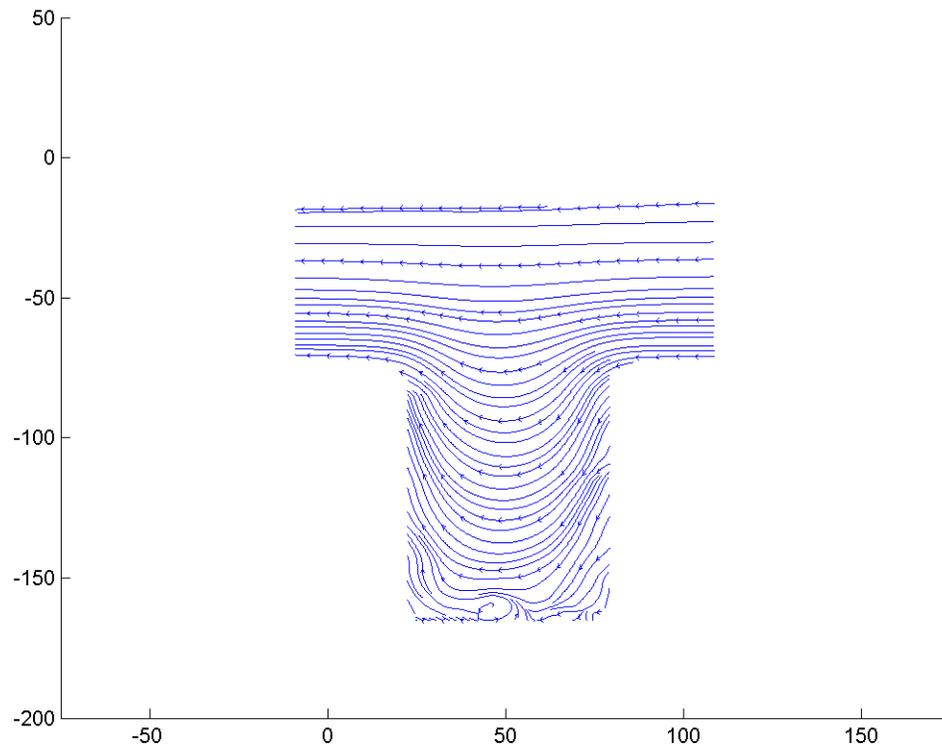


Figure F.74: Streamline image during phase increment 33 at 13 Hz and a Re of 0.1.

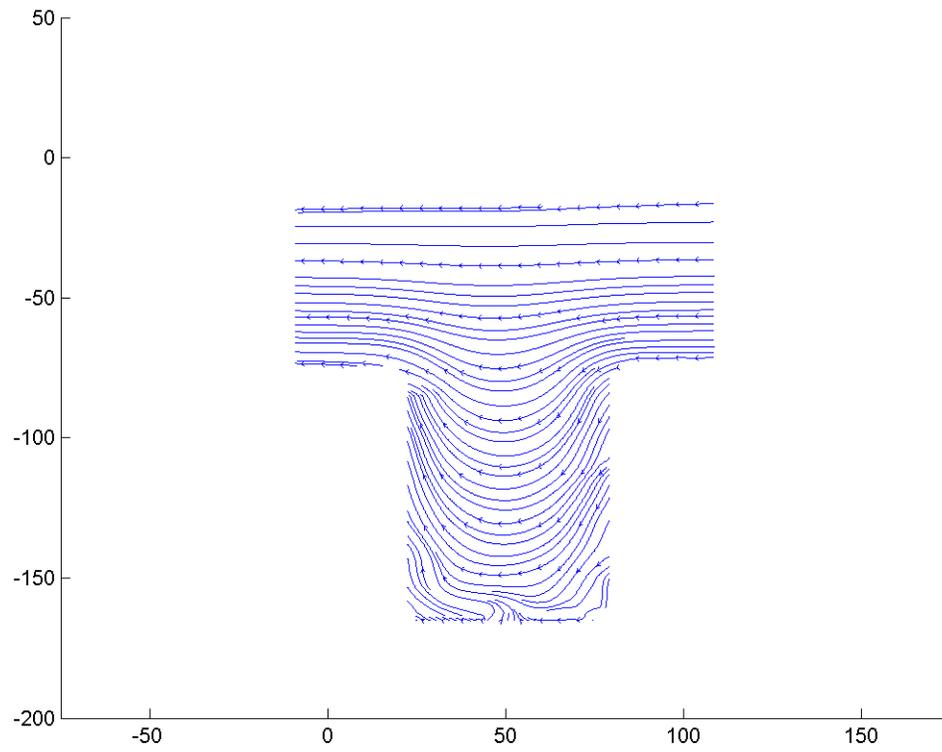


Figure F.75: Streamline image during phase increment 34 at 13 Hz and a Re of 0.1.

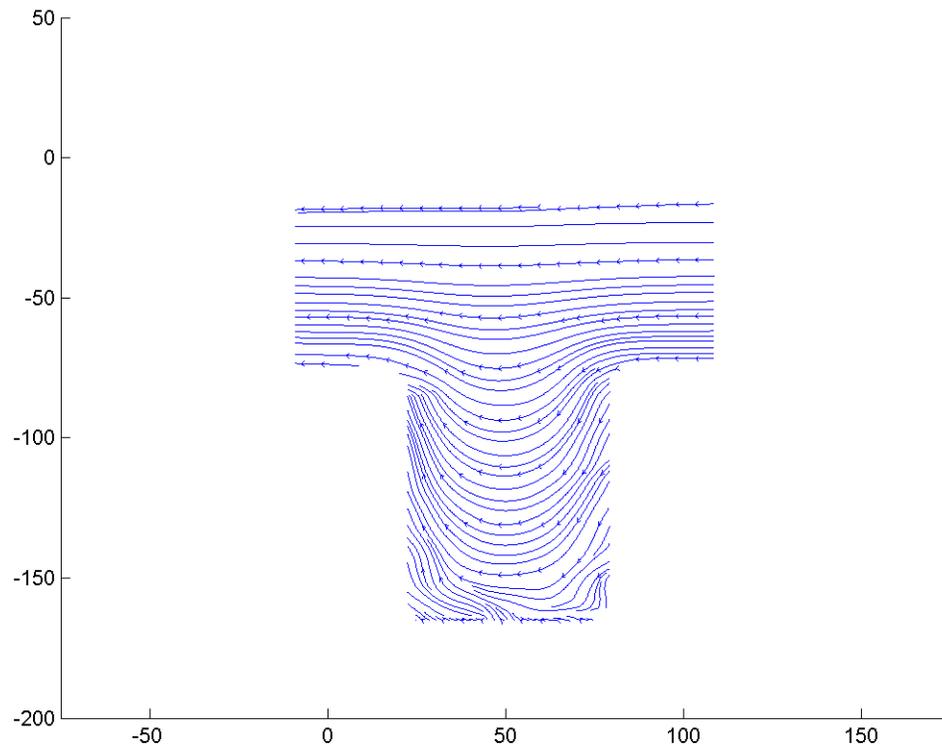


Figure F.76: Streamline image during phase increment 35 at 13 Hz and a Re of 0.1.

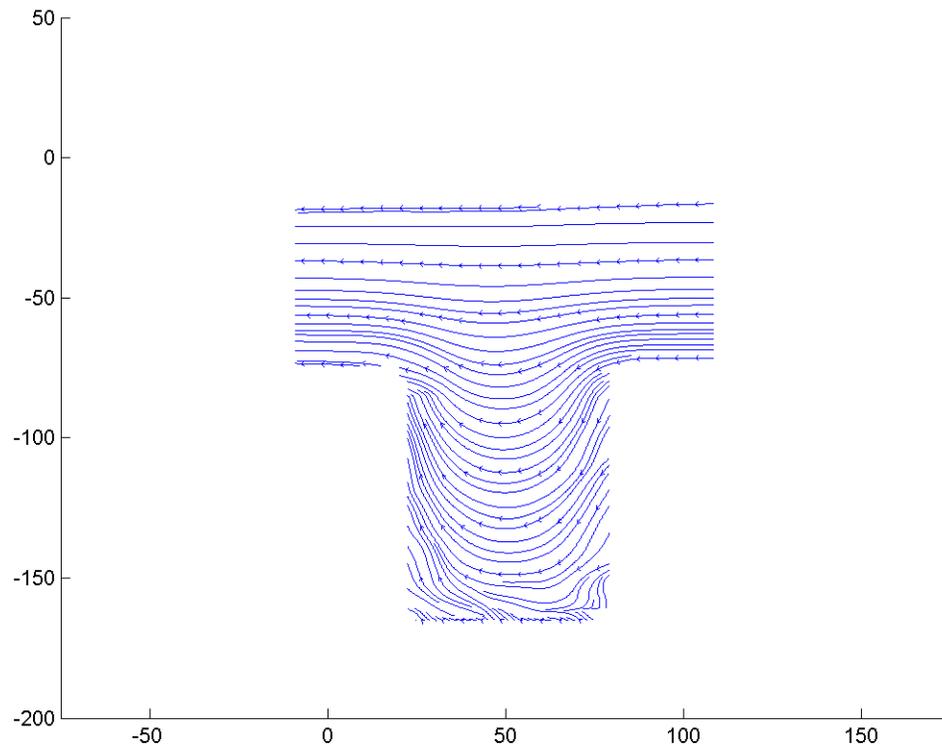


Figure F.77: Streamline image during phase increment 36 at 13 Hz and a Re of 0.1.

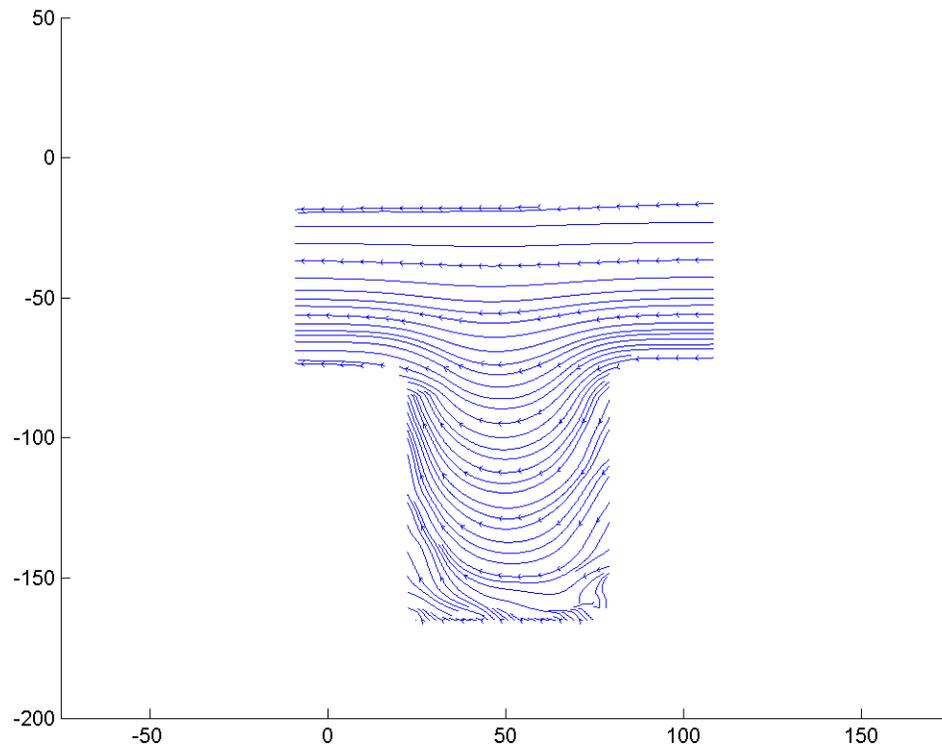


Figure F.78: Streamline image during phase increment 37 at 13 Hz and a Re of 0.1.

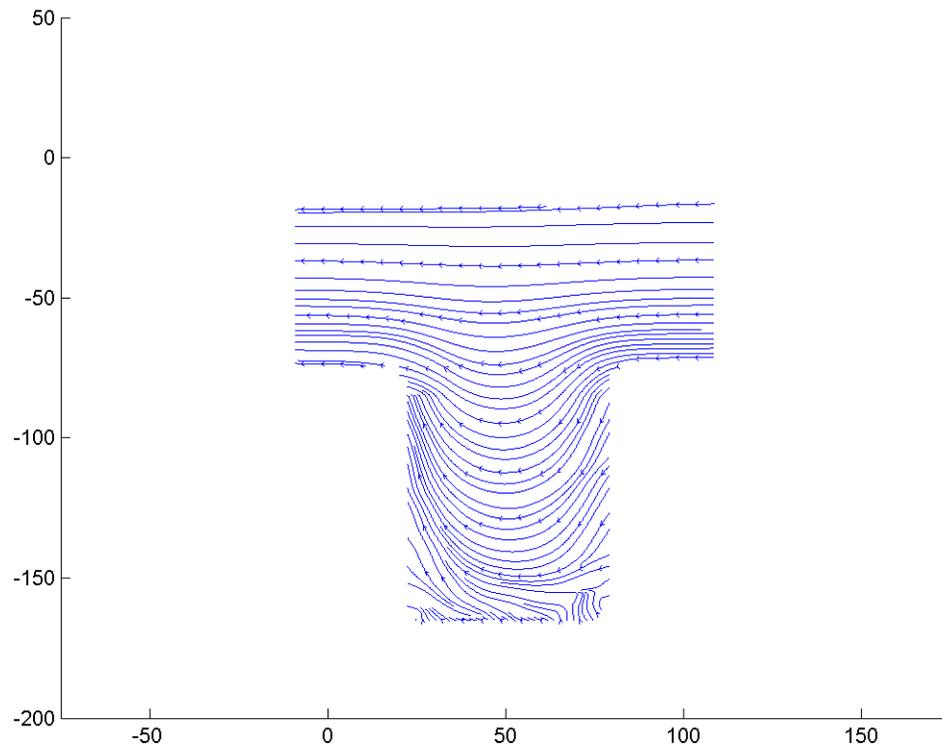


Figure F.79: Streamline image during phase increment 38 at 13 Hz and a Re of 0.1.

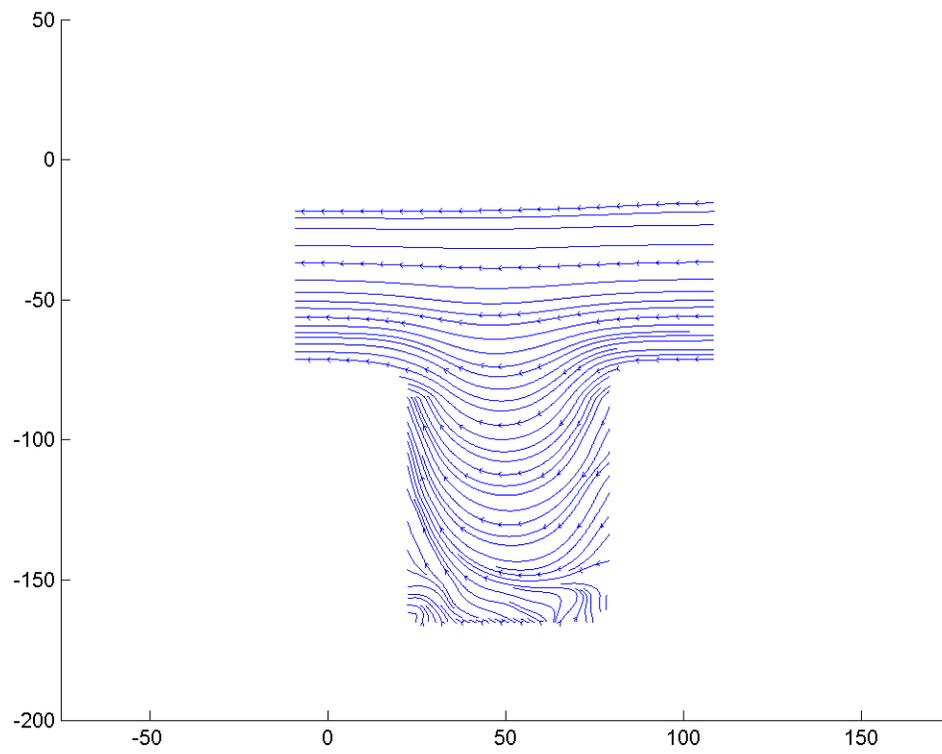


Figure F.80: Streamline image during phase increment 39 at 13 Hz and a Re of 0.1.

F.1.3 Residence time of particles in the cavity at 13 Hz

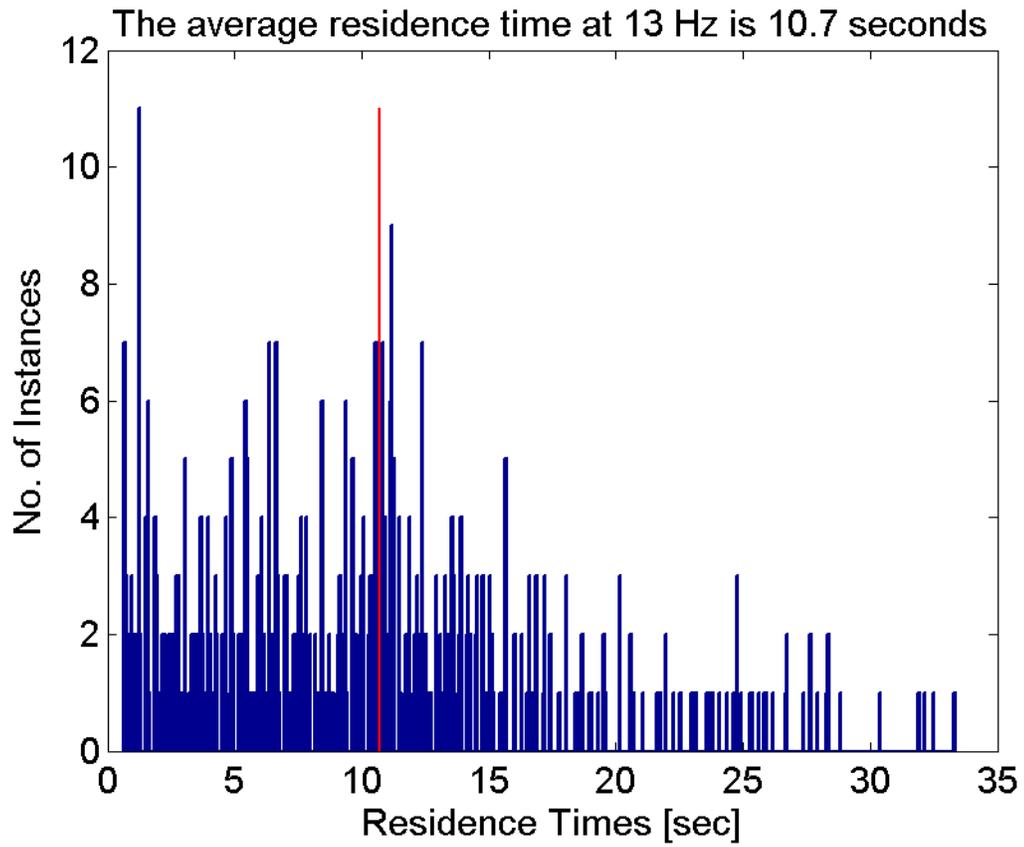


Figure F.81: The residence time distribution for the $AR = 0.5$ cavity at $Re = 0.1$ at 13 Hz. The average residence time is 10.7 secs.

F.1.4 Lagrangian coherent structures at 13 Hz

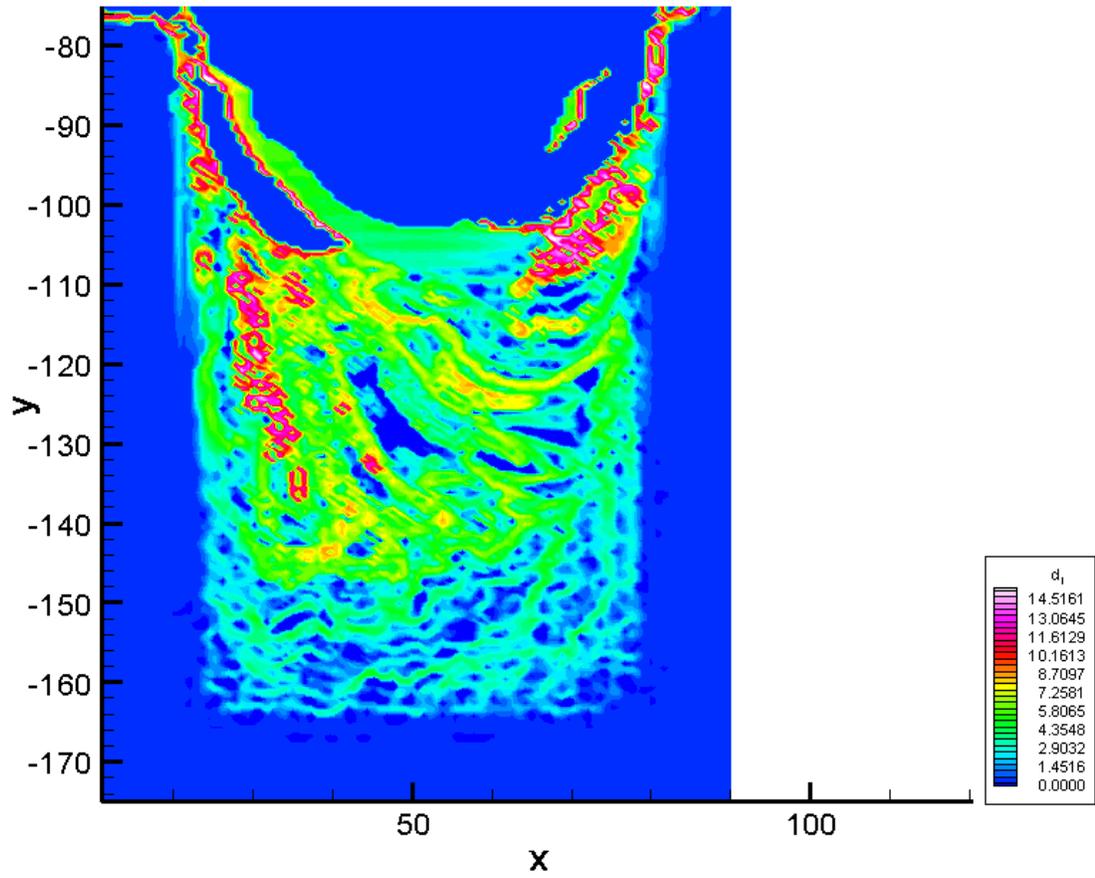


Figure F.82: The backward time LCS during phase increment 1 at 13 Hz.

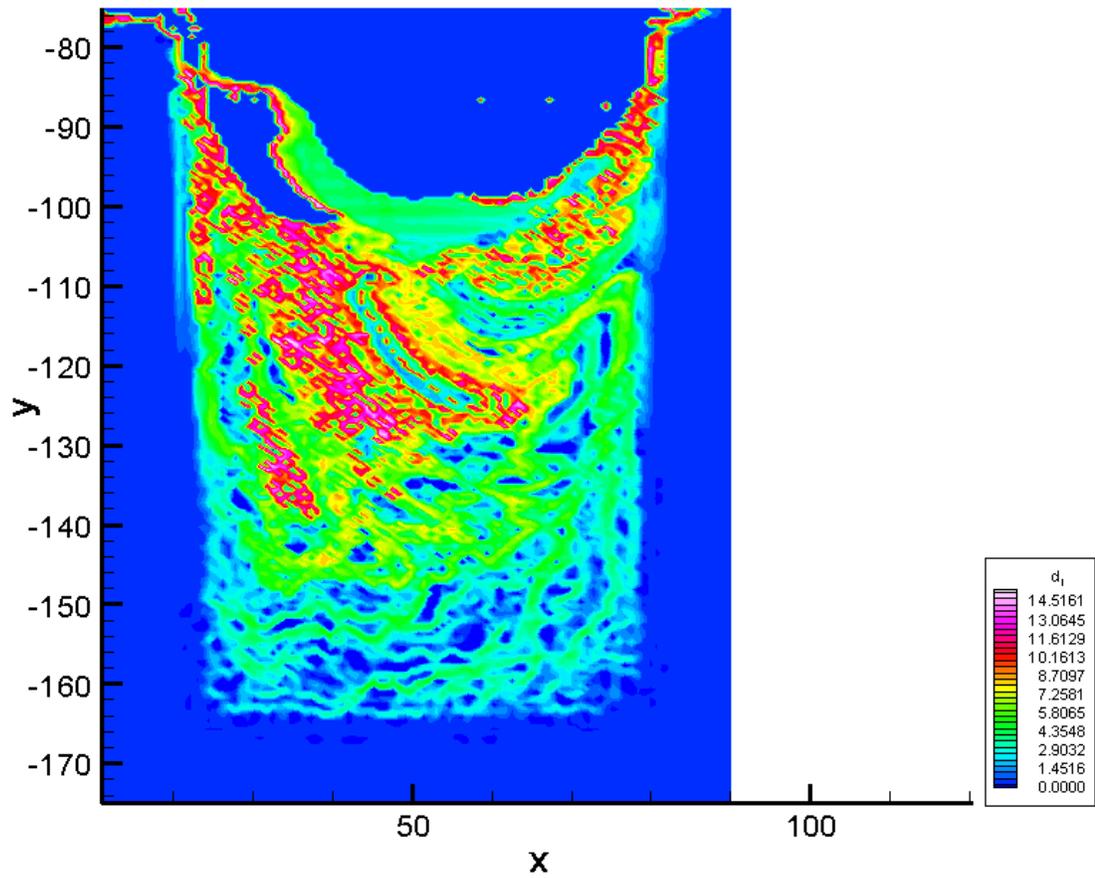


Figure F.83: The backward time LCS during phase increment 2 at 13 Hz.

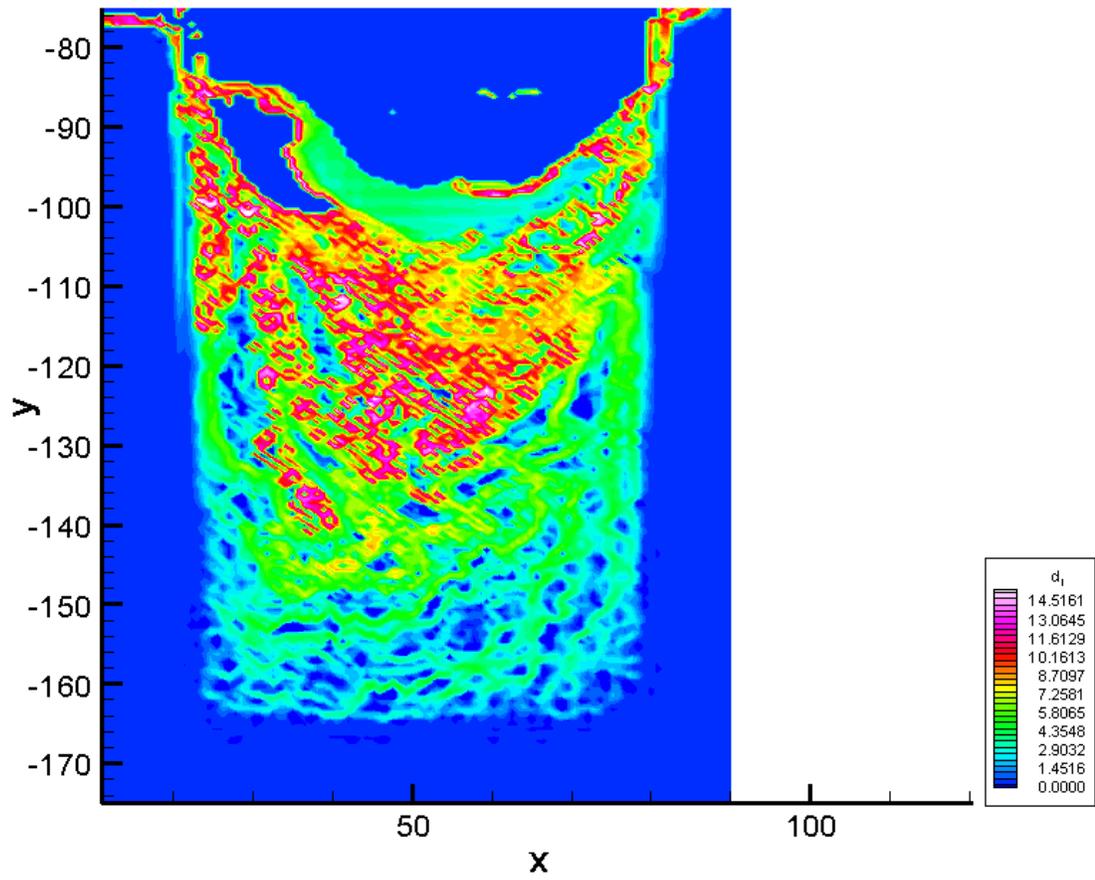


Figure F.84: The backward time LCS during phase increment 3 at 13 Hz.

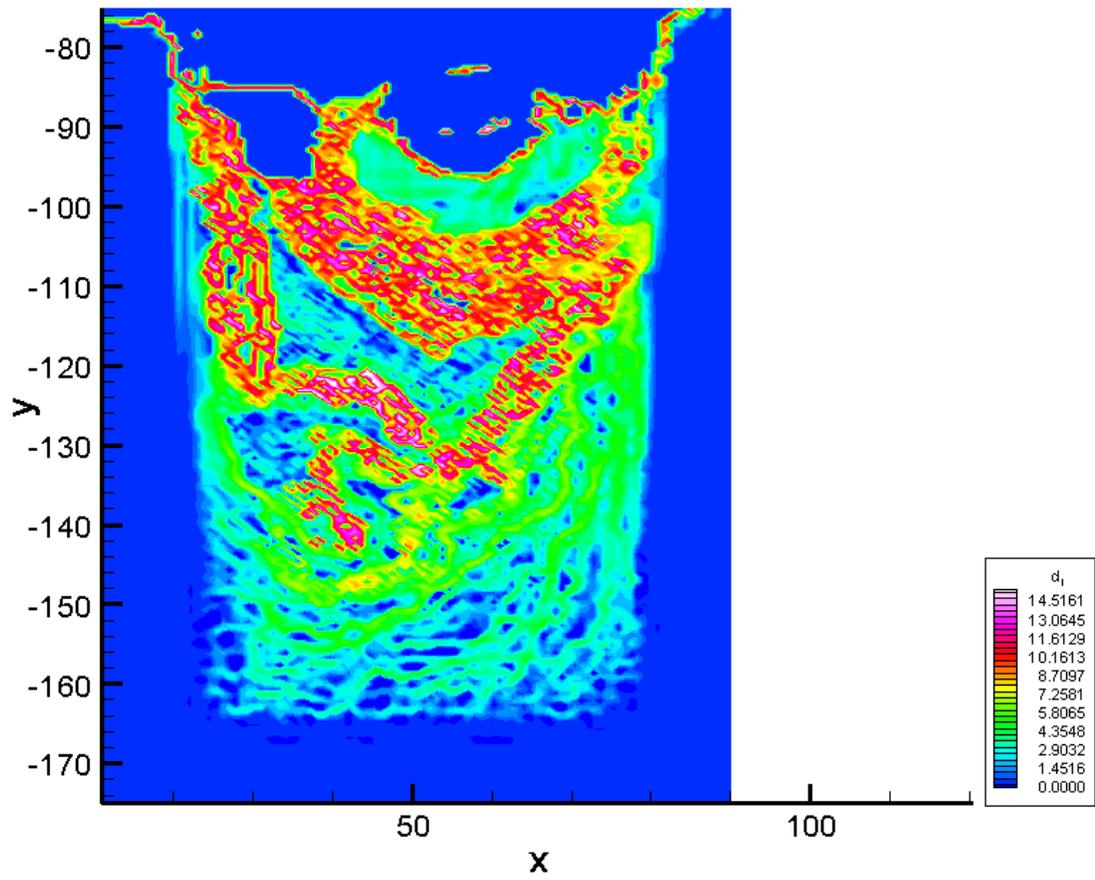


Figure F.85: The backward time LCS during phase increment 4 at 13 Hz.

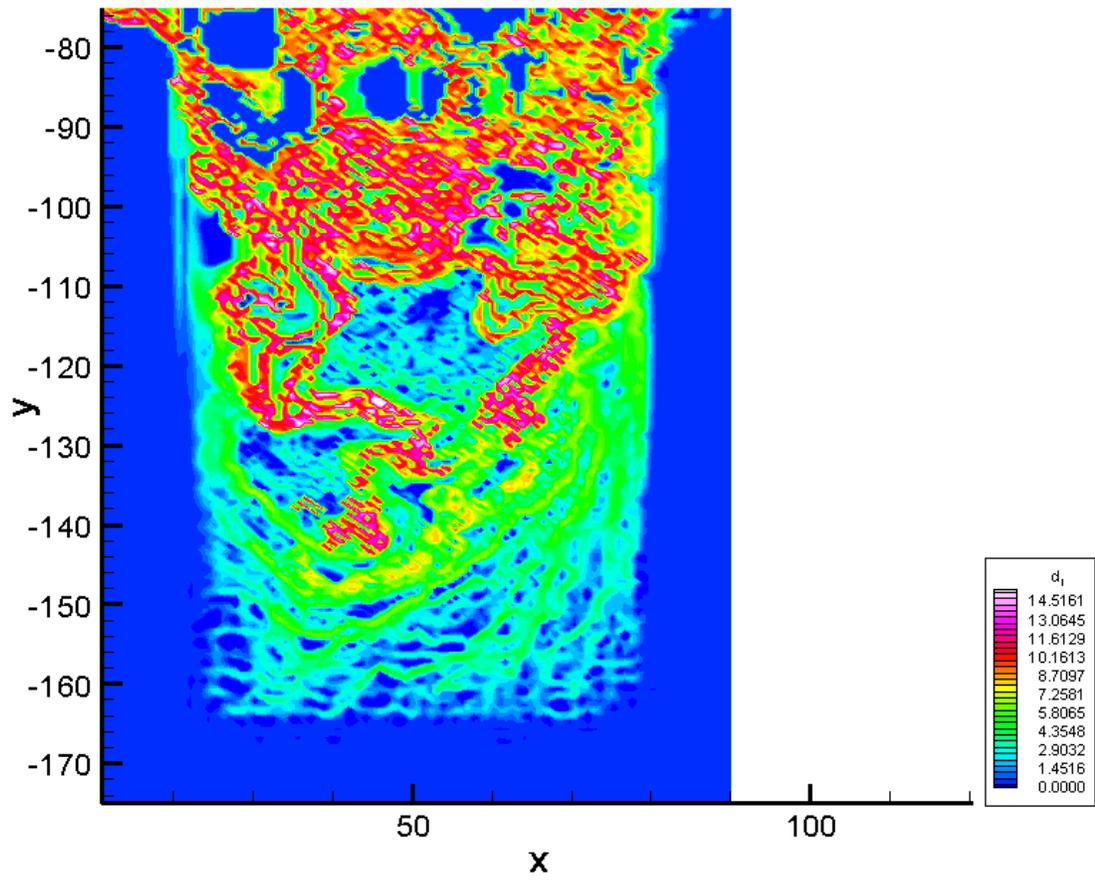


Figure F.86: The backward time LCS during phase increment 5 at 13 Hz.

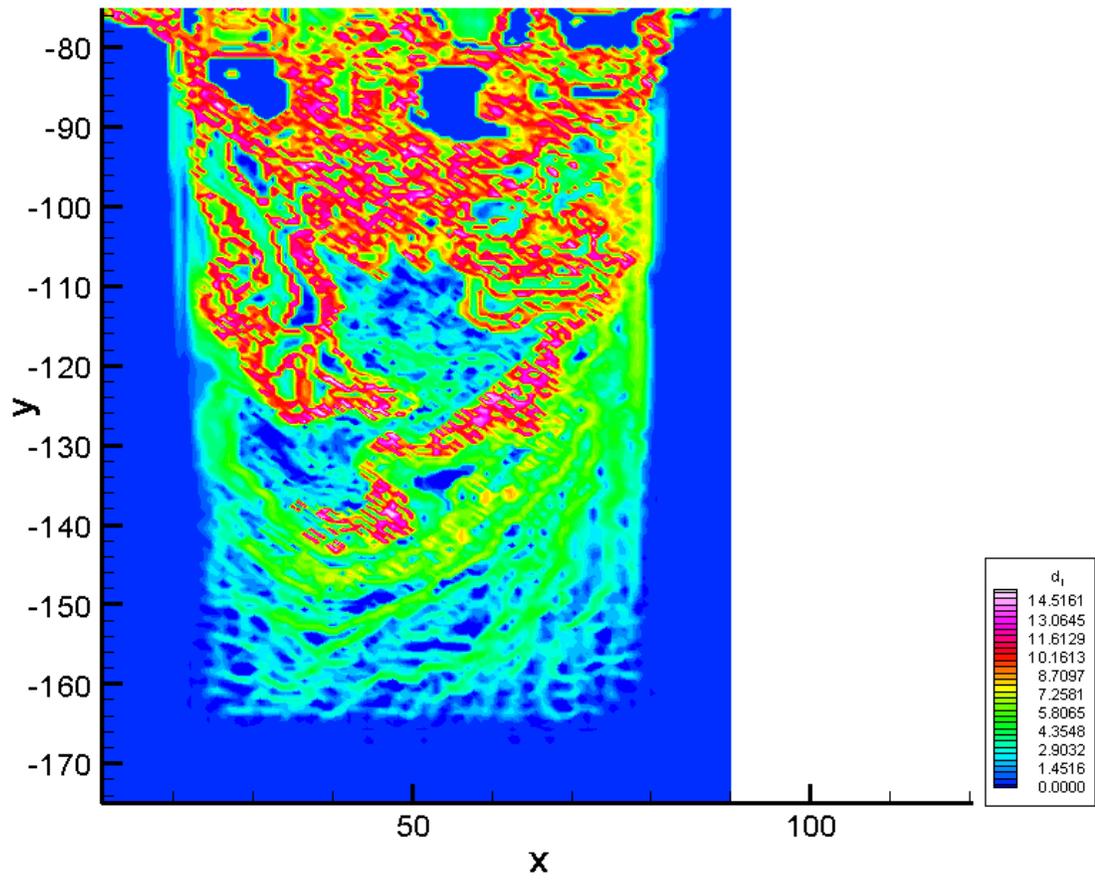


Figure F.87: The backward time LCS during phase increment 6 at 13 Hz.

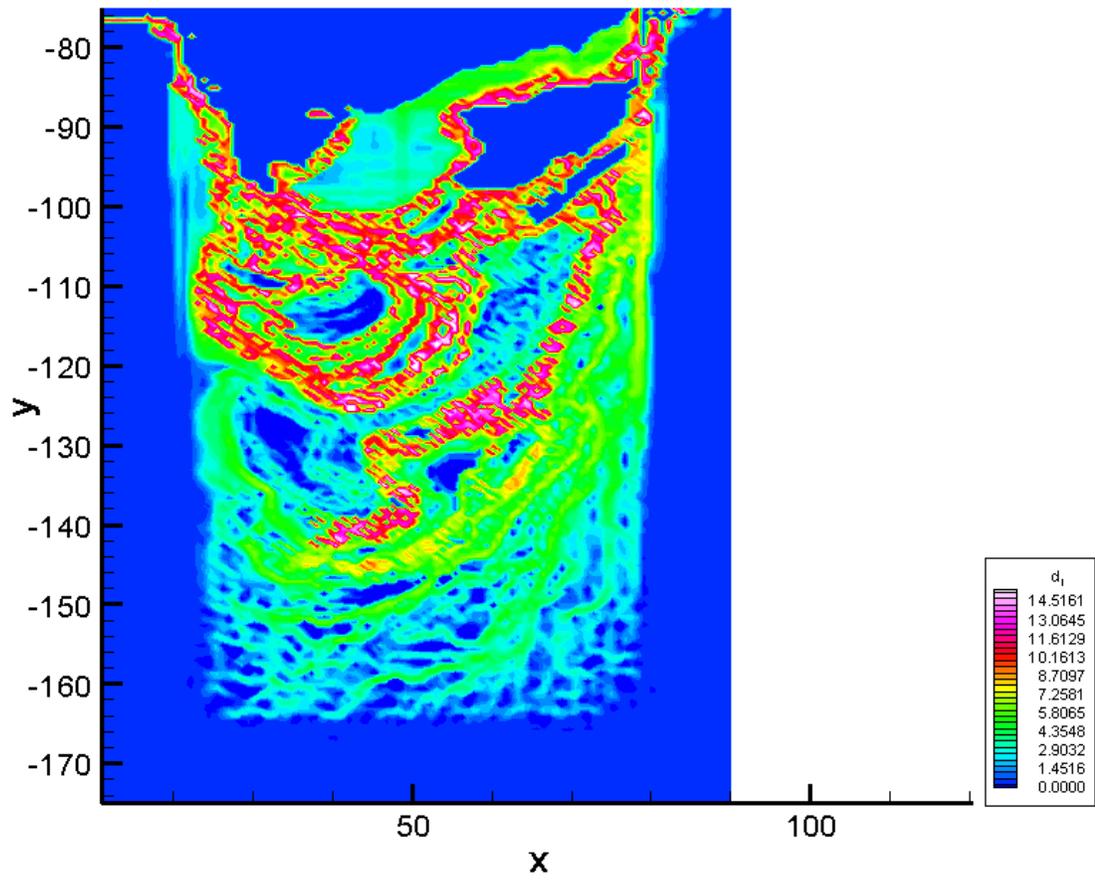


Figure F.88: The backward time LCS during phase increment 7 at 13 Hz.

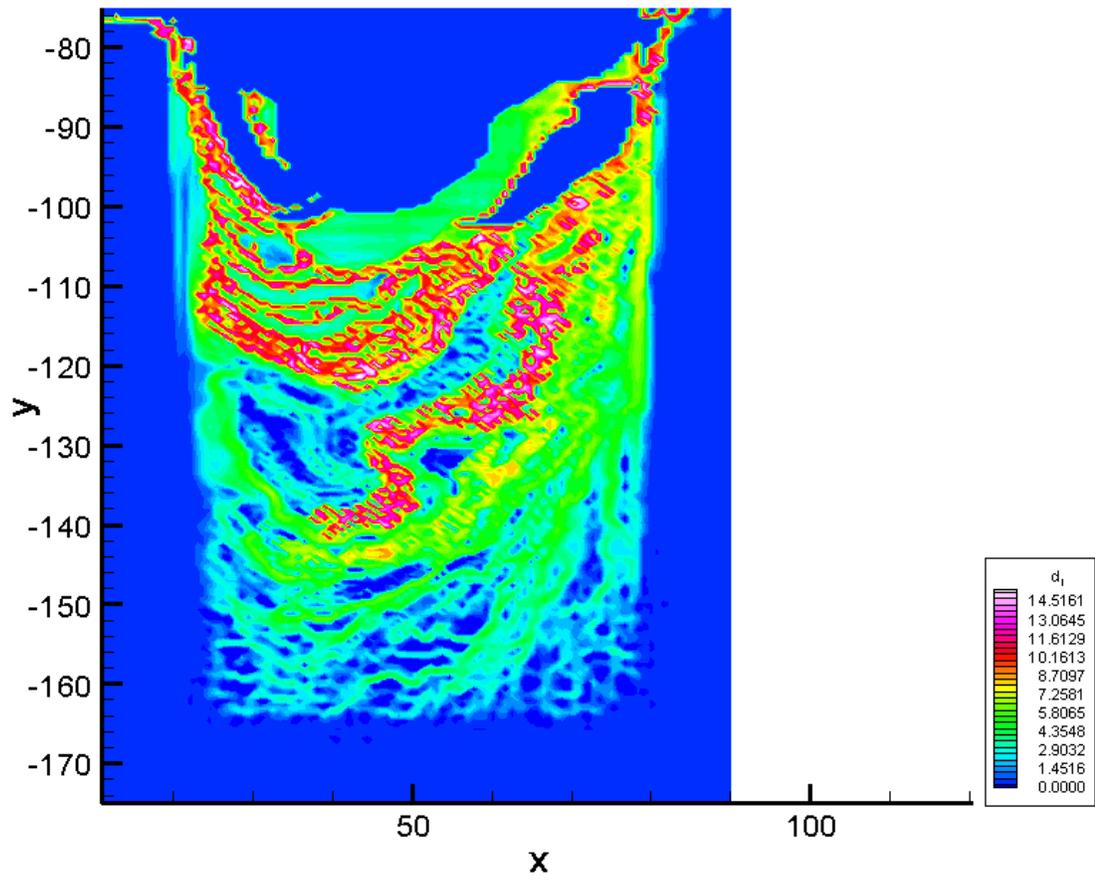


Figure F.89: The backward time LCS during phase increment 8 at 13 Hz.

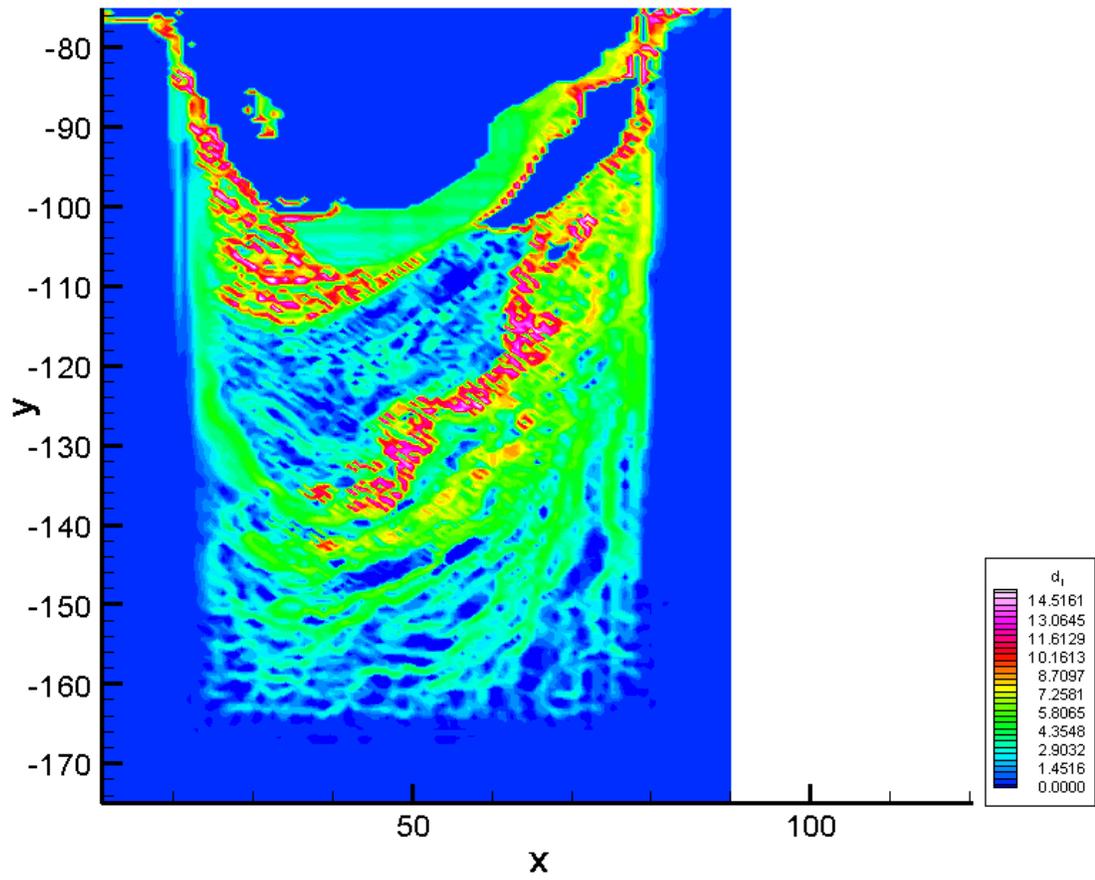


Figure F.90: The backward time LCS during phase increment 9 at 13 Hz.

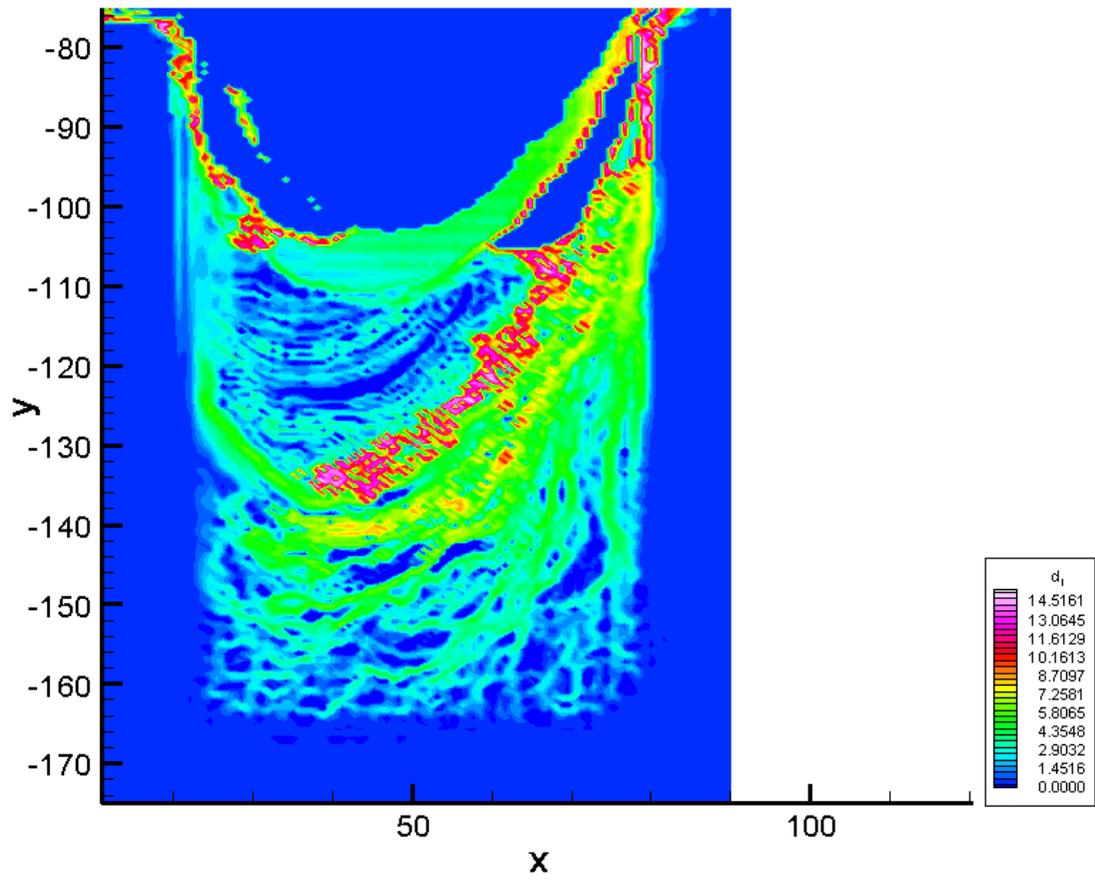


Figure F.91: The backward time LCS during phase increment 10 at 13 Hz.

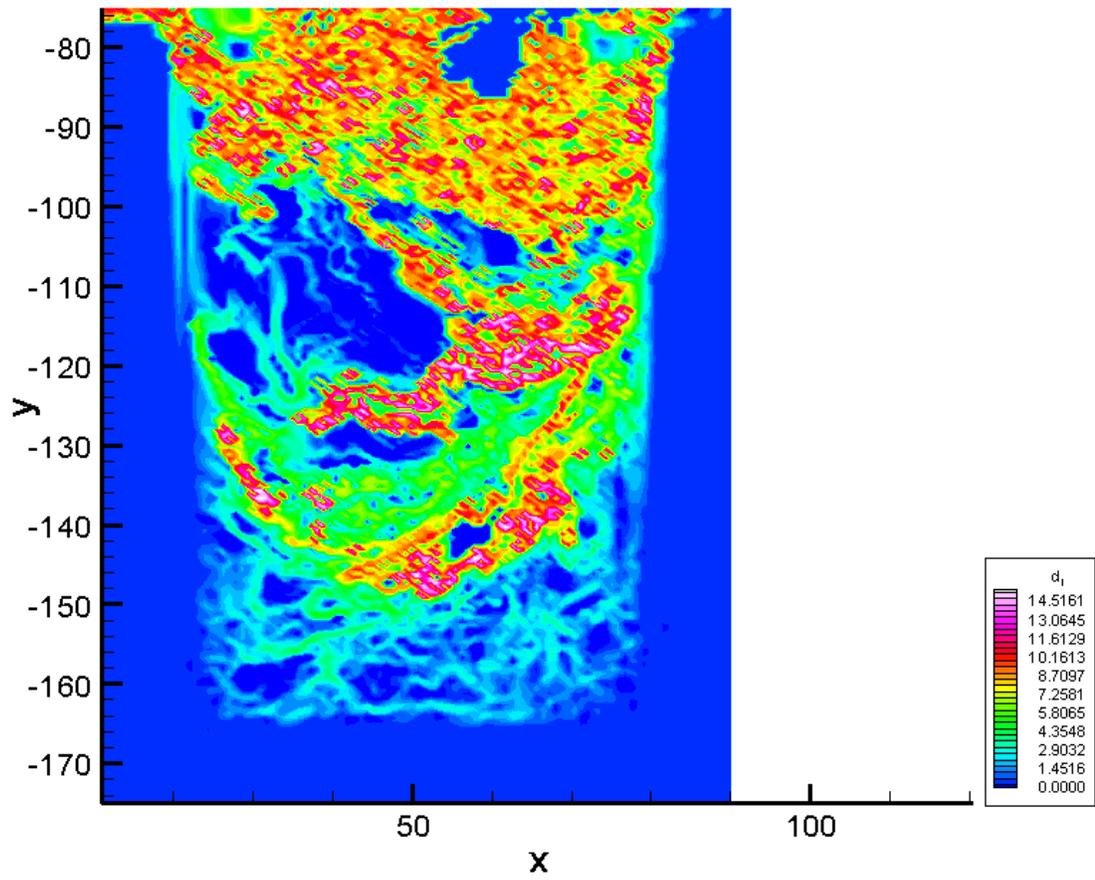


Figure F.92: The forward time LCS during phase increment 1 at 13 Hz.

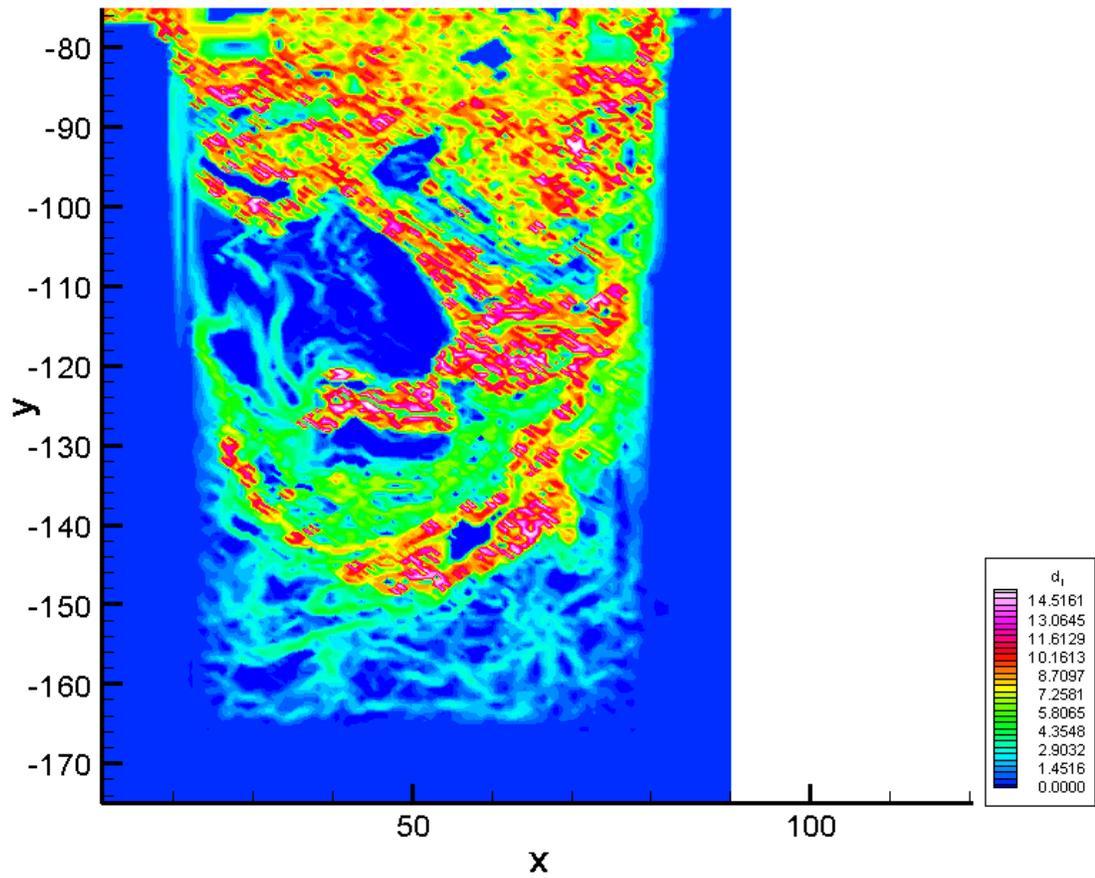


Figure F.93: The forward time LCS during phase increment 2 at 13 Hz.

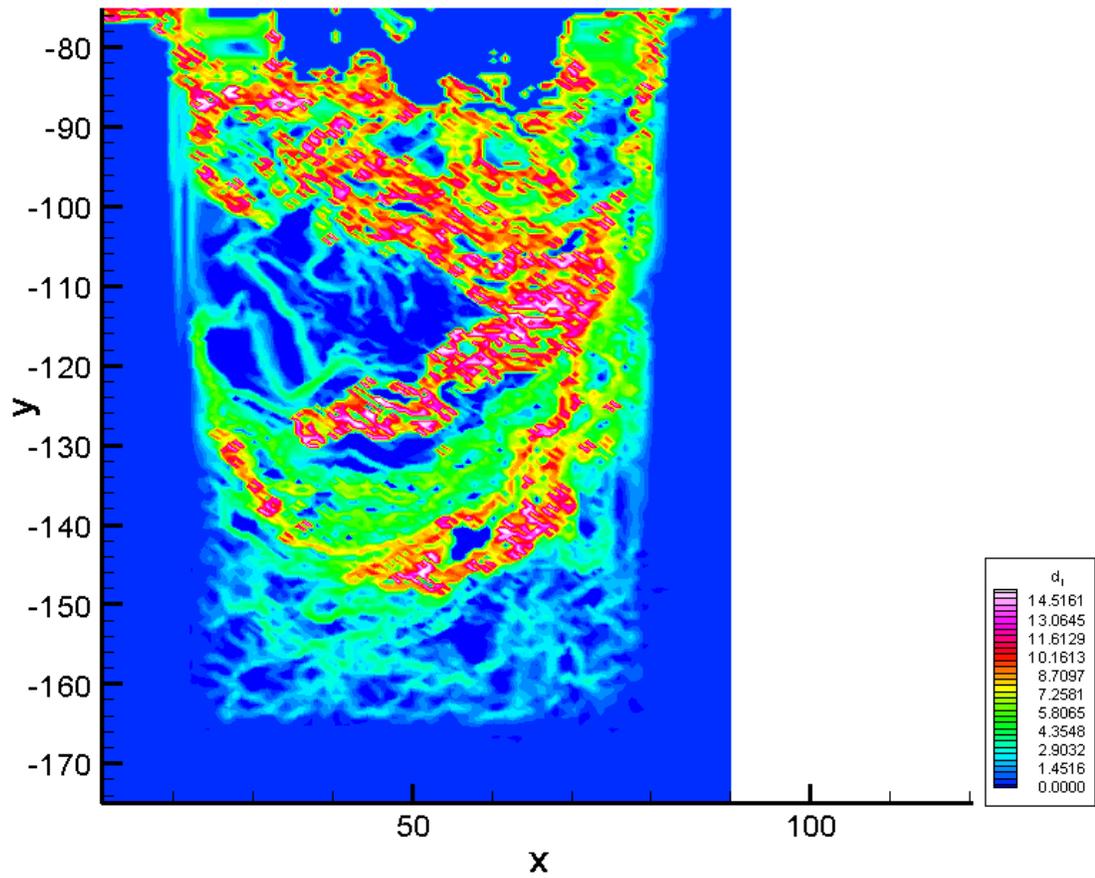


Figure F.94: The forward time LCS during phase increment 3 at 13 Hz.

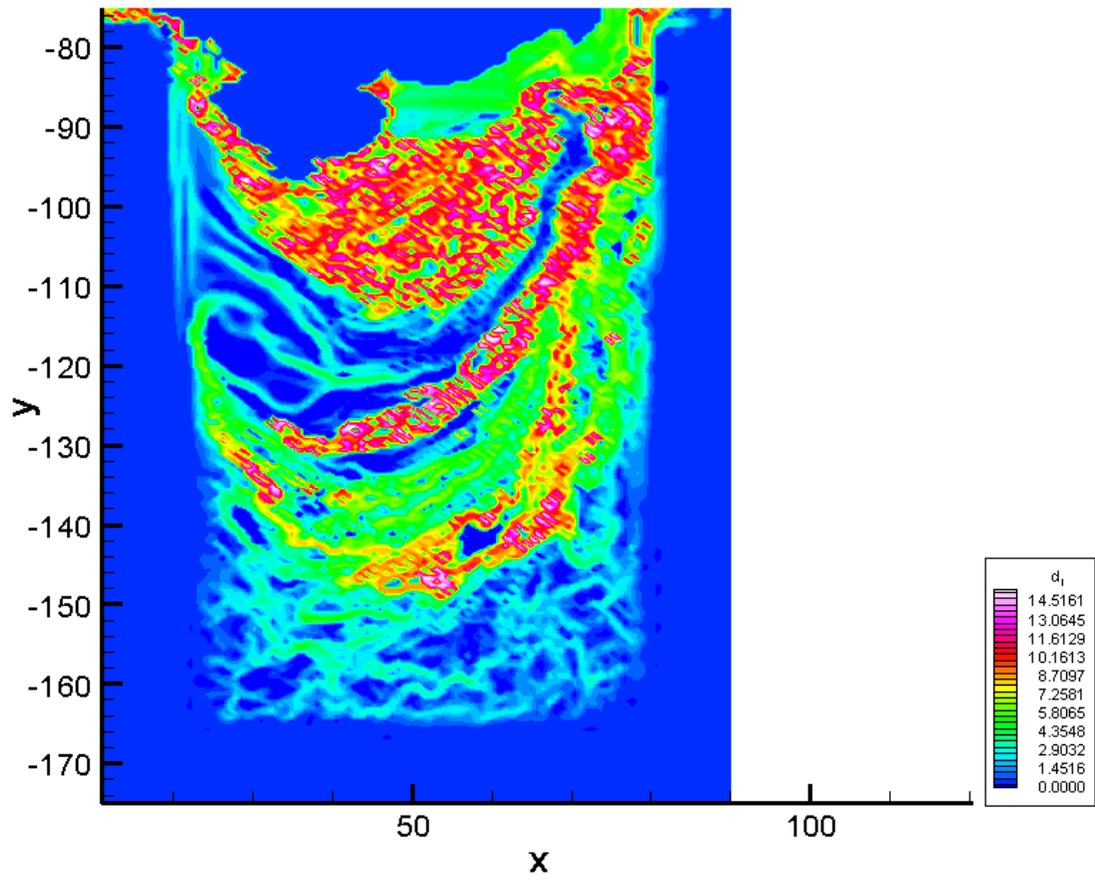


Figure F.95: The forward time LCS during phase increment 4 at 13 Hz.

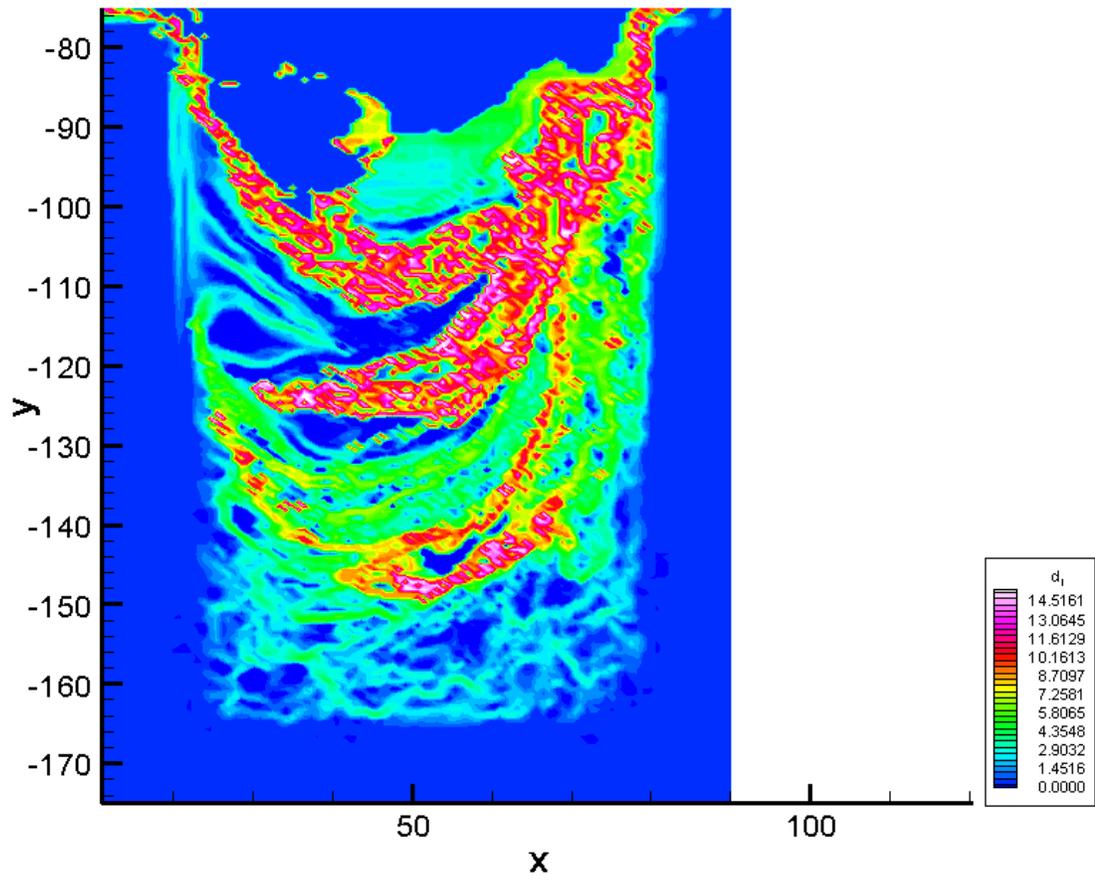


Figure F.96: The forward time LCS during phase increment 5 at 13 Hz.

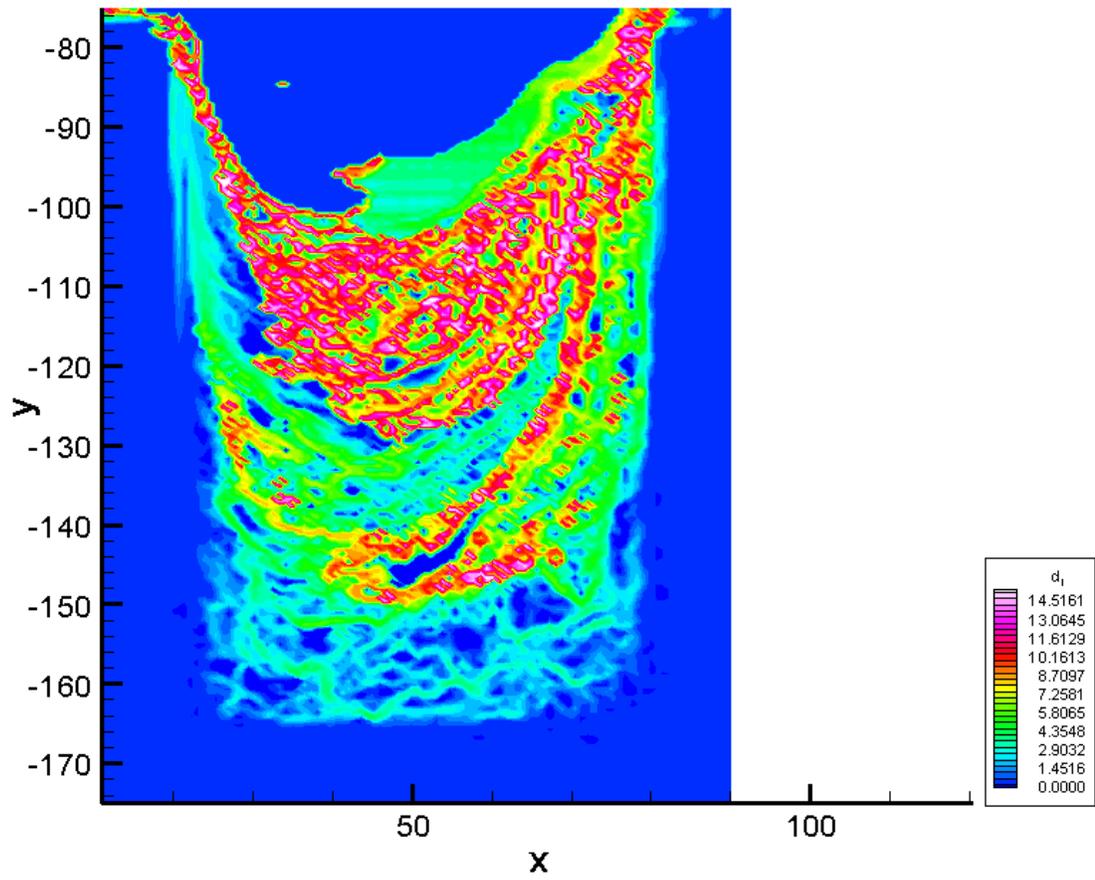


Figure F.97: The forward time LCS during phase increment 6 at 13 Hz.

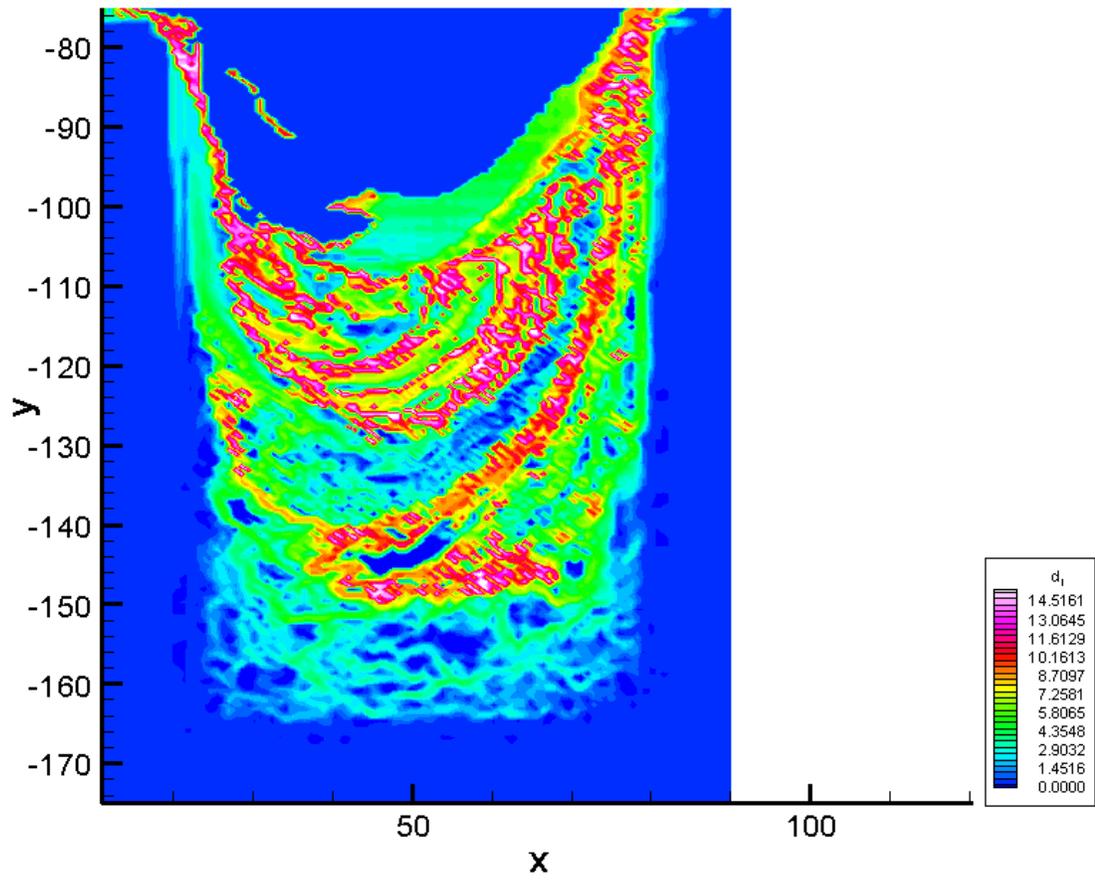


Figure F.98: The forward time LCS during phase increment 7 at 13 Hz.

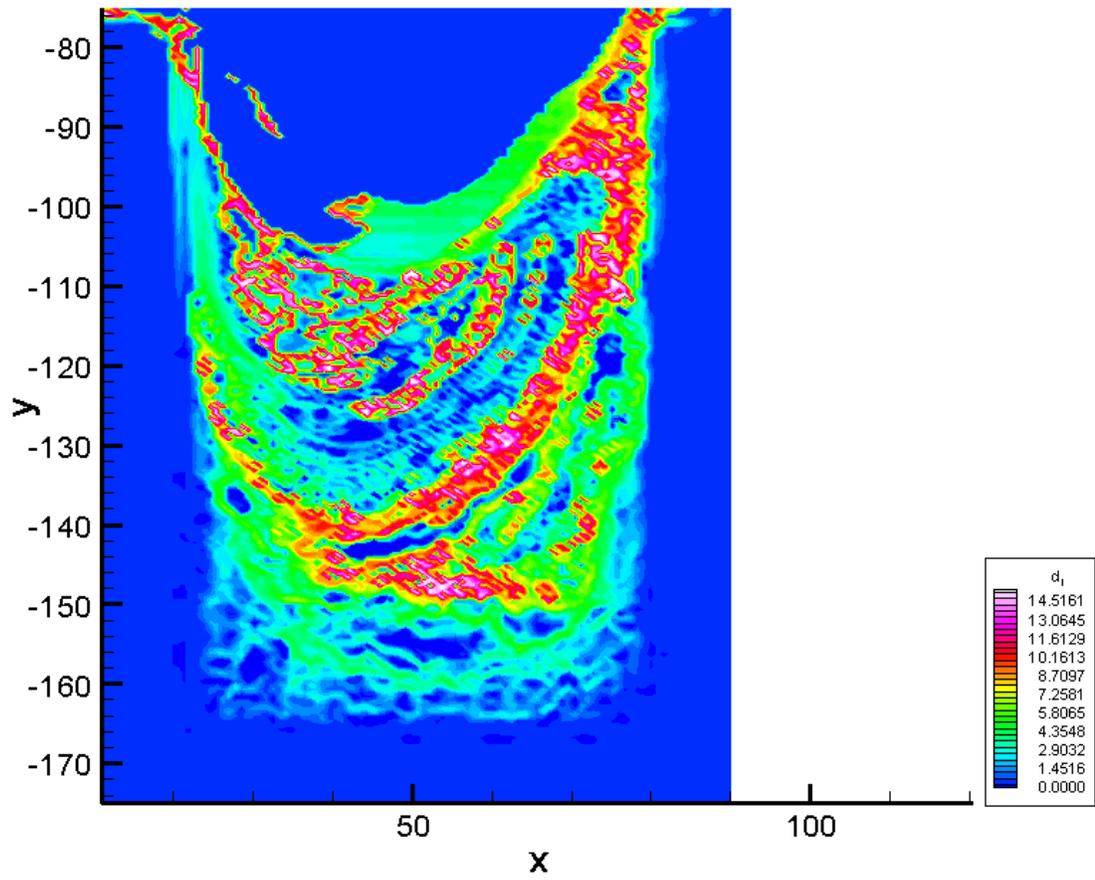


Figure F.99: The forward time LCS during phase increment 8 at 13 Hz.

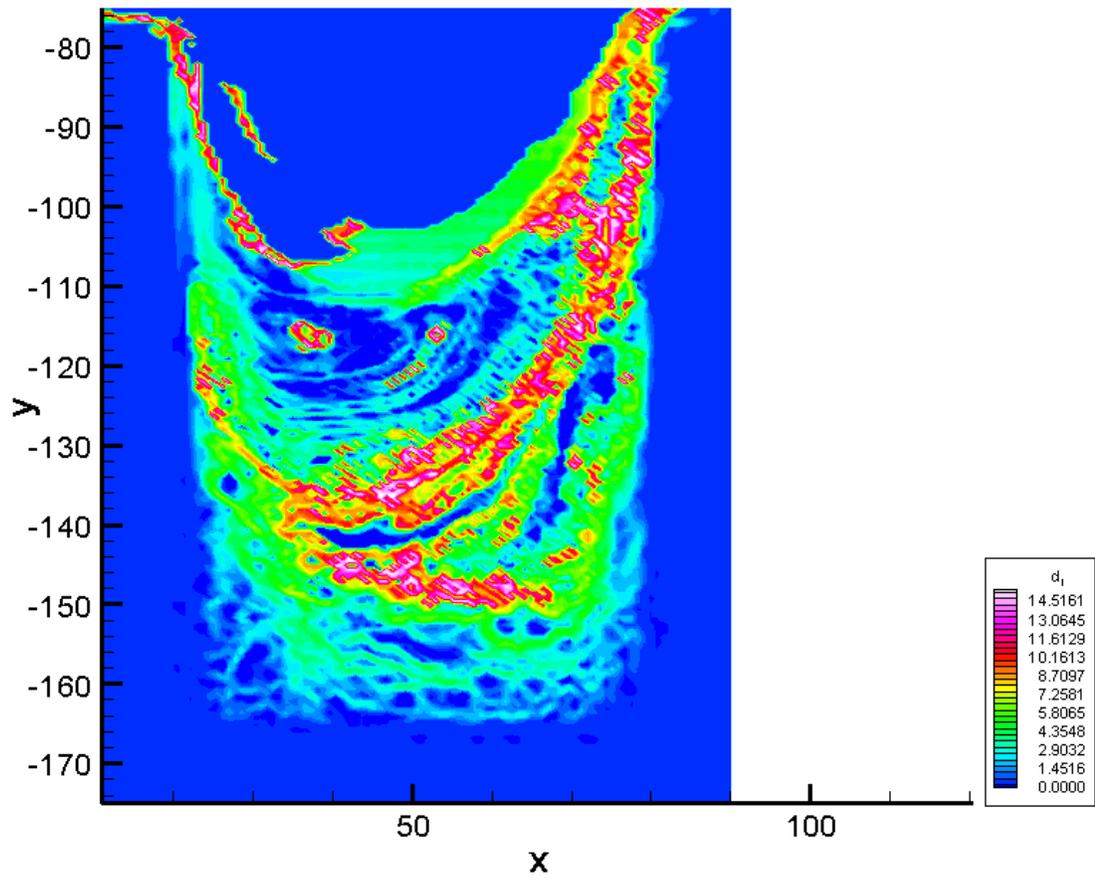


Figure F.100: The forward time LCS during phase increment 9 at 13 Hz.

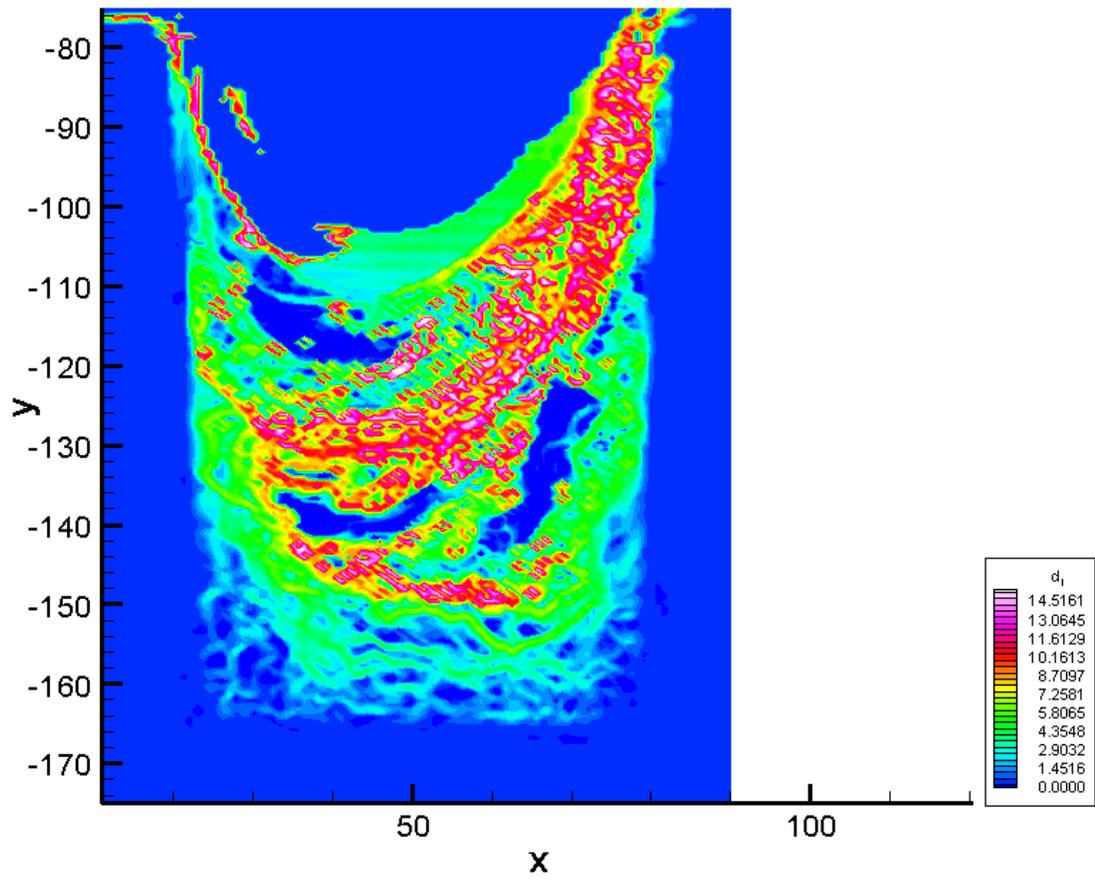


Figure F.101: The forward time LCS during phase increment 10 at 13 Hz.

F.2 80 Hz

F.2.1 Velocity field data at 80 Hz

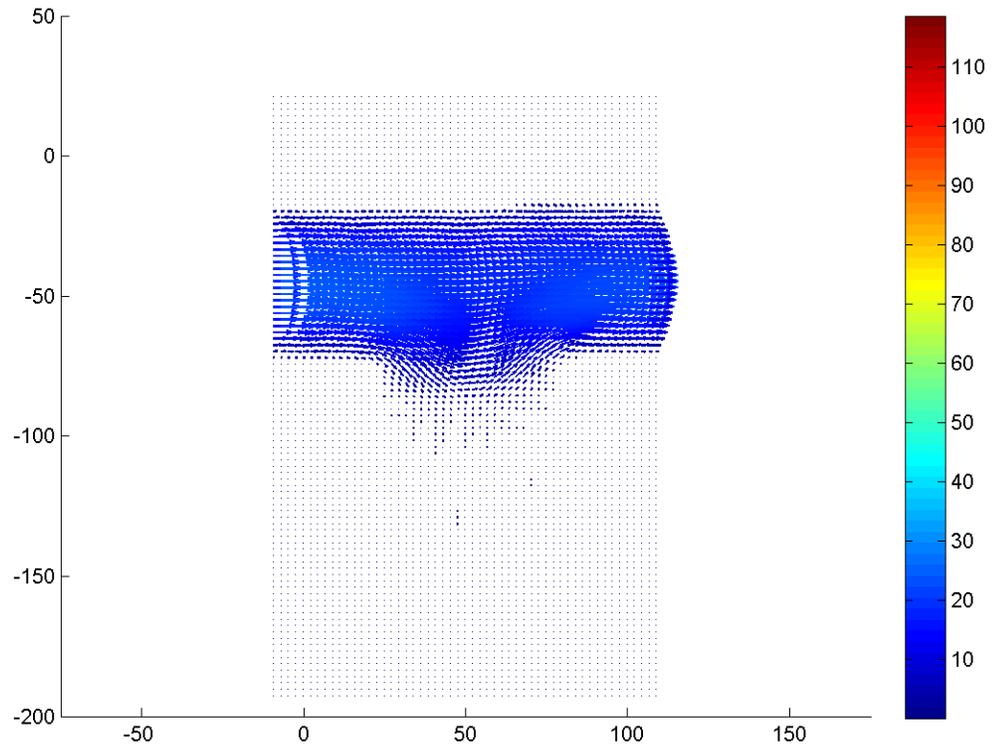


Figure F.102: Velocity field during phase increment 1 at 80 Hz with a Re of 0.1.

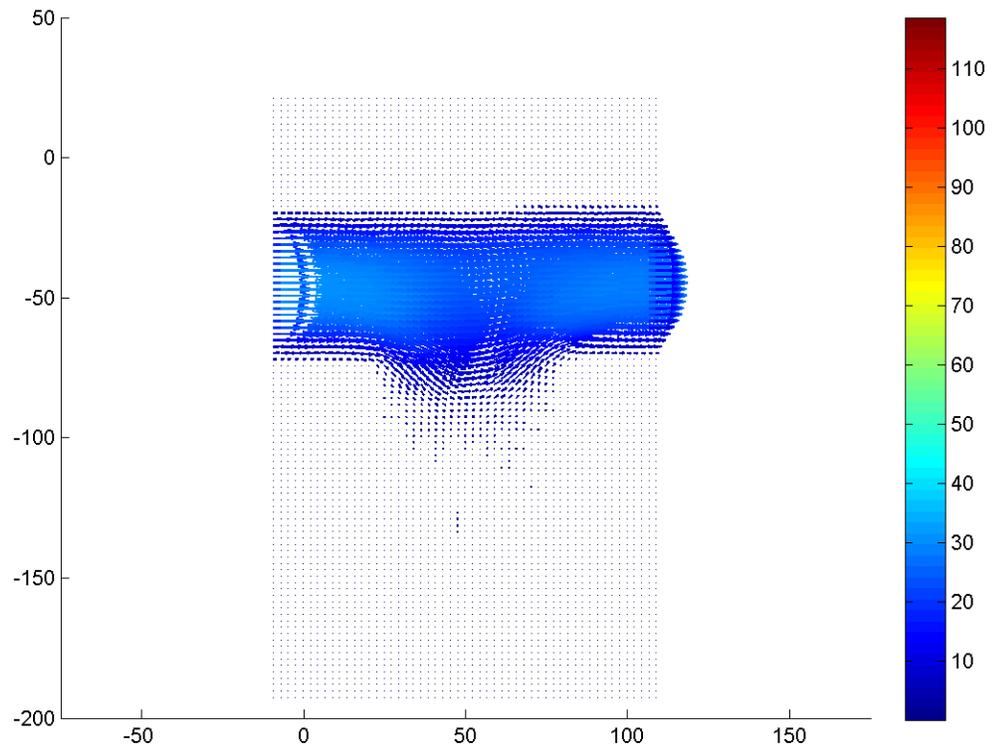


Figure F.103: Velocity field during phase increment 2 at 80 Hz with a Re of 0.1.

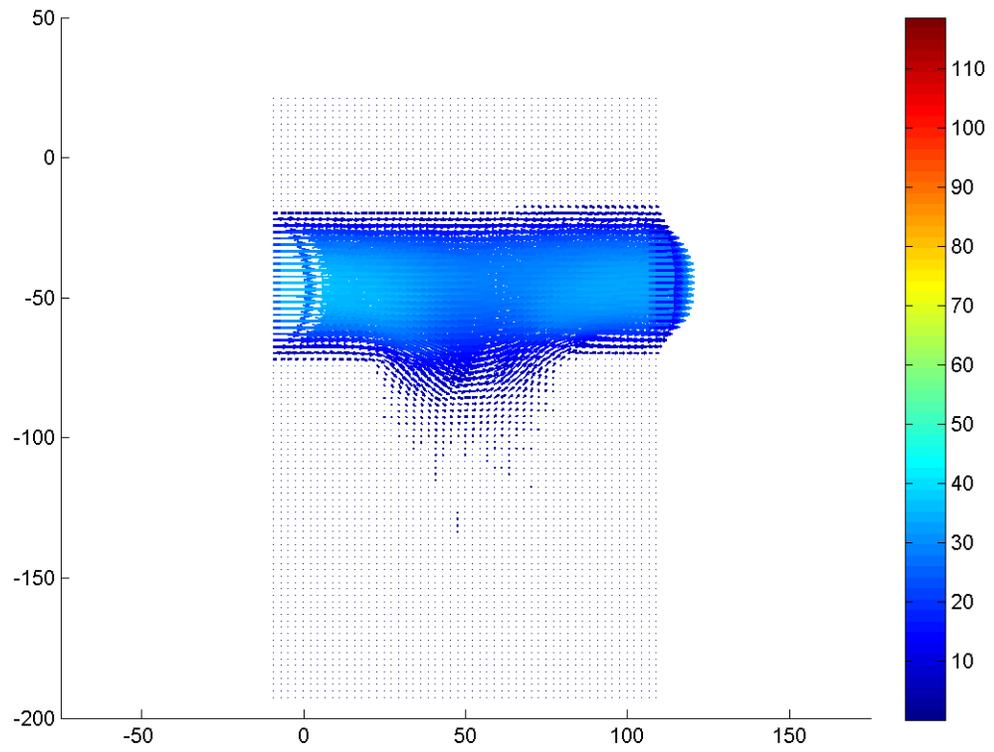


Figure F.104: Velocity field during phase increment 3 at 80 Hz with a Re of 0.1.

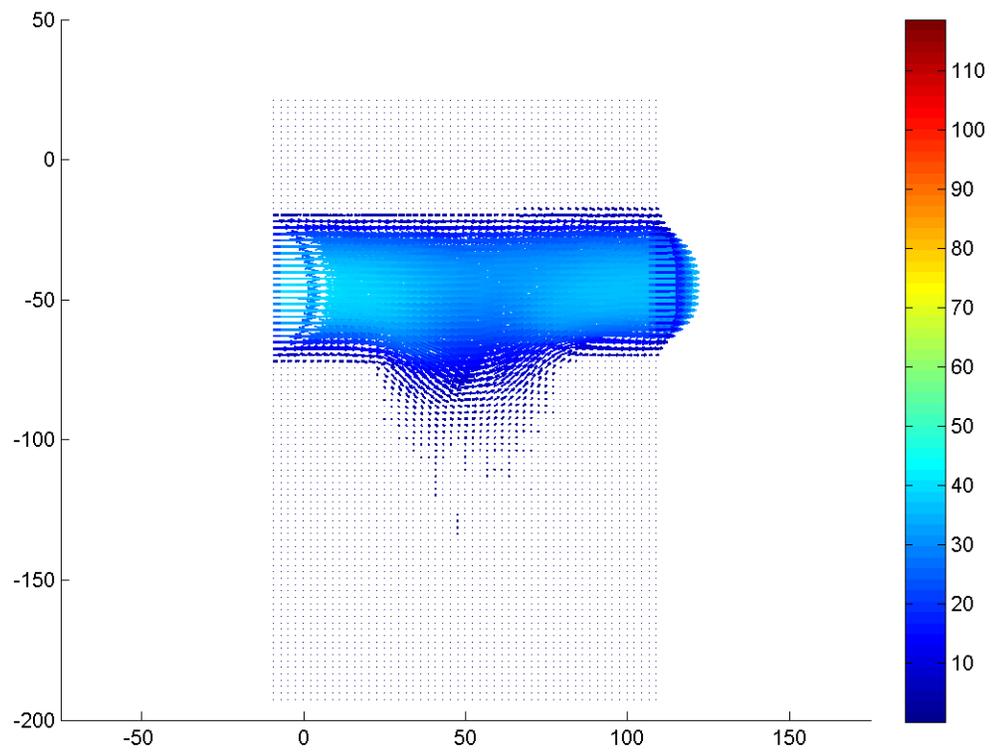


Figure F.105: Velocity field during phase increment 4 at 80 Hz with a Re of 0.1.

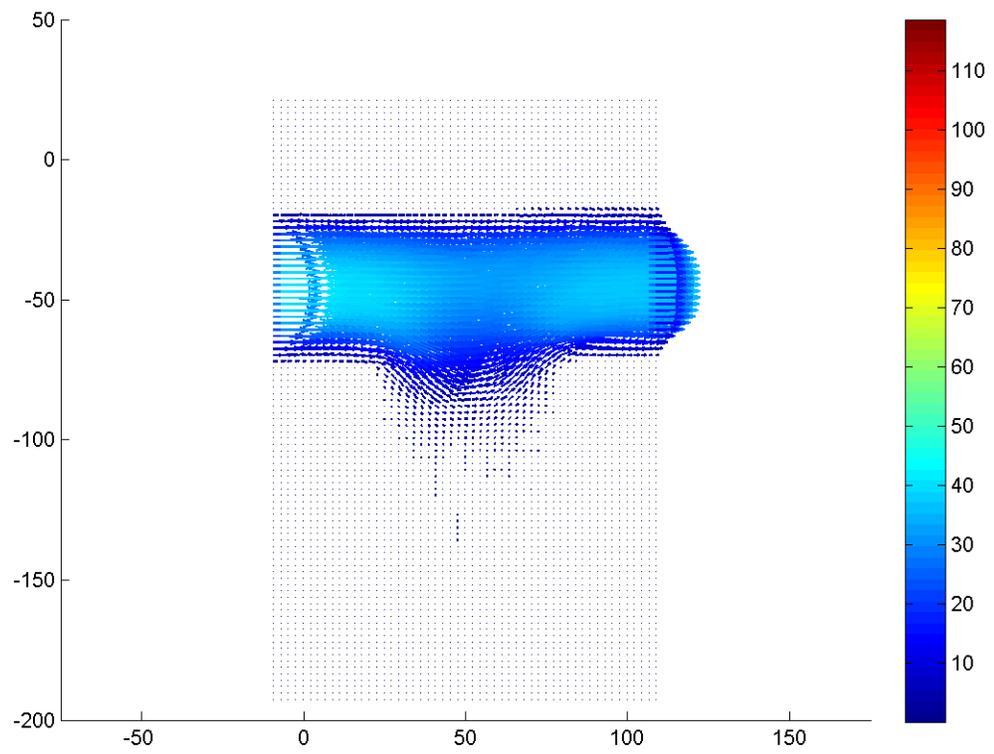


Figure F.106: Velocity field during phase increment 5 at 80 Hz with a Re of 0.1.

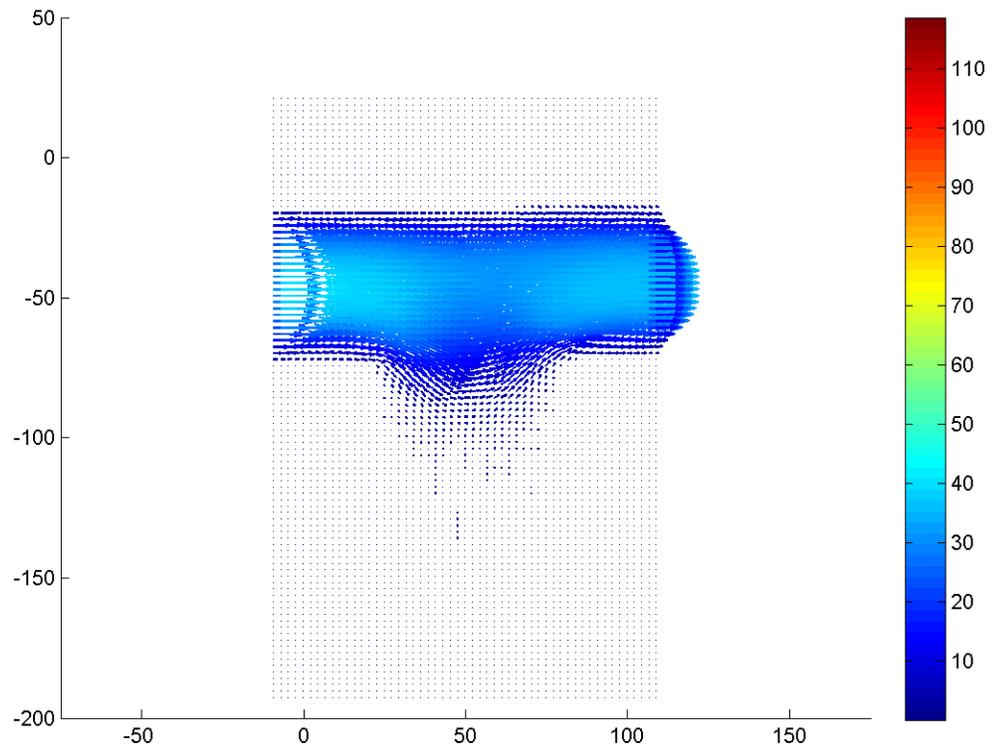


Figure F.107: Velocity field during phase increment 6 at 80 Hz with a Re of 0.1.

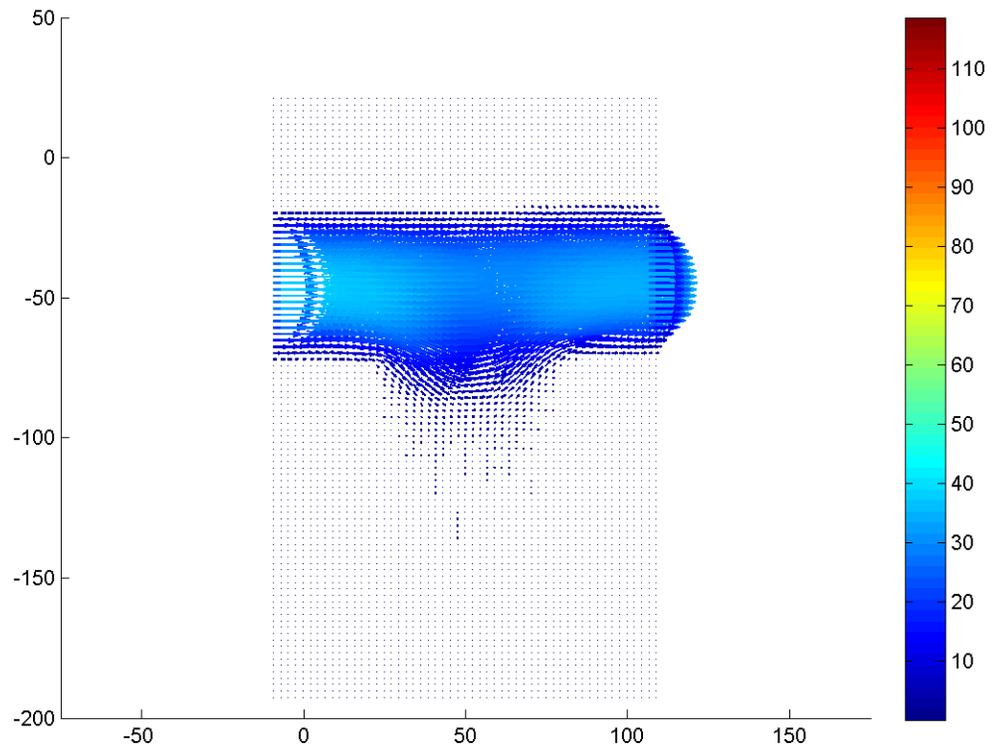


Figure F.108: Velocity field during phase increment 7 at 80 Hz with a Re of 0.1.

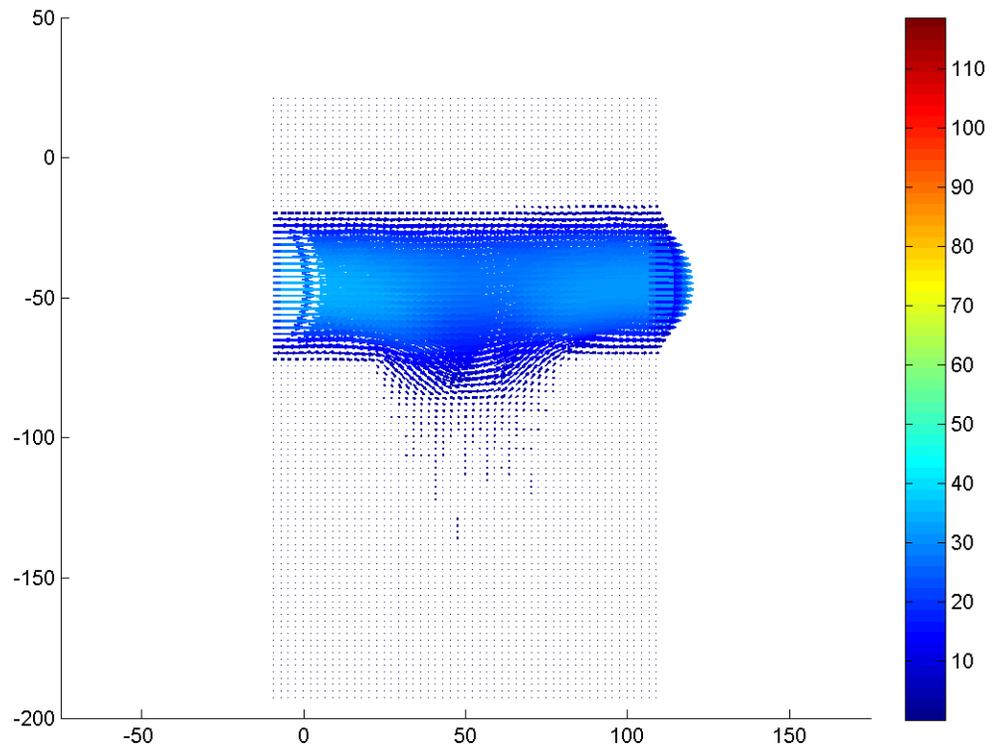


Figure F.109: Velocity field during phase increment 8 at 80 Hz with a Re of 0.1.

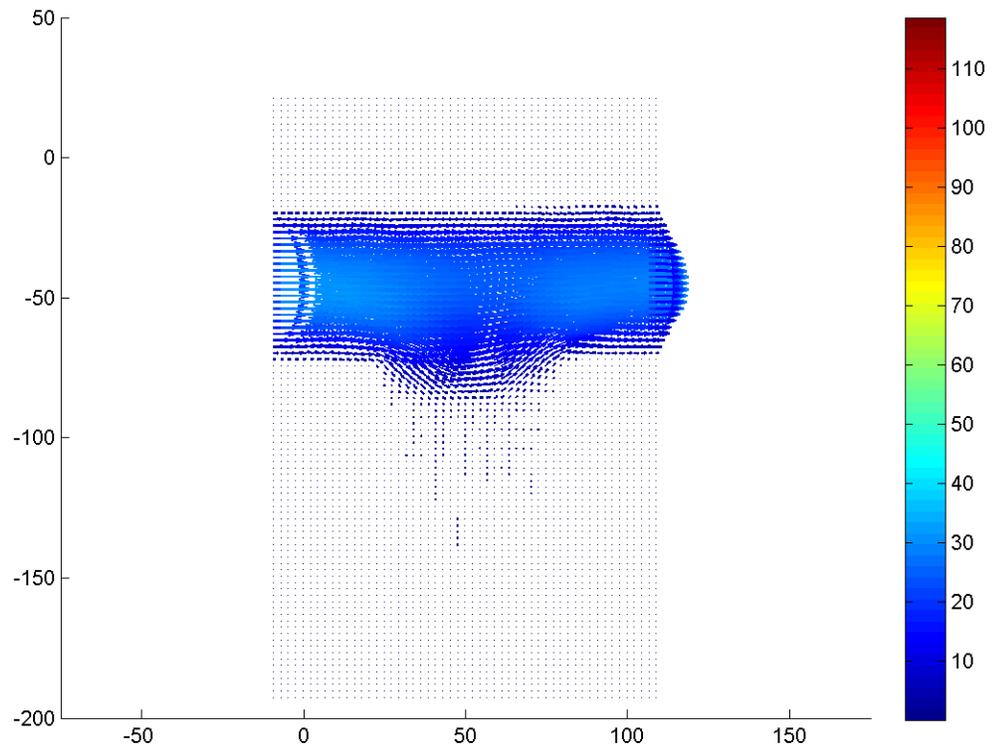


Figure F.110: Velocity field during phase increment 9 at 80 Hz with a Re of 0.1.

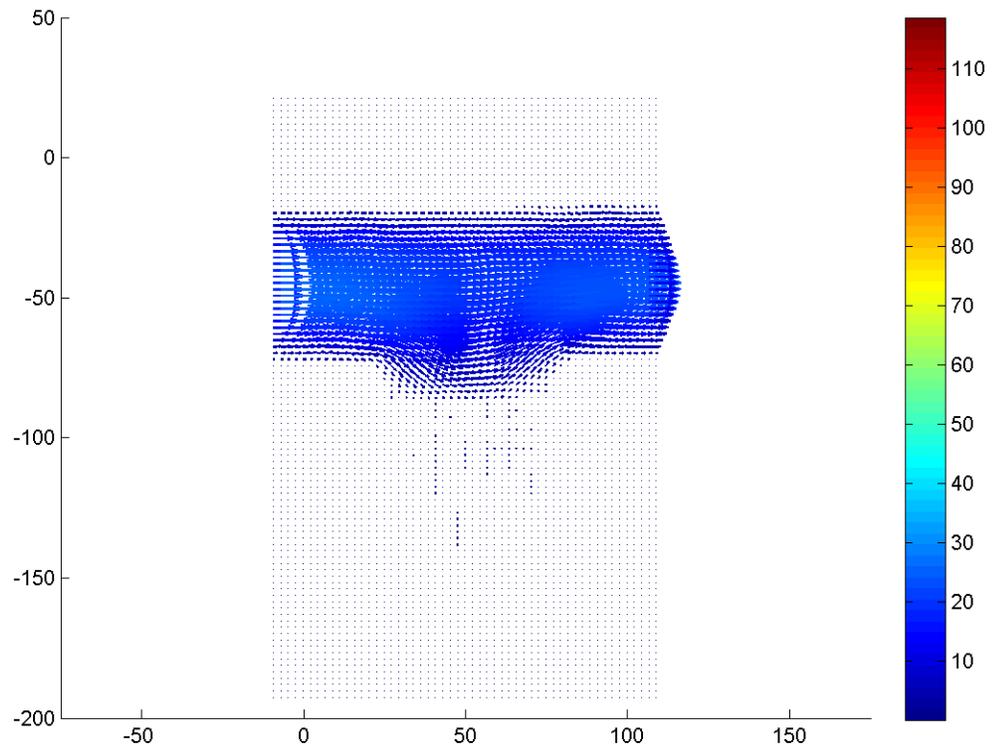


Figure F.111: Velocity field during phase increment 10 at 80 Hz with a Re of 0.1.

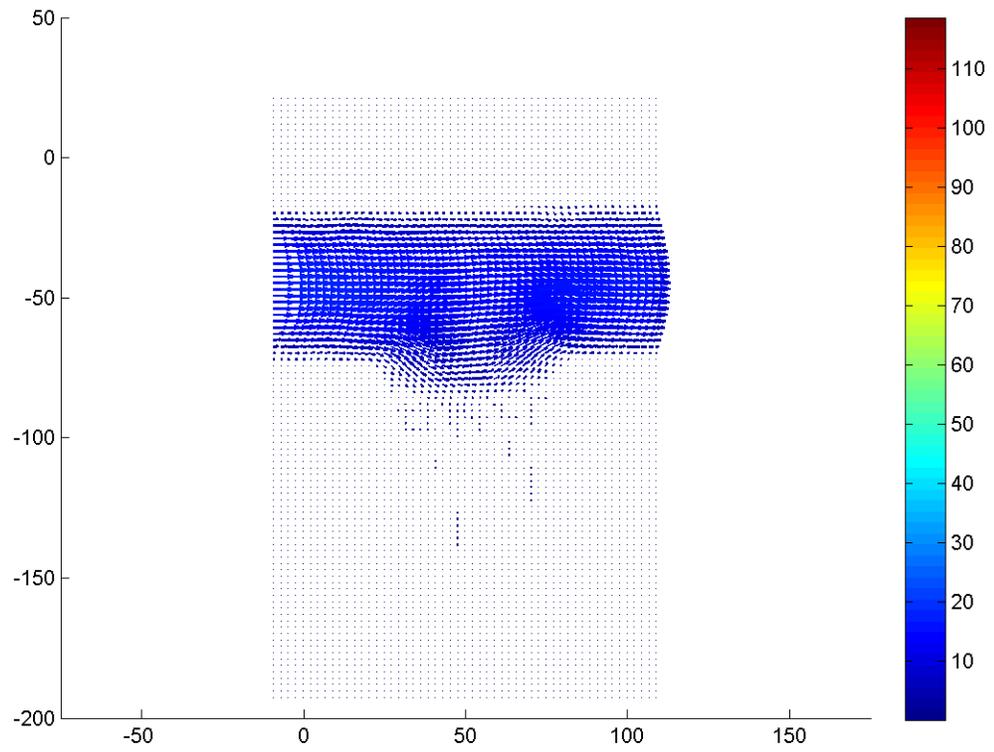


Figure F.112: Velocity field during phase increment 11 at 80 Hz with a Re of 0.1.

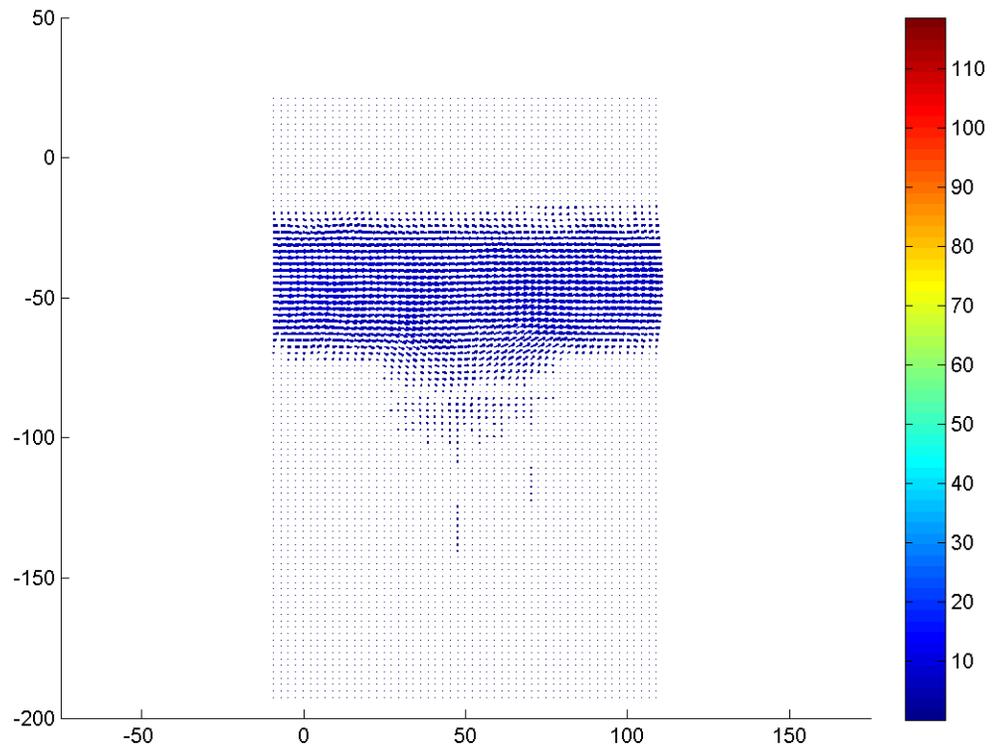


Figure F.113: Velocity field during phase increment 12 at 80 Hz with a Re of 0.1.

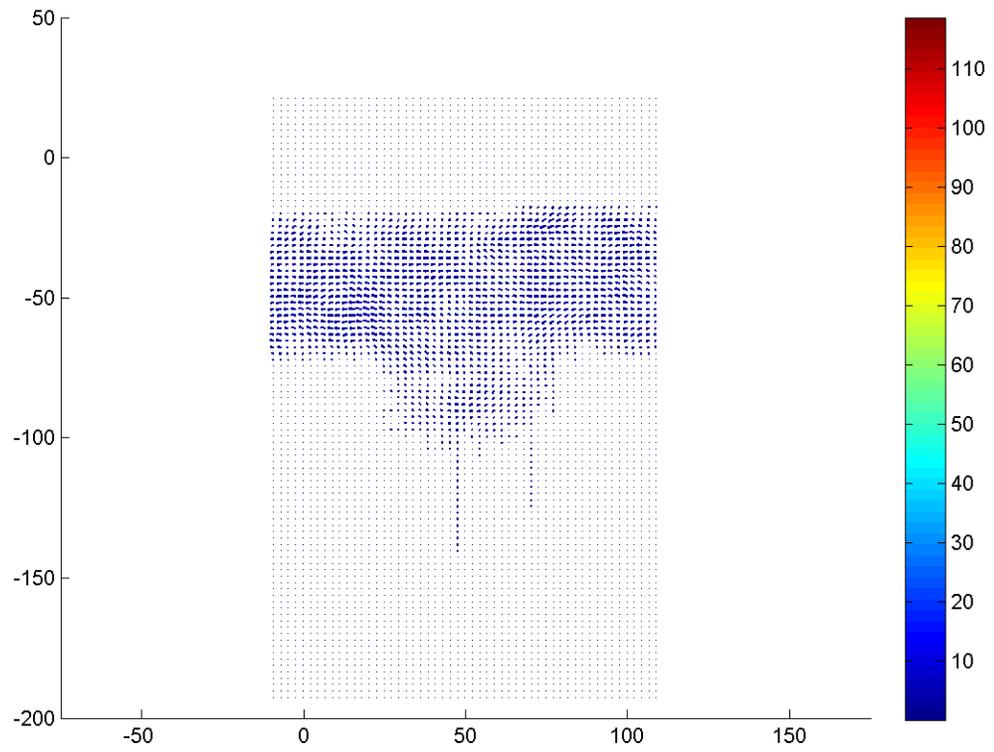


Figure F.114: Velocity field during phase increment 13 at 80 Hz with a Re of 0.1.

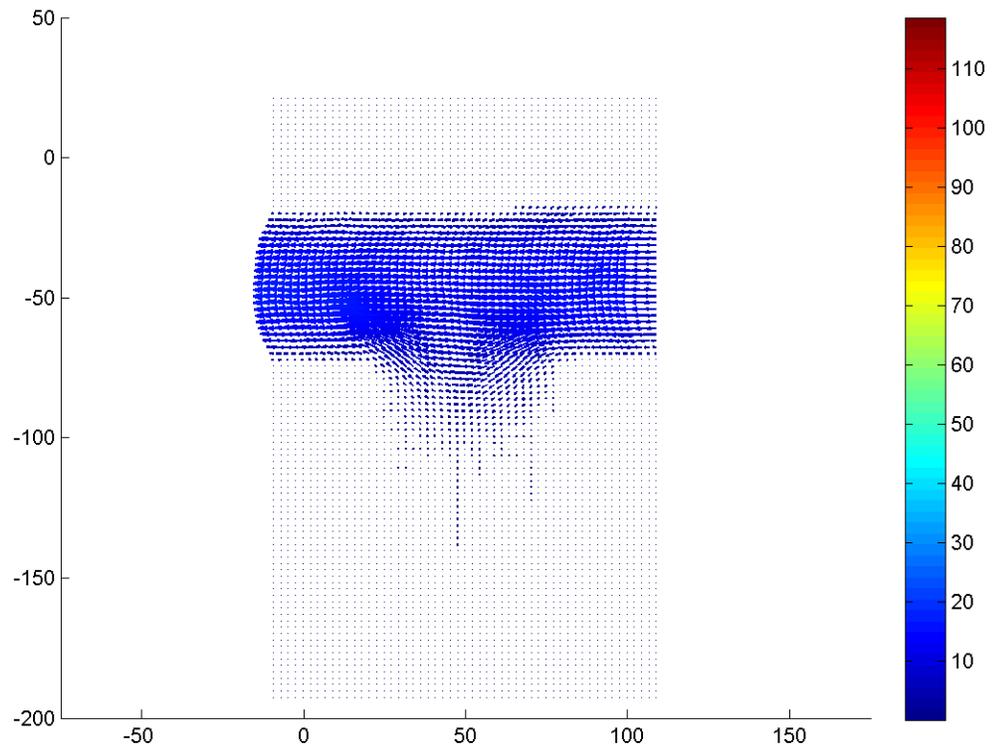


Figure F.115: Velocity field during phase increment 14 at 80 Hz with a Re of 0.1.

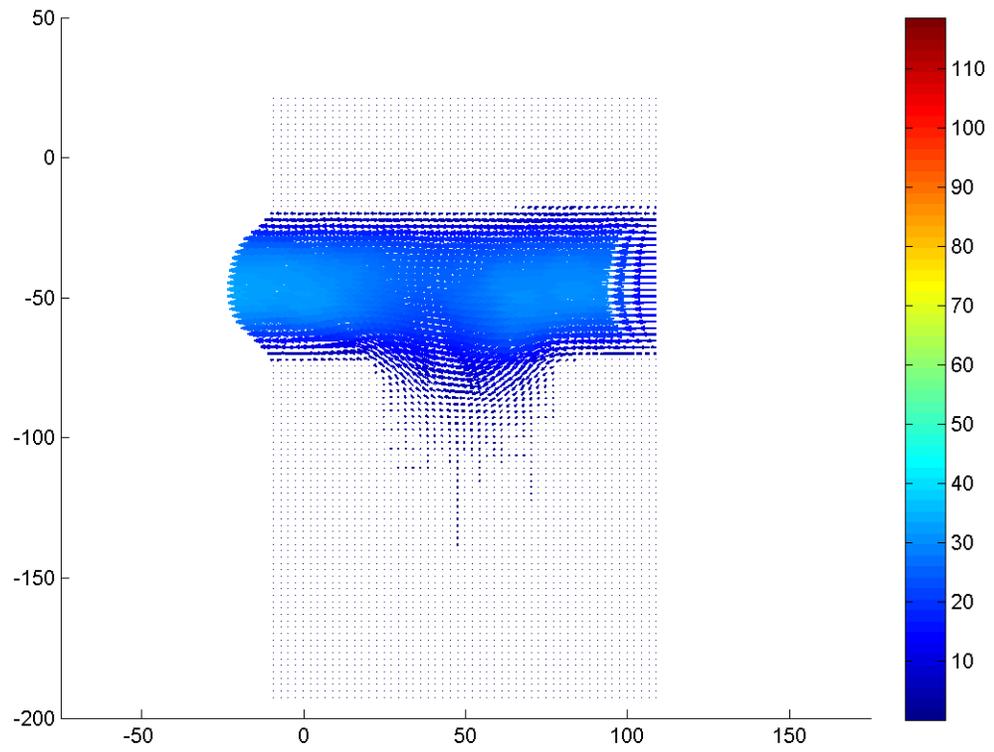


Figure F.116: Velocity field during phase increment 15 at 80 Hz with a Re of 0.1.

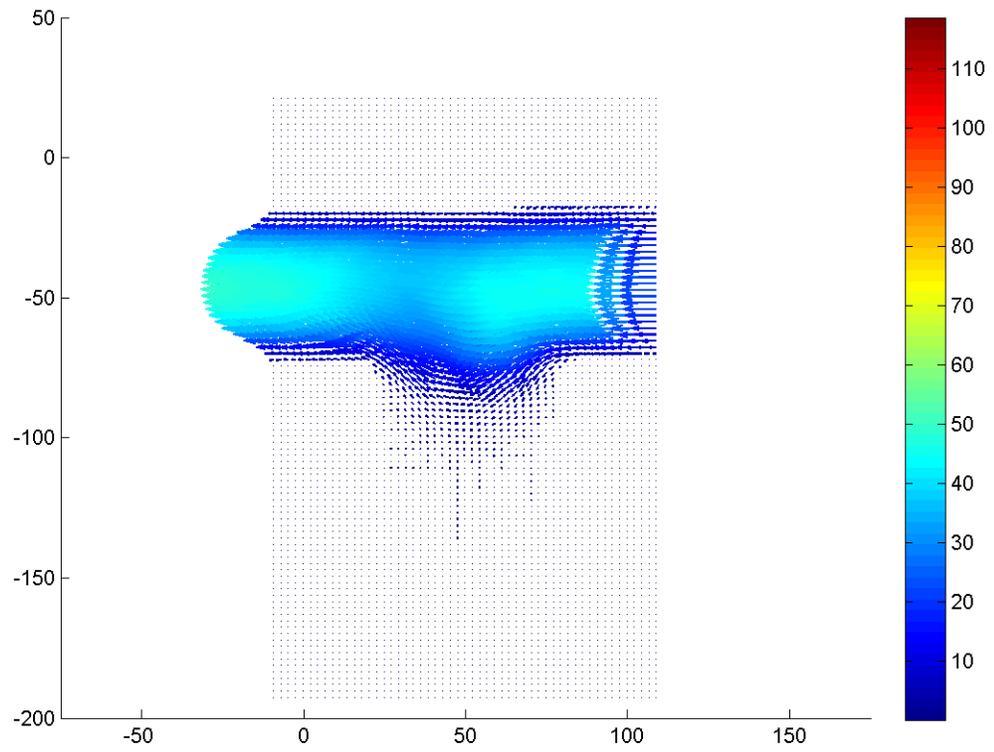


Figure F.117: Velocity field during phase increment 16 at 80 Hz with a Re of 0.1.

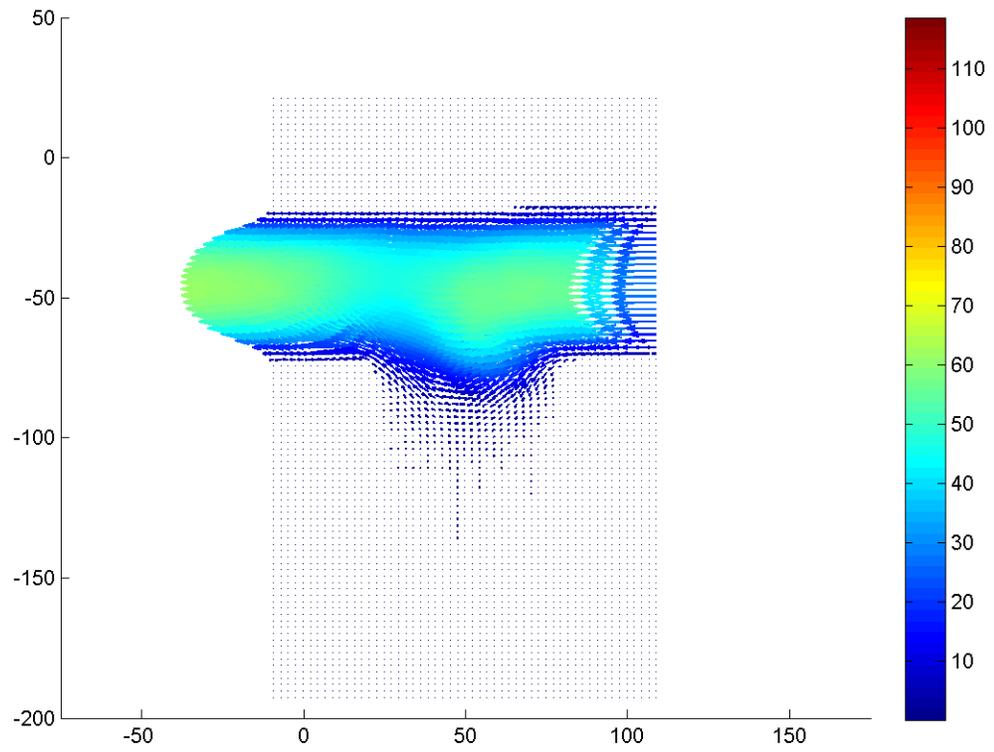


Figure F.118: Velocity field during phase increment 17 at 80 Hz with a Re of 0.1.

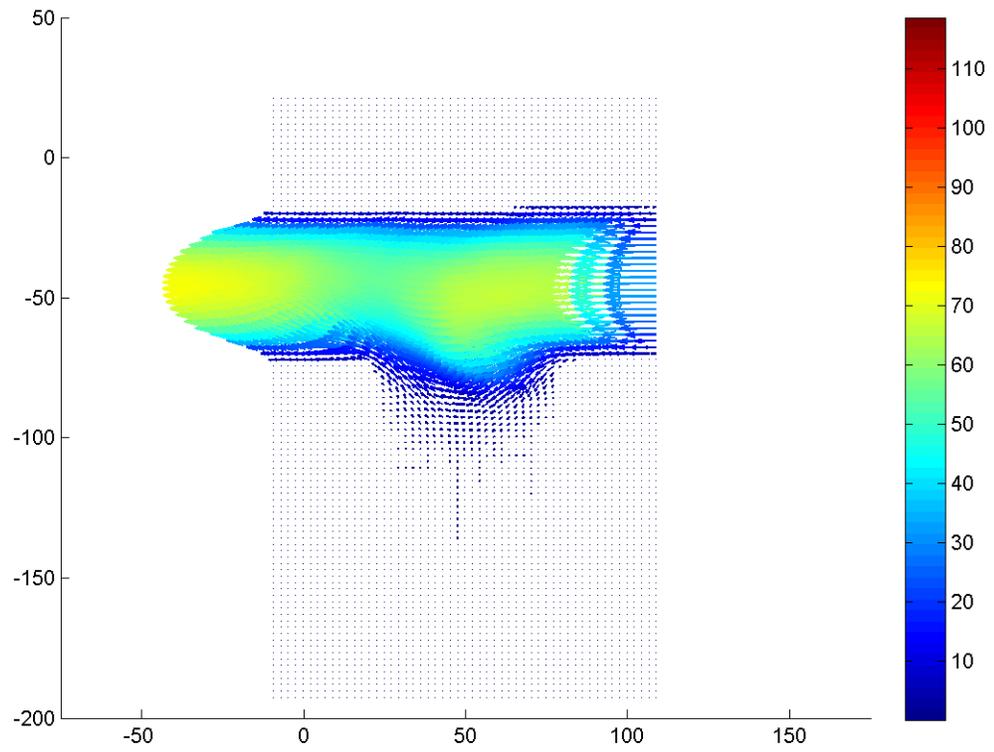


Figure F.119: Velocity field during phase increment 18 at 80 Hz with a Re of 0.1.

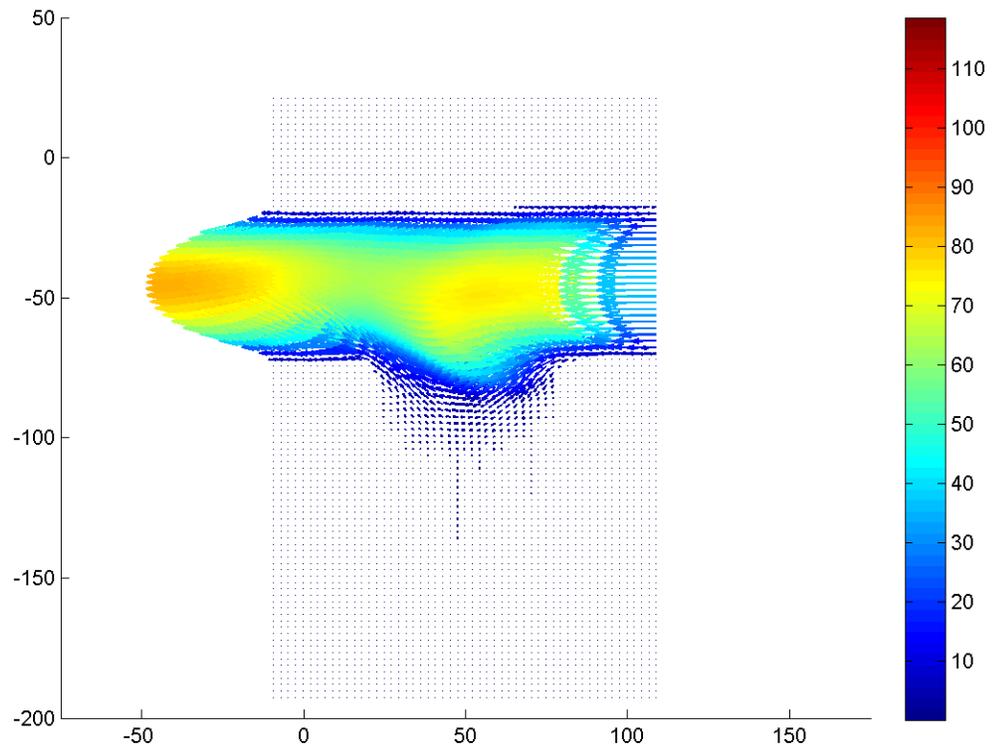


Figure F.120: Velocity field during phase increment 18 at 80 Hz with a Re of 0.1.

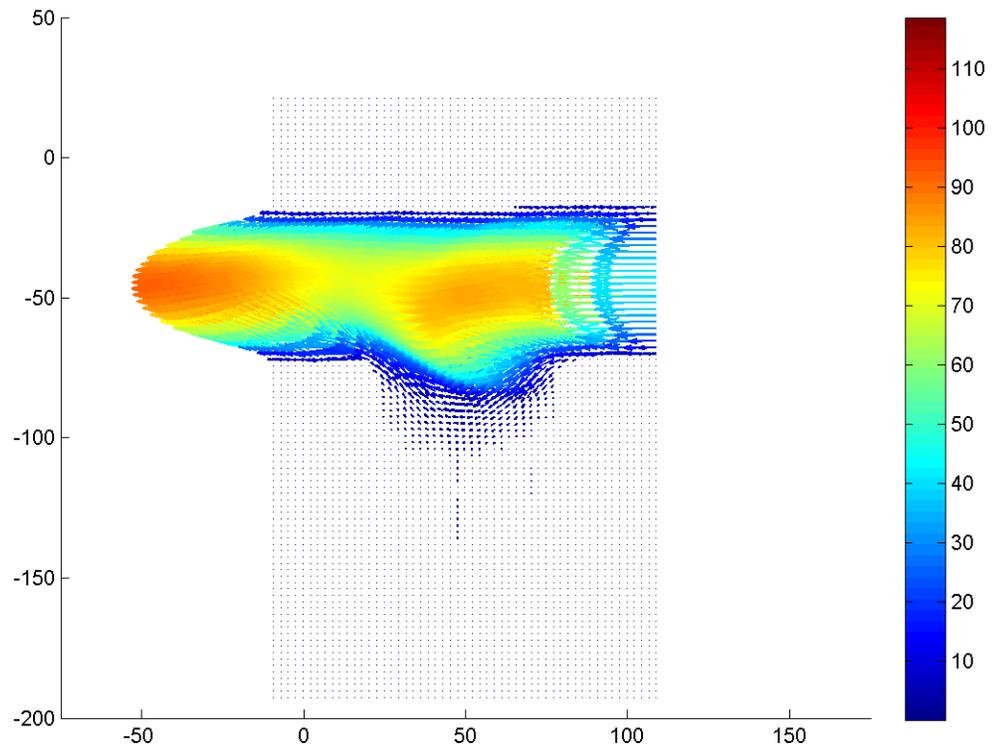


Figure F.121: Velocity field during phase increment 20 at 80 Hz with a Re of 0.1.

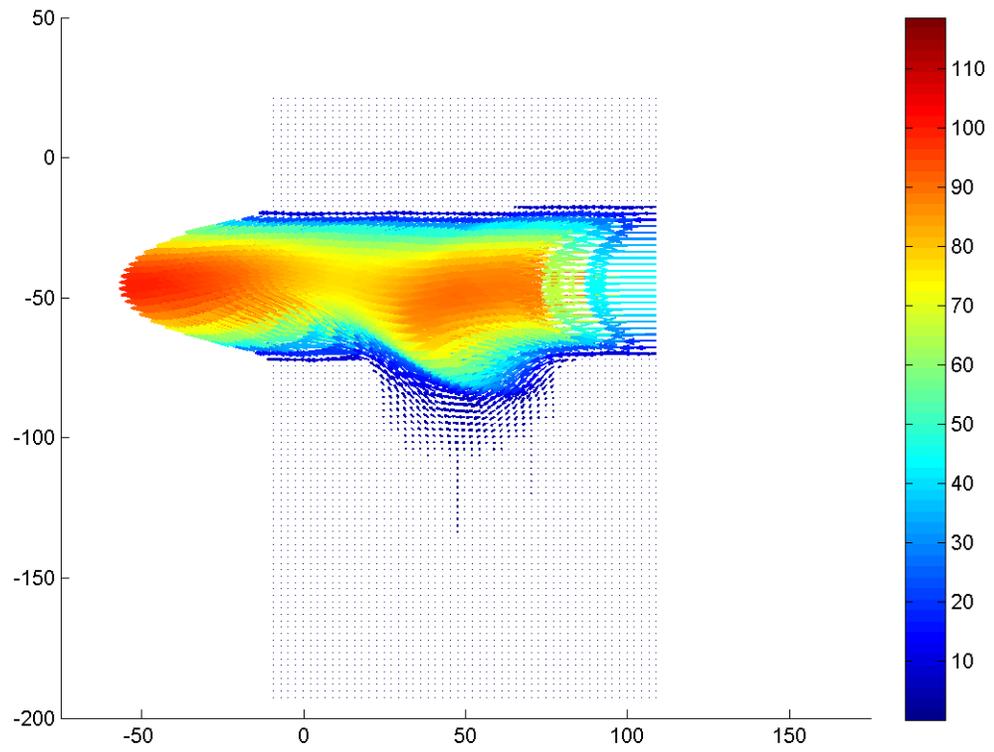


Figure F.122: Velocity field during phase increment 21 at 80 Hz with a Re of 0.1.

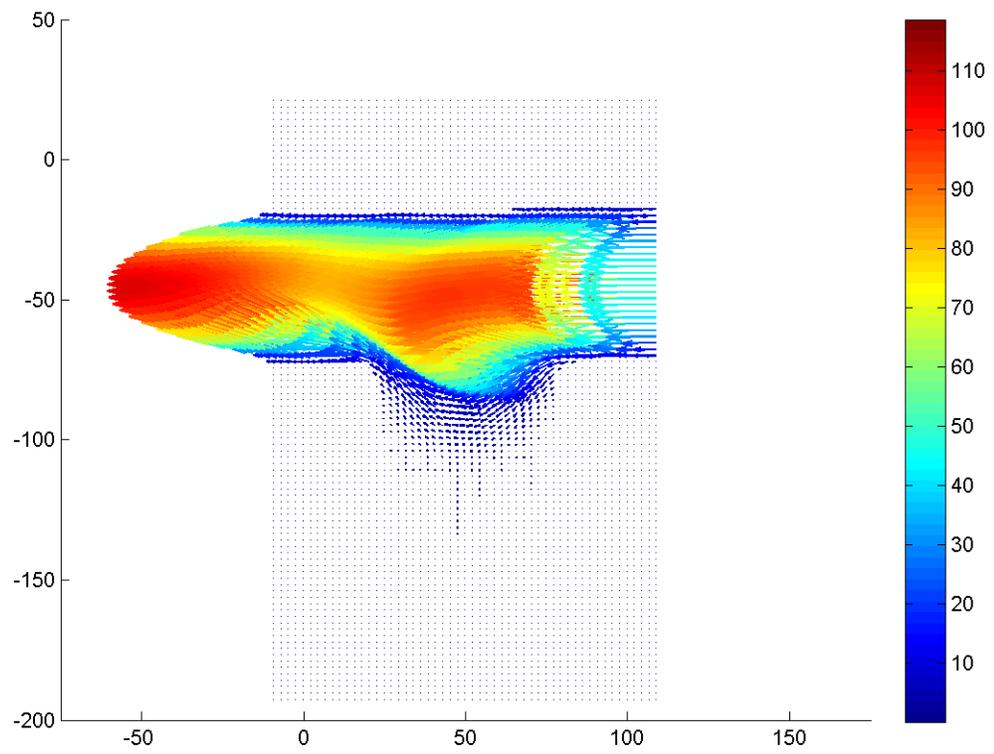


Figure F.123: Velocity field during phase increment 22 at 80 Hz with a Re of 0.1.

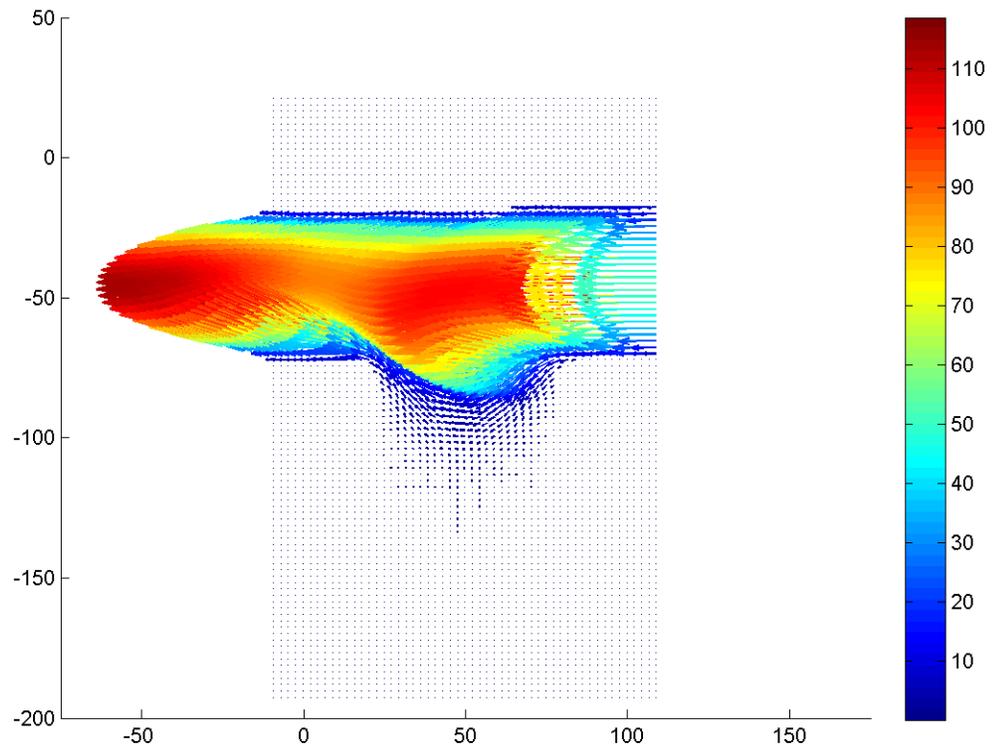


Figure F.124: Velocity field during phase increment 23 at 80 Hz with a Re of 0.1.

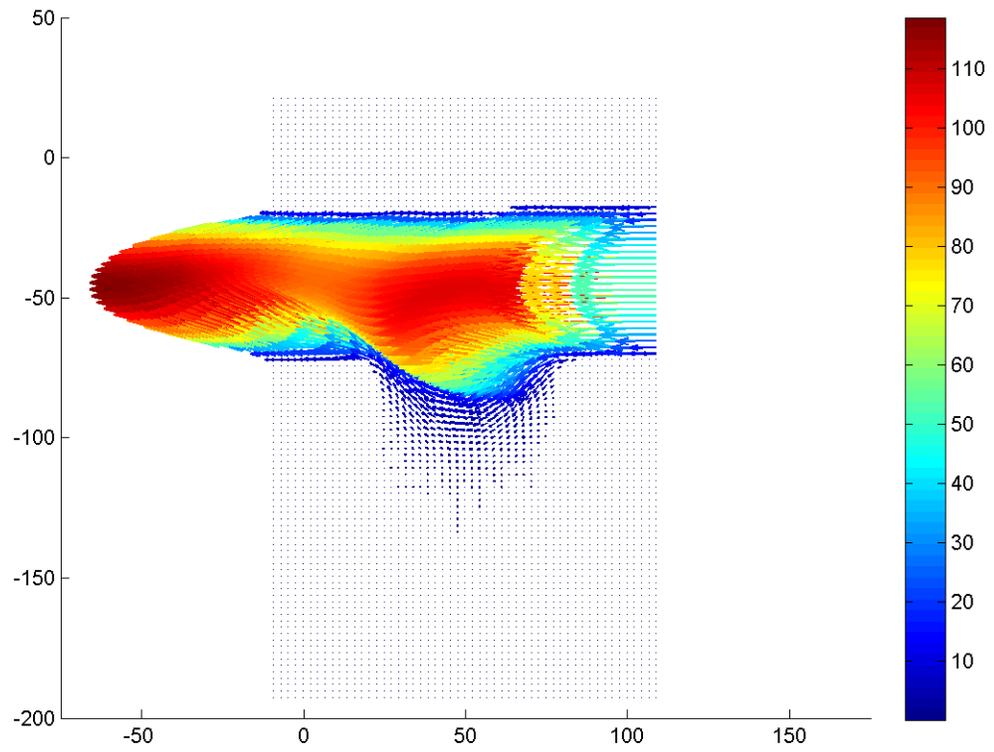


Figure F.125: Velocity field during phase increment 24 at 80 Hz with a Re of 0.1.

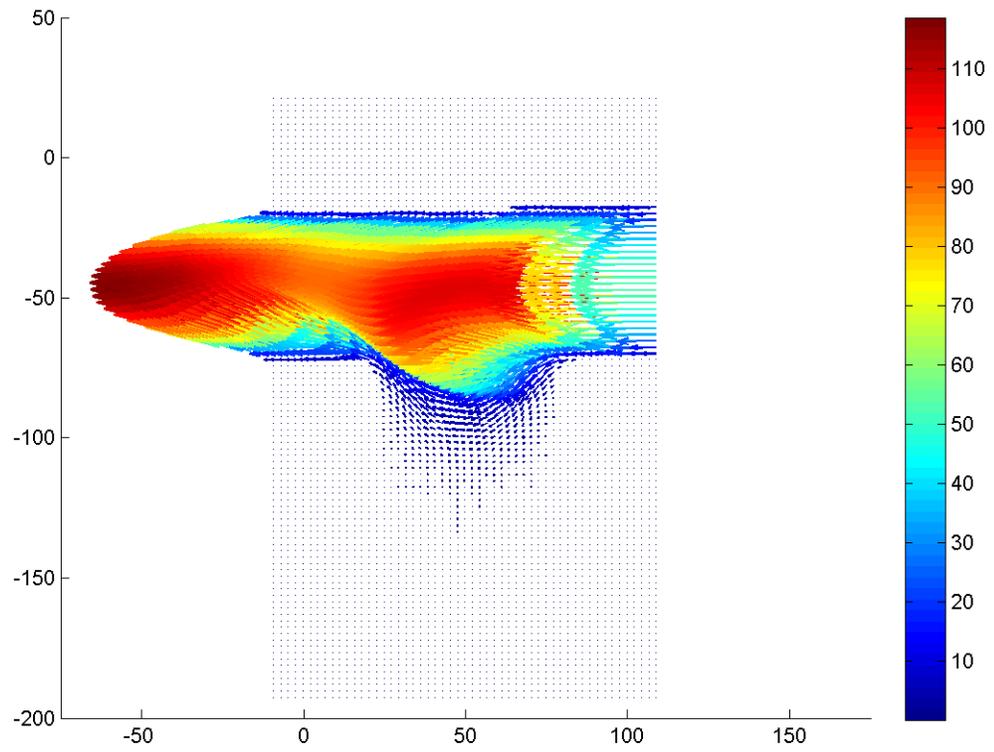


Figure F.126: Velocity field during phase increment 25 at 80 Hz with a Re of 0.1.

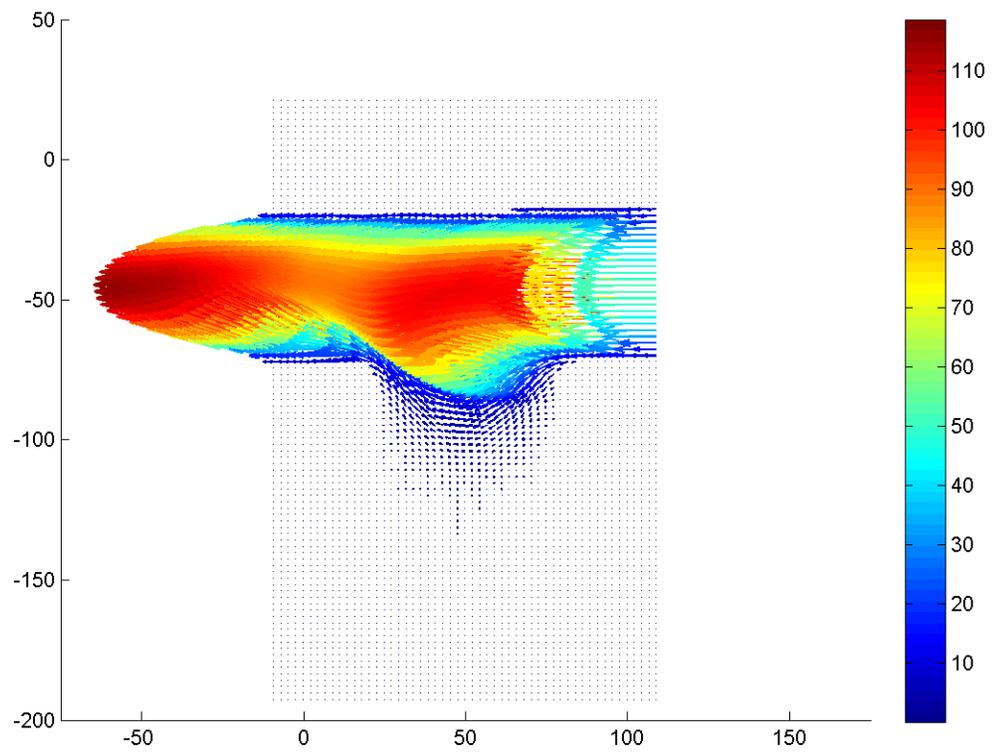


Figure F.127: Velocity field during phase increment 26 at 80 Hz with a Re of 0.1.

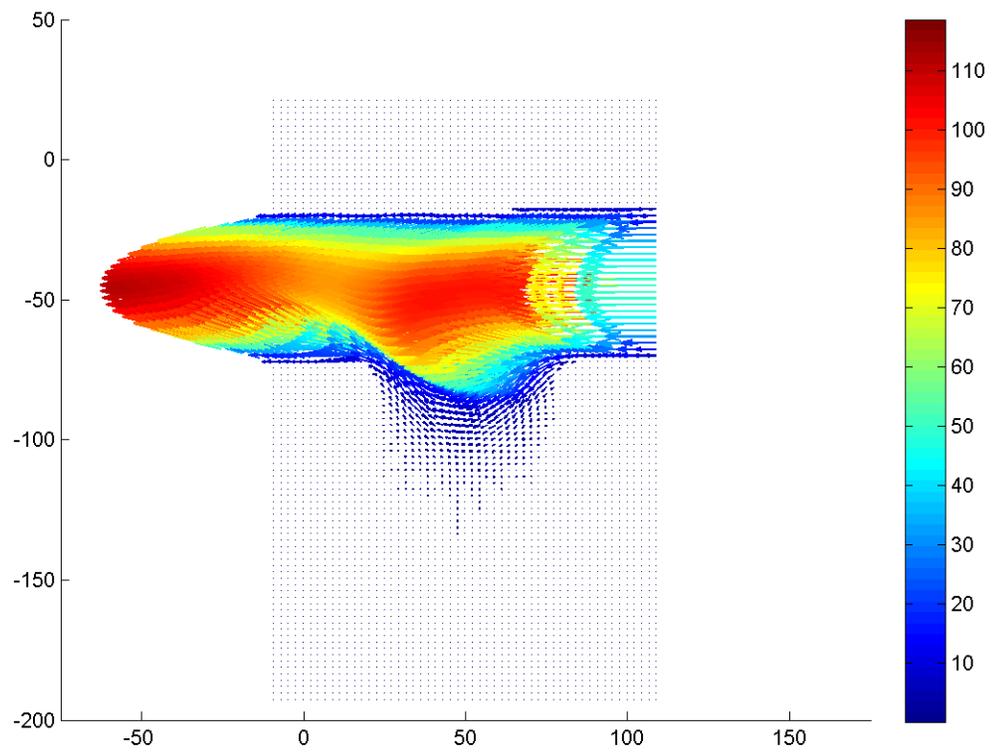


Figure F.128: Velocity field during phase increment 27 at 80 Hz with a Re of 0.1.

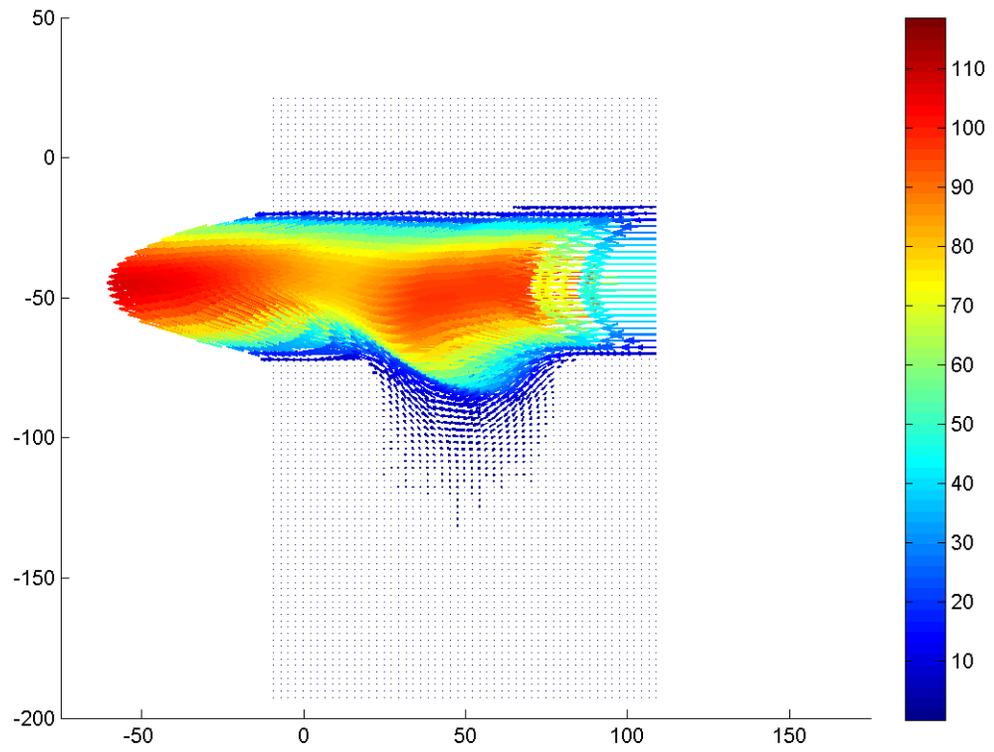


Figure F.129: Velocity field during phase increment 28 at 80 Hz with a Re of 0.1.

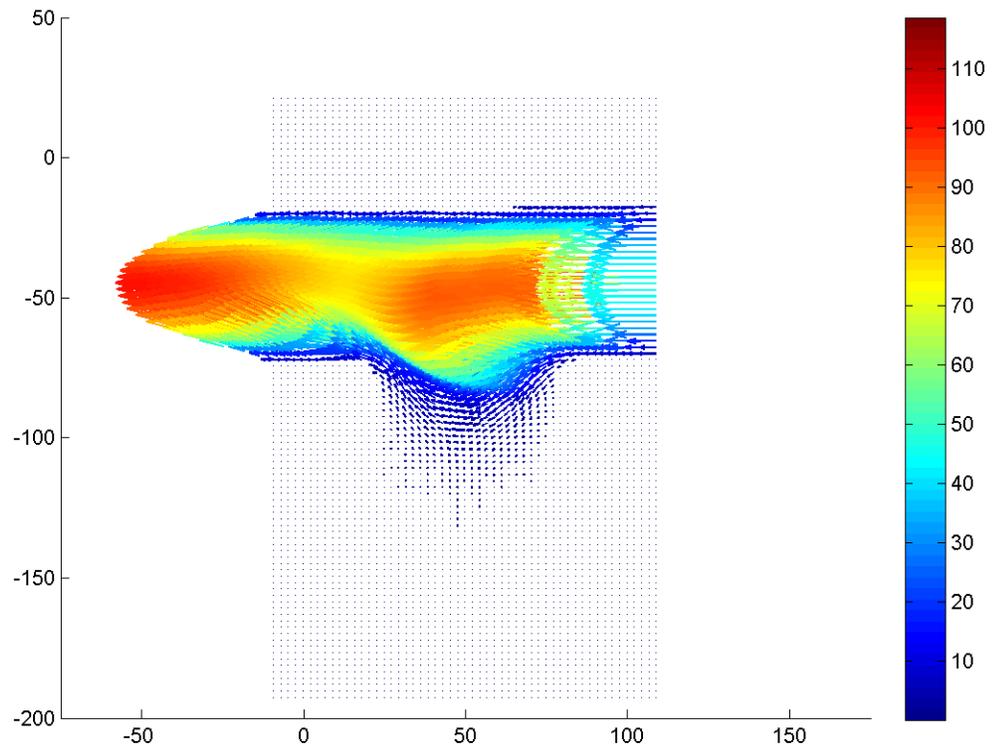


Figure F.130: Velocity field during phase increment 29 at 80 Hz with a Re of 0.1.

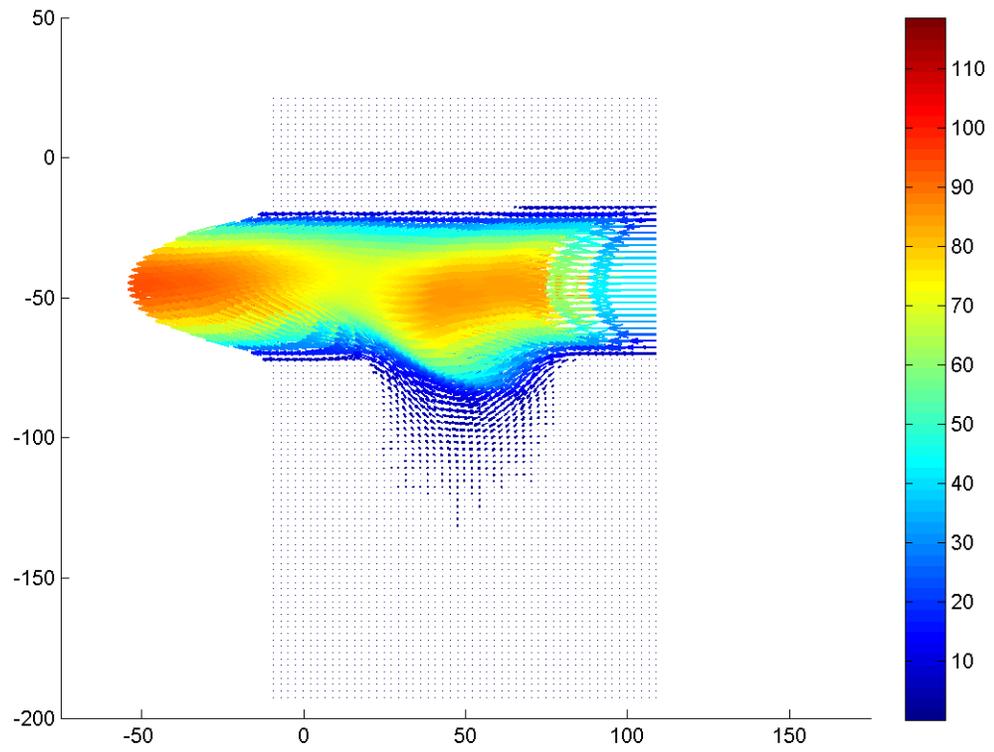


Figure F.131: Velocity field during phase increment 30 at 80 Hz with a Re of 0.1.

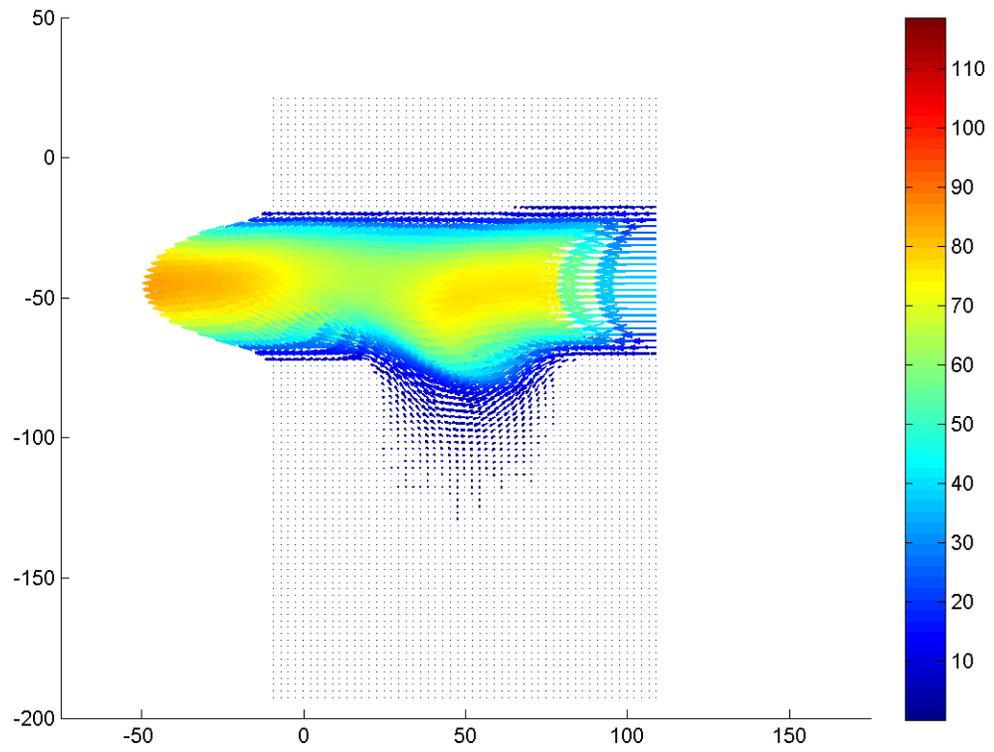


Figure F.132: Velocity field during phase increment 31 at 80 Hz with a Re of 0.1.

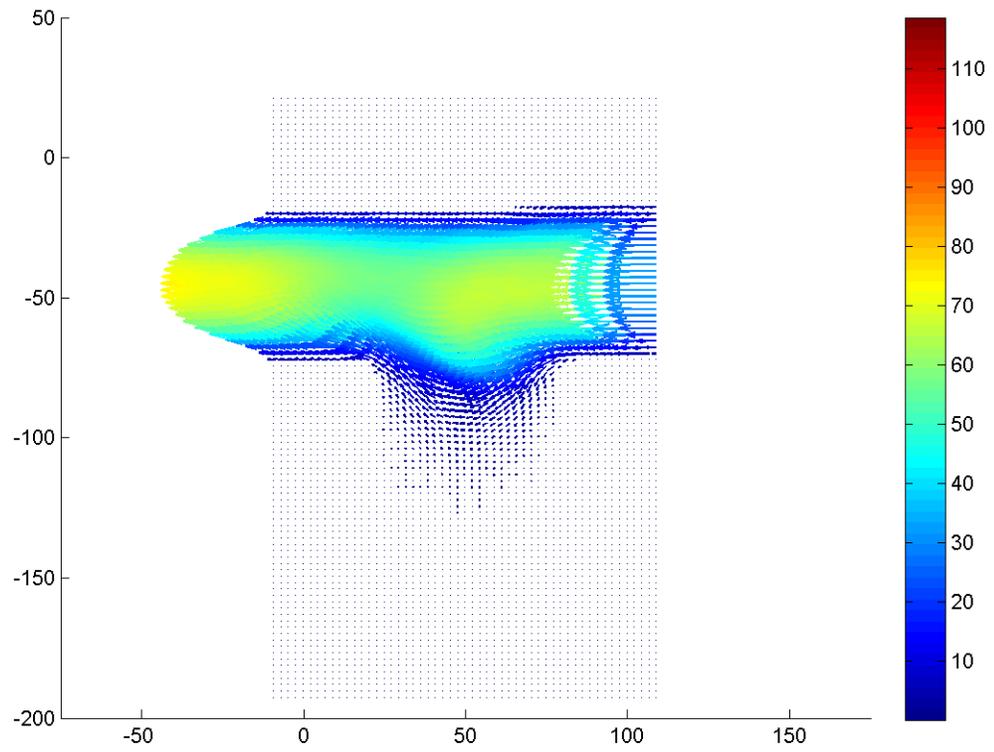


Figure F.133: Velocity field during phase increment 32 at 80 Hz with a Re of 0.1.

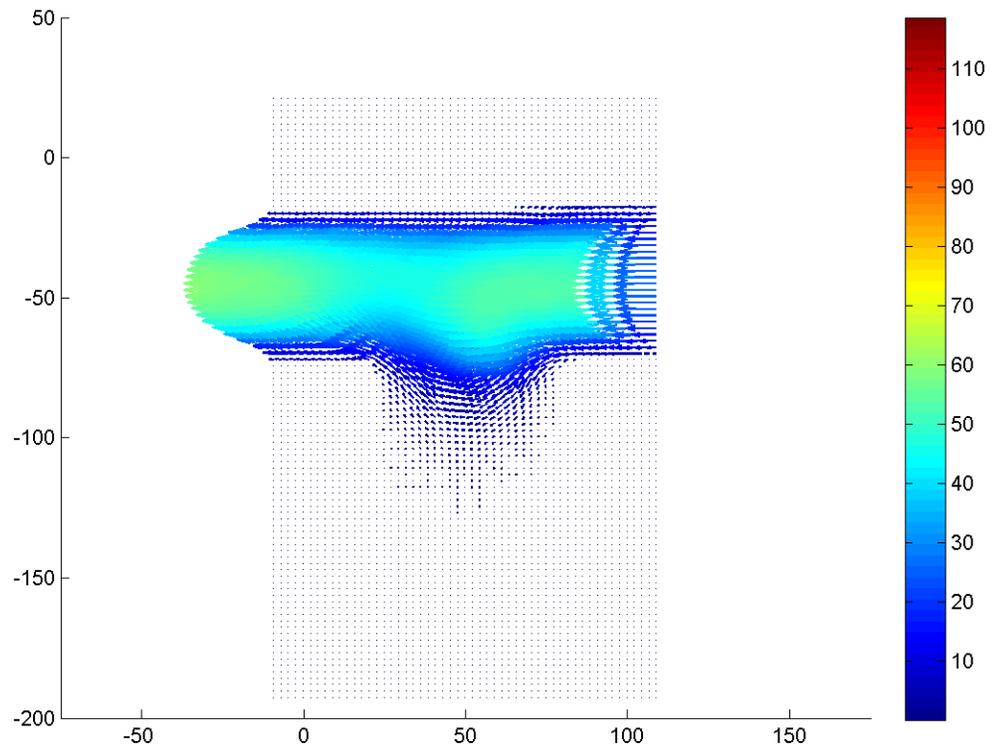


Figure F.134: Velocity field during phase increment 33 at 80 Hz with a Re of 0.1.

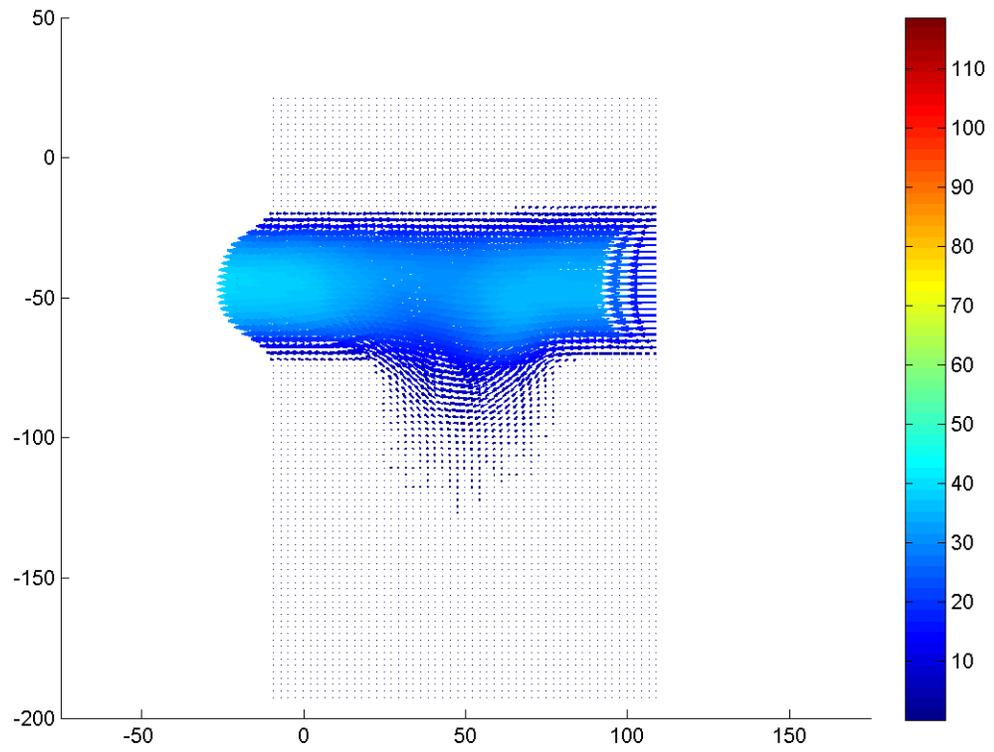


Figure F.135: Velocity field during phase increment 34 at 80 Hz with a Re of 0.1.

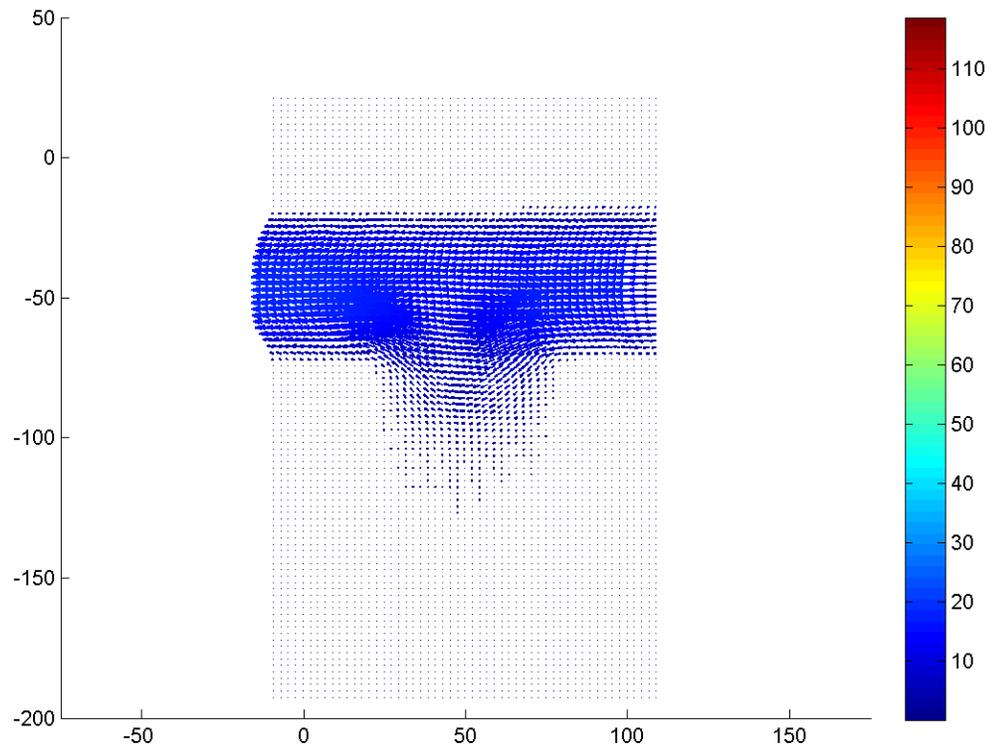


Figure F.136: Velocity field during phase increment 35 at 80 Hz with a Re of 0.1.

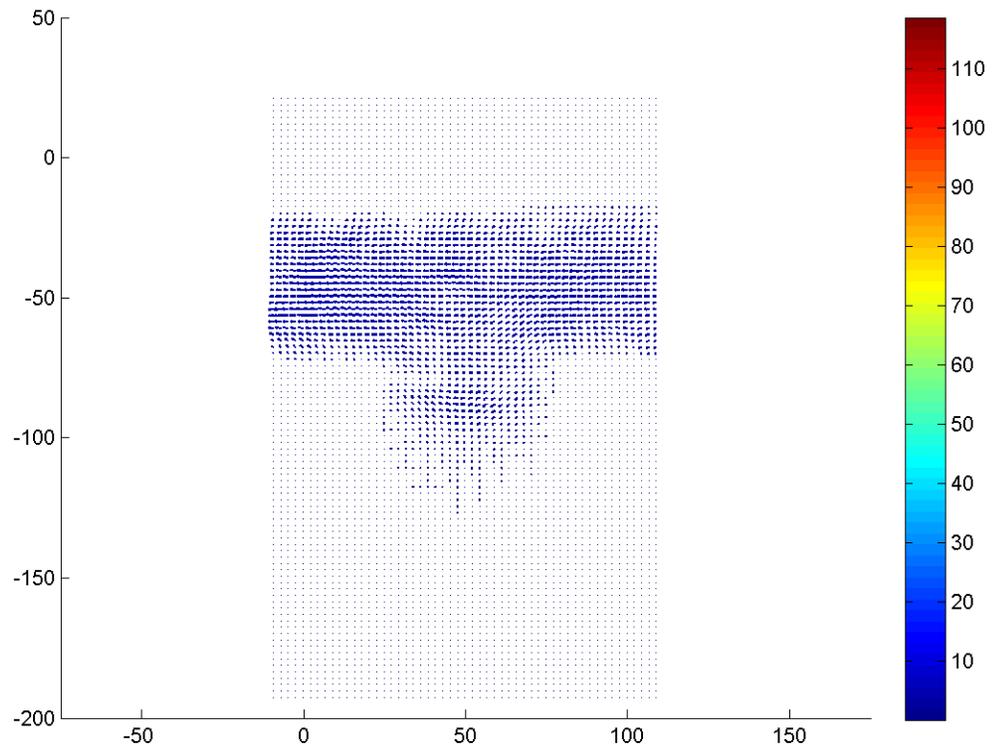


Figure F.137: Velocity field during phase increment 36 at 80 Hz with a Re of 0.1.

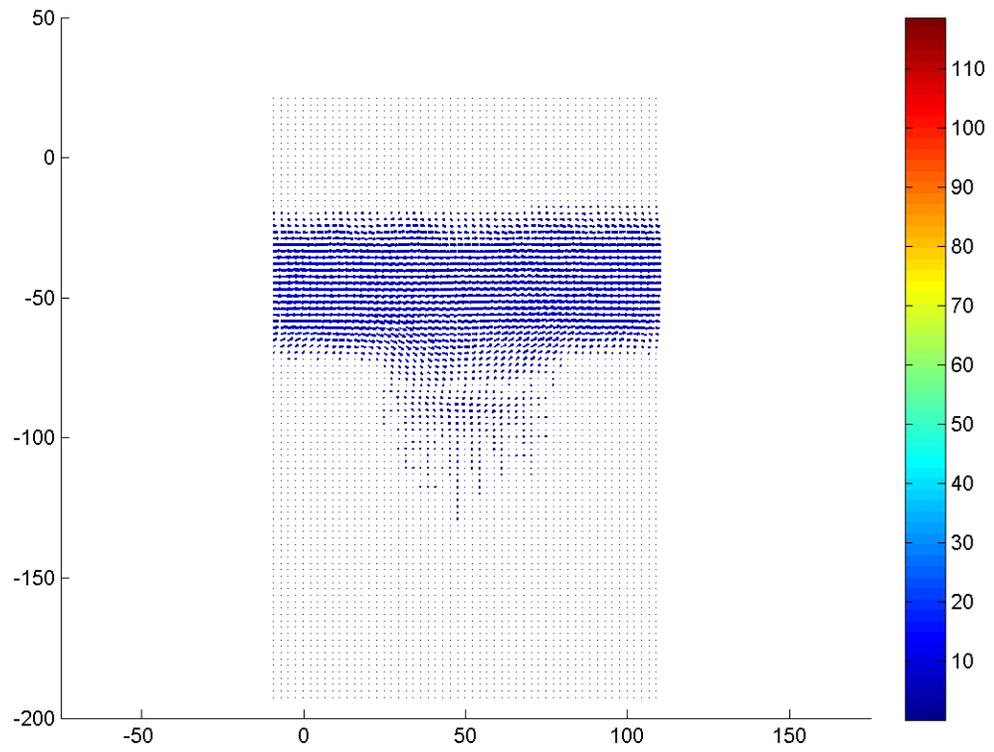


Figure F.138: Velocity field during phase increment 37 at 80 Hz with a Re of 0.1.

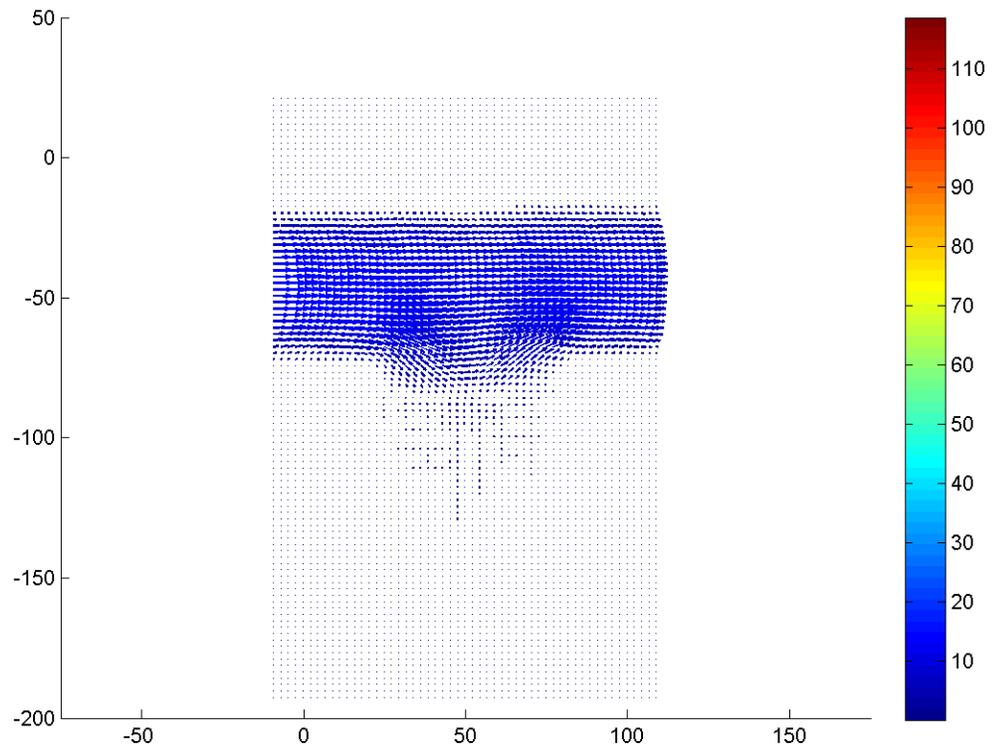


Figure F.139: Velocity field during phase increment 38 at 80 Hz with a Re of 0.1.

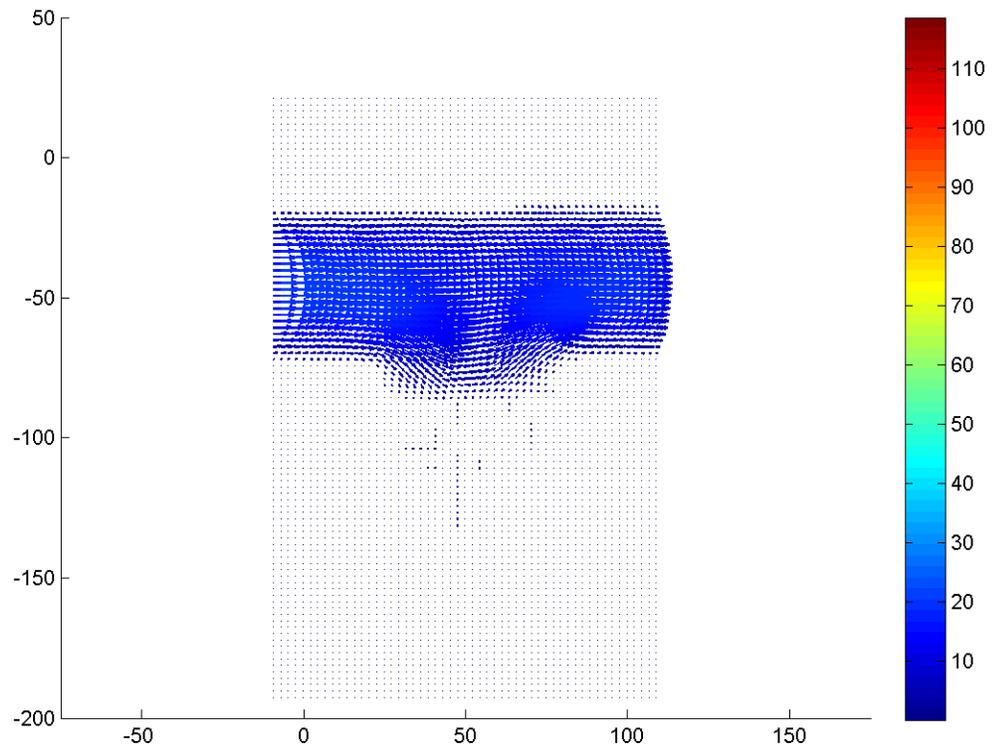


Figure F.140: Velocity field during phase increment 39 at 80 Hz with a Re of 0.1.

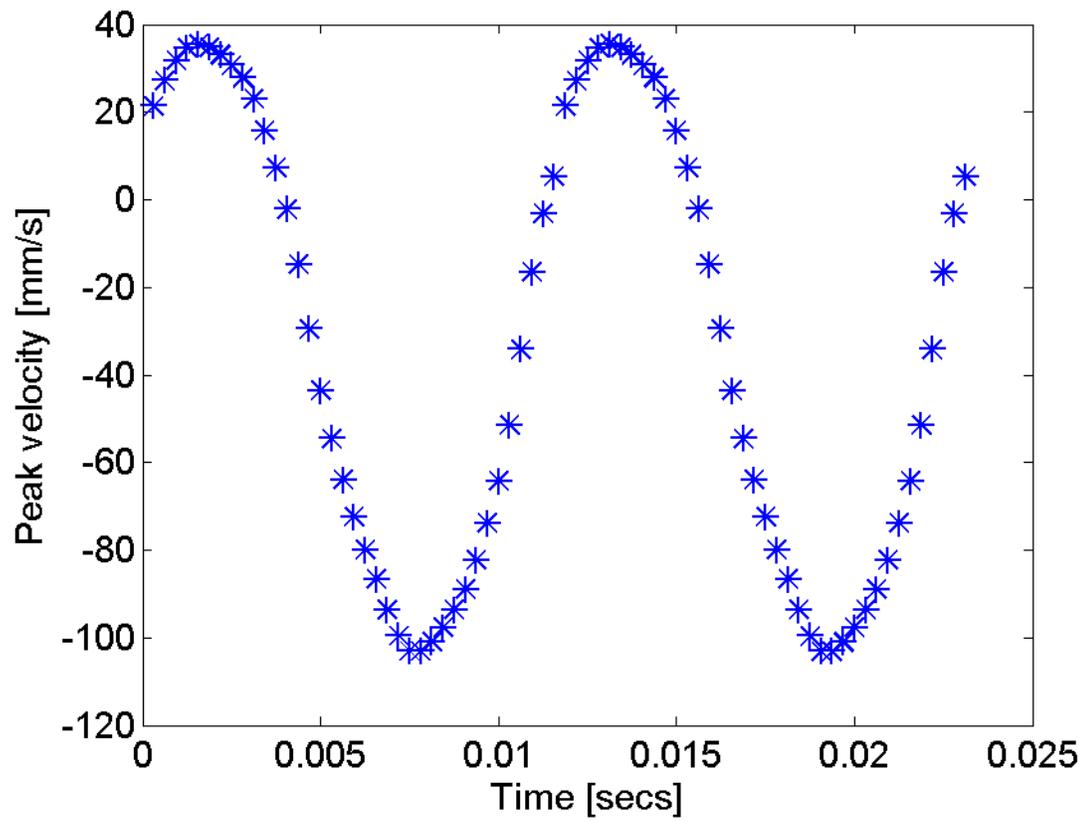


Figure F.141: The peak velocity in the free stream region in time at 80 Hz.

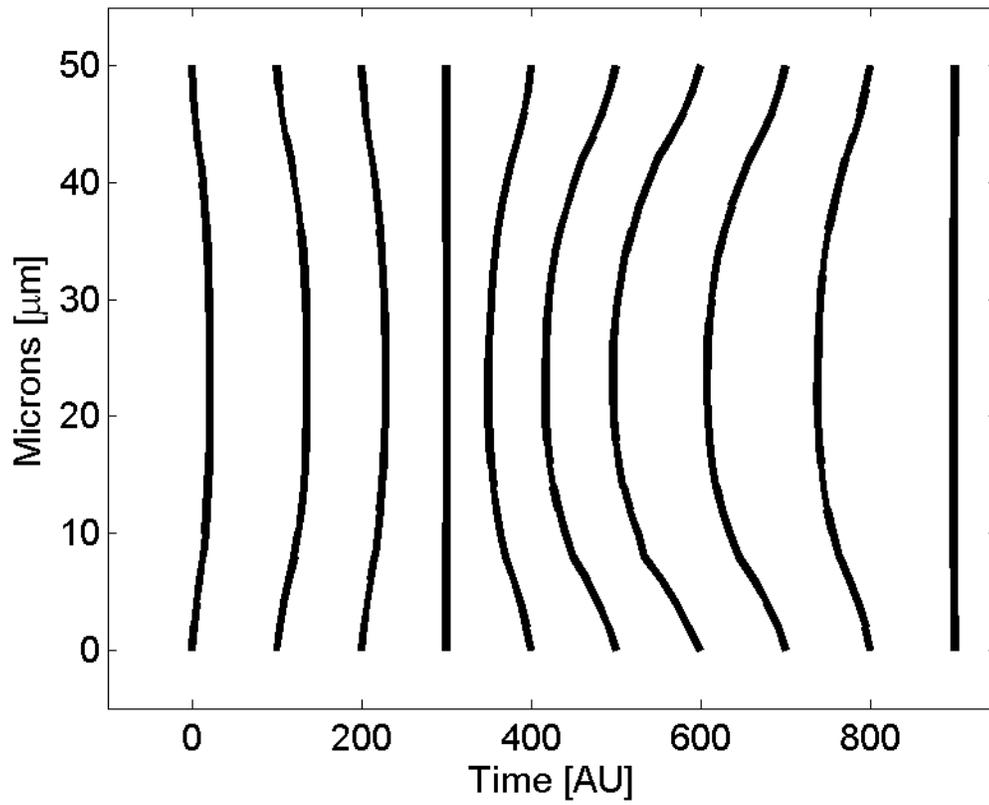


Figure F.142: The velocity profile in the free stream versus time at 80 Hz.

F.2.2 Streamline images at 80 Hz

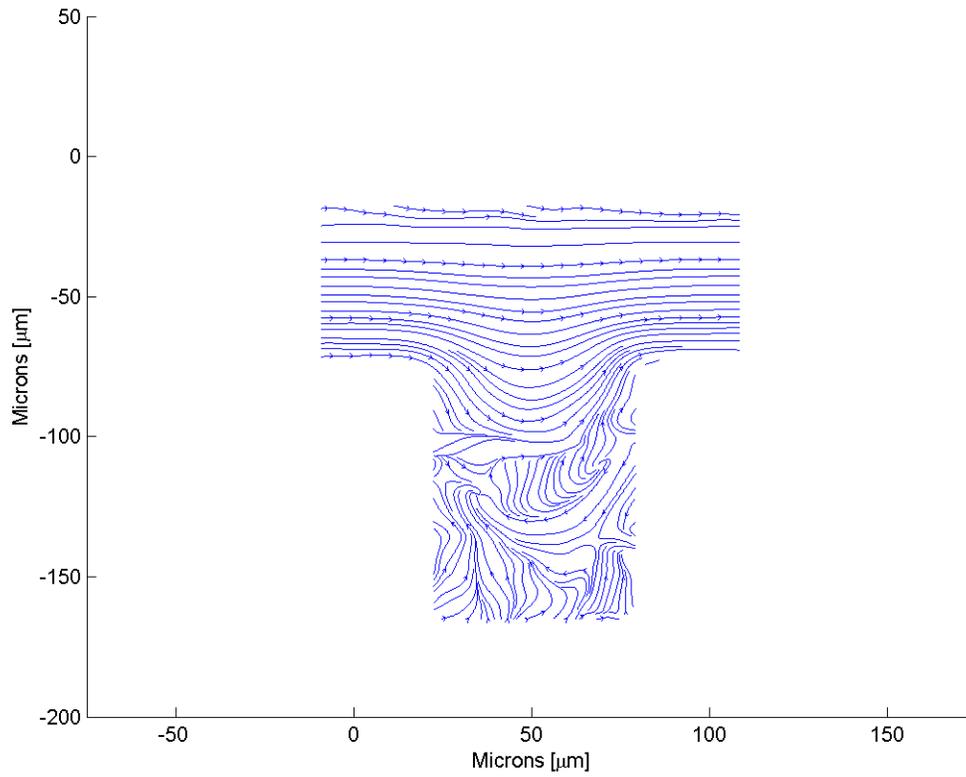


Figure F.143: Streamline image during phase increment 1 at 80 Hz and a Re of 0.1.

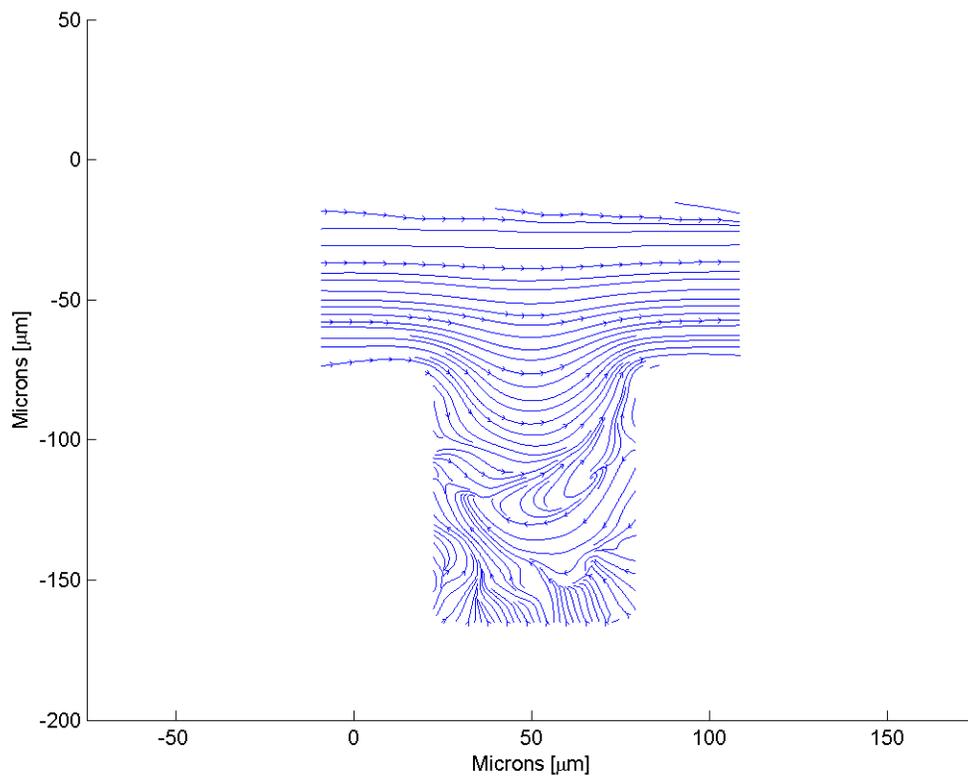


Figure F.144: Streamline image during phase increment 2 at 80 Hz and a Re of 0.1.

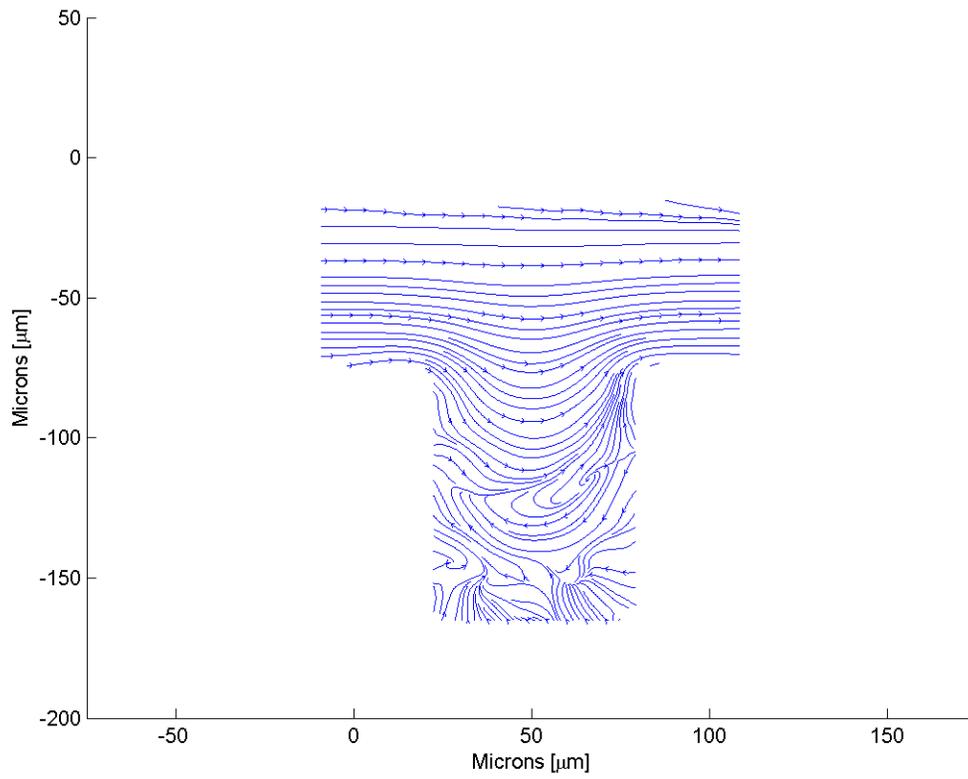


Figure F.145: Streamline image during phase increment 3 at 80 Hz and a Re of 0.1.

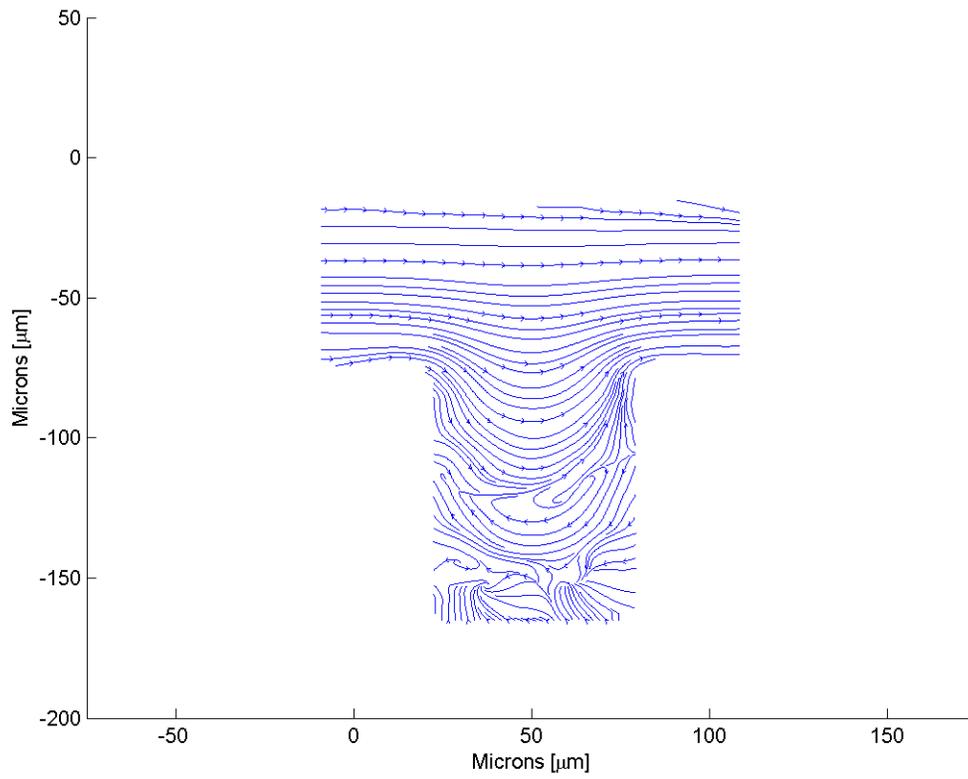


Figure F.146: Streamline image during phase increment 4 at 80 Hz and a Re of 0.1.

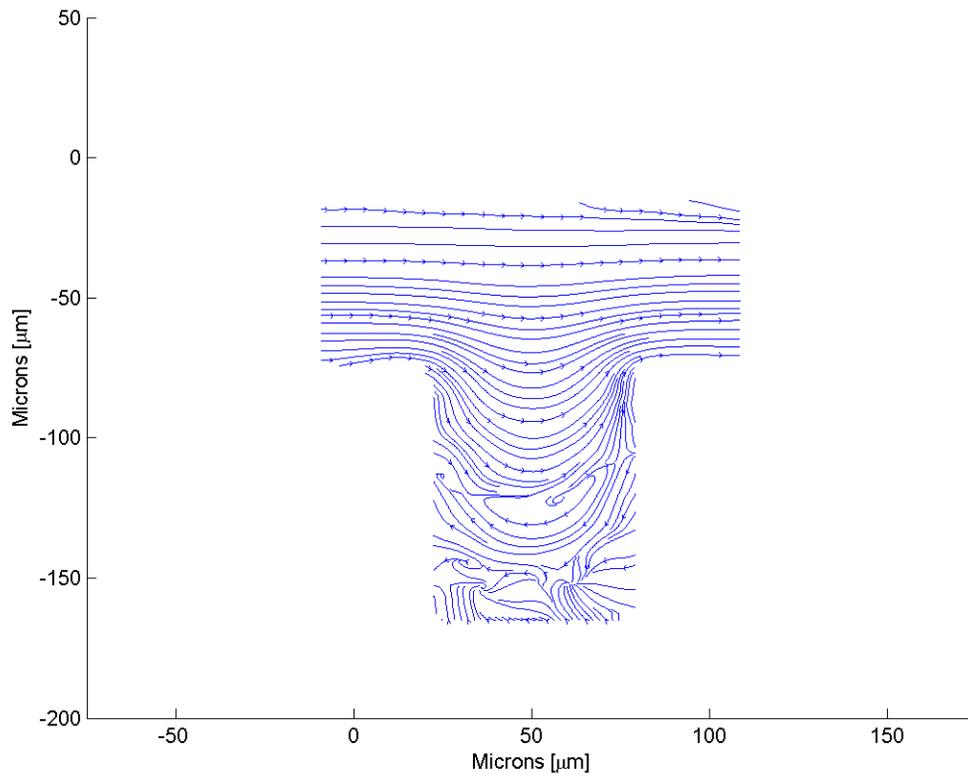


Figure F.147: Streamline image during phase increment 5 at 80 Hz and a Re of 0.1.

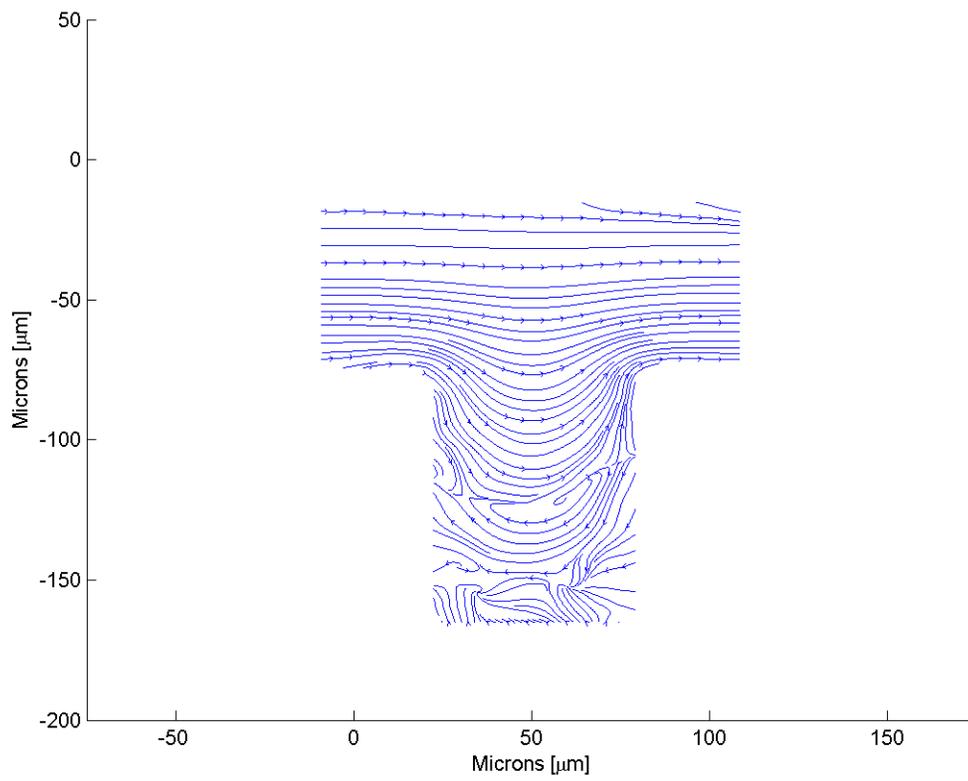


Figure F.148: Streamline image during phase increment 6 at 80 Hz and a Re of 0.1.

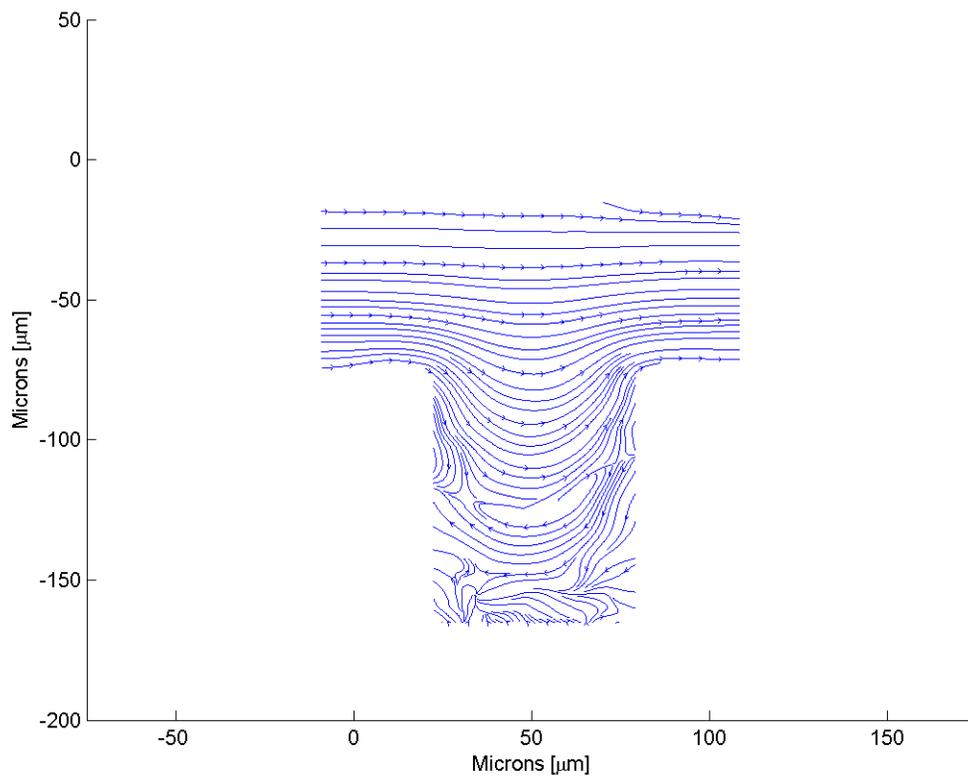


Figure F.149: Streamline image during phase increment 7 at 80 Hz and a Re of 0.1.

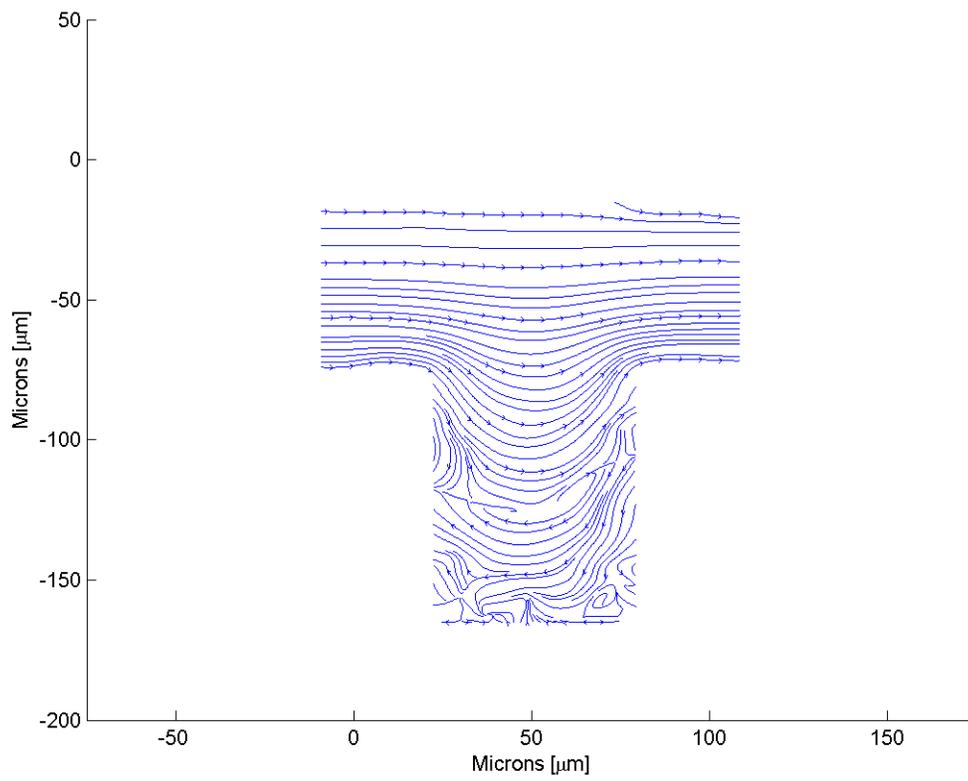


Figure F.150: Streamline image during phase increment 8 at 80 Hz and a Re of 0.1.

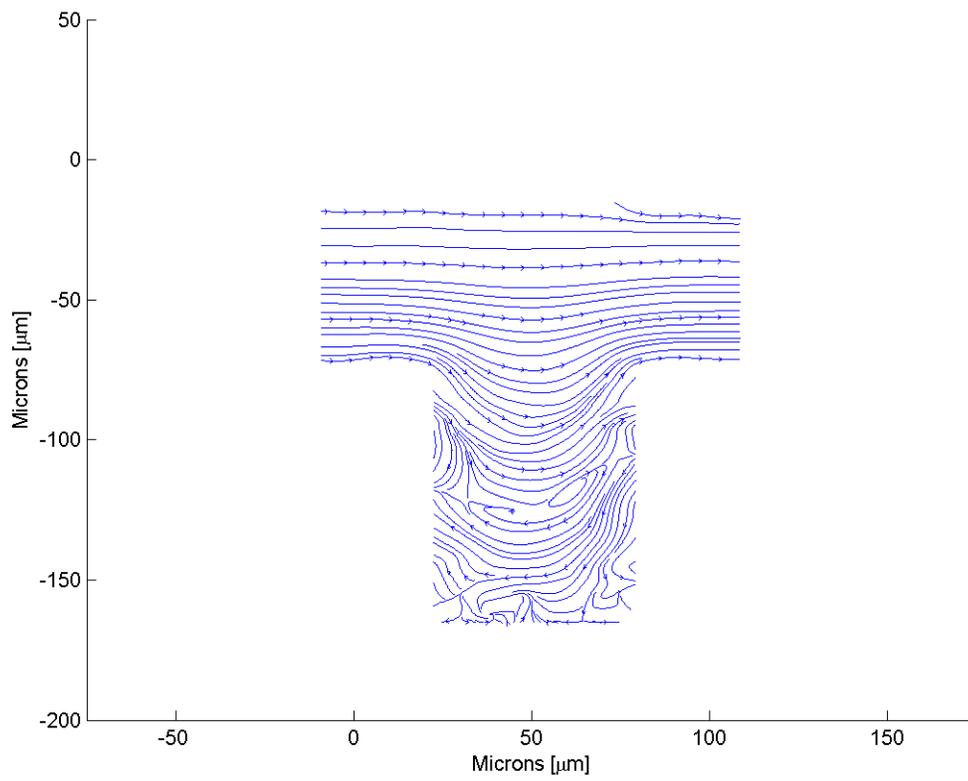


Figure F.151: Streamline image during phase increment 9 at 80 Hz and a Re of 0.1.

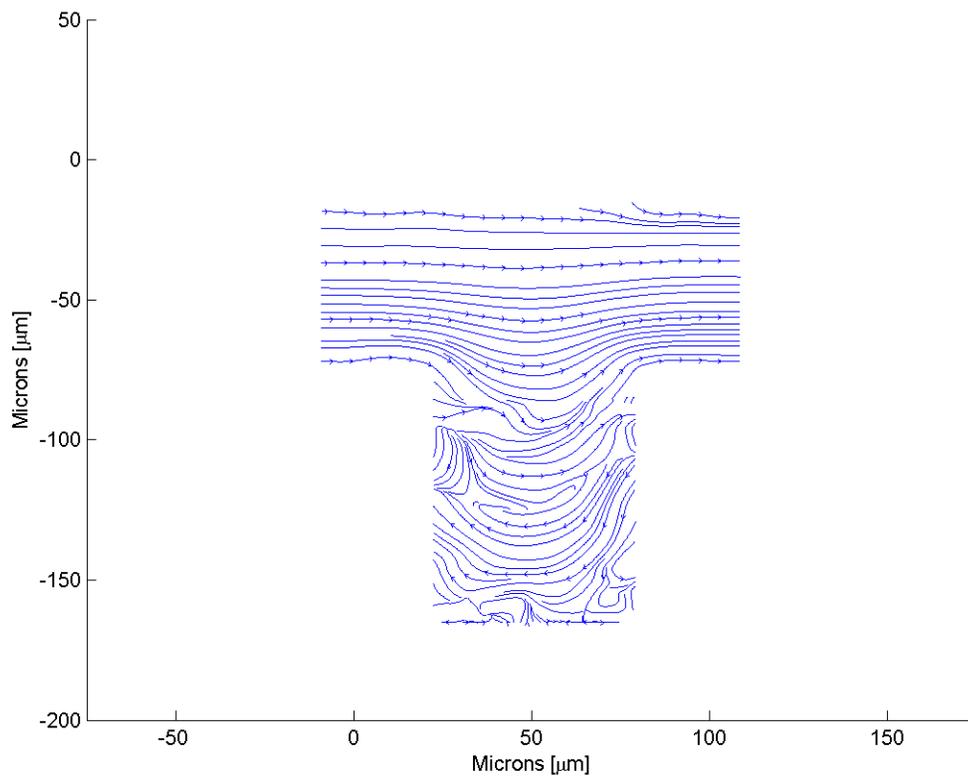


Figure F.152: Streamline image during phase increment 10 at 80 Hz and a Re of 0.1.

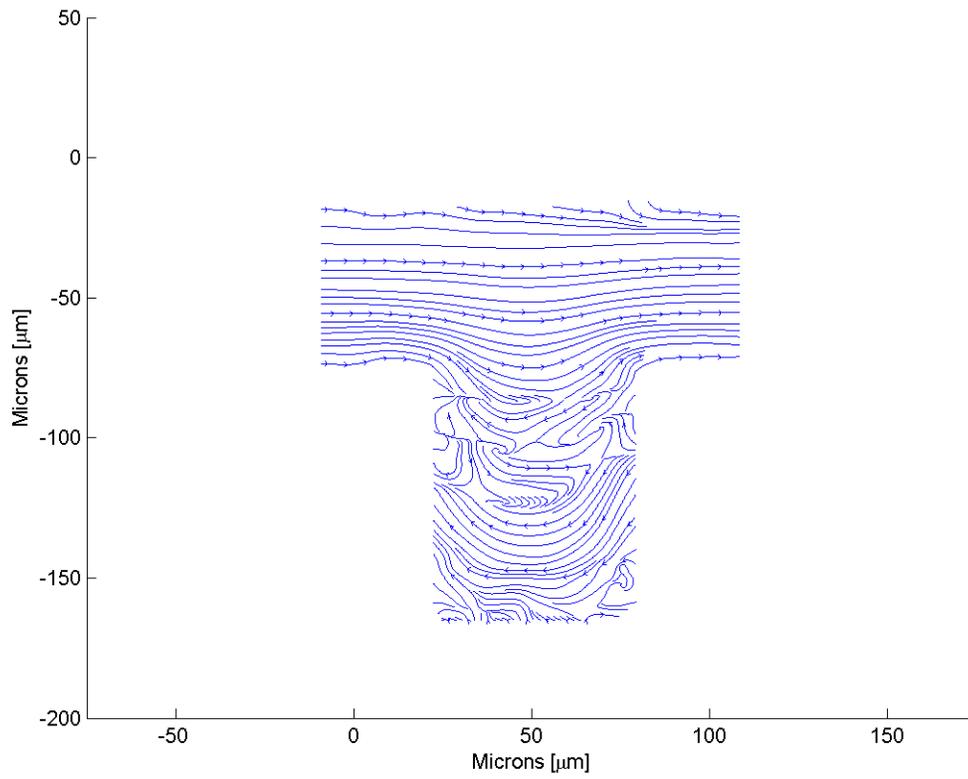


Figure F.153: Streamline image during phase increment 11 at 80 Hz and a Re of 0.1.

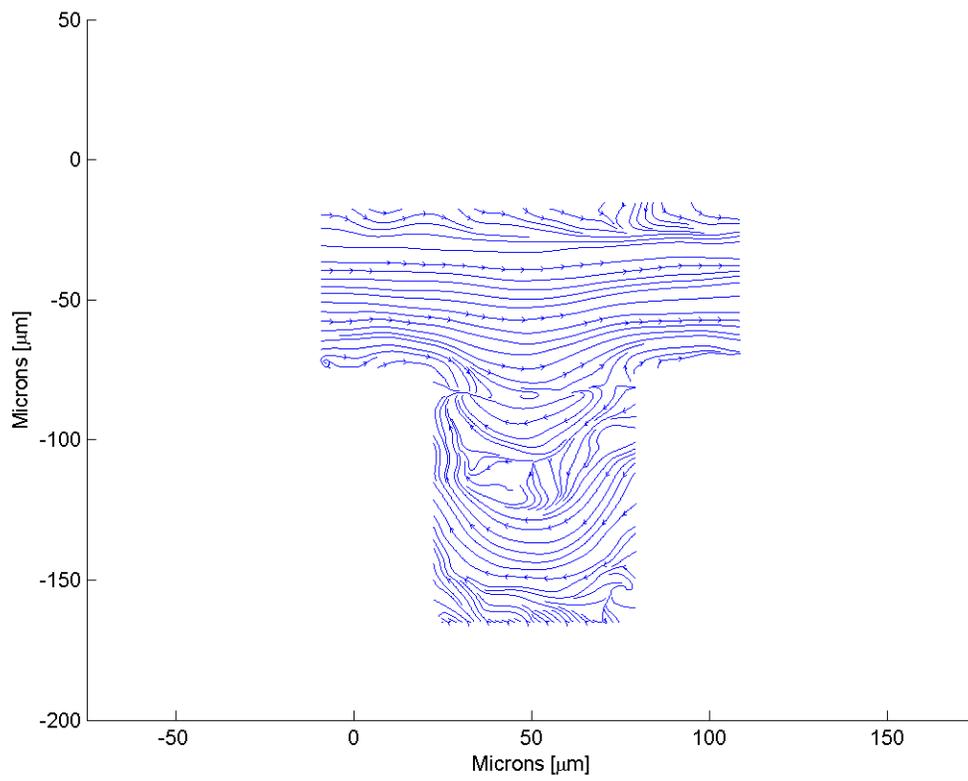


Figure F.154: Streamline image during phase increment 12 at 80 Hz and a Re of 0.1.

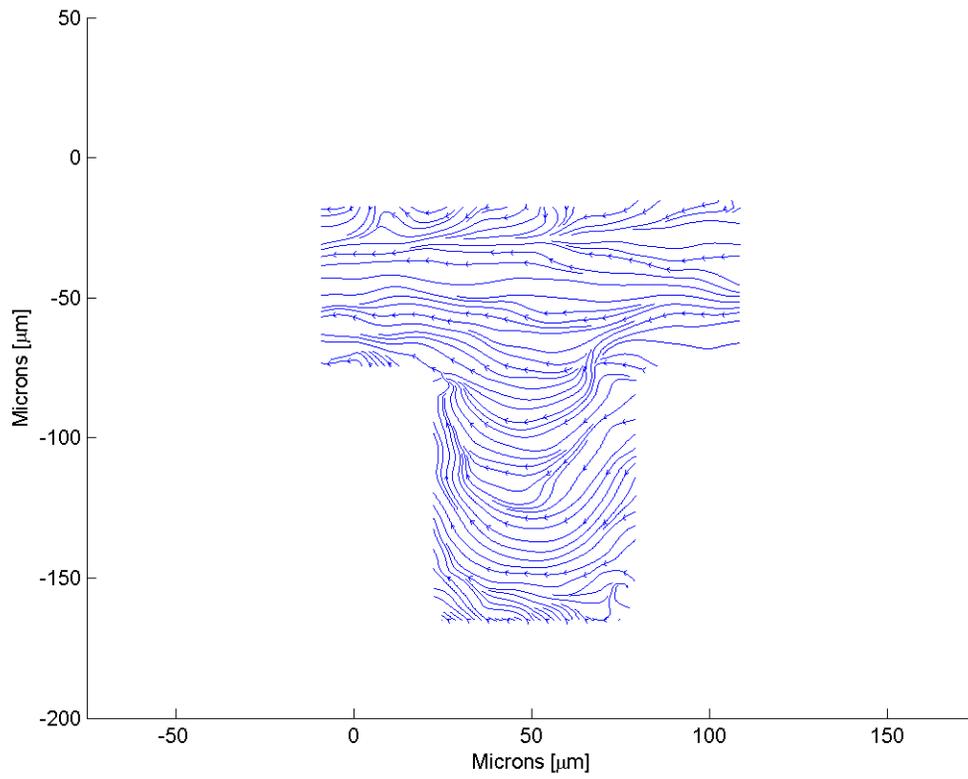


Figure F.155: Streamline image during phase increment 13 at 80 Hz and a Re of 0.1.

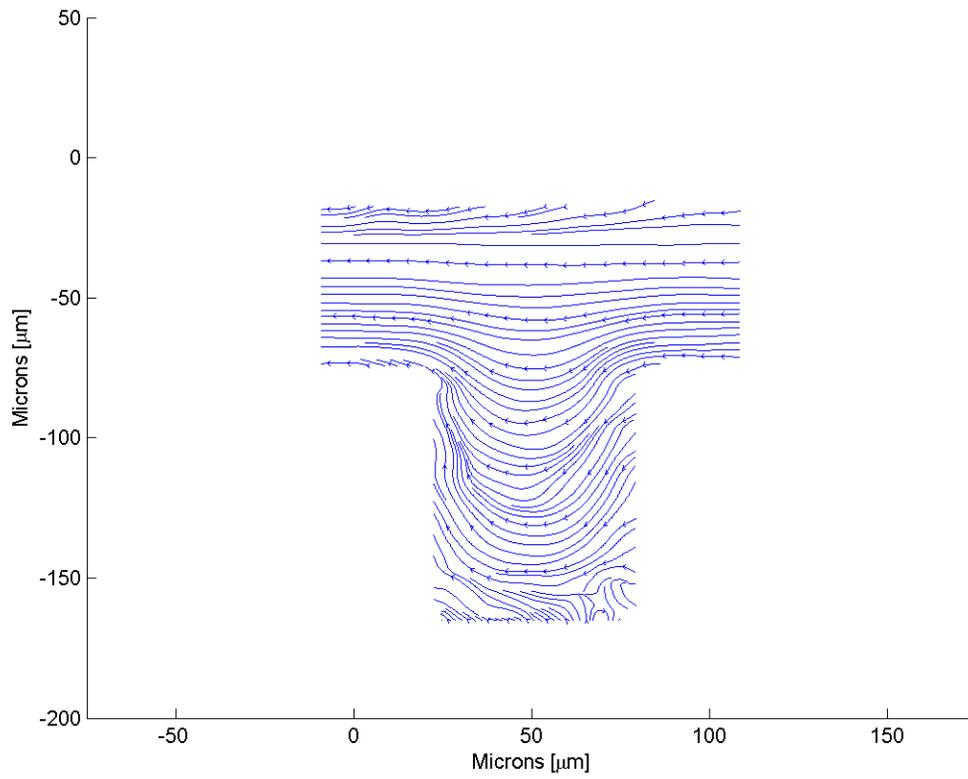


Figure F.156: Streamline image during phase increment 14 at 80 Hz and a Re of 0.1.

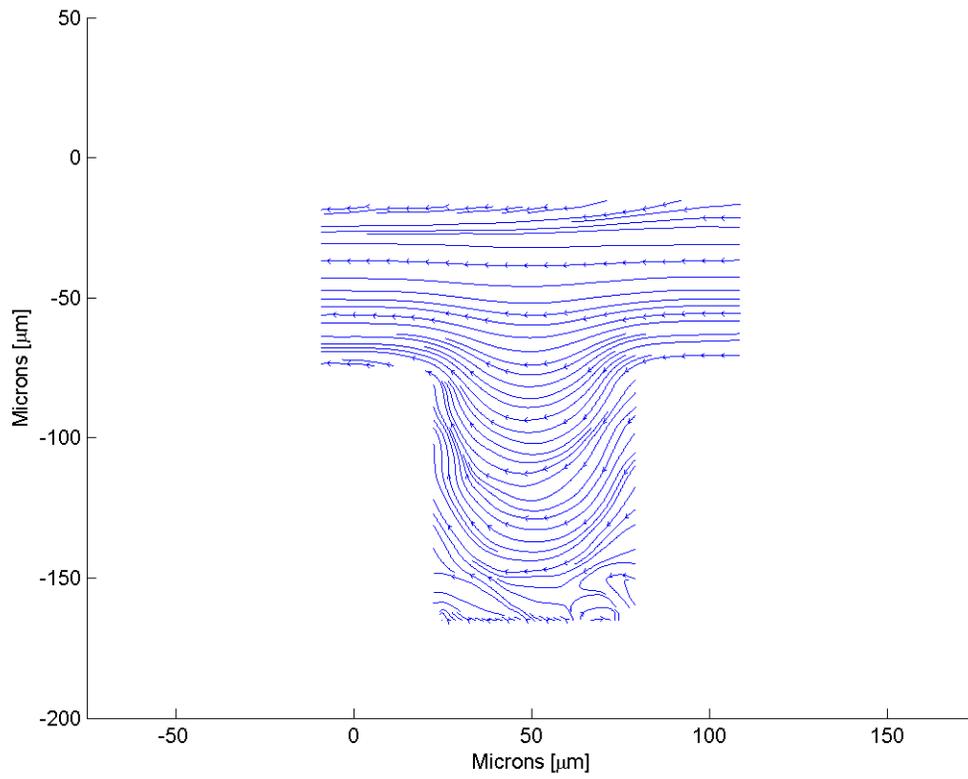


Figure F.157: Streamline image during phase increment 15 at 80 Hz and a Re of 0.1.

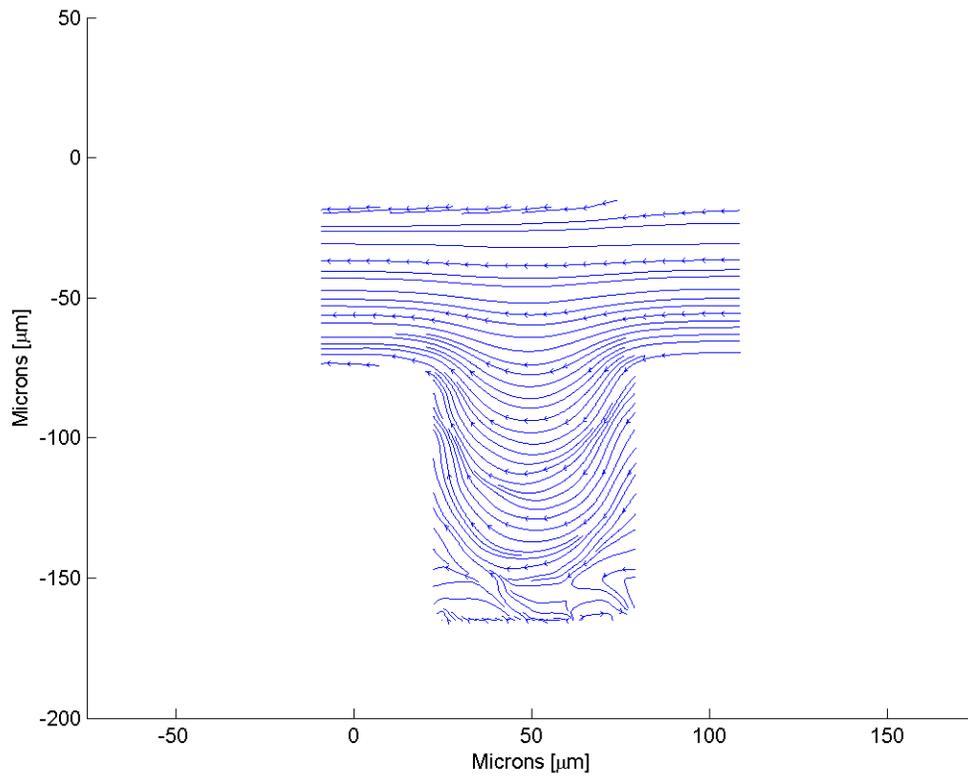


Figure F.158: Streamline image during phase increment 16 at 80 Hz and a Re of 0.1.

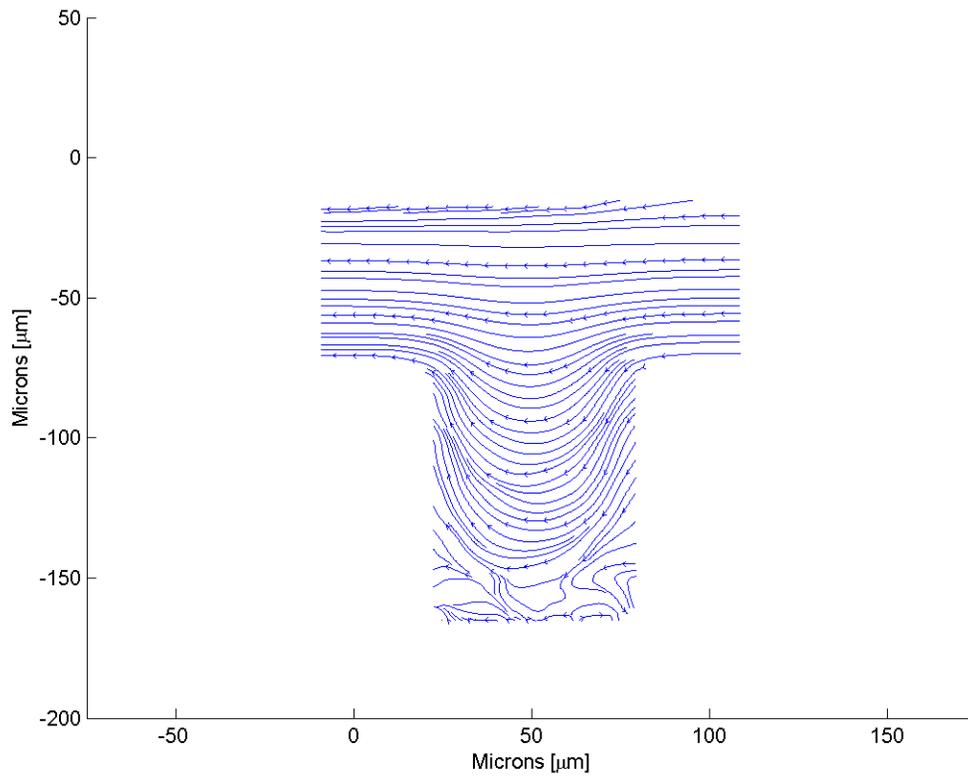


Figure F.159: Streamline image during phase increment 17 at 80 Hz and a Re of 0.1.

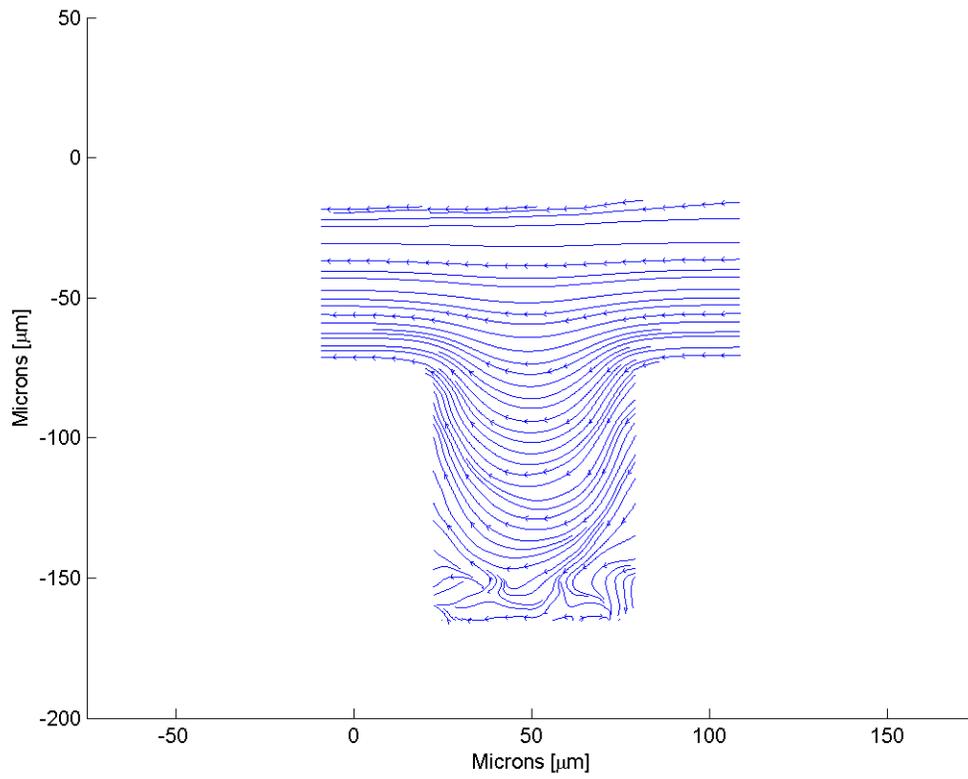


Figure F.160: Streamline image during phase increment 18 at 80 Hz and a Re of 0.1.

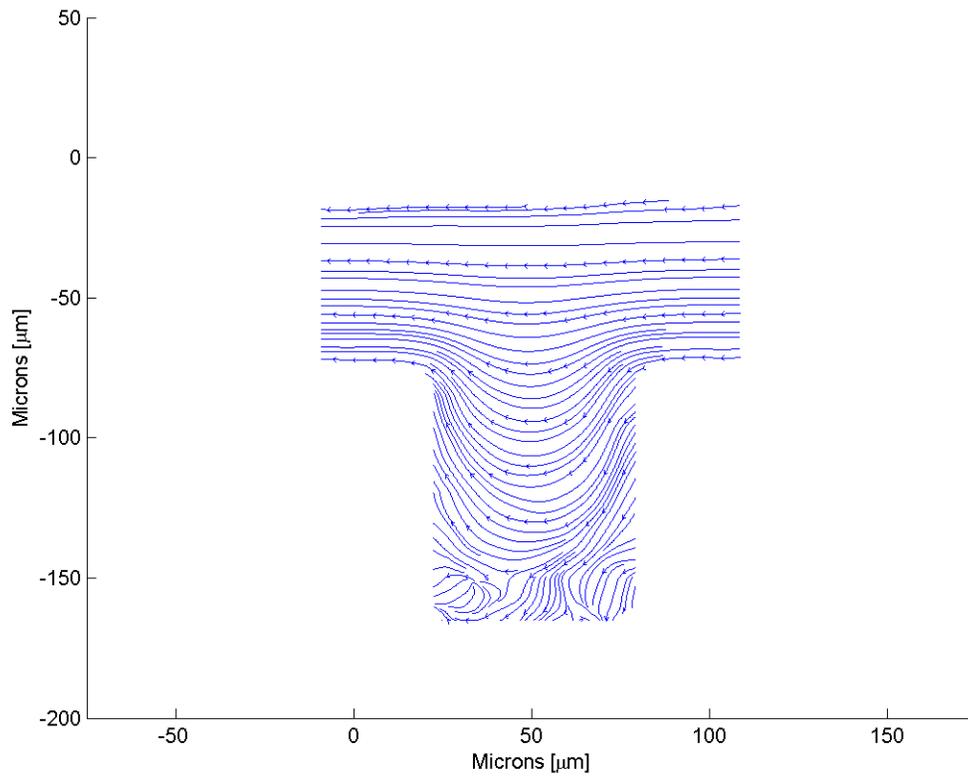


Figure F.161: Streamline image during phase increment 18 at 80 Hz and a Re of 0.1.

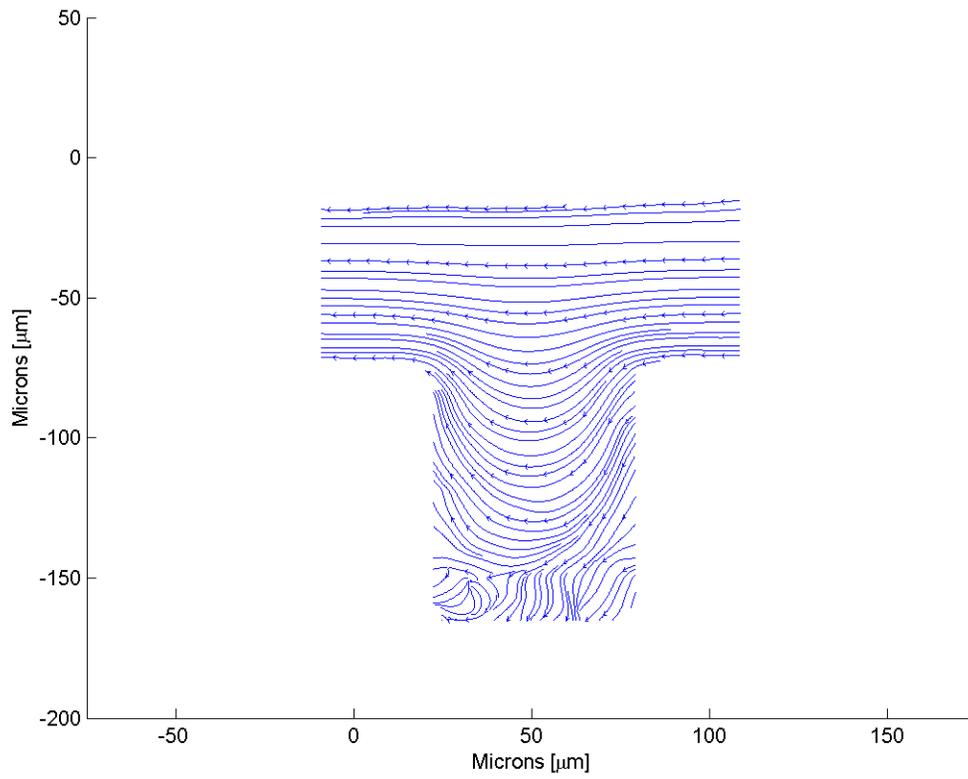


Figure F.162: Streamline image during phase increment 20 at 80 Hz and a Re of 0.1.

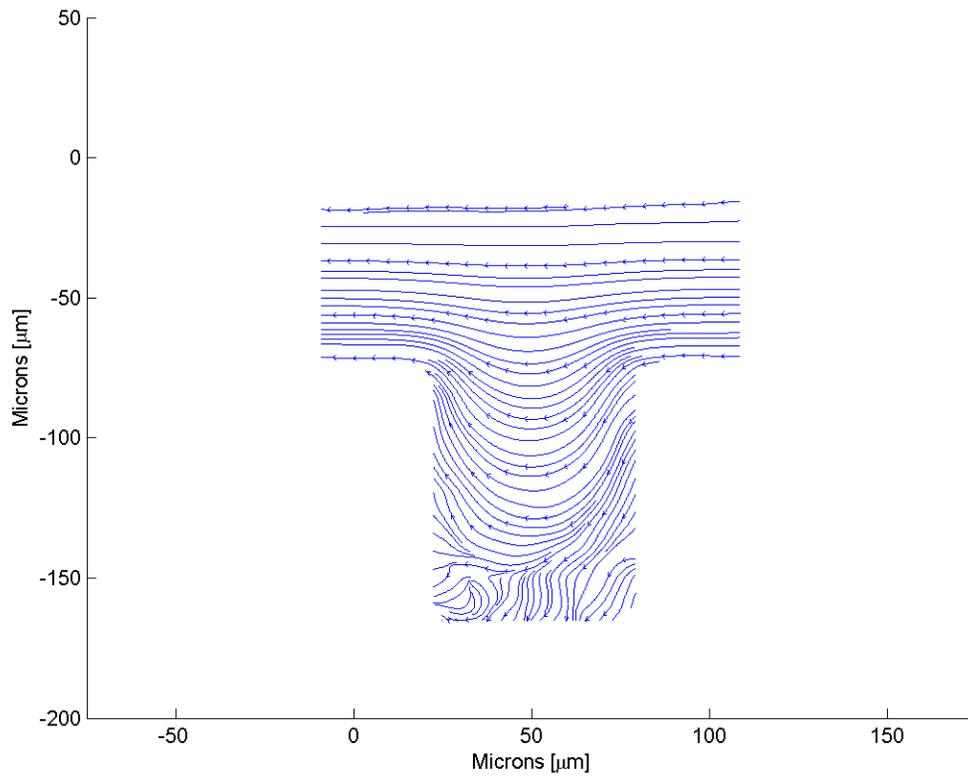


Figure F.163: Streamline image during phase increment 21 at 80 Hz and a Re of 0.1.

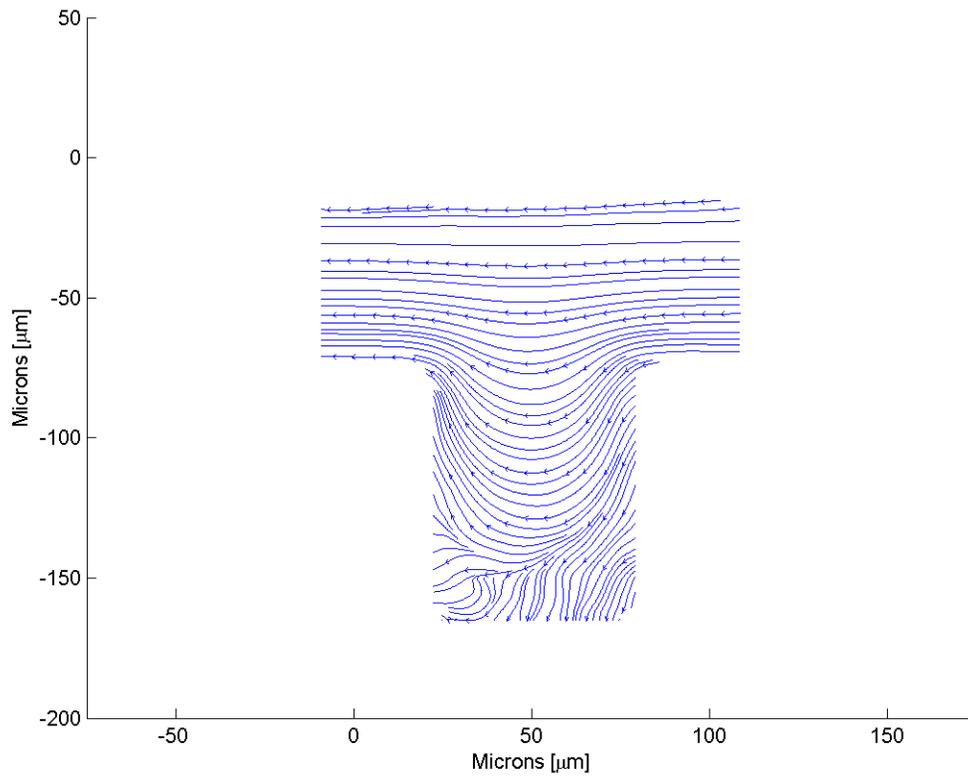


Figure F.164: Streamline image during phase increment 22 at 80 Hz and a Re of 0.1.

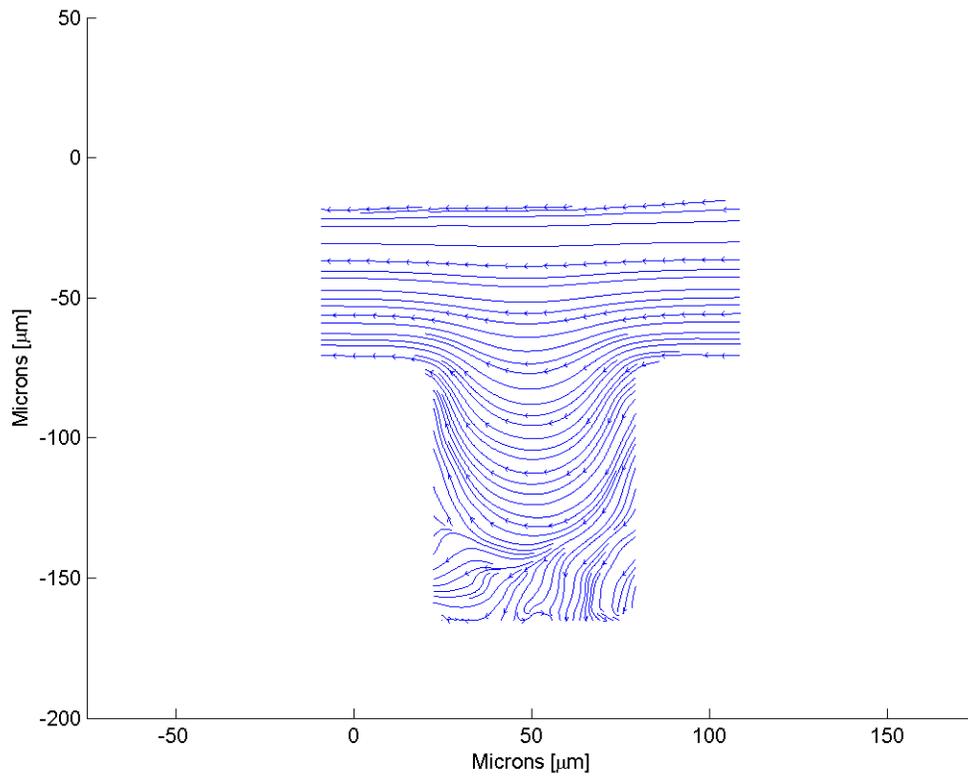


Figure F.165: Streamline image during phase increment 23 at 80 Hz and a Re of 0.1.

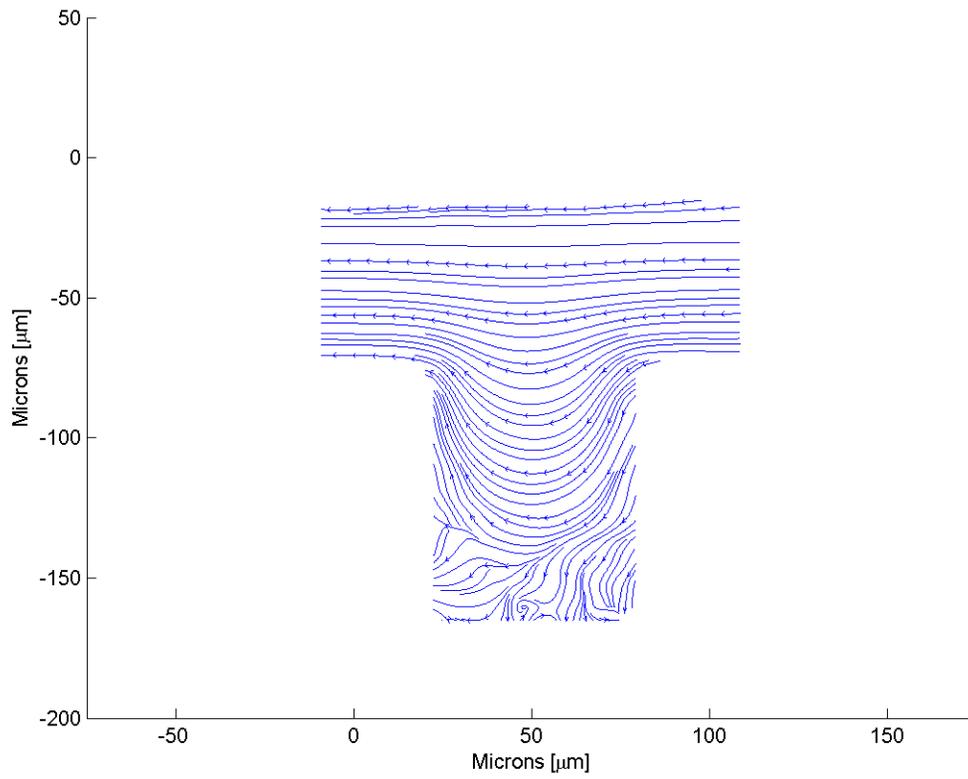


Figure F.166: Streamline image during phase increment 24 at 80 Hz and a Re of 0.1.

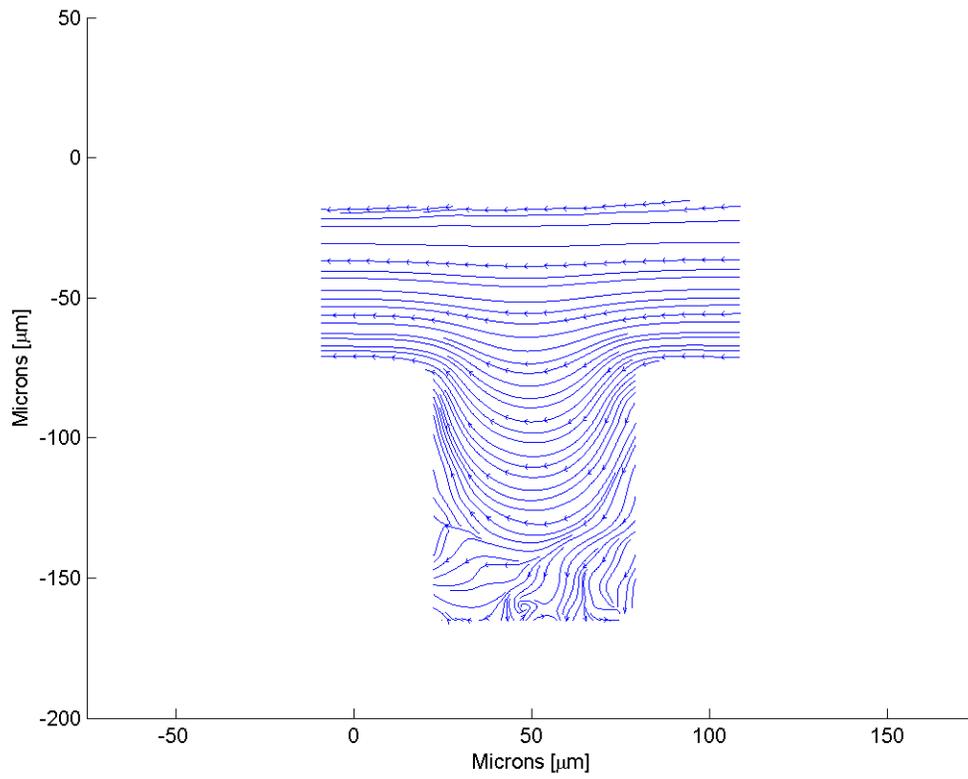


Figure F.167: Streamline image during phase increment 25 at 80 Hz and a Re of 0.1.

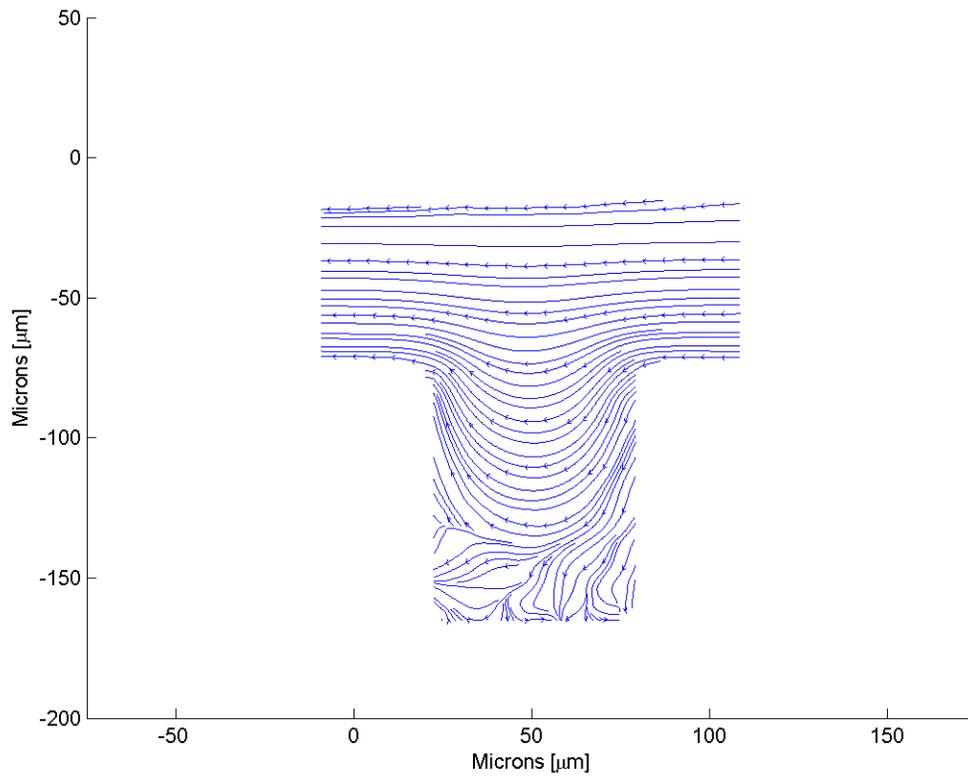


Figure F.168: Streamline image during phase increment 26 at 80 Hz and a Re of 0.1.

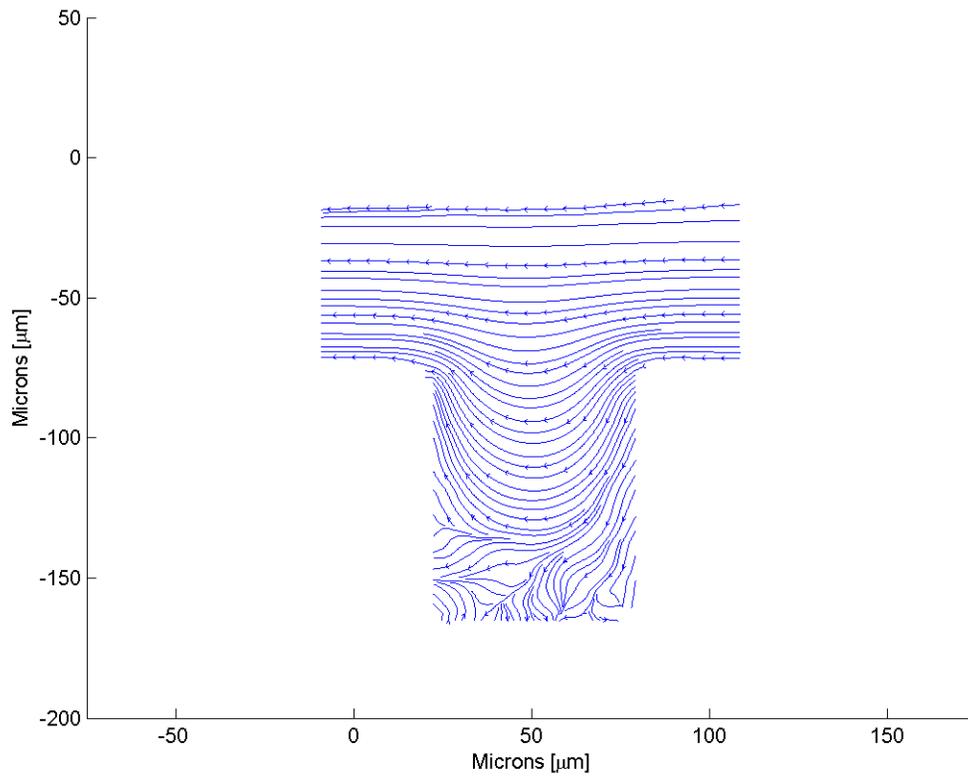


Figure F.169: Streamline image during phase increment 27 at 80 Hz and a Re of 0.1.

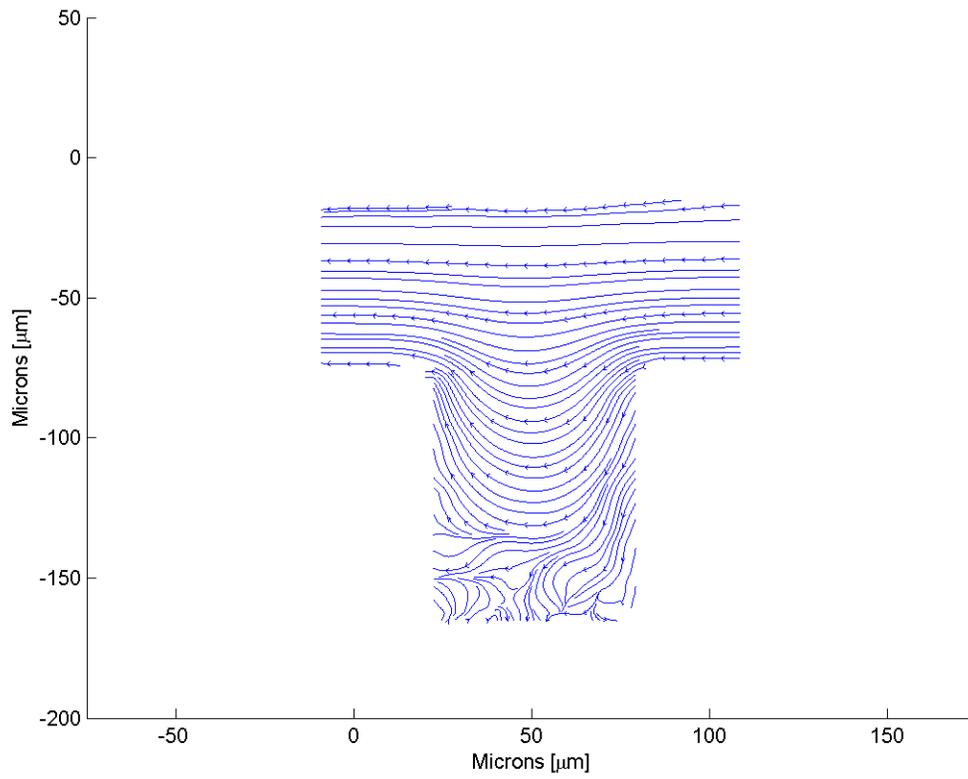


Figure F.170: Streamline image during phase increment 28 at 80 Hz and a Re of 0.1.

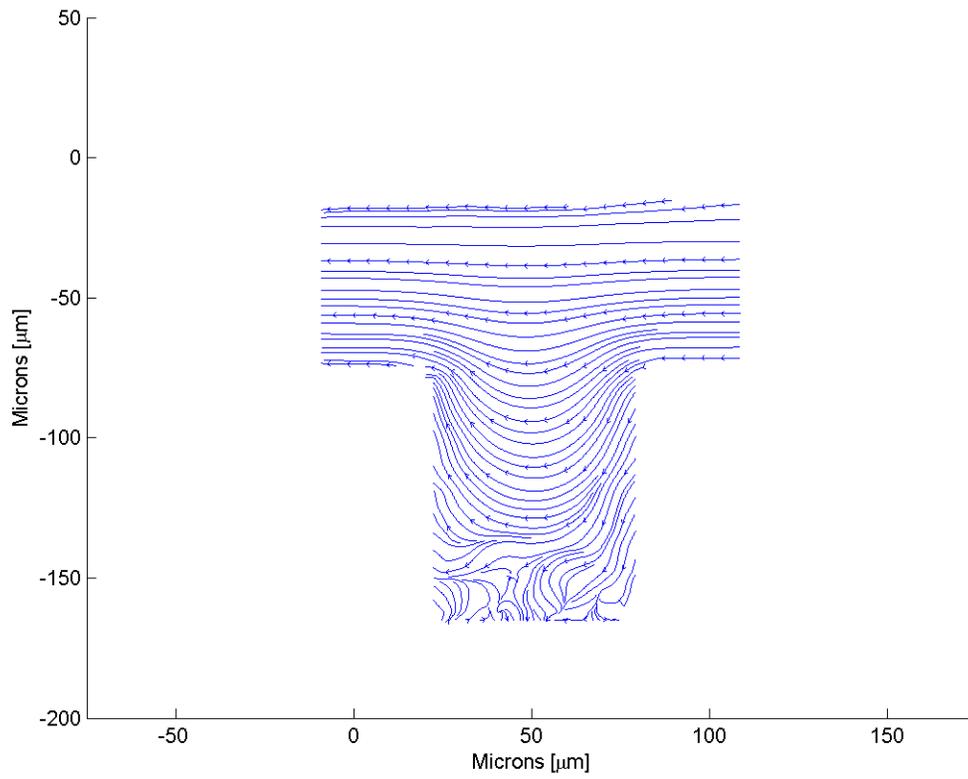


Figure F.171: Streamline image during phase increment 29 at 80 Hz and a Re of 0.1.

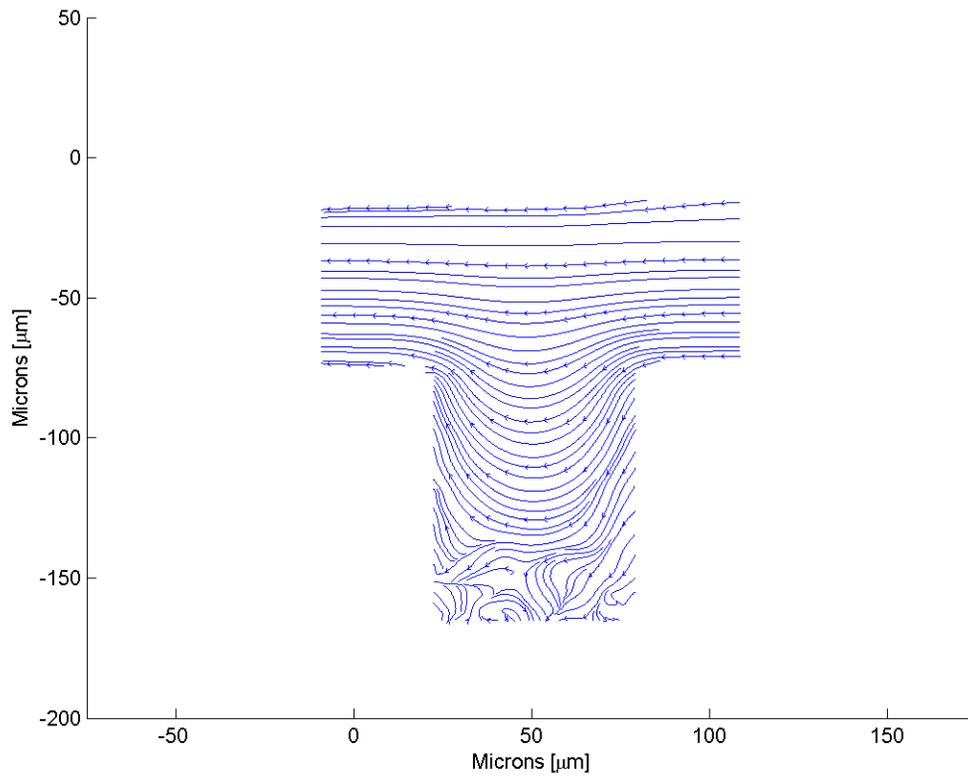


Figure F.172: Streamline image during phase increment 30 at 80 Hz and a Re of 0.1.

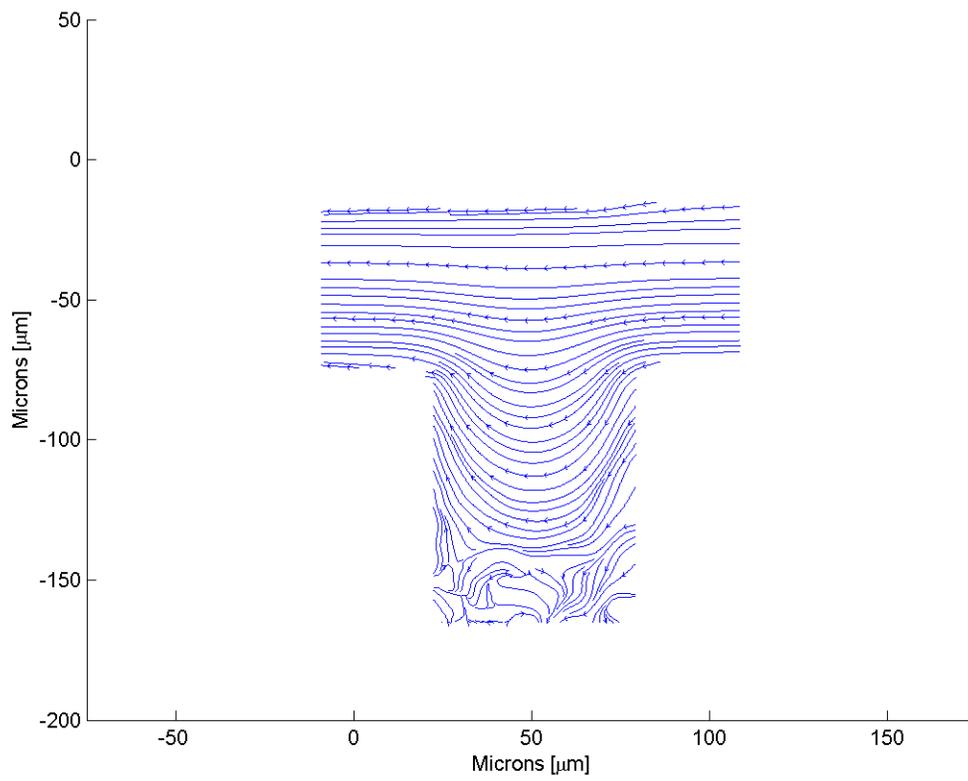


Figure F.173: Streamline image during phase increment 31 at 80 Hz and a Re of 0.1.

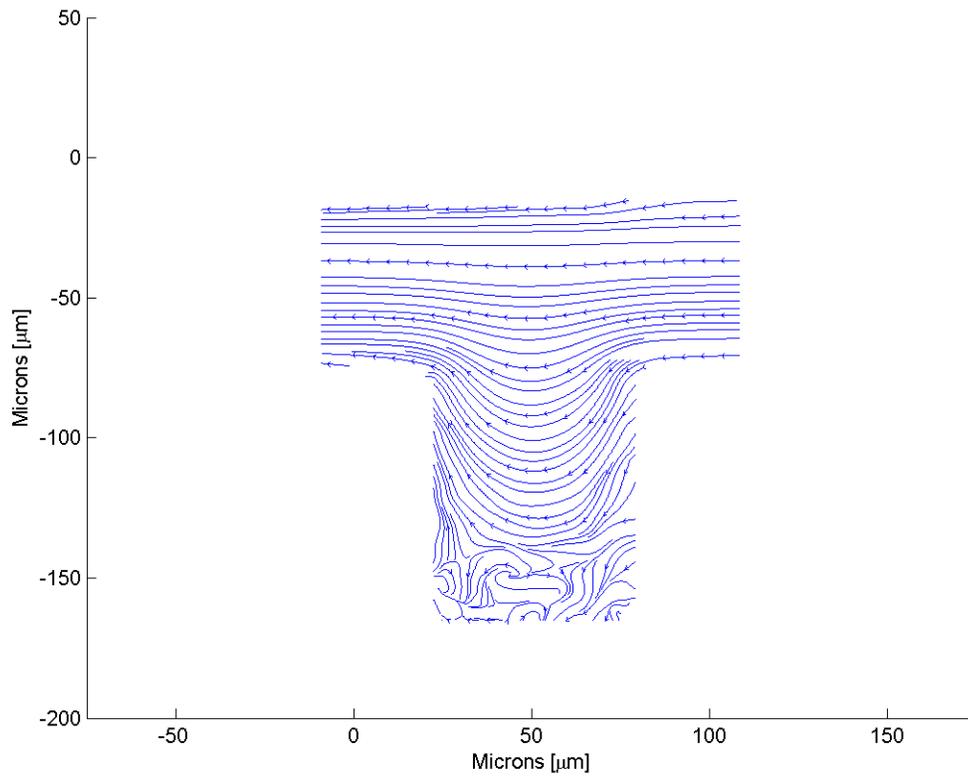


Figure F.174: Streamline image during phase increment 32 at 80 Hz and a Re of 0.1.

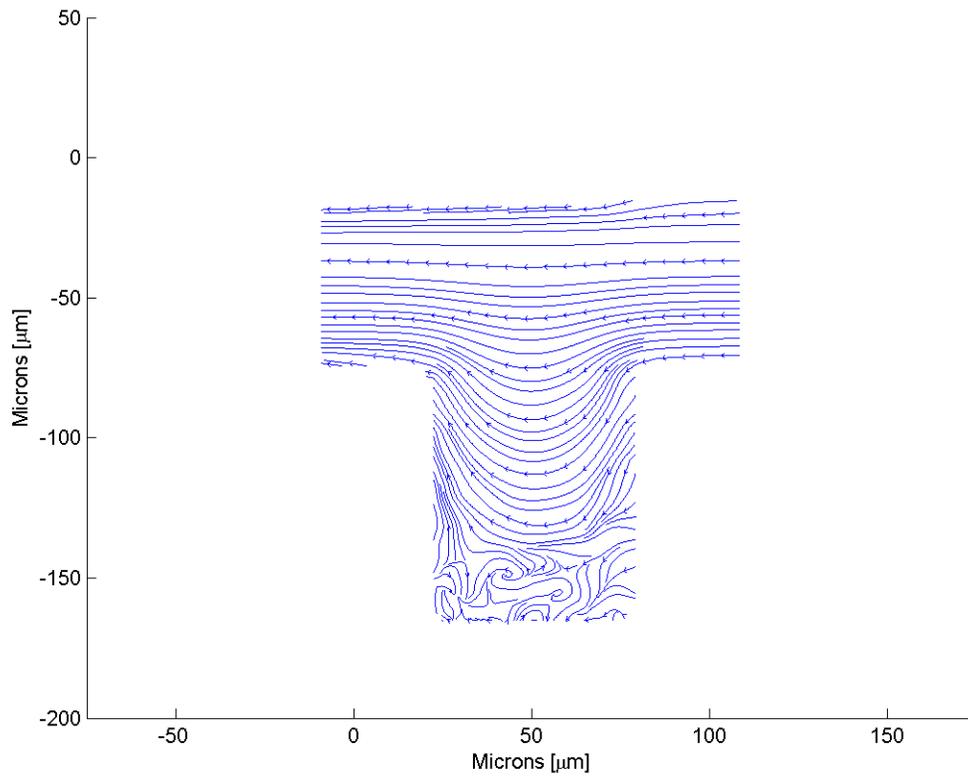


Figure F.175: Streamline image during phase increment 33 at 80 Hz and a Re of 0.1.

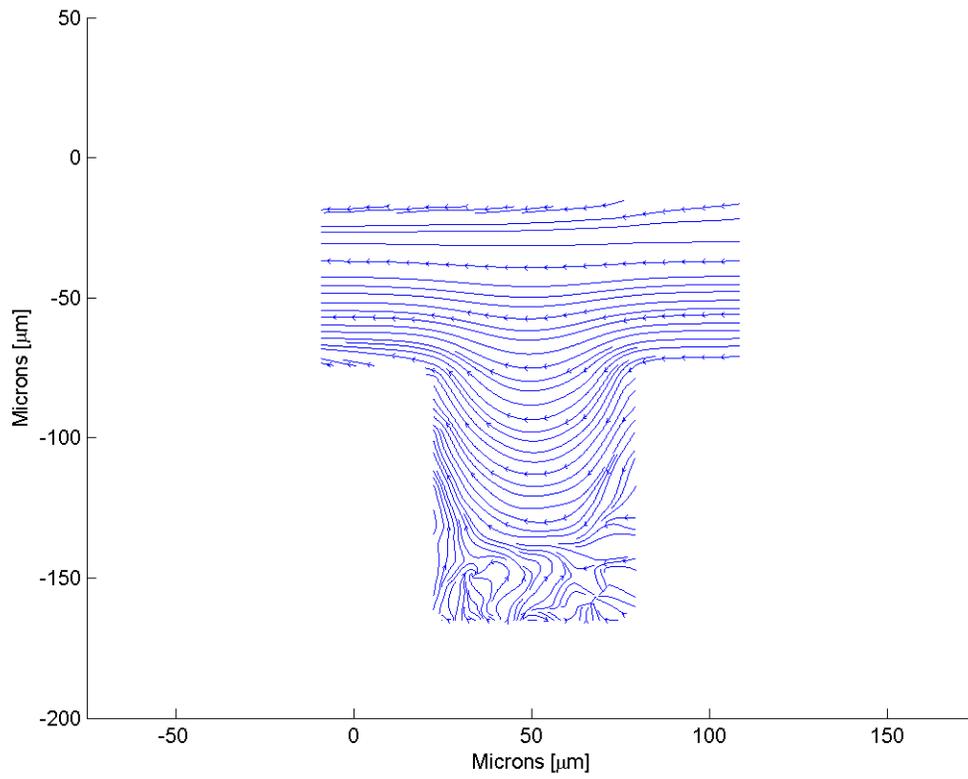


Figure F.176: Streamline image during phase increment 34 at 80 Hz and a Re of 0.1.

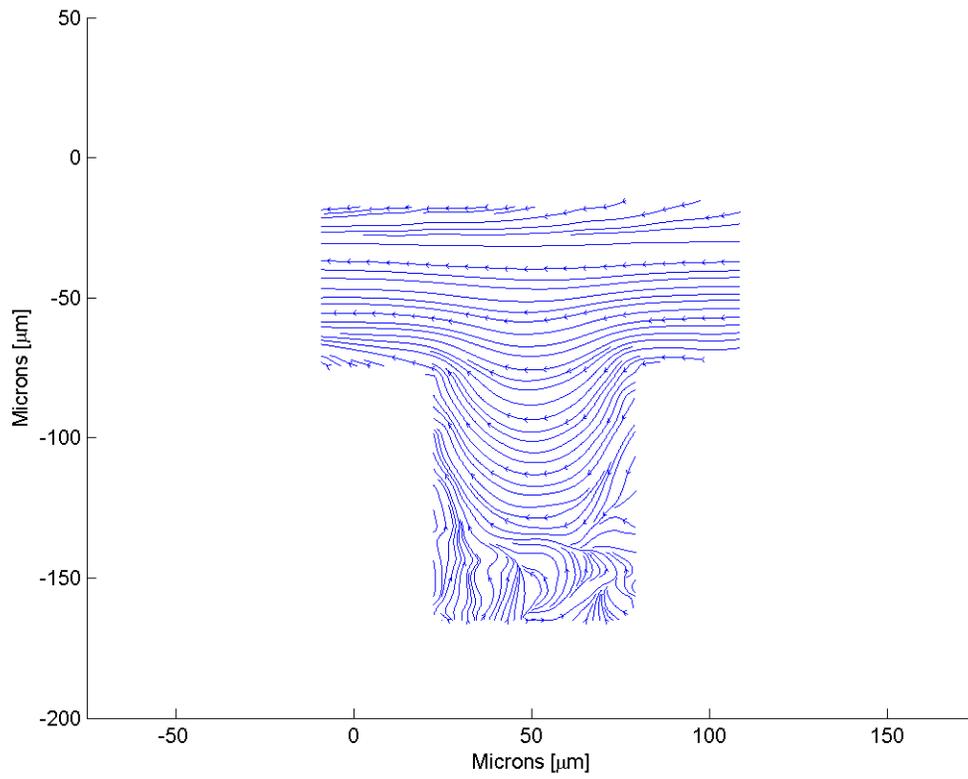


Figure F.177: Streamline image during phase increment 35 at 80 Hz and a Re of 0.1.

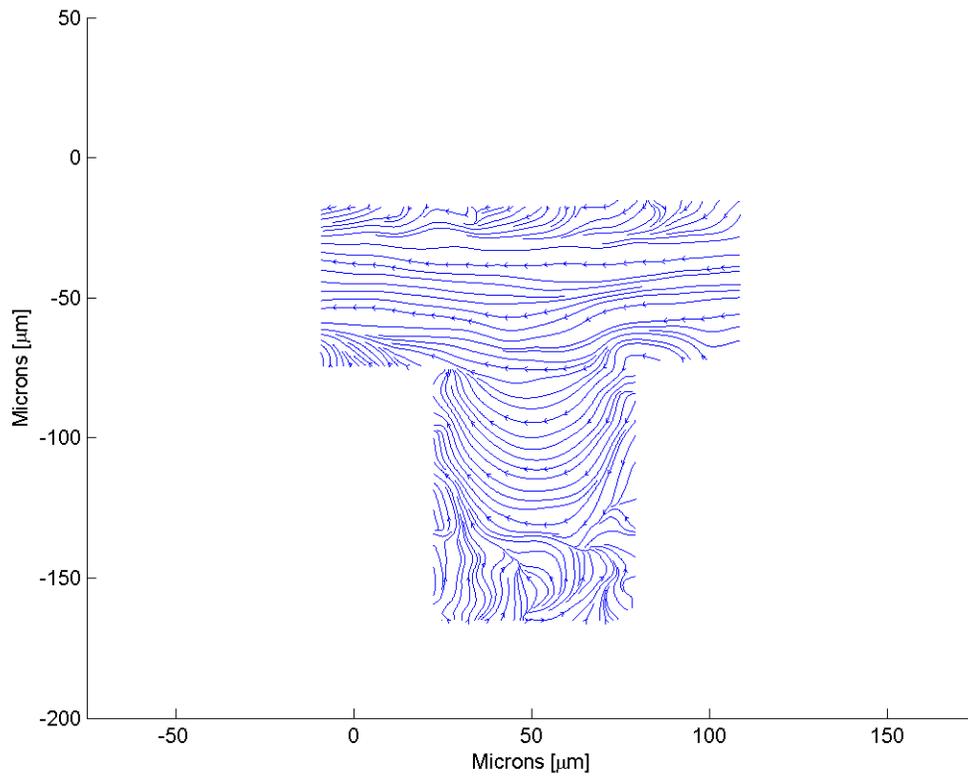


Figure F.178: Streamline image during phase increment 36 at 80 Hz and a Re of 0.1.

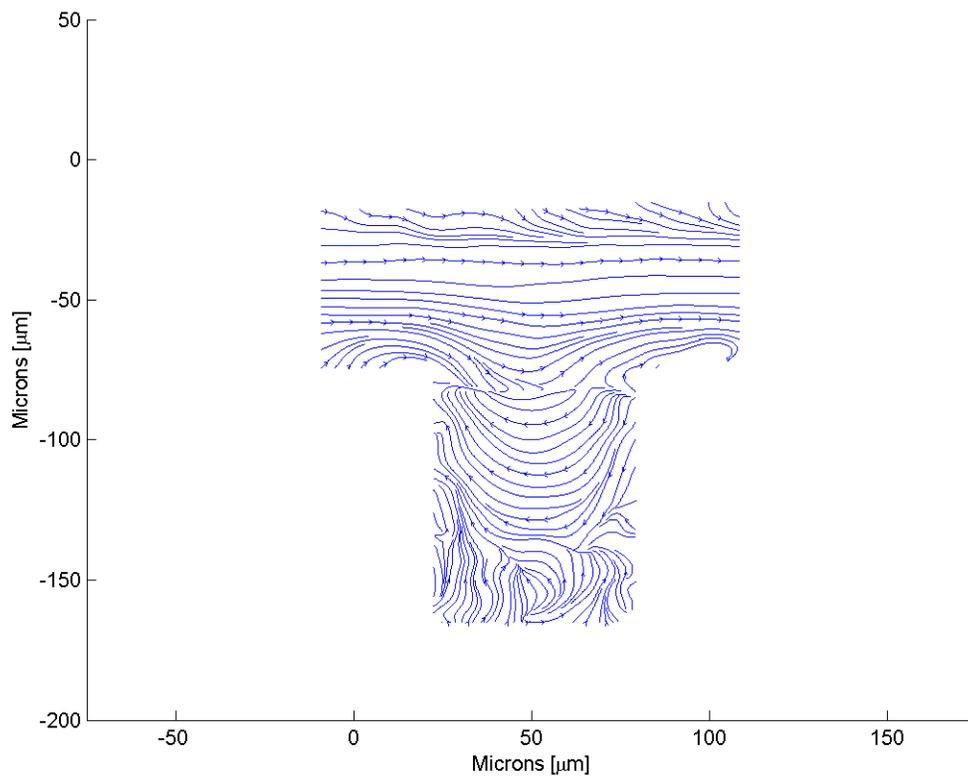


Figure F.179: Streamline image during phase increment 37 at 80 Hz and a Re of 0.1.

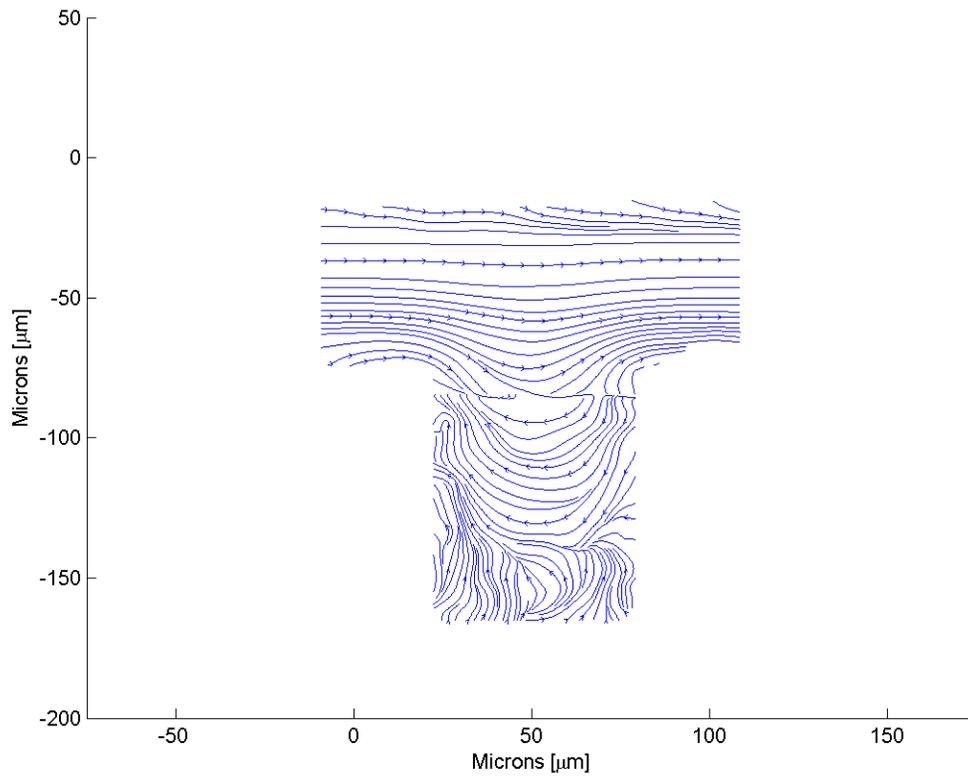


Figure F.180: Streamline image during phase increment 38 at 80 Hz and a Re of 0.1.

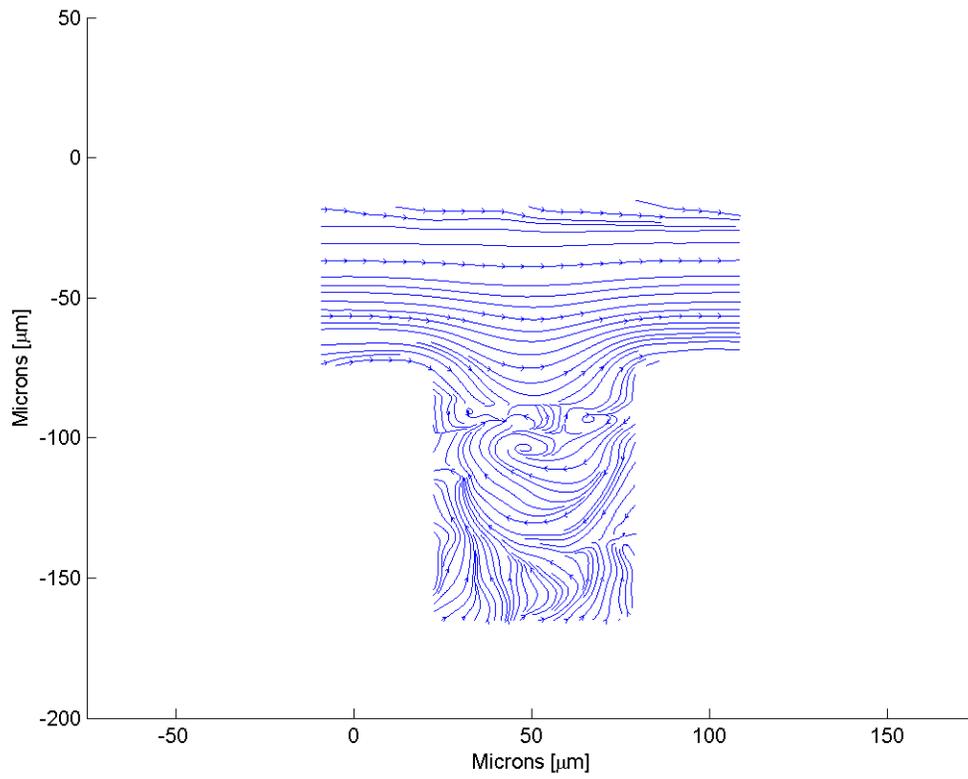


Figure F.181: Streamline image during phase increment 39 at 80 Hz and a Re of 0.1.

F.2.3 Residence time of particles in the cavity at 80 Hz

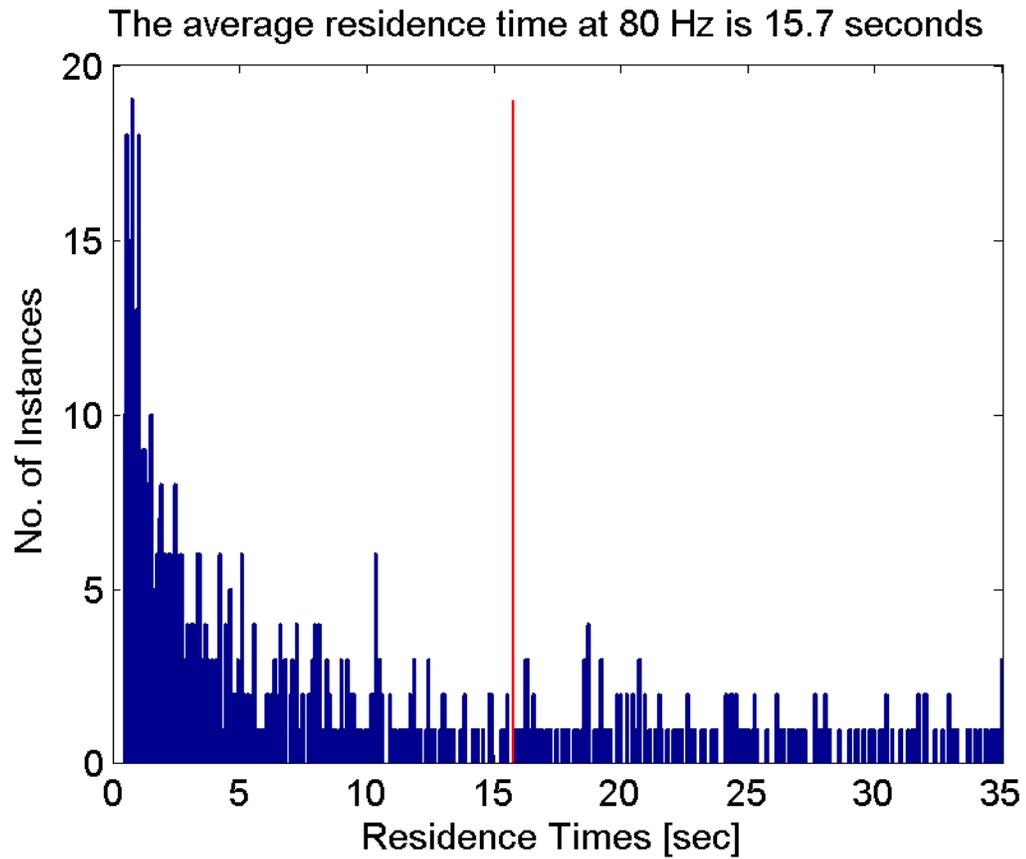


Figure F.182: The residence time distribution for the AR = 0.5 cavity at Re 0.1 at 80 Hz. The average residence time is 15.7 secs.

F.2.4 Lagrangian coherent structures at 80 Hz

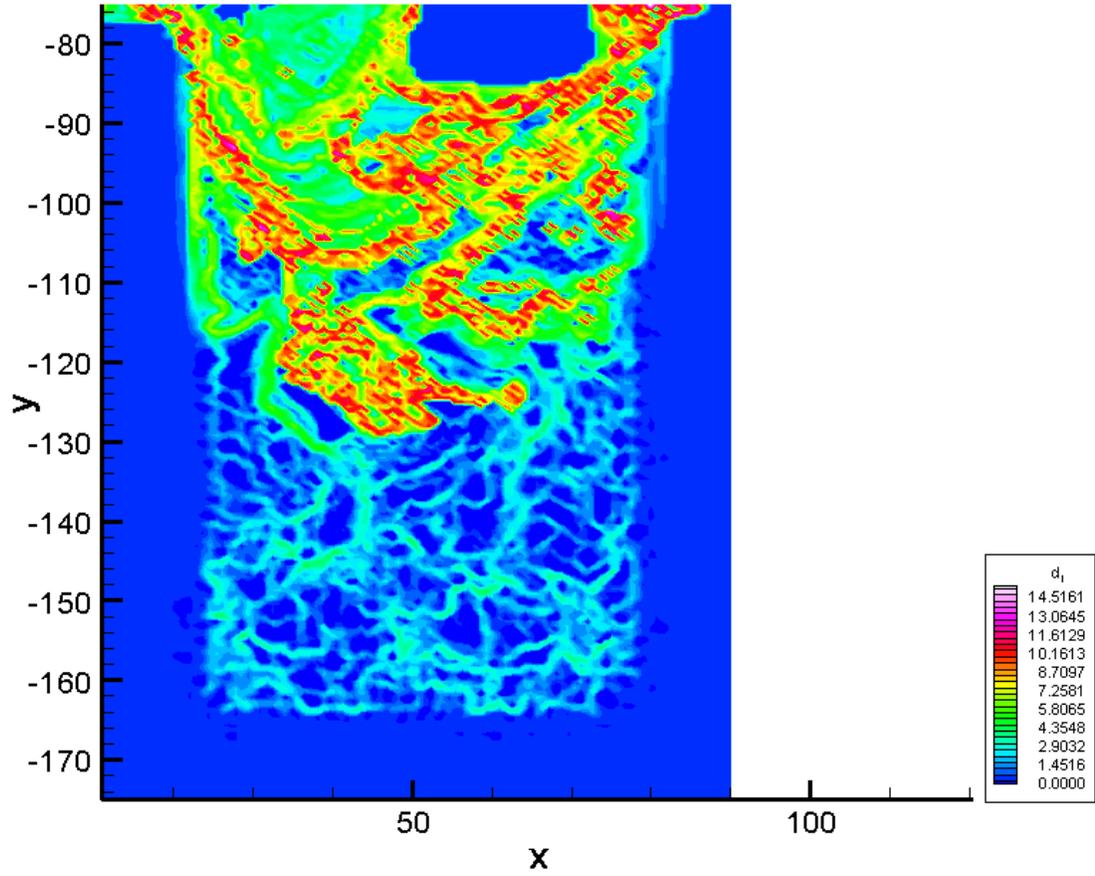


Figure F.183: The backward time LCS during phase increment 1 at 80 Hz.

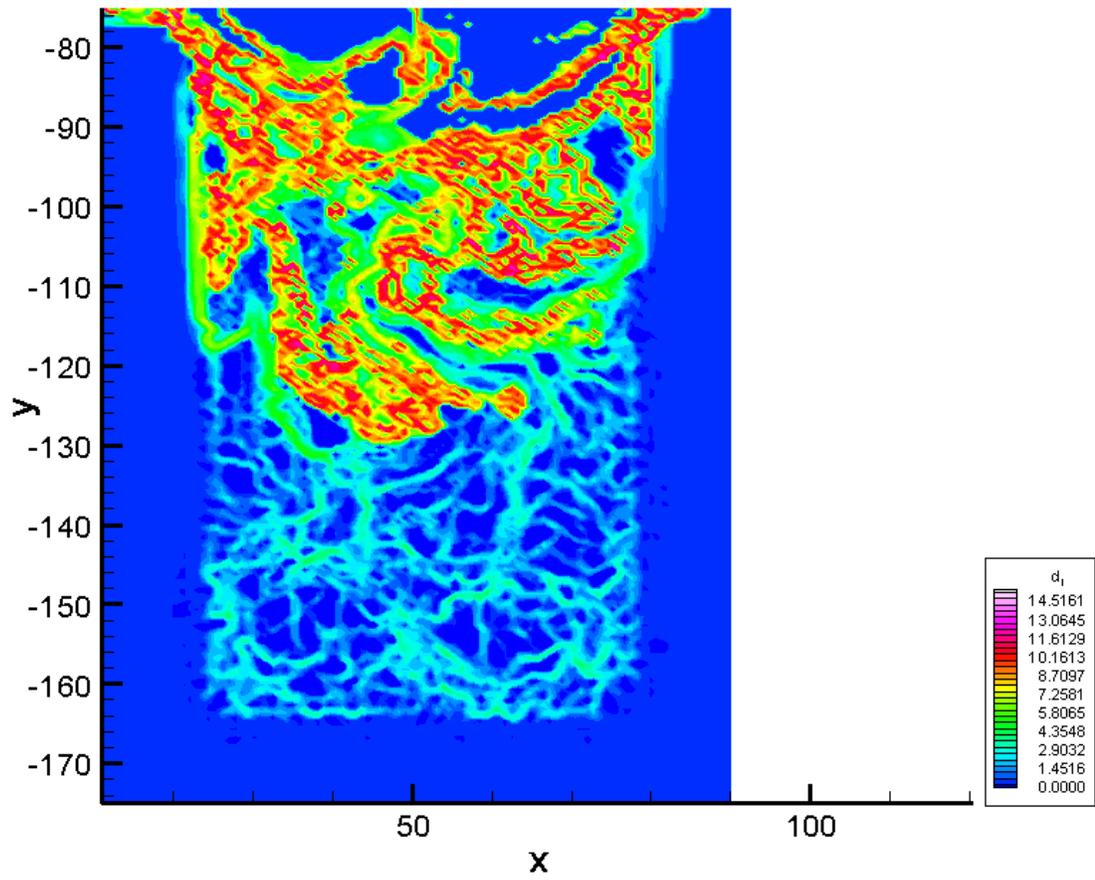


Figure F.184: The backward time LCS during phase increment 2 at 80 Hz.

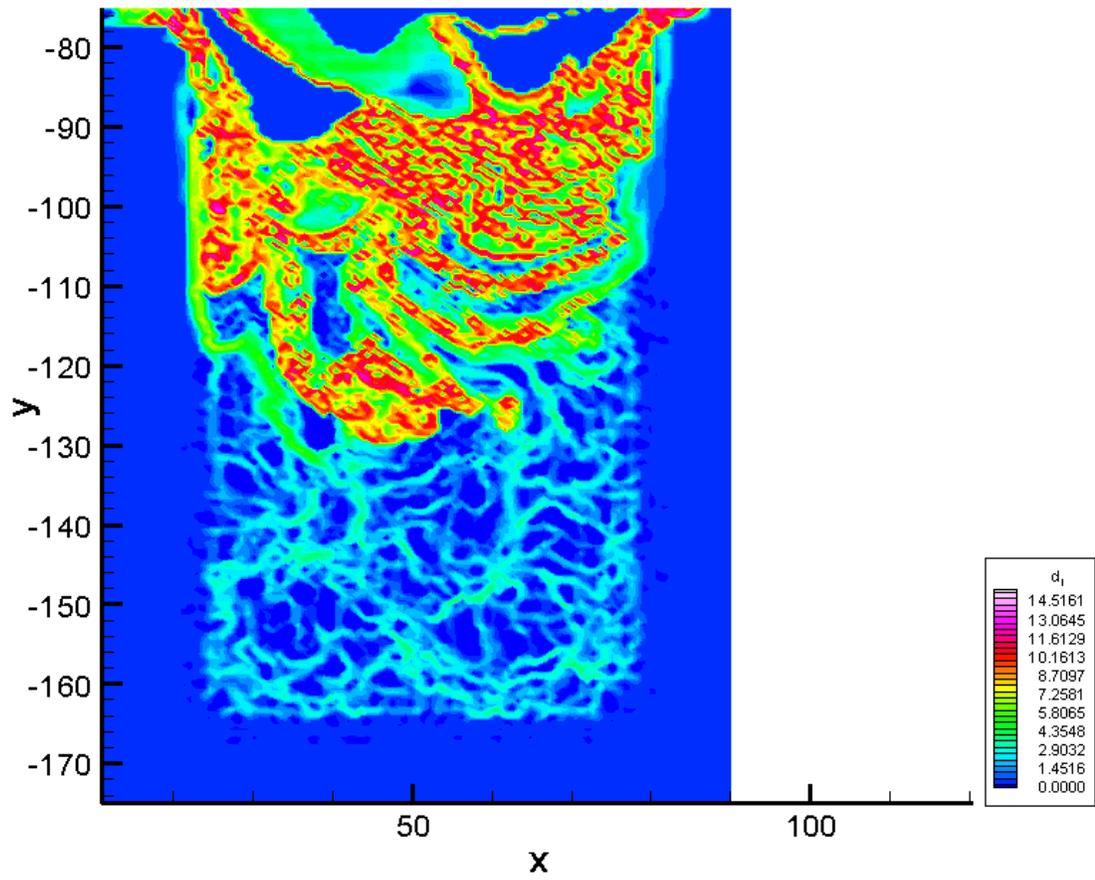


Figure F.185: The backward time LCS during phase increment 3 at 80 Hz.

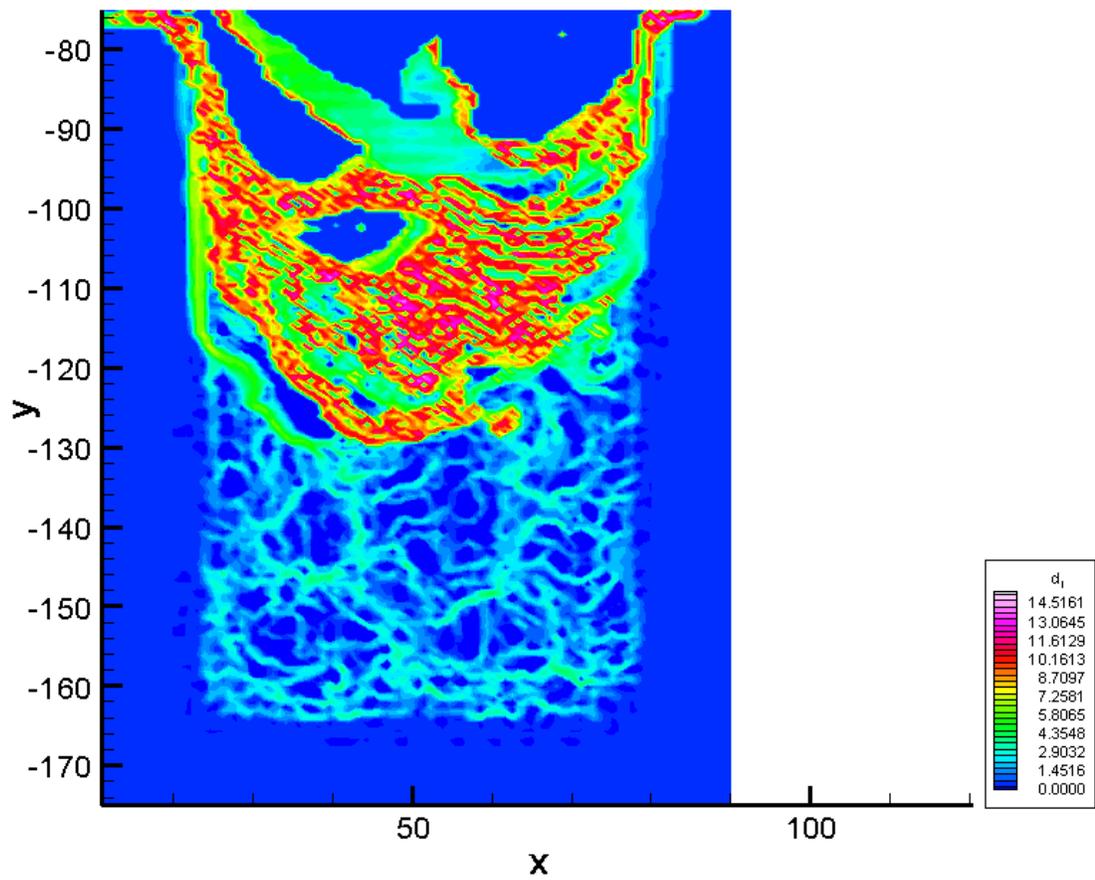


Figure F.186: The backward time LCS during phase increment 4 at 80 Hz.

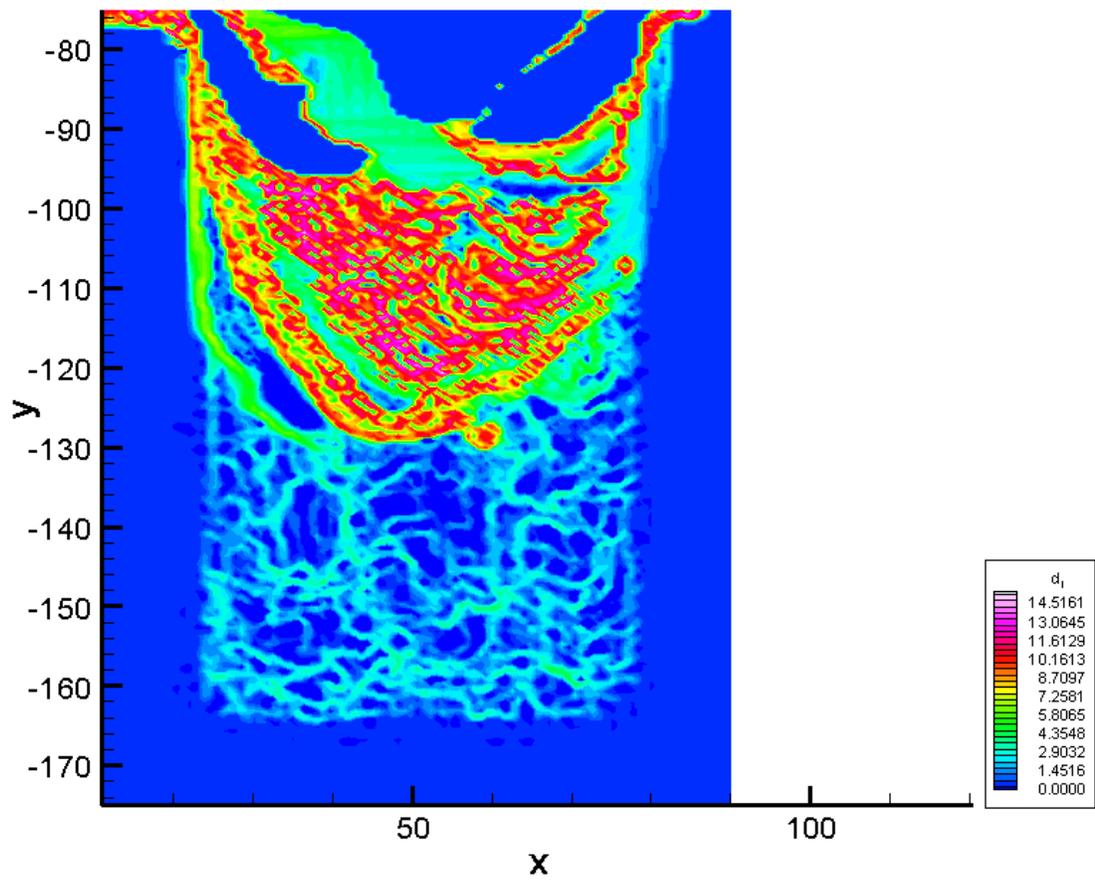


Figure F.187: The backward time LCS during phase increment 5 at 80 Hz.

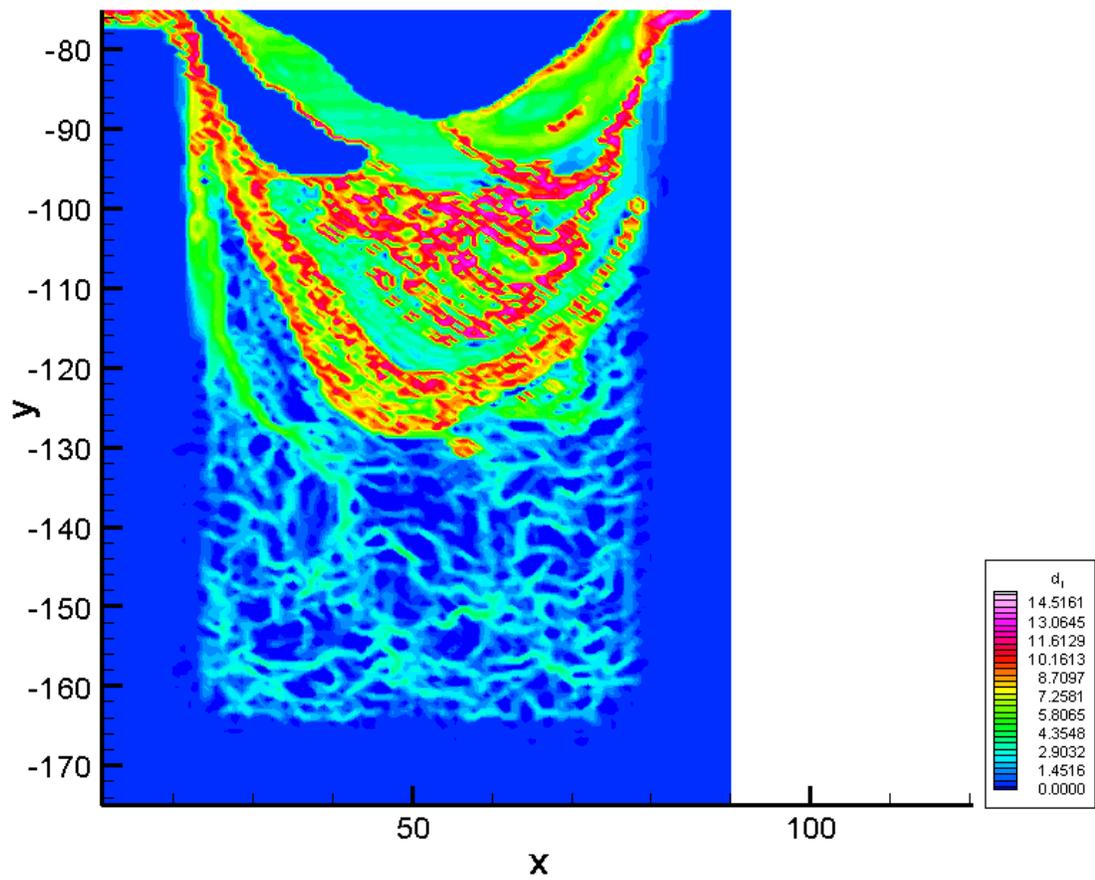


Figure F.188: The backward time LCS during phase increment 6 at 80 Hz.

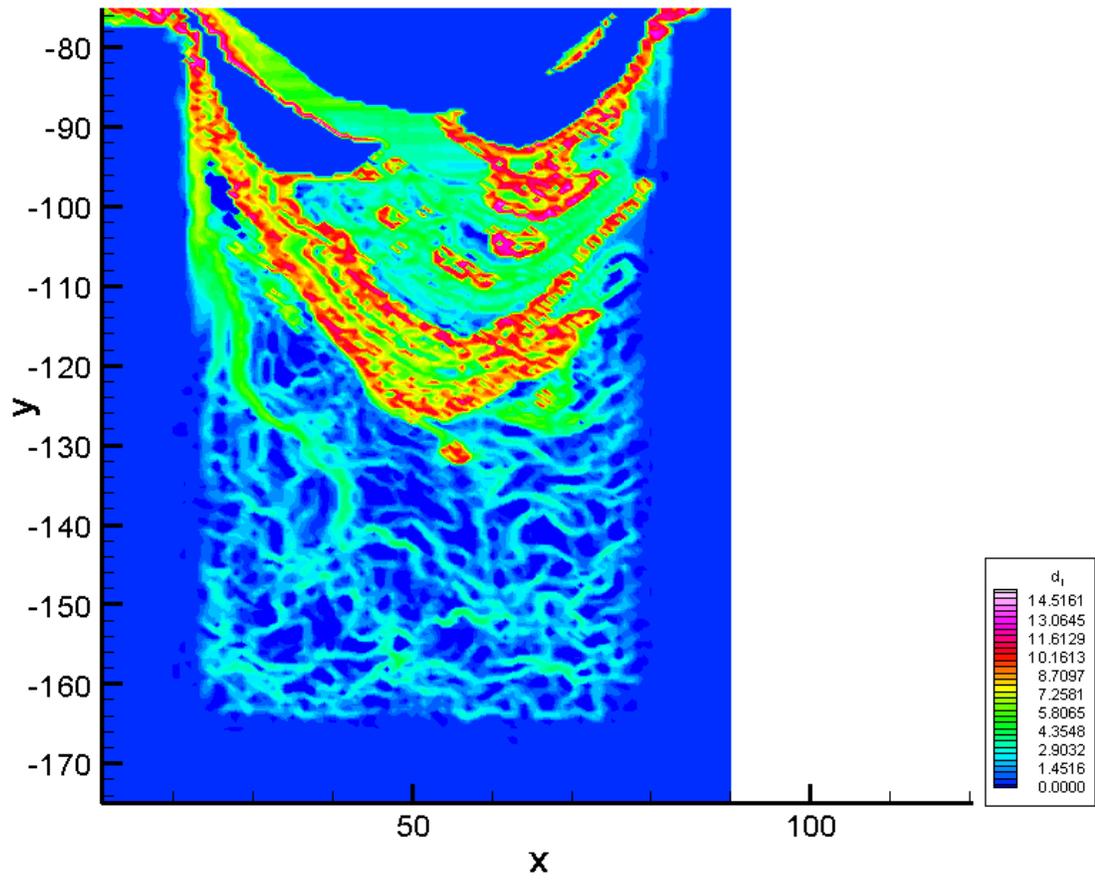


Figure F.189: The backward time LCS during phase increment 7 at 80 Hz.

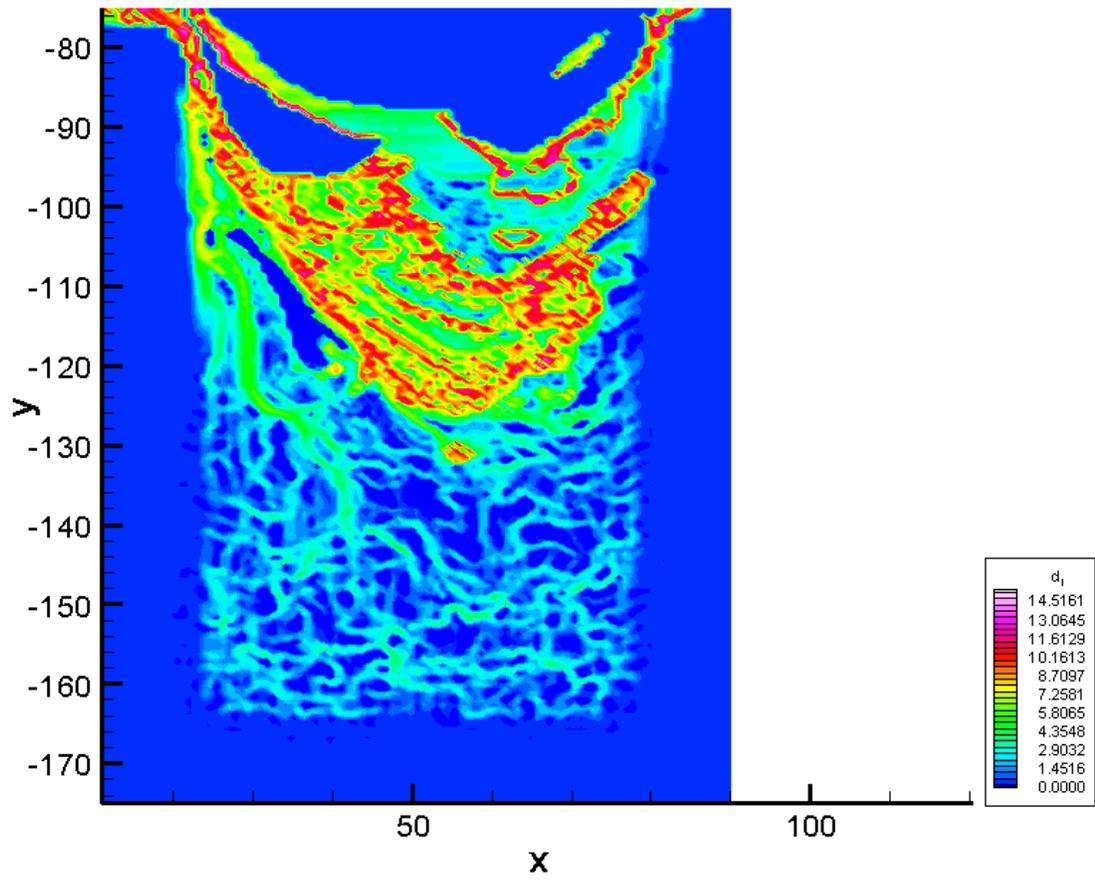


Figure F.190: The backward time LCS during phase increment 8 at 80 Hz.

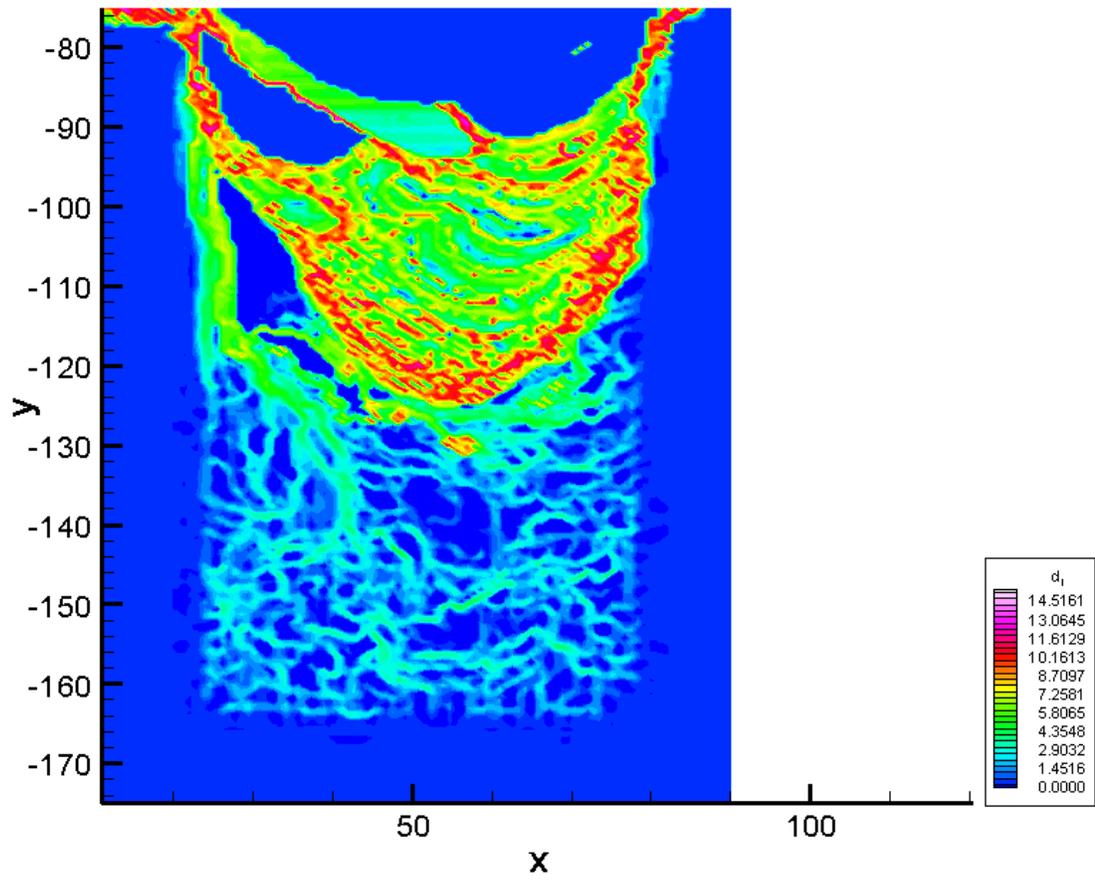


Figure F.191: The backward time LCS during phase increment 9 at 80 Hz.

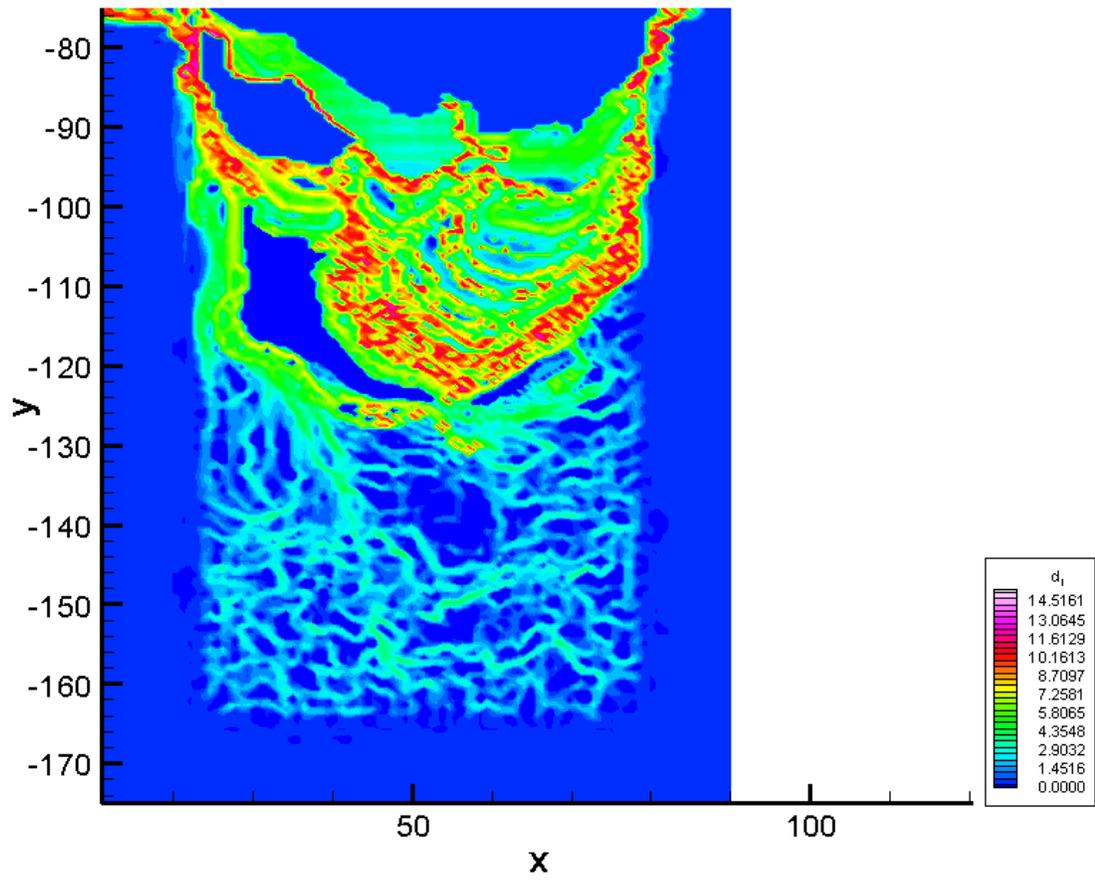


Figure F.192: The backward time LCS during phase increment 10 at 80 Hz.

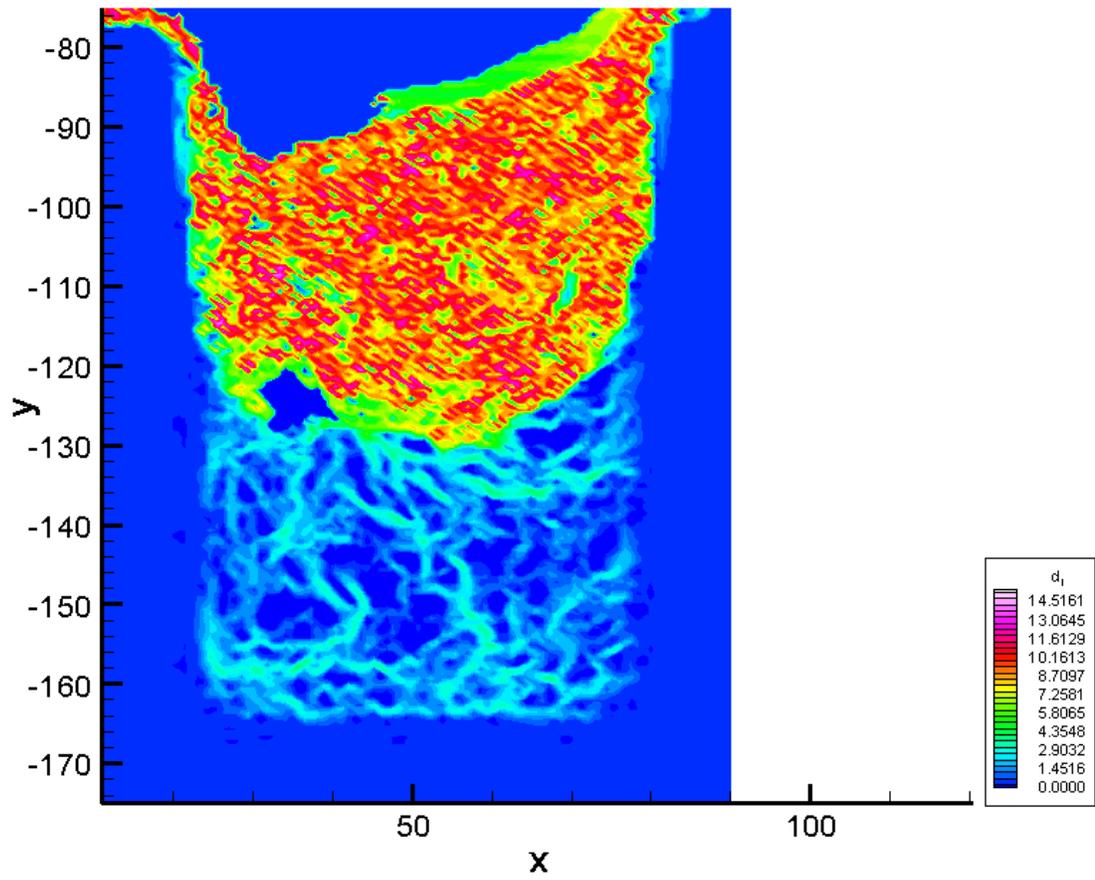


Figure F.193: The forward time LCS during phase increment 1 at 80 Hz.

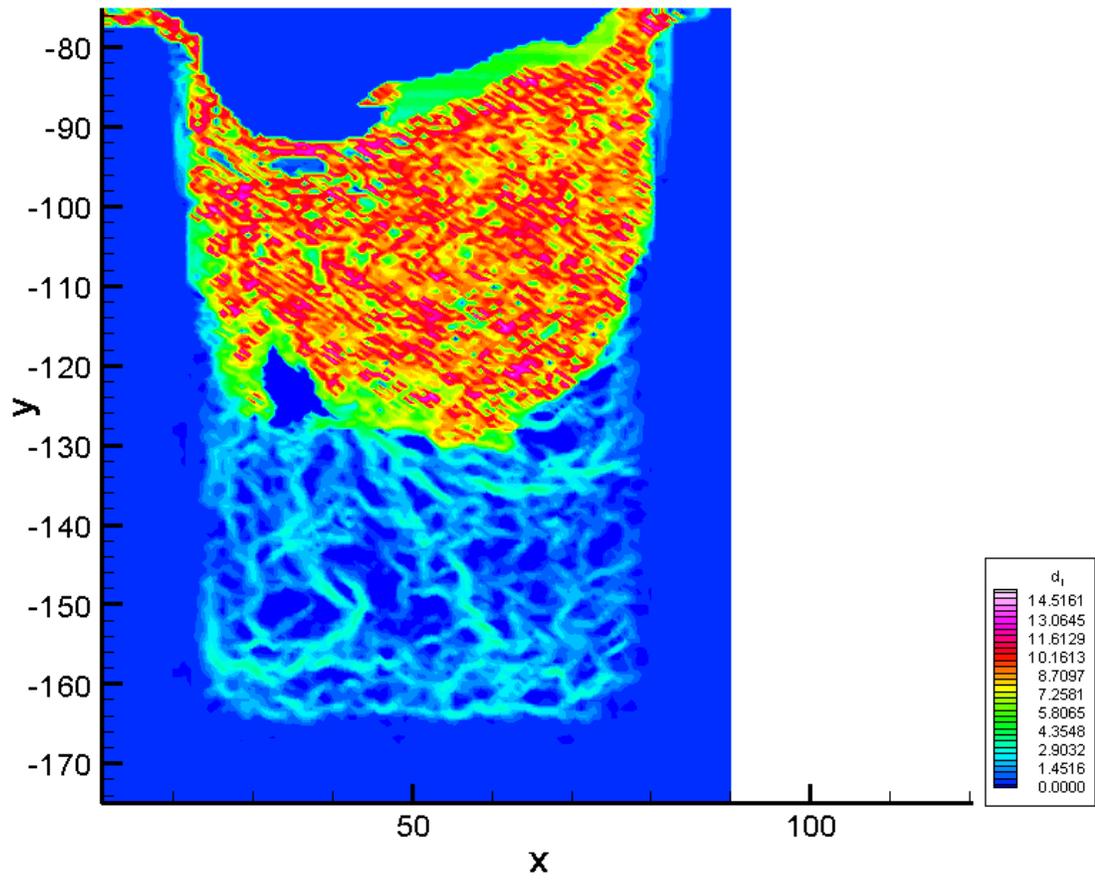


Figure F.194: The forward time LCS during phase increment 2 at 80 Hz.

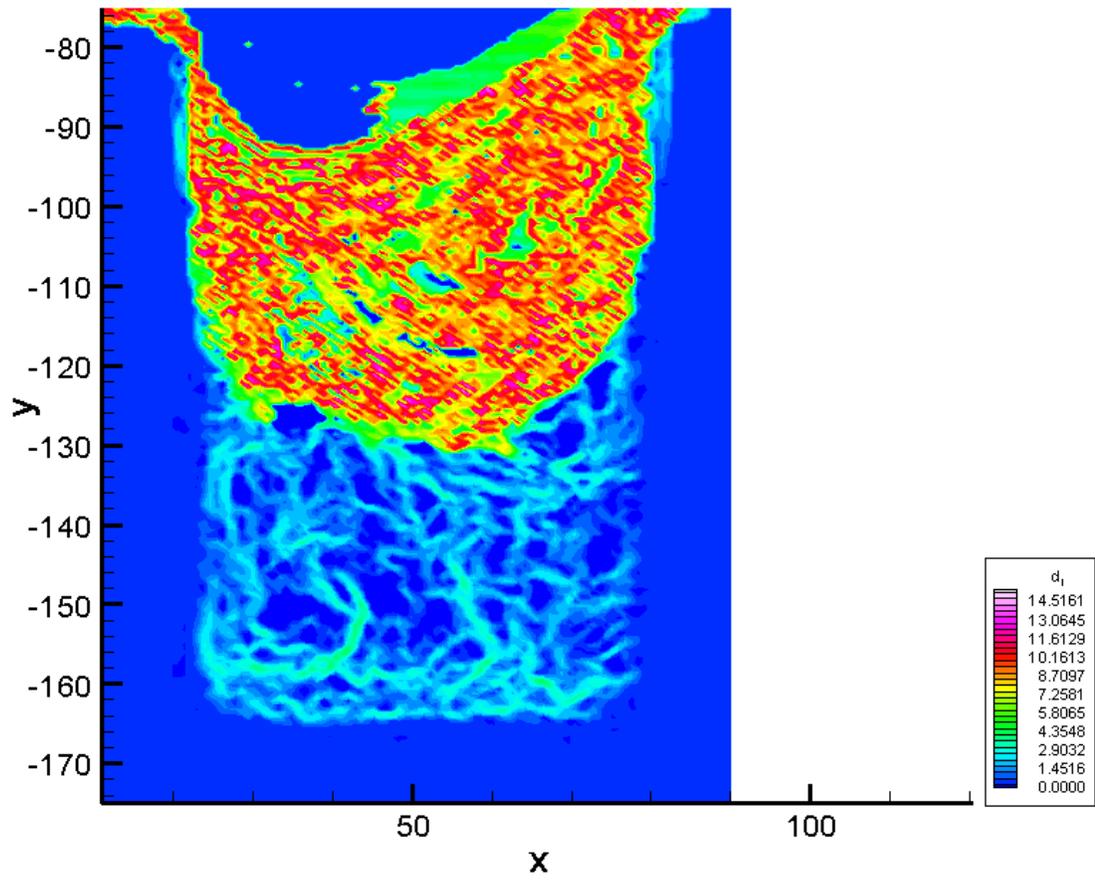


Figure F.195: The forward time LCS during phase increment 3 at 80 Hz.

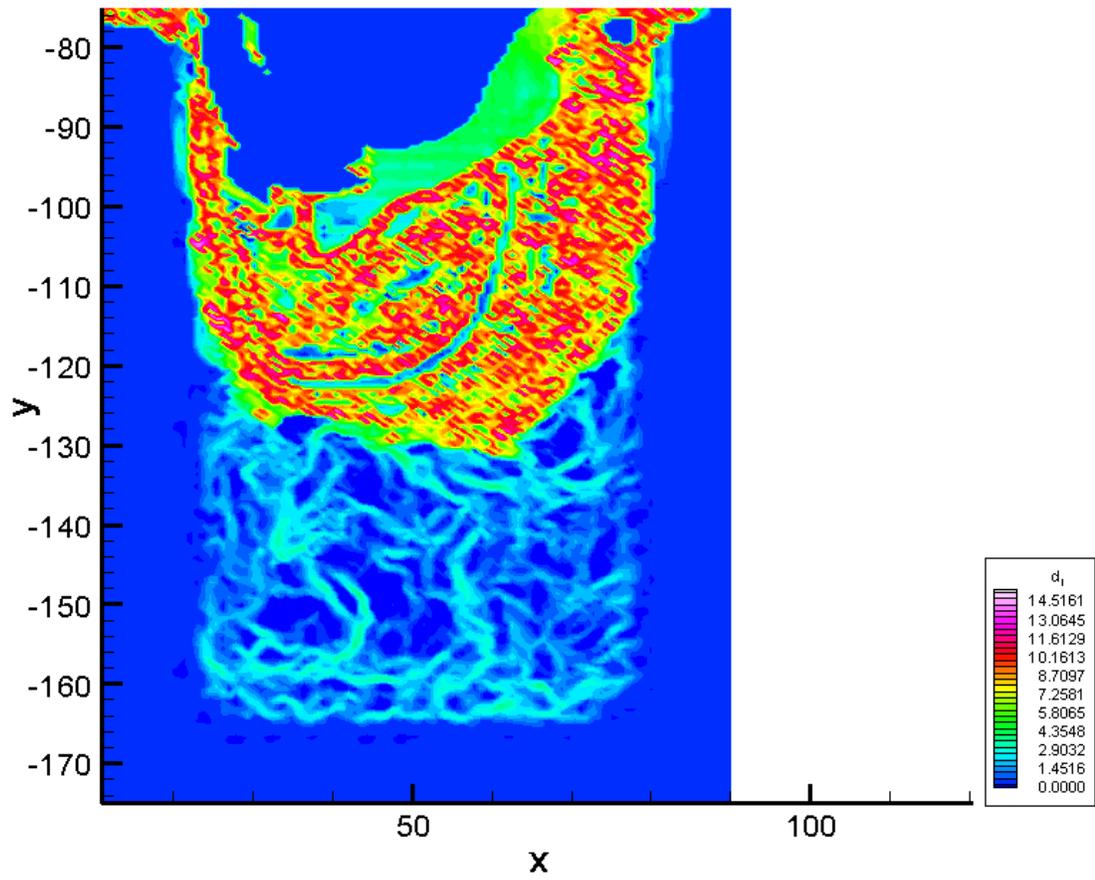


Figure F.196: The forward time LCS during phase increment 4 at 80 Hz.

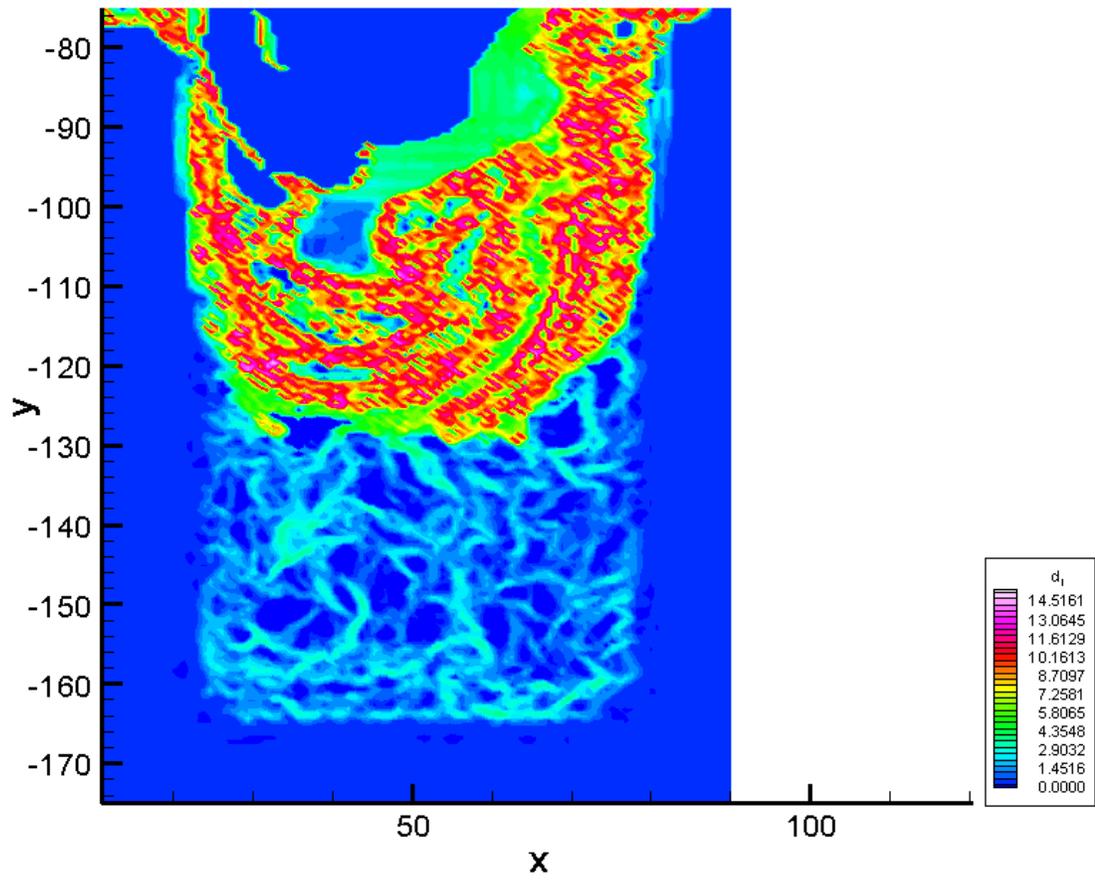


Figure F.197: The forward time LCS during phase increment 5 at 80 Hz.

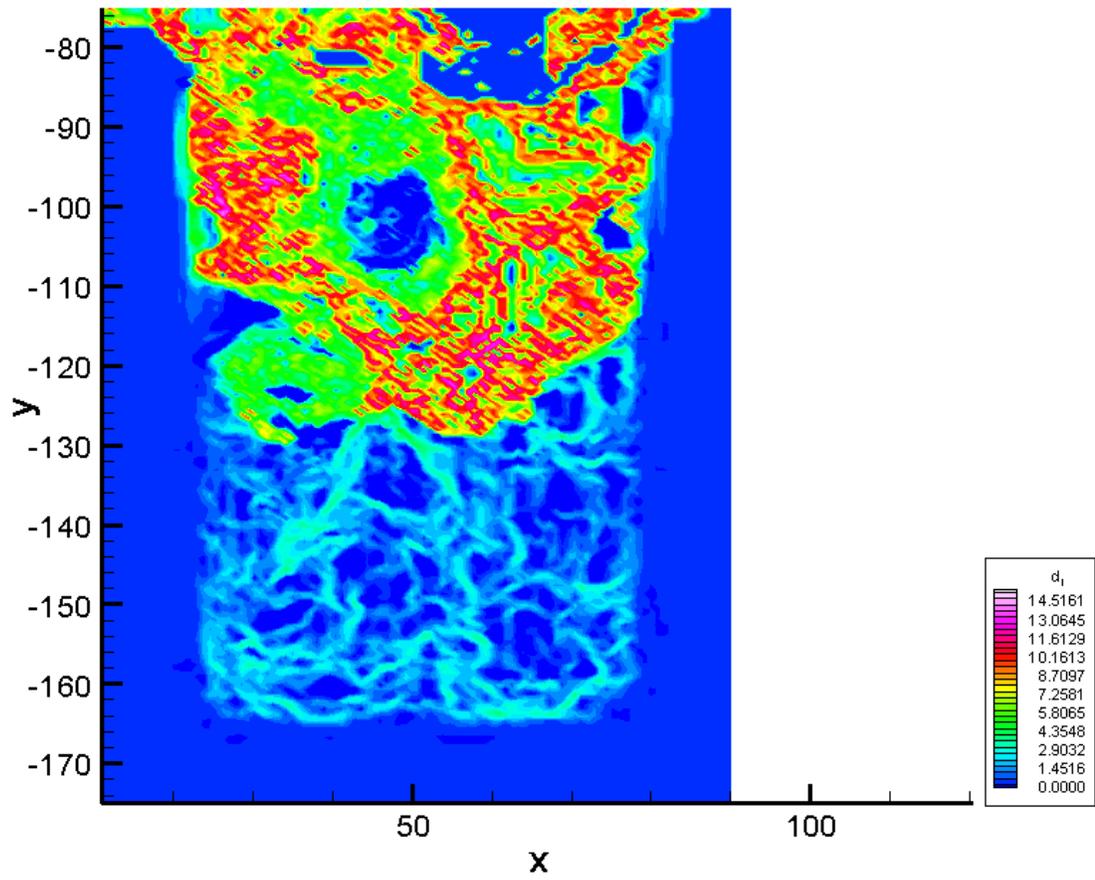


Figure F.198: The forward time LCS during phase increment 6 at 80 Hz.

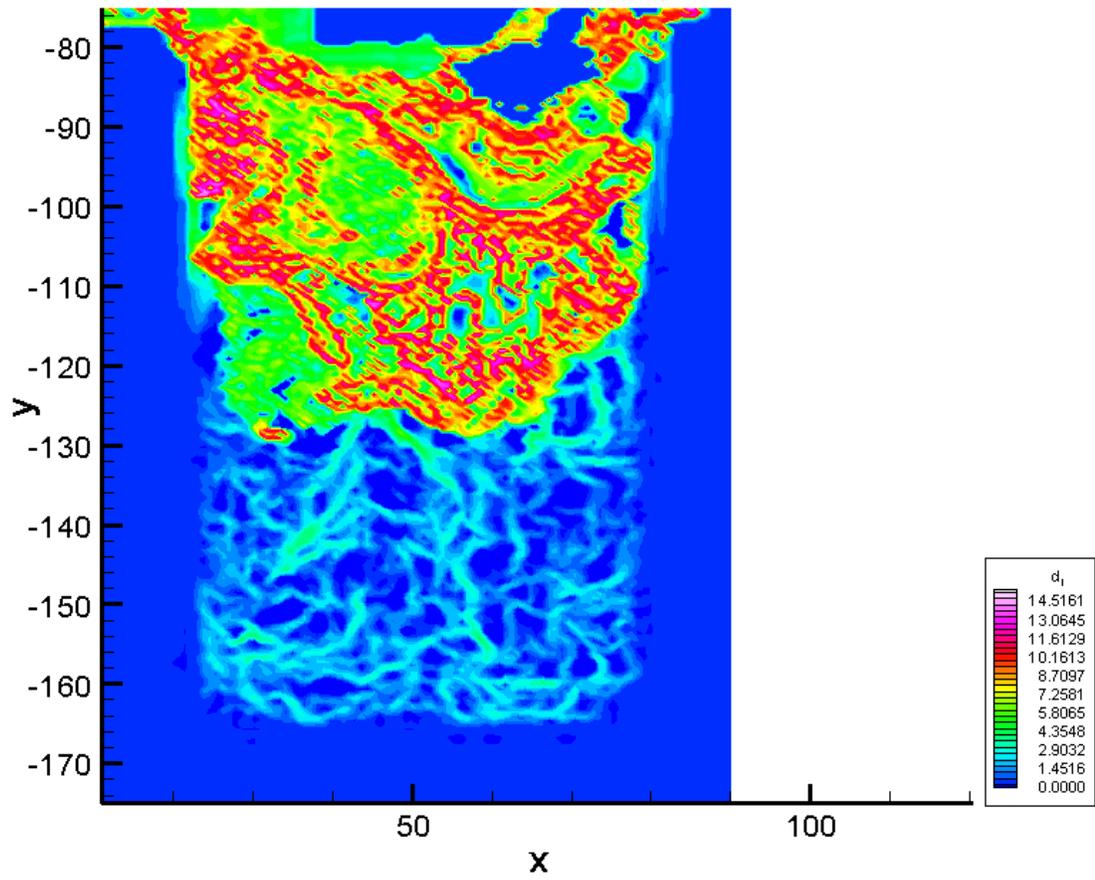


Figure F.199: The forward time LCS during phase increment 7 at 80 Hz.

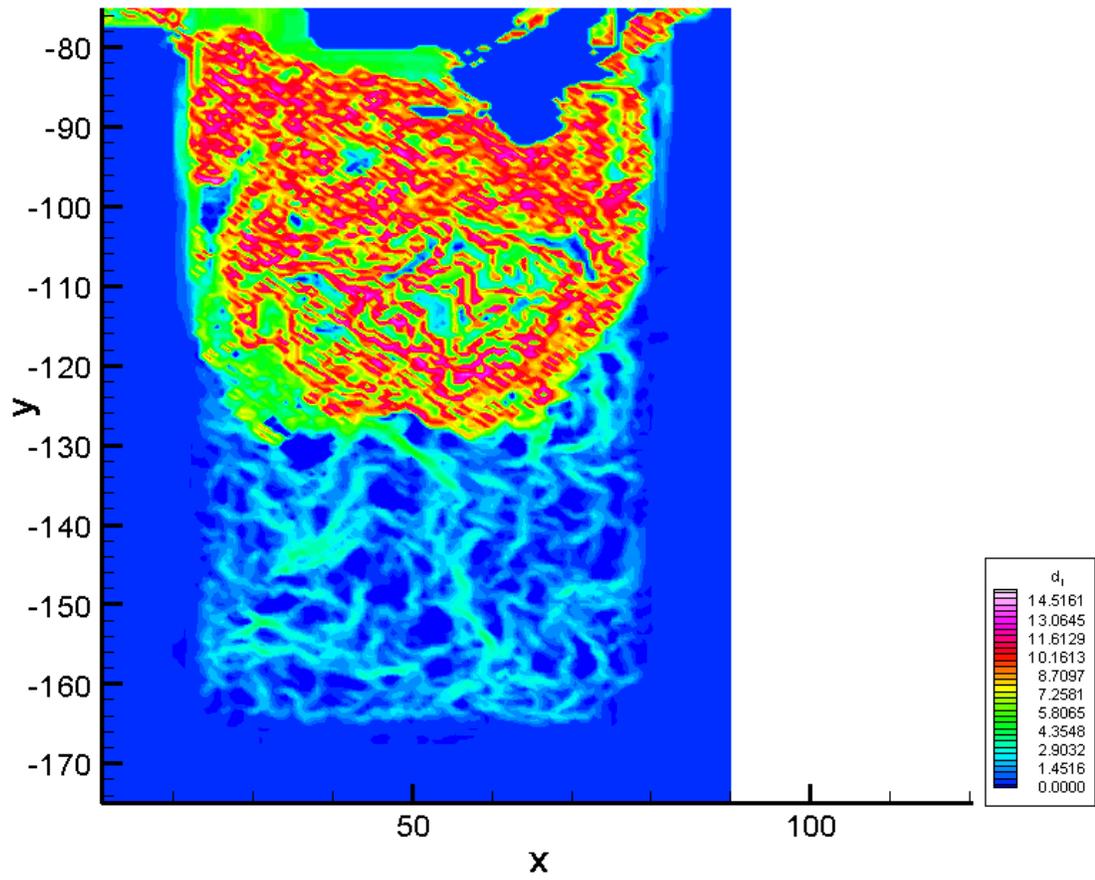


Figure F.200: The forward time LCS during phase increment 8 at 80 Hz.

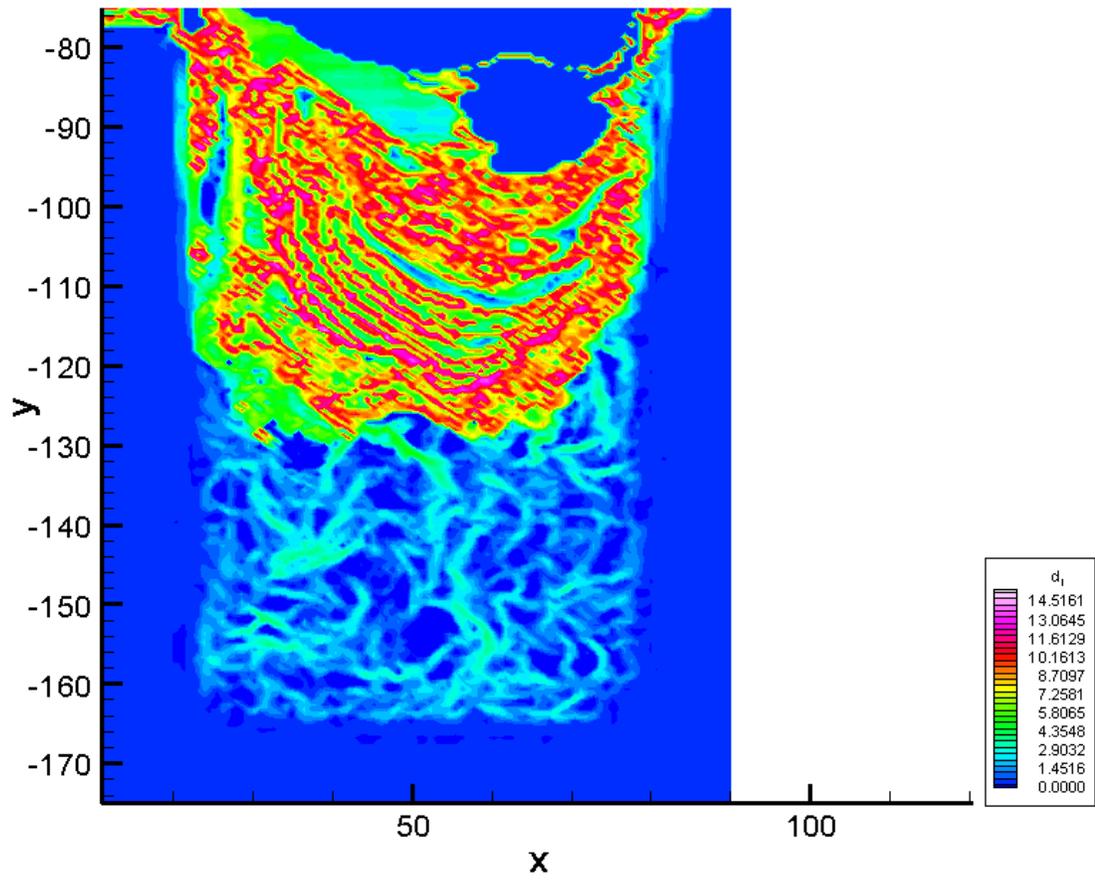


Figure F.201: The forward time LCS during phase increment 9 at 80 Hz.

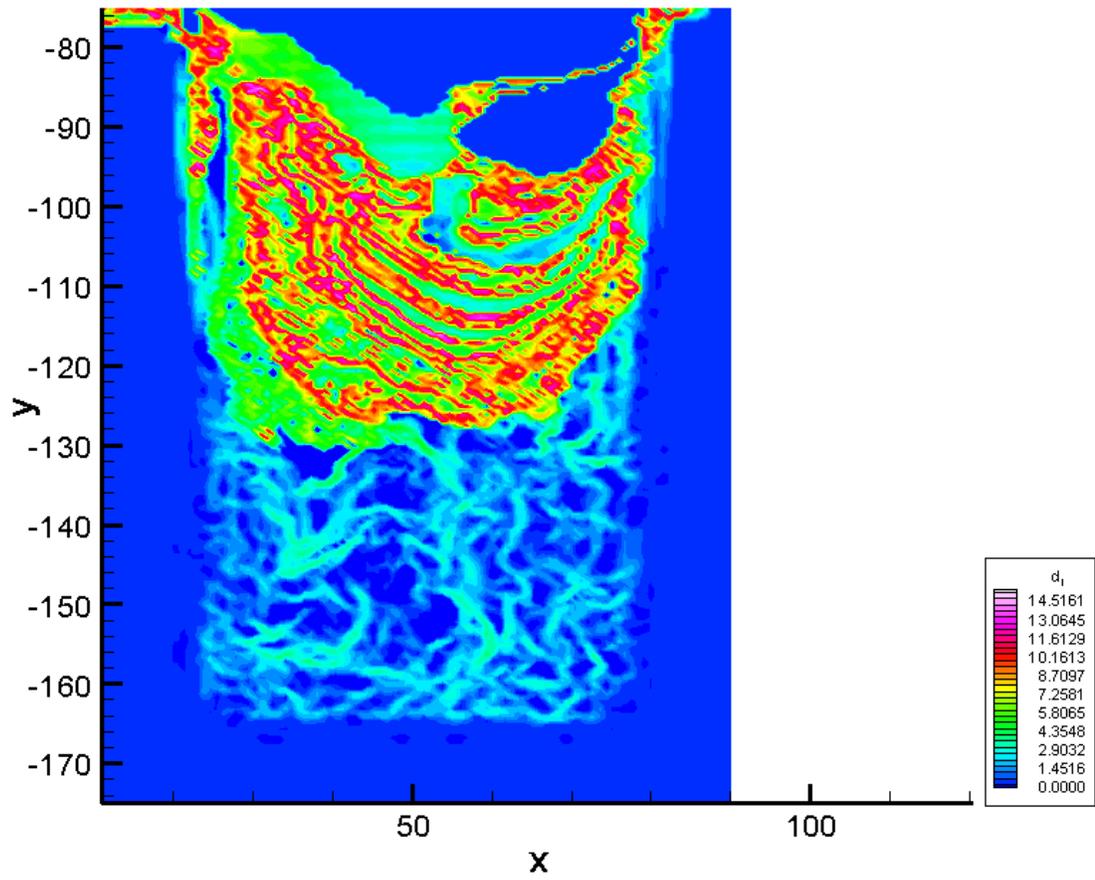


Figure F.202: The forward time LCS during phase increment 10 at 80 Hz.

F.3 113.14 Hz

F.3.1 Velocity field data at 113.14 Hz

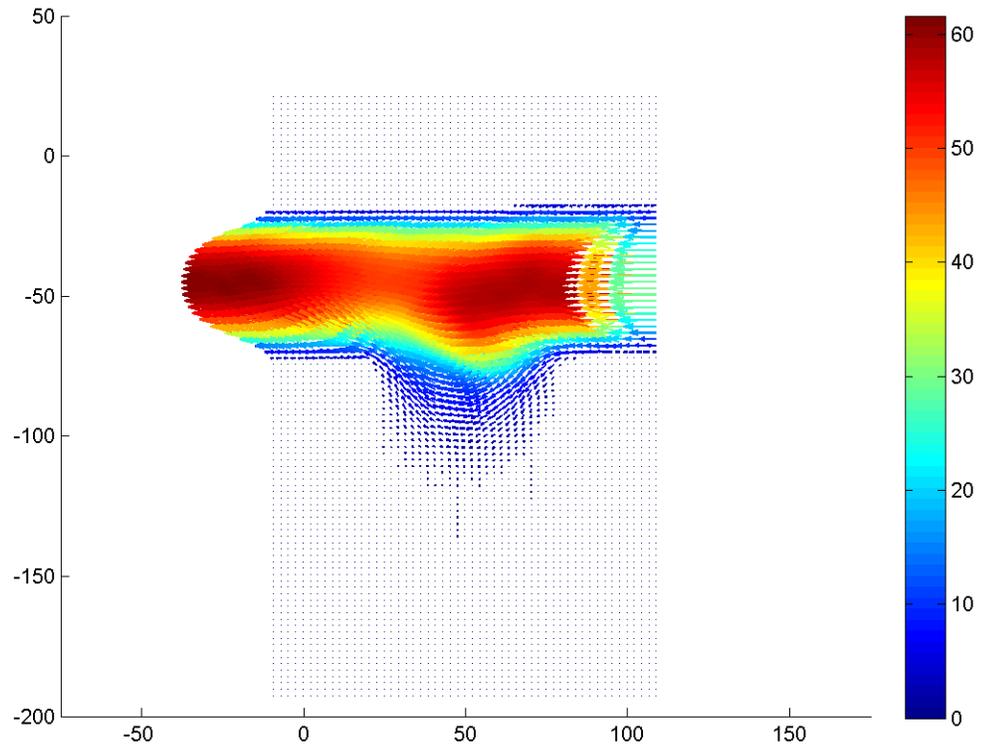


Figure F.203: Velocity field during phase increment 1 at 113.14 Hz with a Re of 0.1.

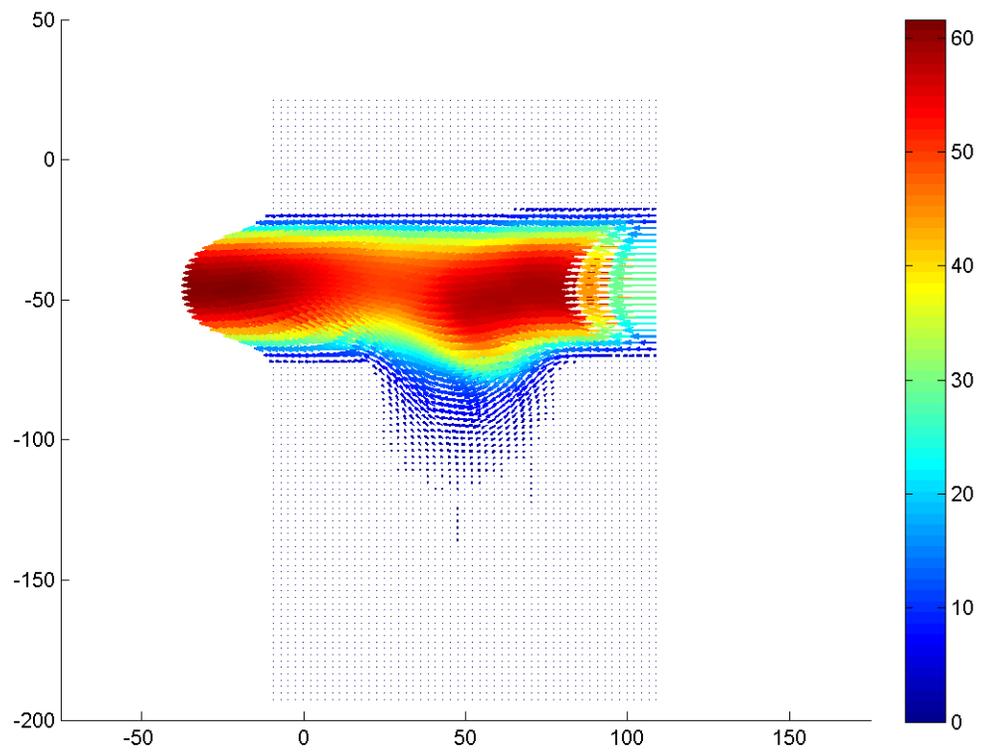


Figure F.204: Velocity field during phase increment 2 at 113.14 Hz with a Re of 0.1.

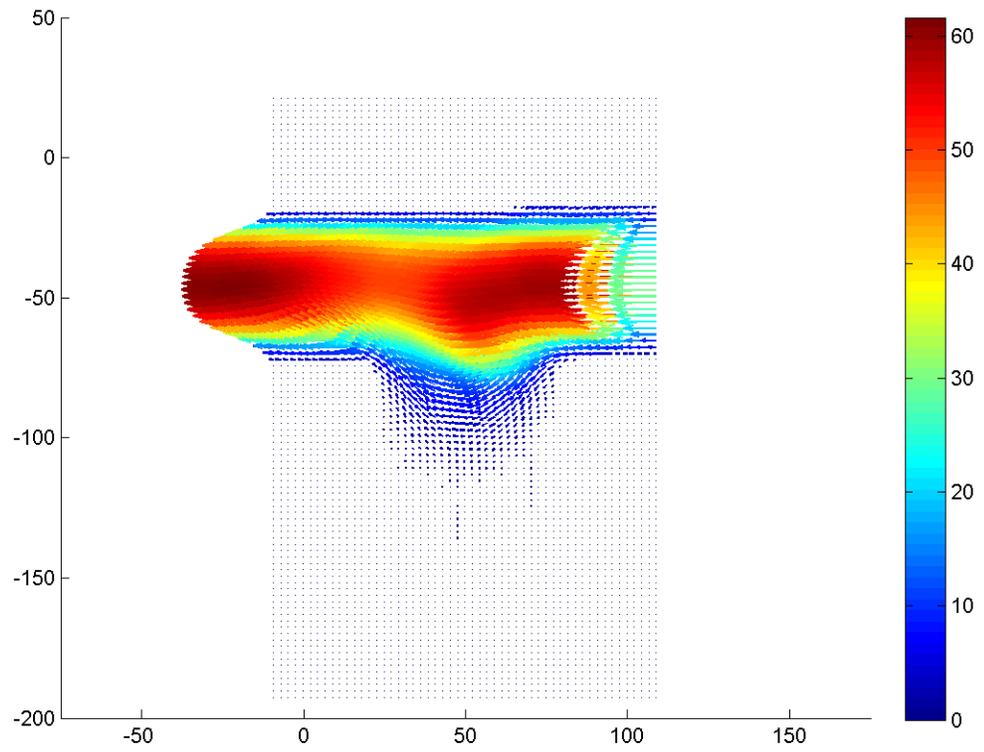


Figure F.205: Velocity field during phase increment 3 at 113.14 Hz with a Re of 0.1.

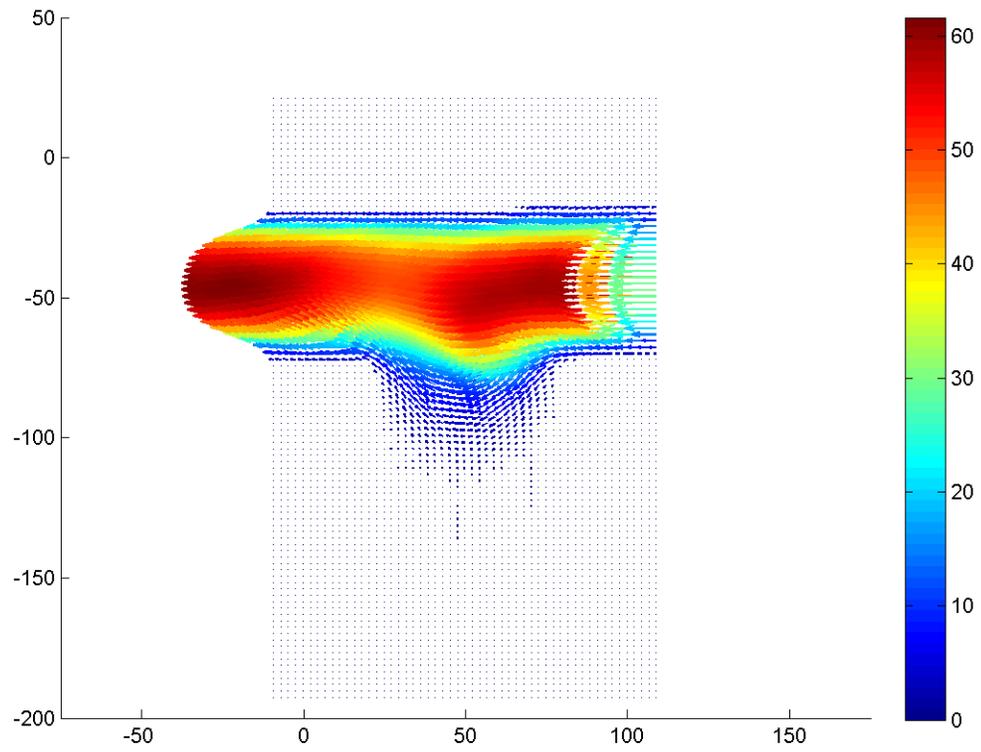


Figure F.206: Velocity field during phase increment 4 at 113.14 Hz with a Re of 0.1.

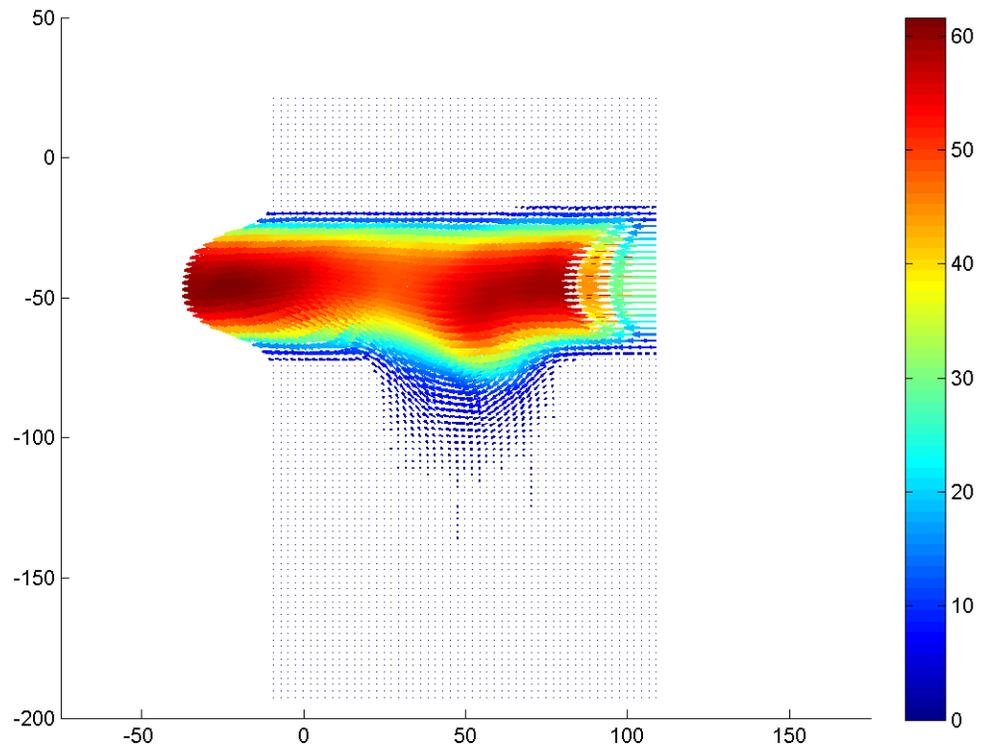


Figure F.207: Velocity field during phase increment 5 at 113.14 Hz with a Re of 0.1.

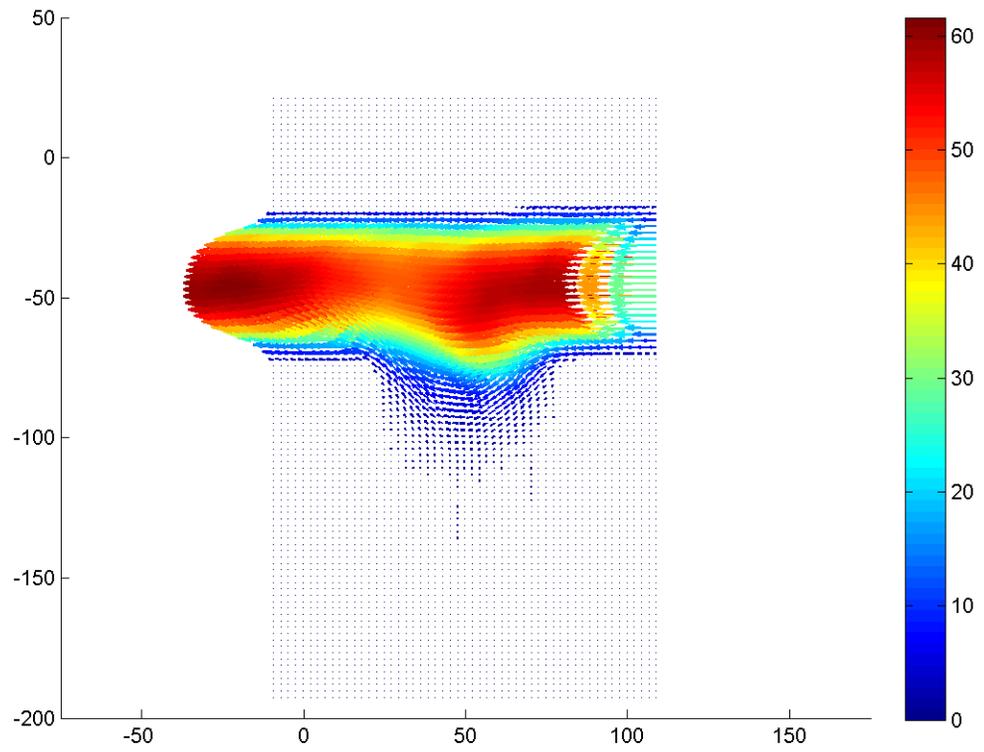


Figure F.208: Velocity field during phase increment 6 at 113.14 Hz with a Re of 0.1.

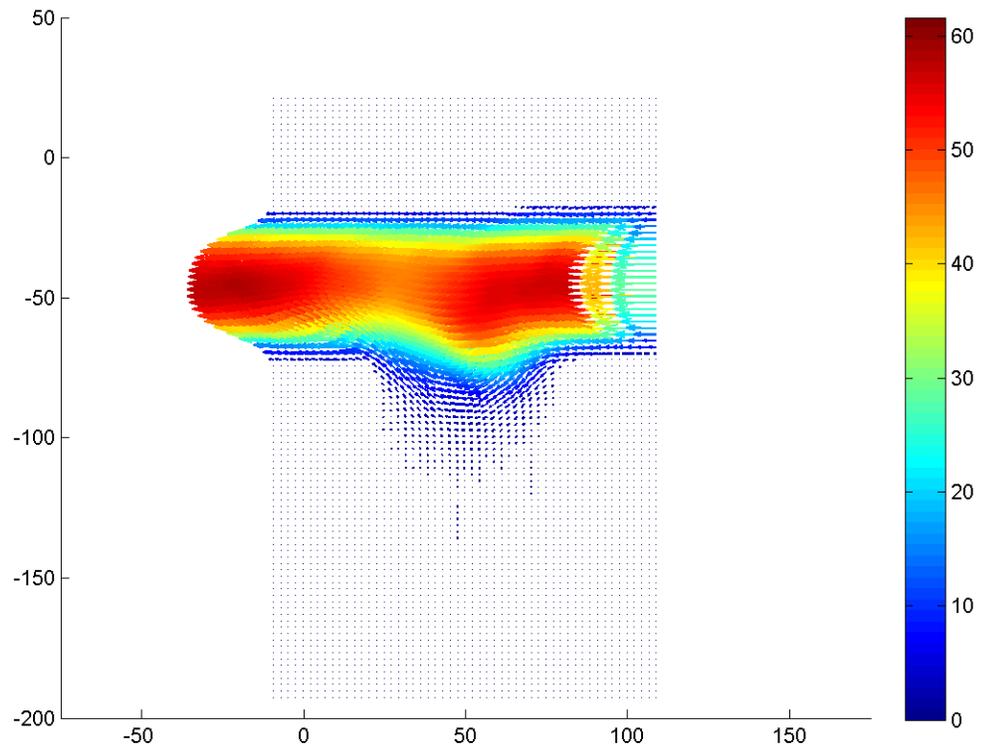


Figure F.209: Velocity field during phase increment 7 at 113.14 Hz with a Re of 0.1.

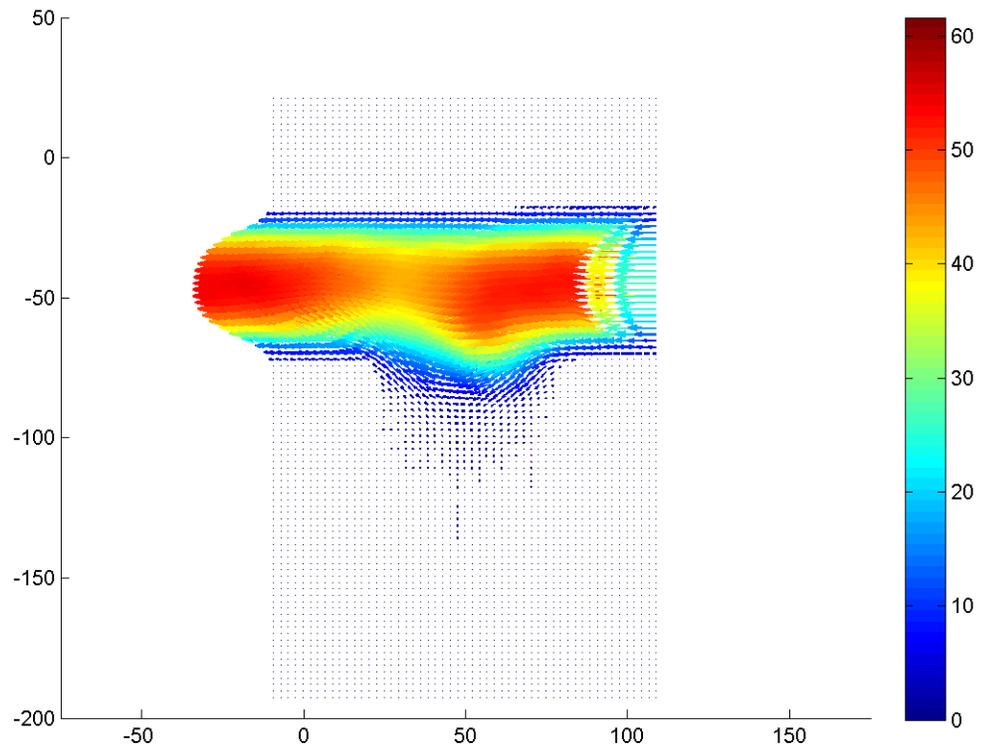


Figure F.210: Velocity field during phase increment 8 at 113.14 Hz with a Re of 0.1.

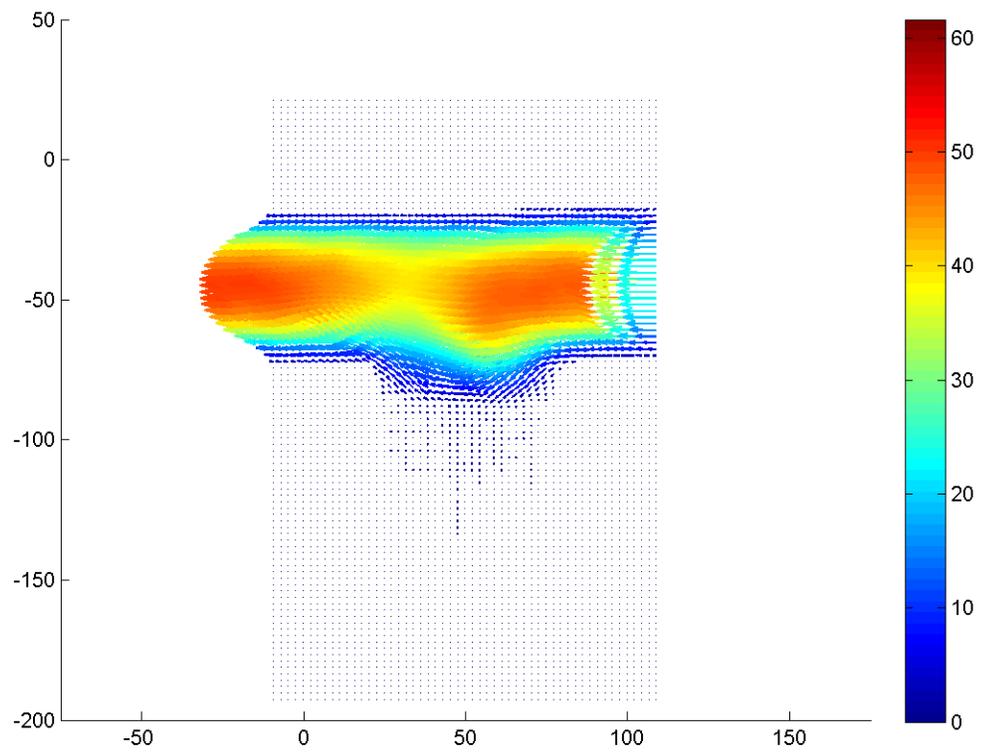


Figure F.211: Velocity field during phase increment 9 at 113.14 Hz with a Re of 0.1.

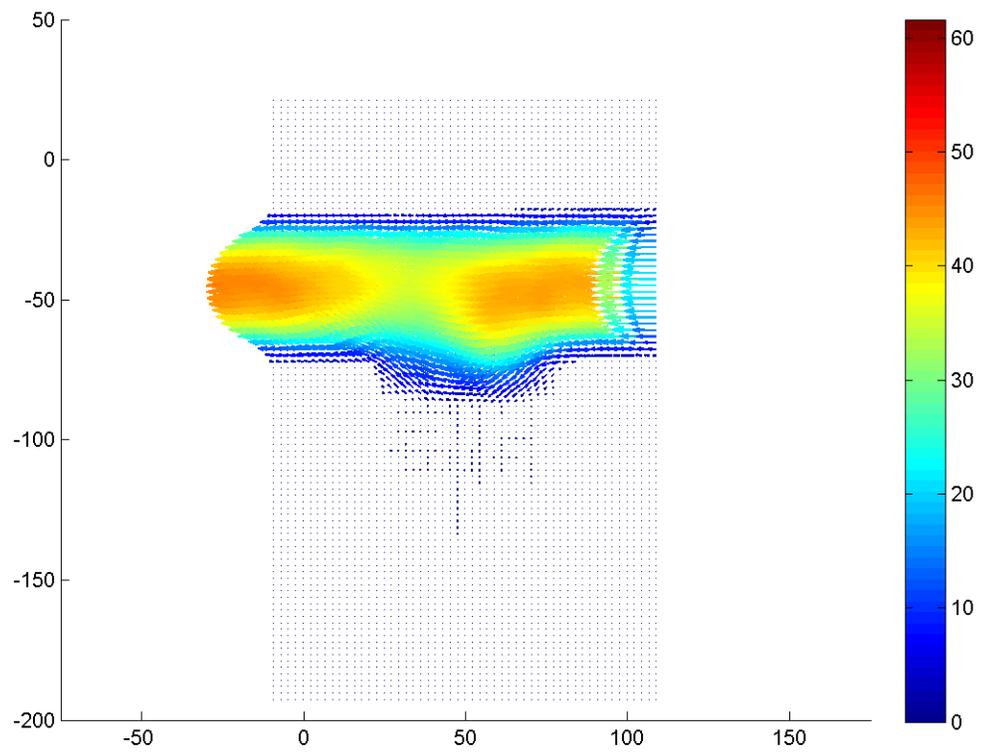


Figure F.212: Velocity field during phase increment 10 at 113.14 Hz with a Re of 0.1.

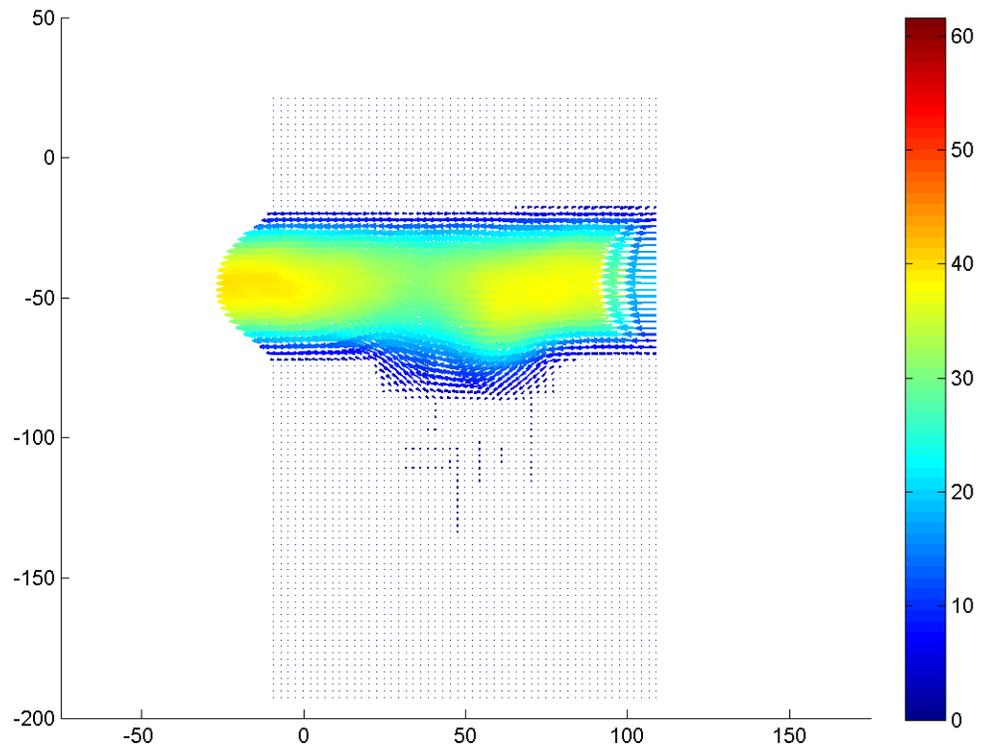


Figure F.213: Velocity field during phase increment 11 at 113.14 Hz with a Re of 0.1.

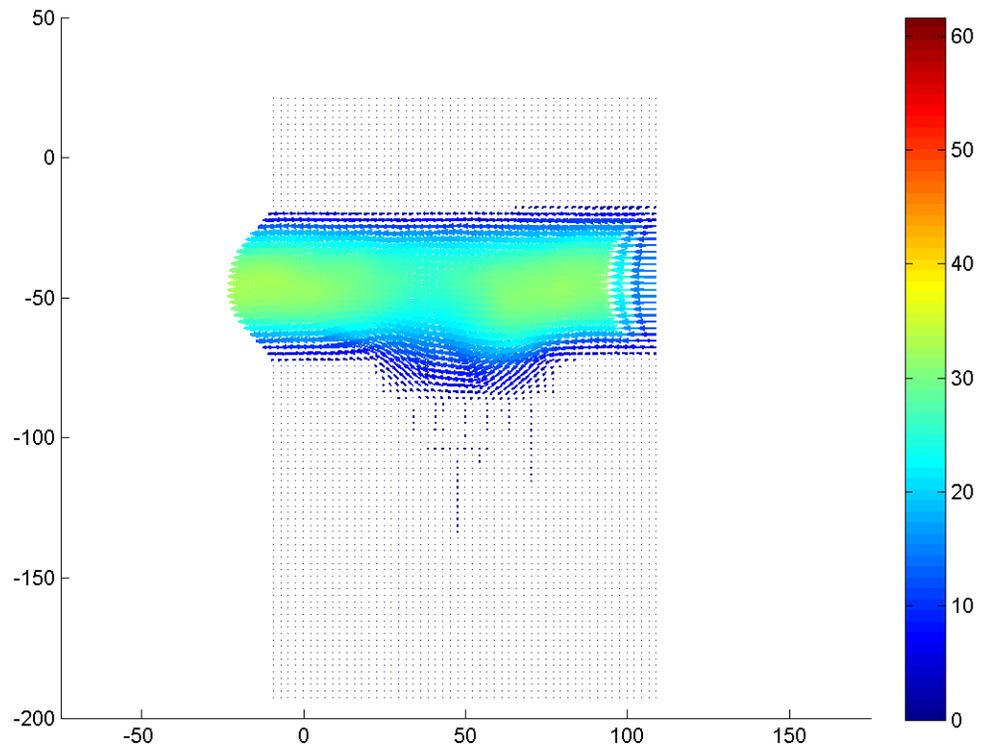


Figure F.214: Velocity field during phase increment 12 at 113.14 Hz with a Re of 0.1.

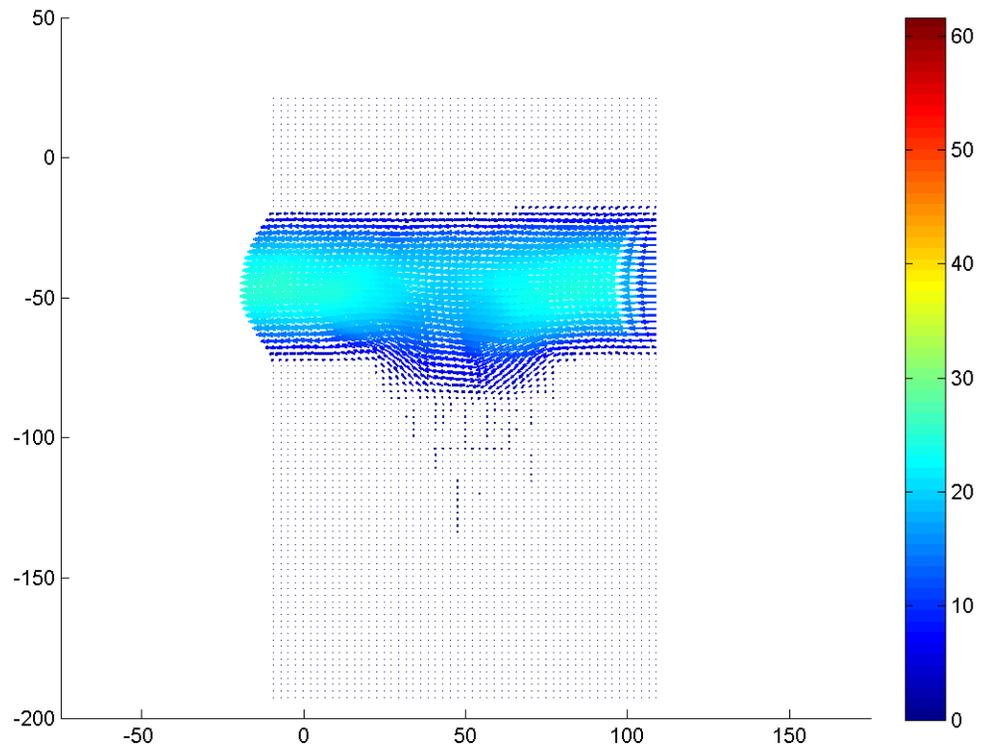


Figure F.215: Velocity field during phase increment 13 at 113.14 Hz with a Re of 0.1.

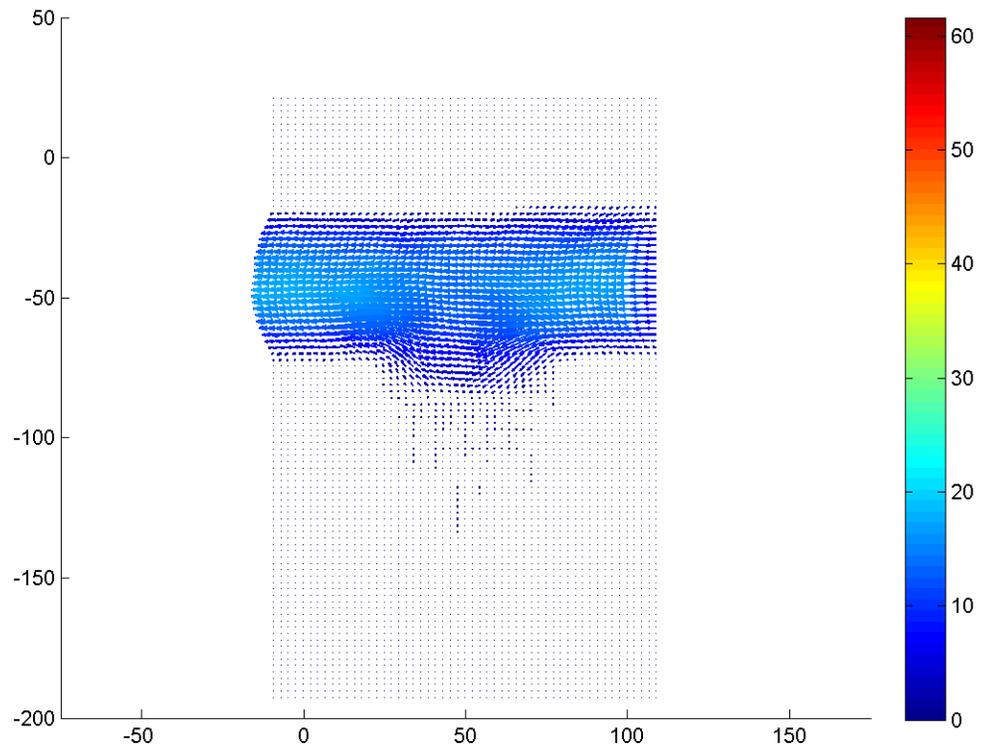


Figure F.216: Velocity field during phase increment 14 at 113.14 Hz with a Re of 0.1.

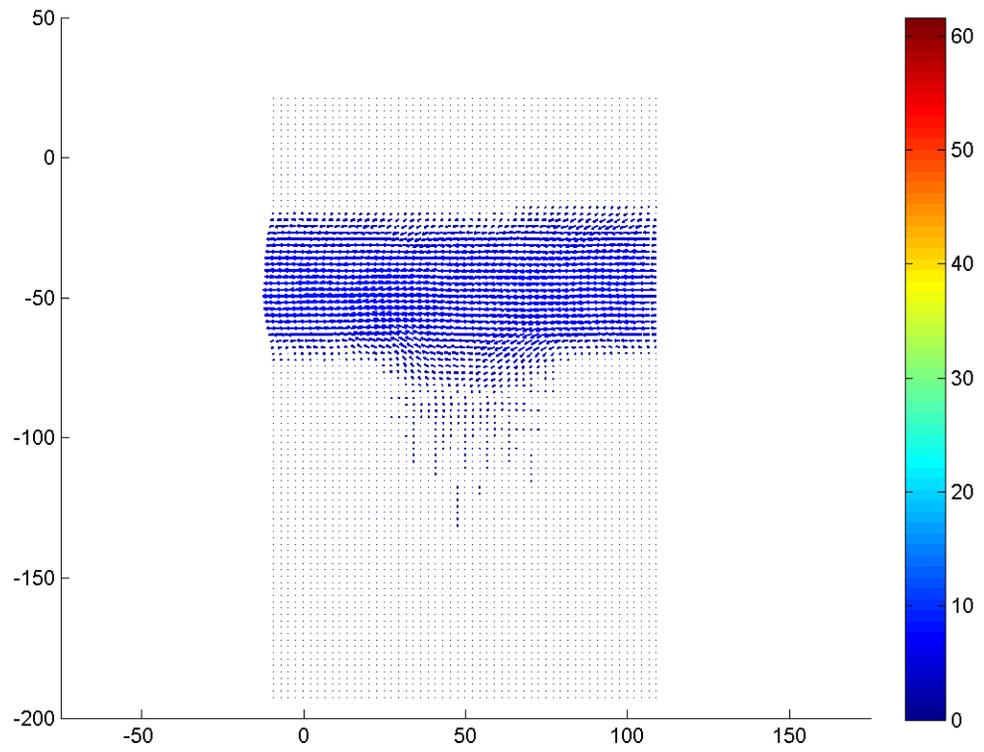


Figure F.217: Velocity field during phase increment 15 at 113.14 Hz with a Re of 0.1.

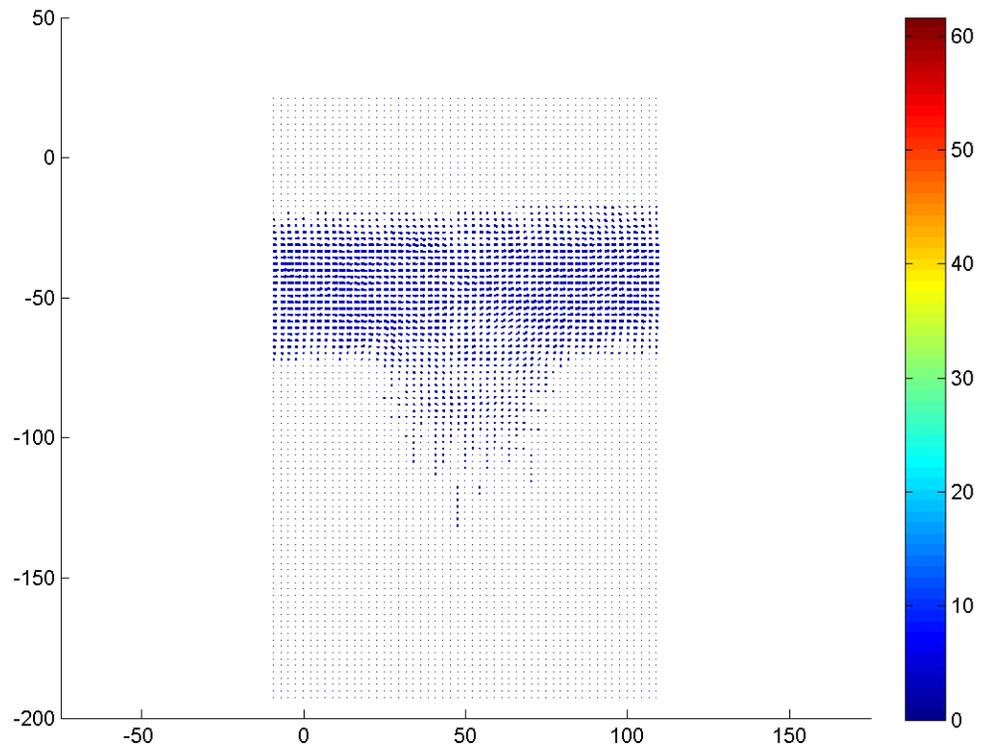


Figure F.218: Velocity field during phase increment 16 at 113.14 Hz with a Re of 0.1.

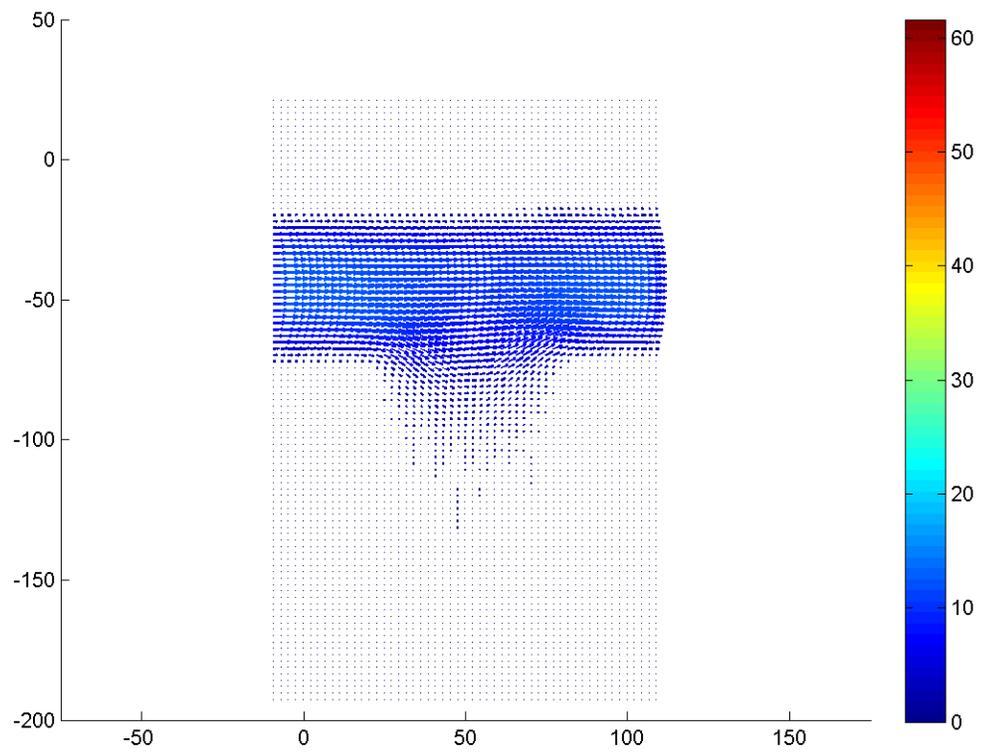


Figure F.219: Velocity field during phase increment 17 at 113.14 Hz with a Re of 0.1.

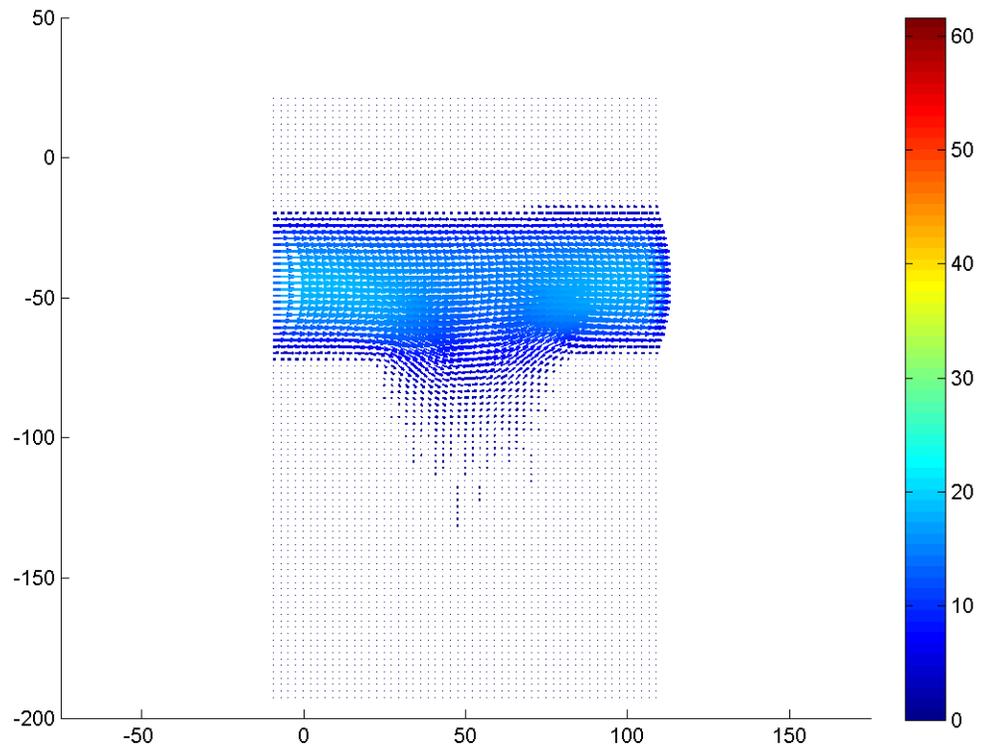


Figure F.220: Velocity field during phase increment 18 at 113.14 Hz with a Re of 0.1.

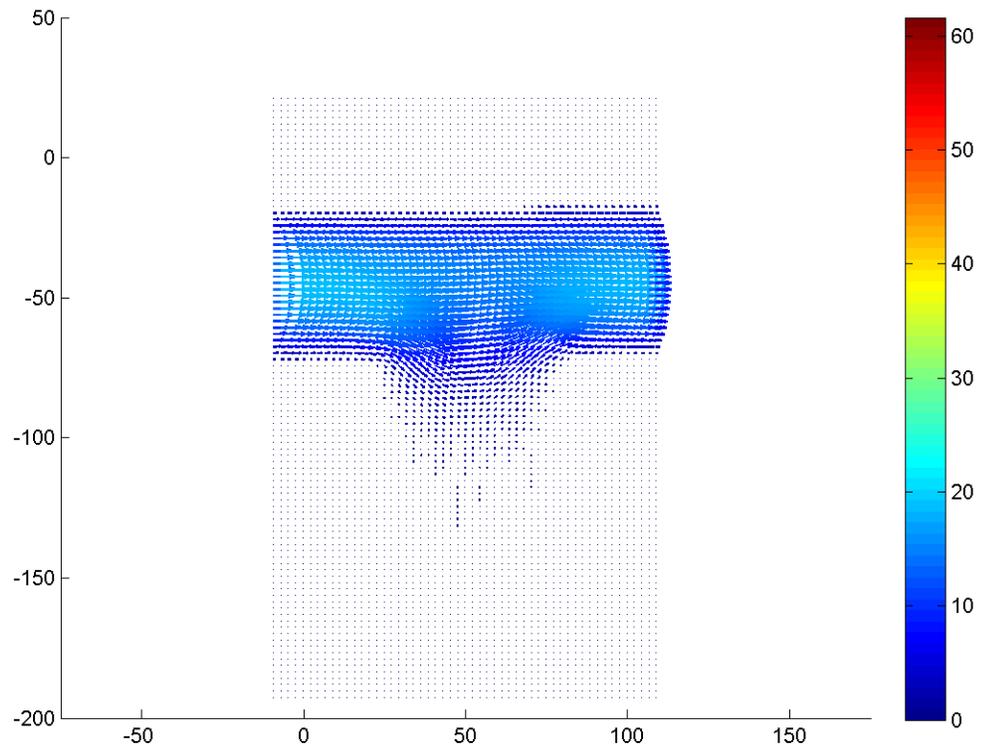


Figure F.221: Velocity field during phase increment 18 at 113.14 Hz with a Re of 0.1.

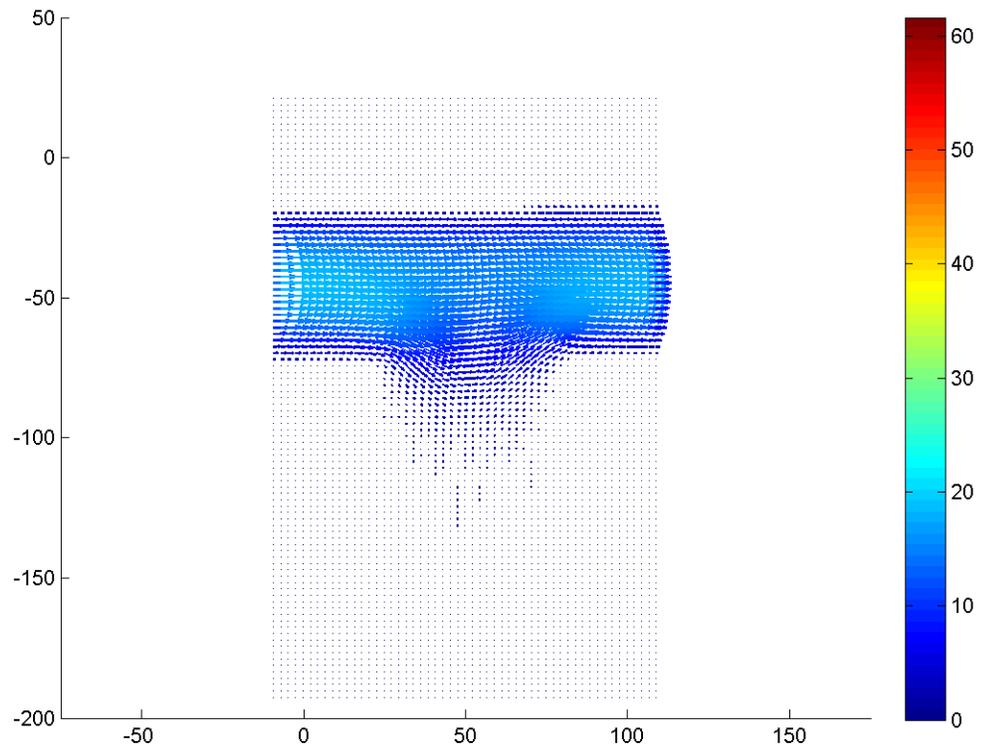


Figure F.222: Velocity field during phase increment 20 at 113.14 Hz with a Re of 0.1.

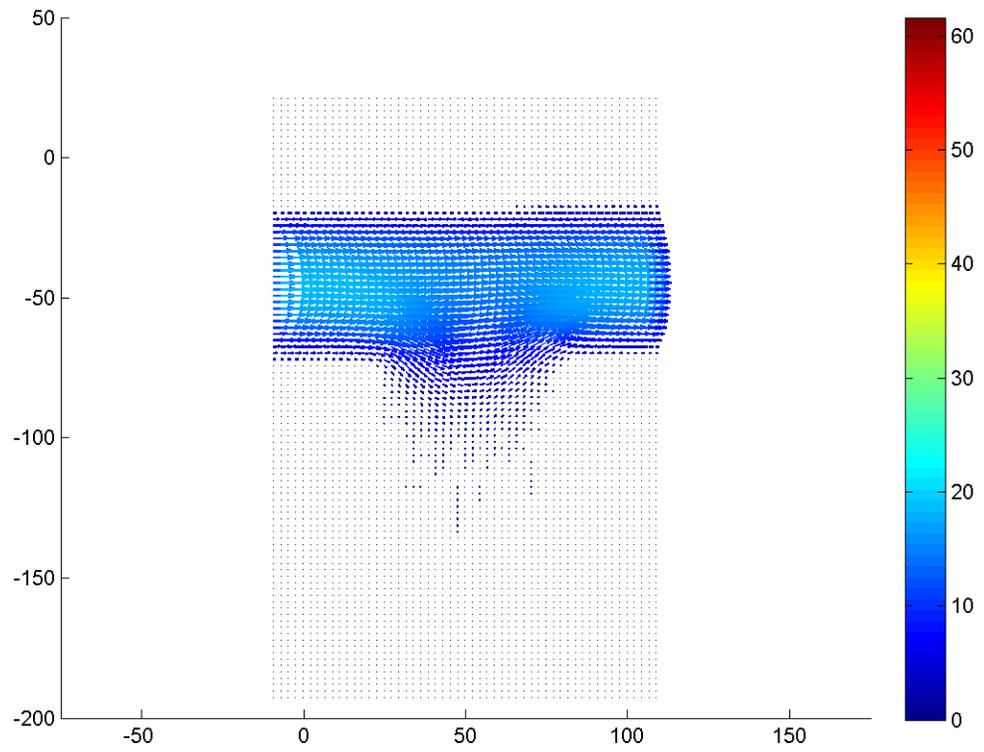


Figure F.223: Velocity field during phase increment 21 at 113.14 Hz with a Re of 0.1.

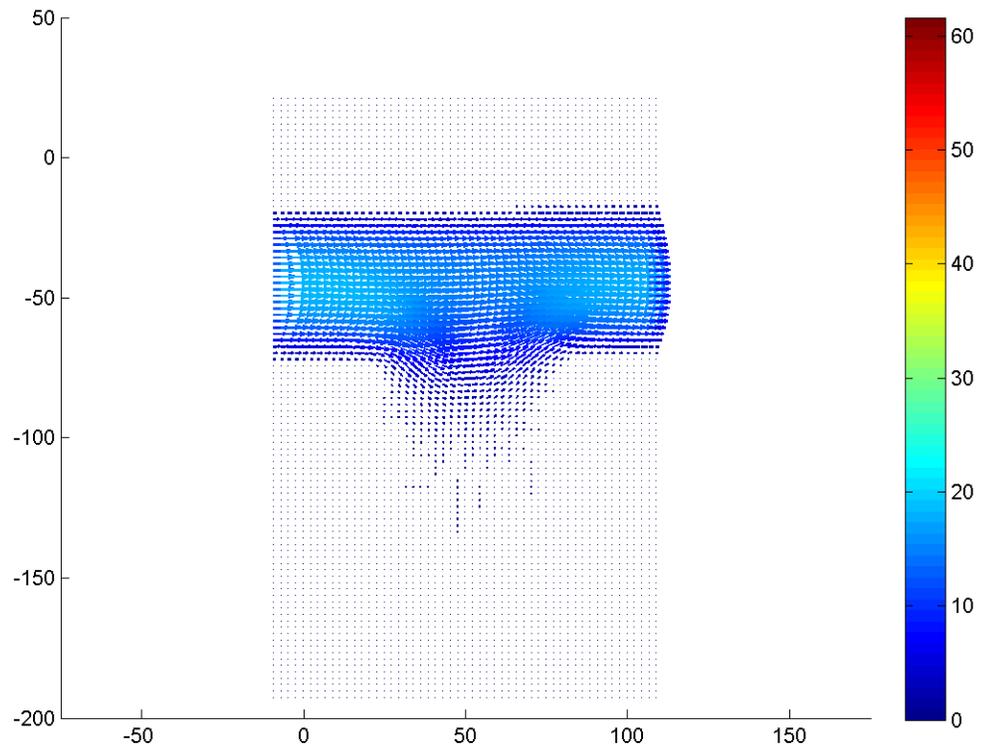


Figure F.224: Velocity field during phase increment 22 at 113.14 Hz with a Re of 0.1.

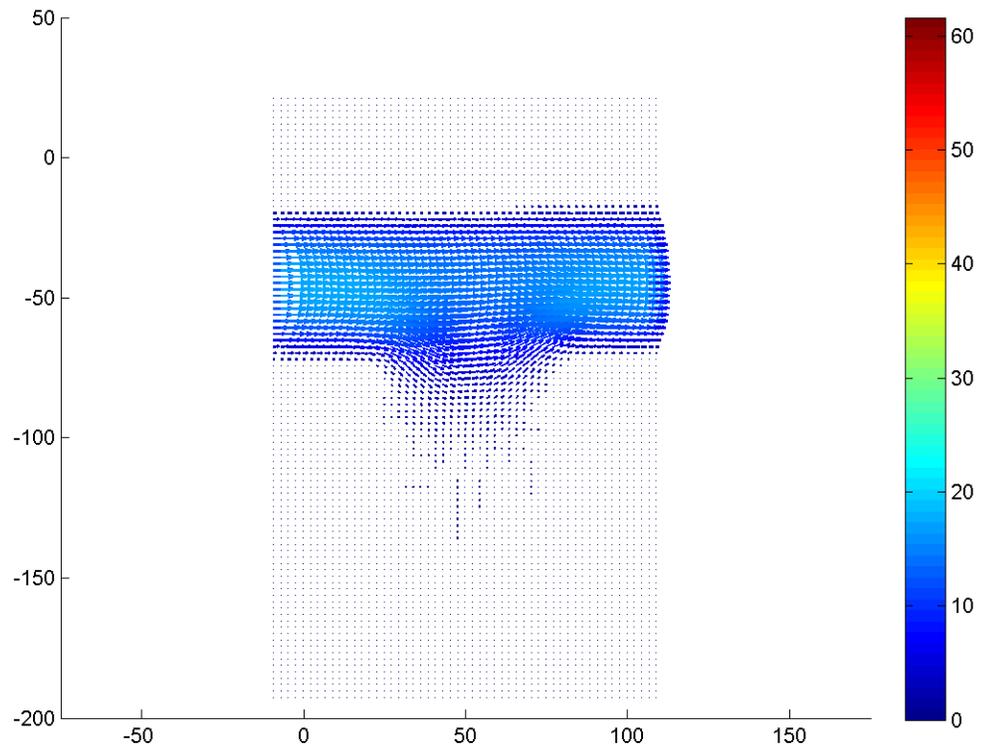


Figure F.225: Velocity field during phase increment 23 at 113.14 Hz with a Re of 0.1.

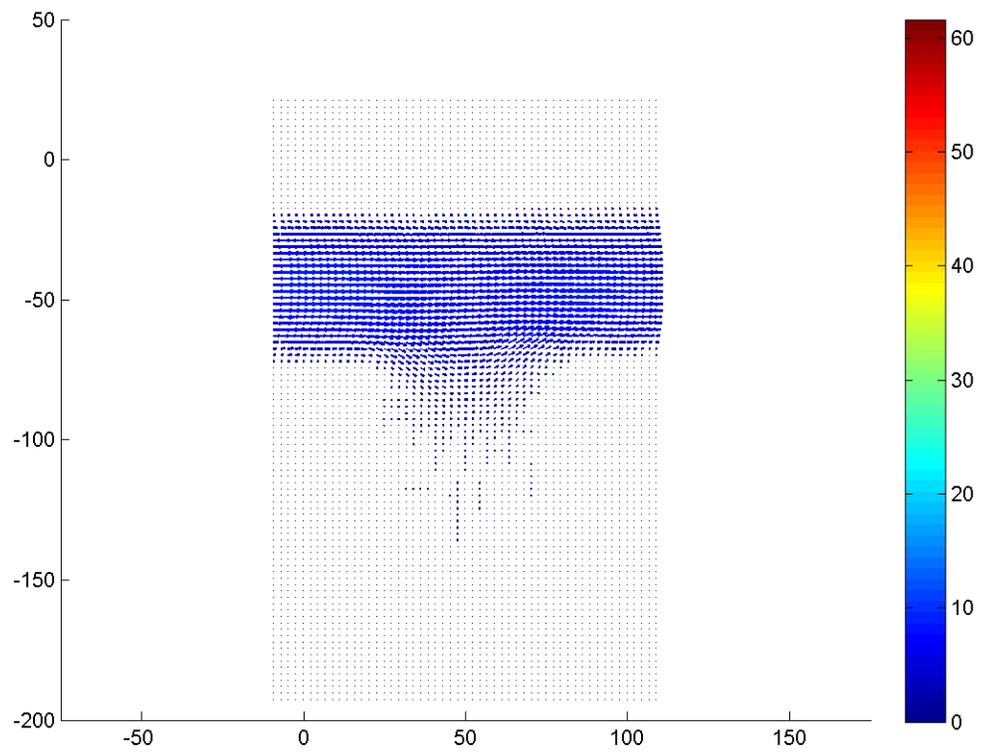


Figure F.226: Velocity field during phase increment 24 at 113.14 Hz with a Re of 0.1.

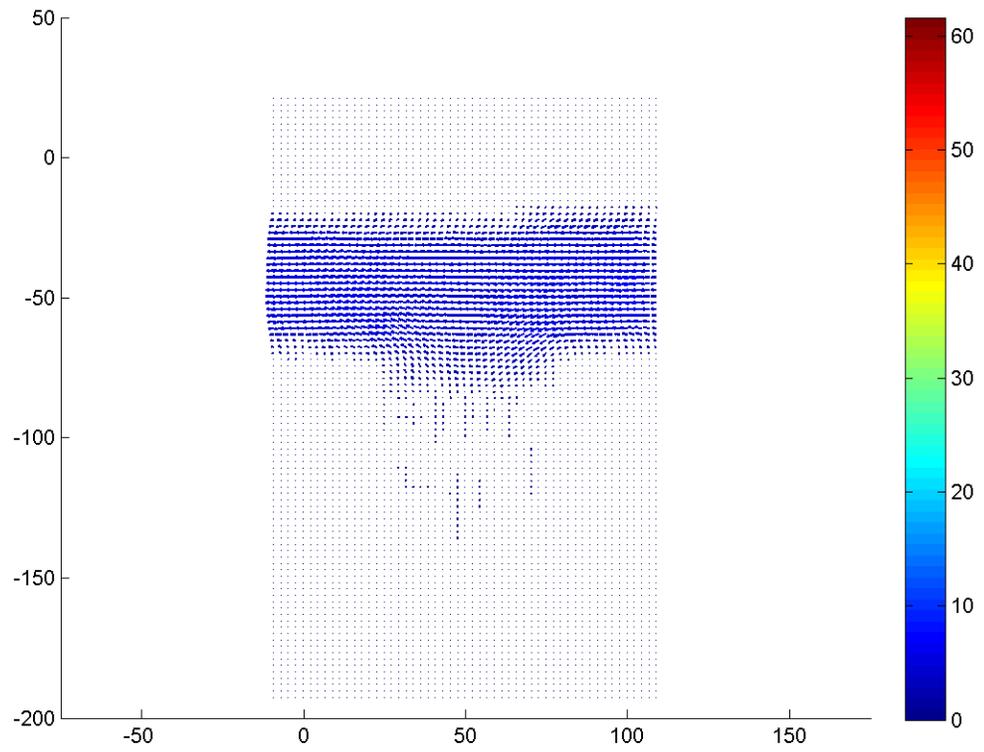


Figure F.227: Velocity field during phase increment 25 at 113.14 Hz with a Re of 0.1.

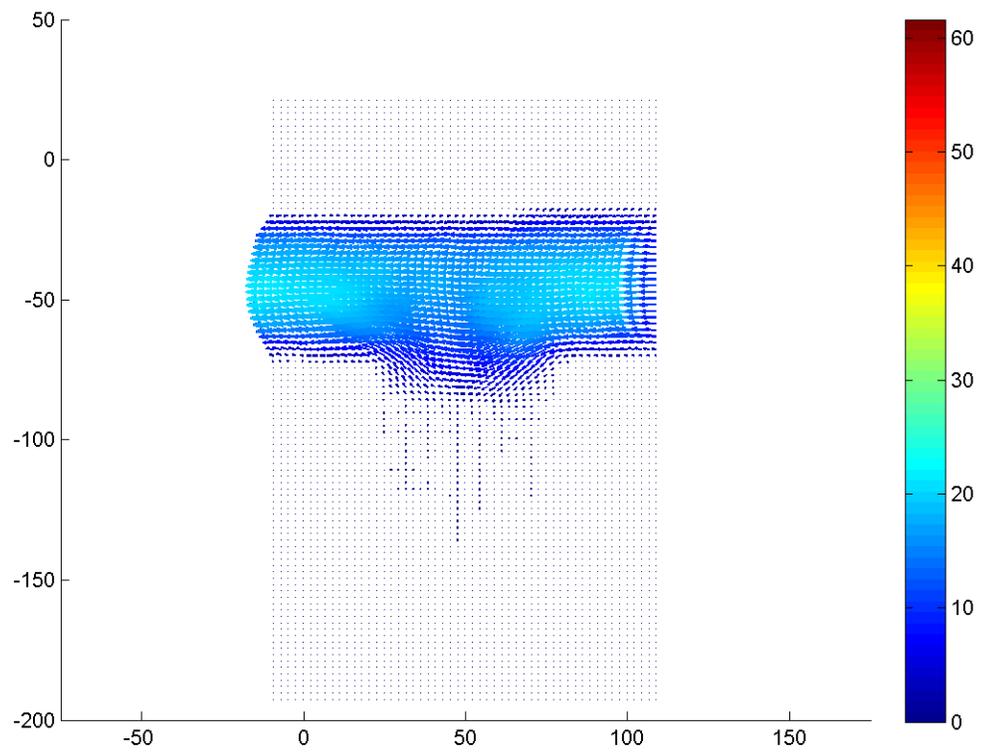


Figure F.228: Velocity field during phase increment 26 at 113.14 Hz with a Re of 0.1.

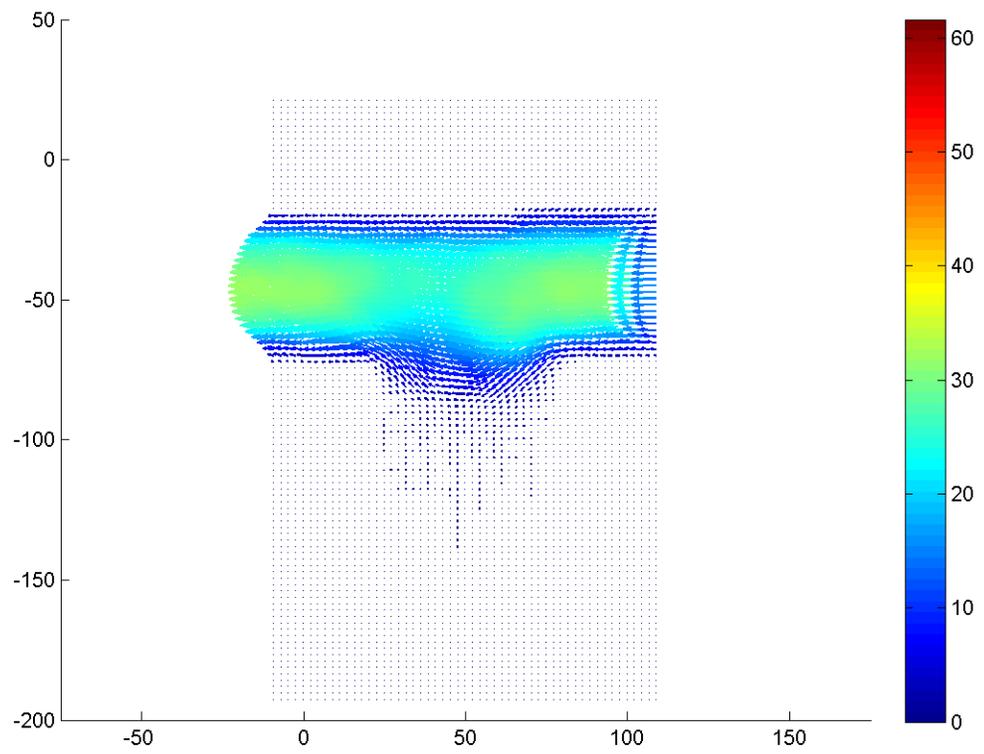


Figure F.229: Velocity field during phase increment 27 at 113.14 Hz with a Re of 0.1.

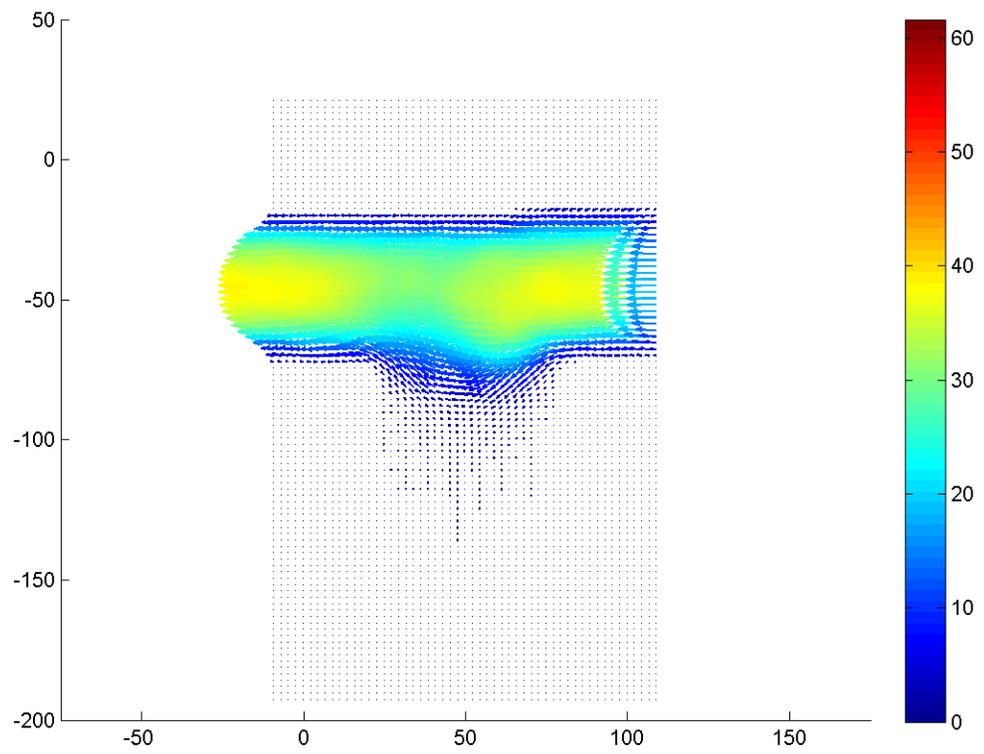


Figure F.230: Velocity field during phase increment 28 at 113.14 Hz with a Re of 0.1.

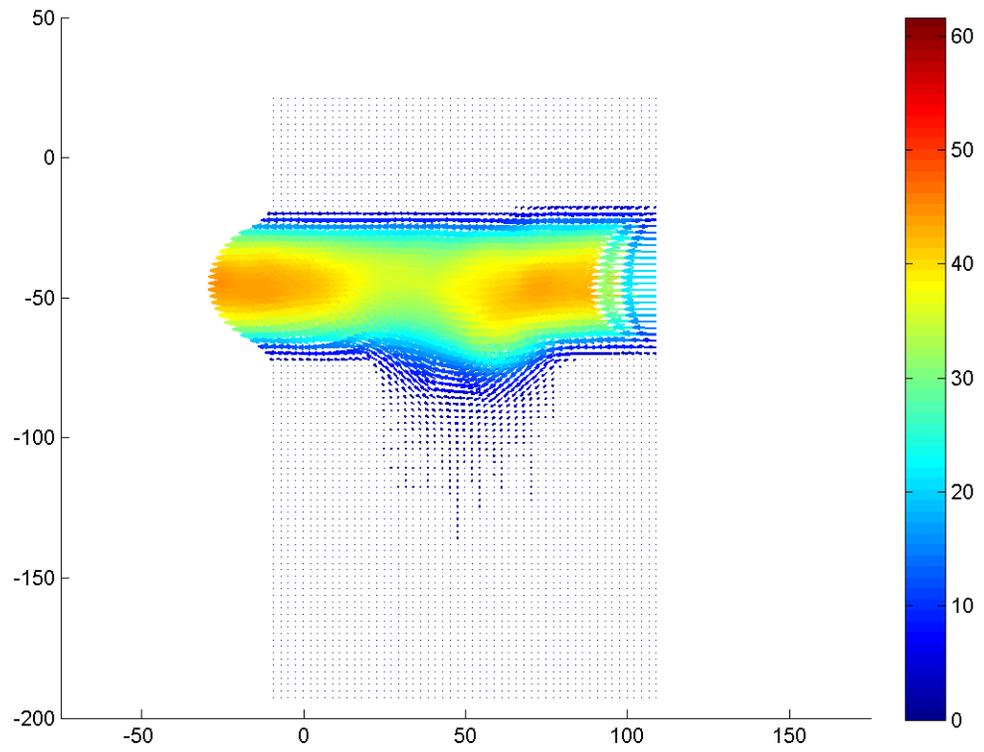


Figure F.231: Velocity field during phase increment 29 at 113.14 Hz with a Re of 0.1.

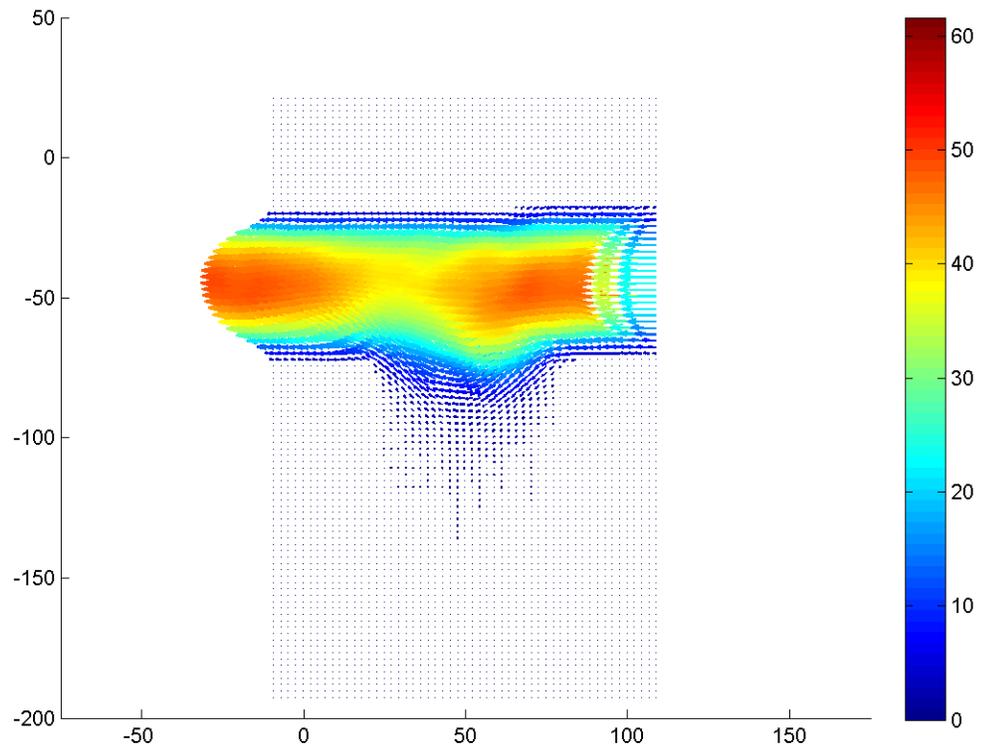


Figure F.232: Velocity field during phase increment 30 at 113.14 Hz with a Re of 0.1.

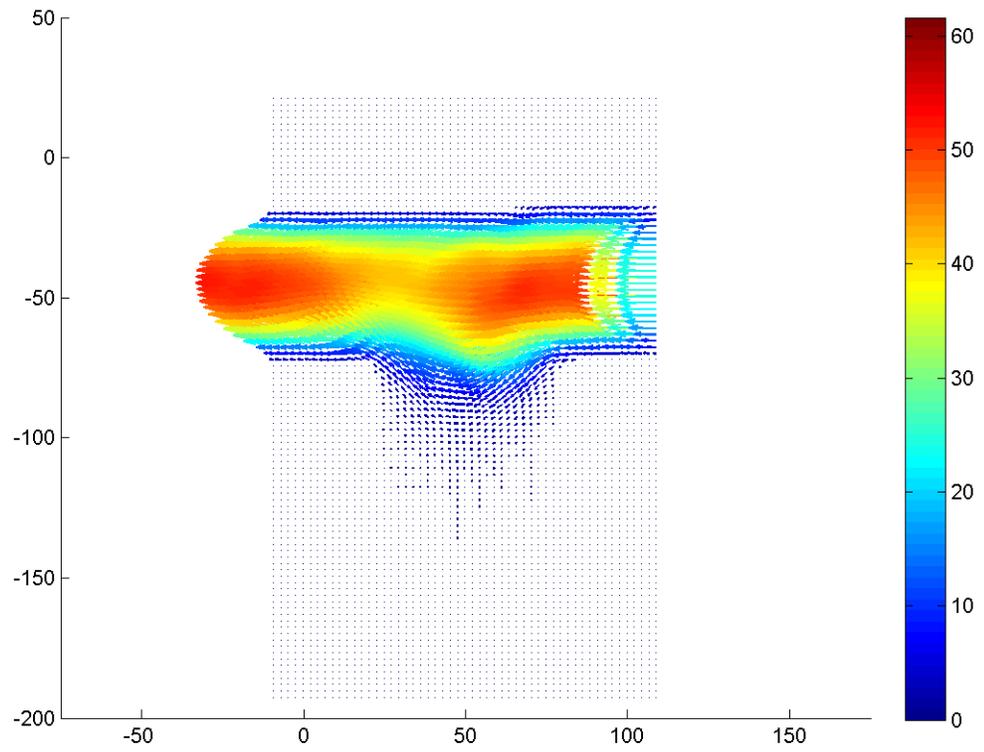


Figure F.233: Velocity field during phase increment 31 at 113.14 Hz with a Re of 0.1.

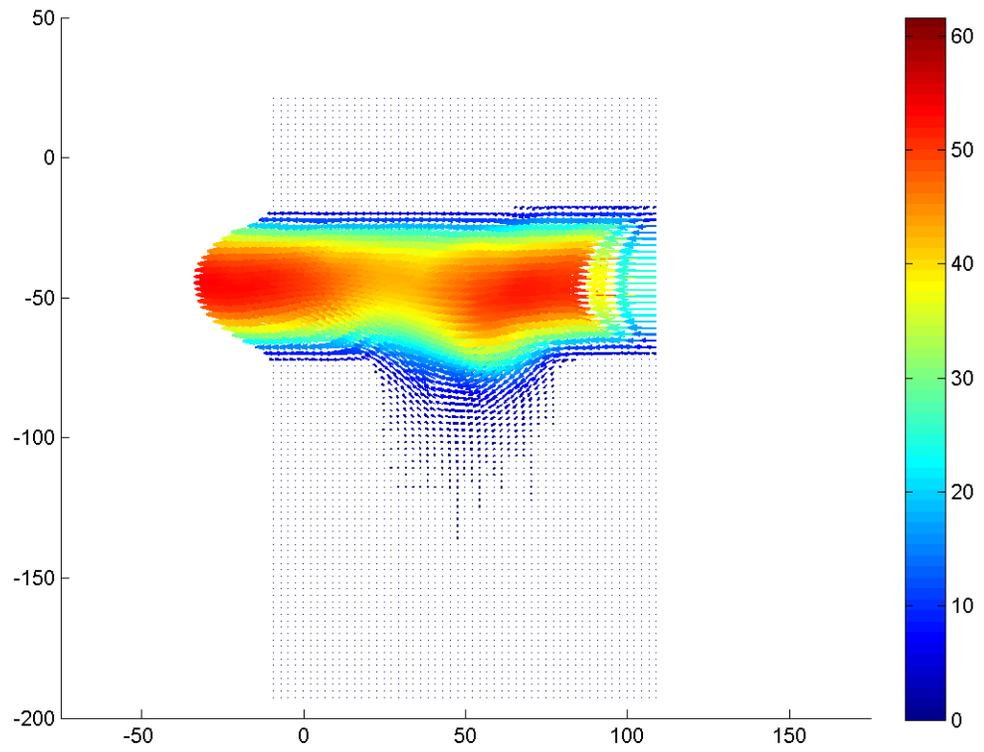


Figure F.234: Velocity field during phase increment 32 at 113.14 Hz with a Re of 0.1.

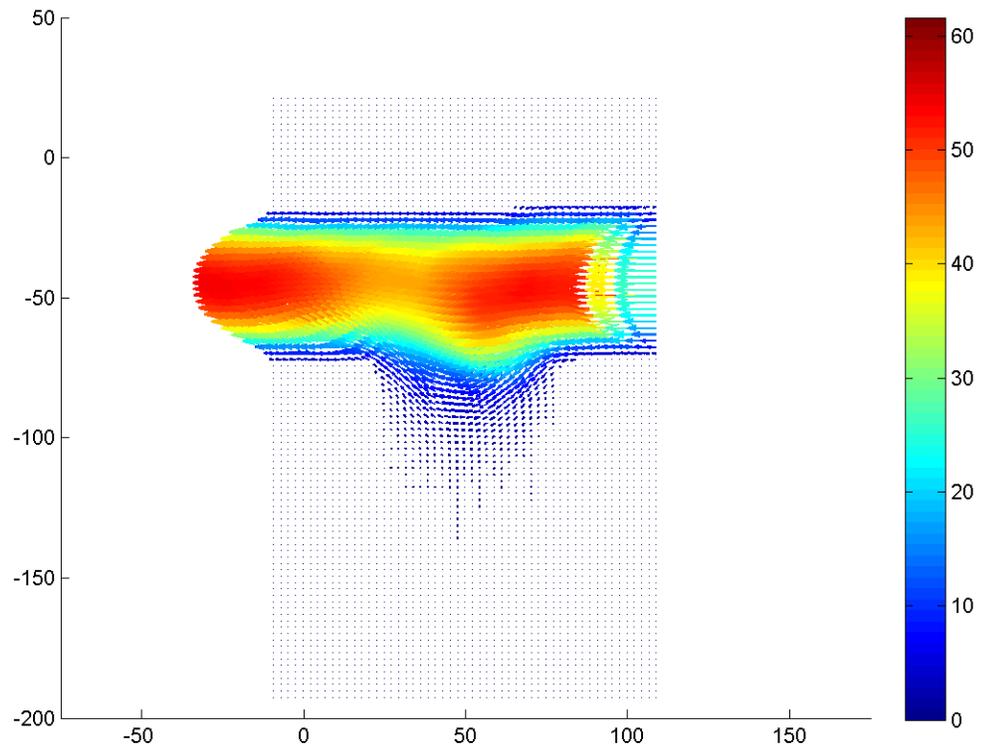


Figure F.235: Velocity field during phase increment 33 at 113.14 Hz with a Re of 0.1.

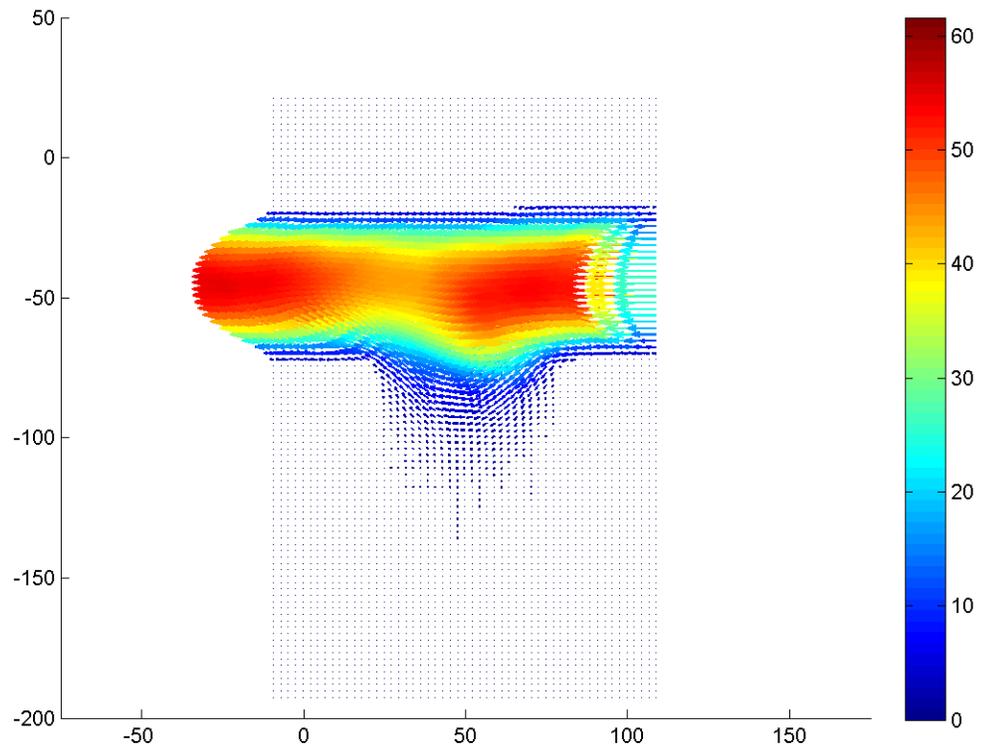


Figure F.236: Velocity field during phase increment 34 at 113.14 Hz with a Re of 0.1.

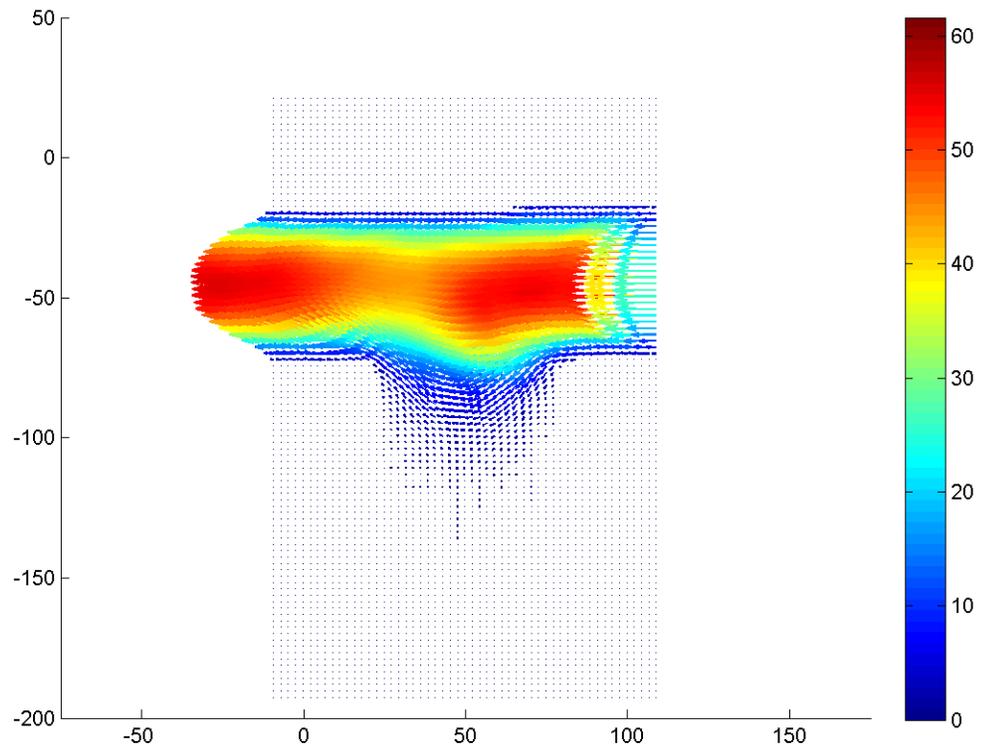


Figure F.237: Velocity field during phase increment 35 at 113.14 Hz with a Re of 0.1.

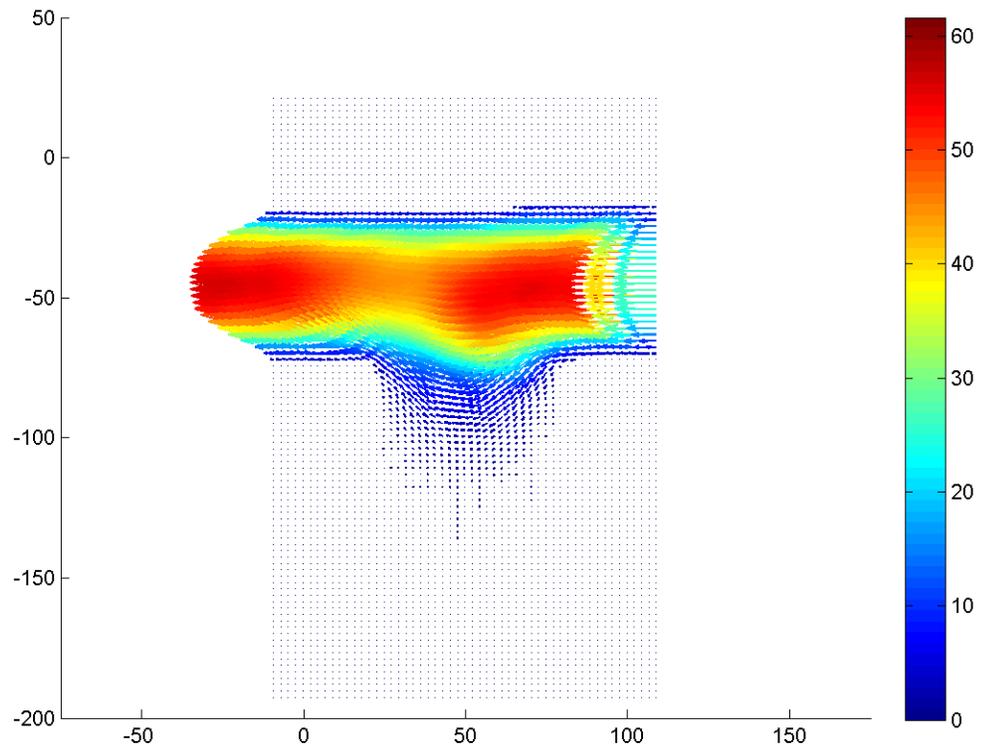


Figure F.238: Velocity field during phase increment 36 at 113.14 Hz with a Re of 0.1.

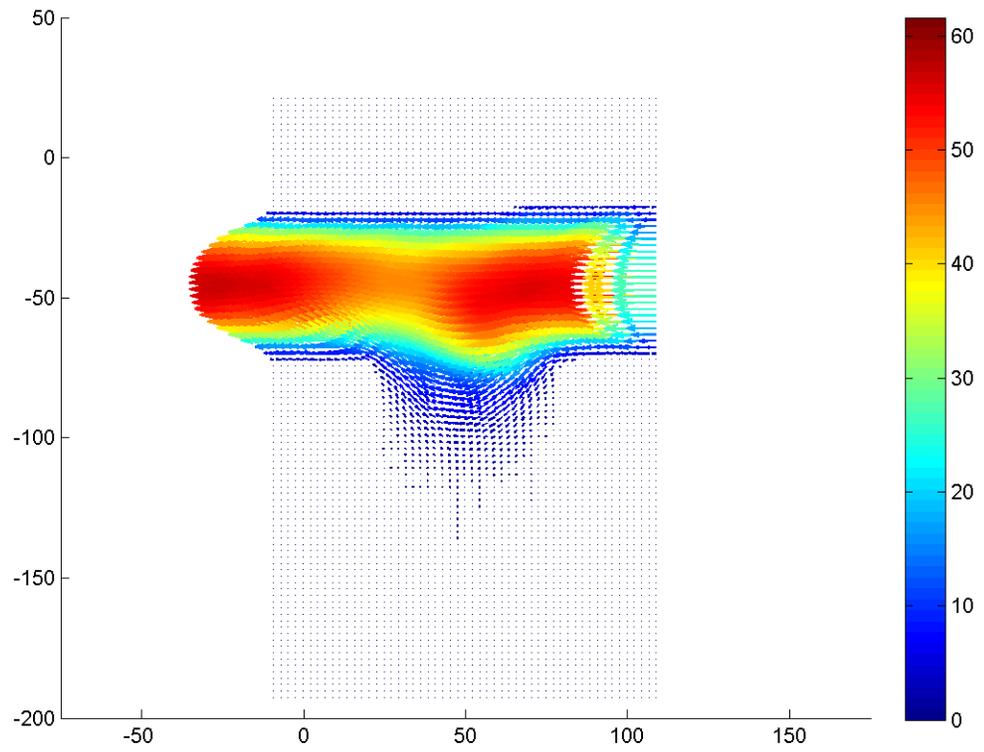


Figure F.239: Velocity field during phase increment 37 at 113.14 Hz with a Re of 0.1.

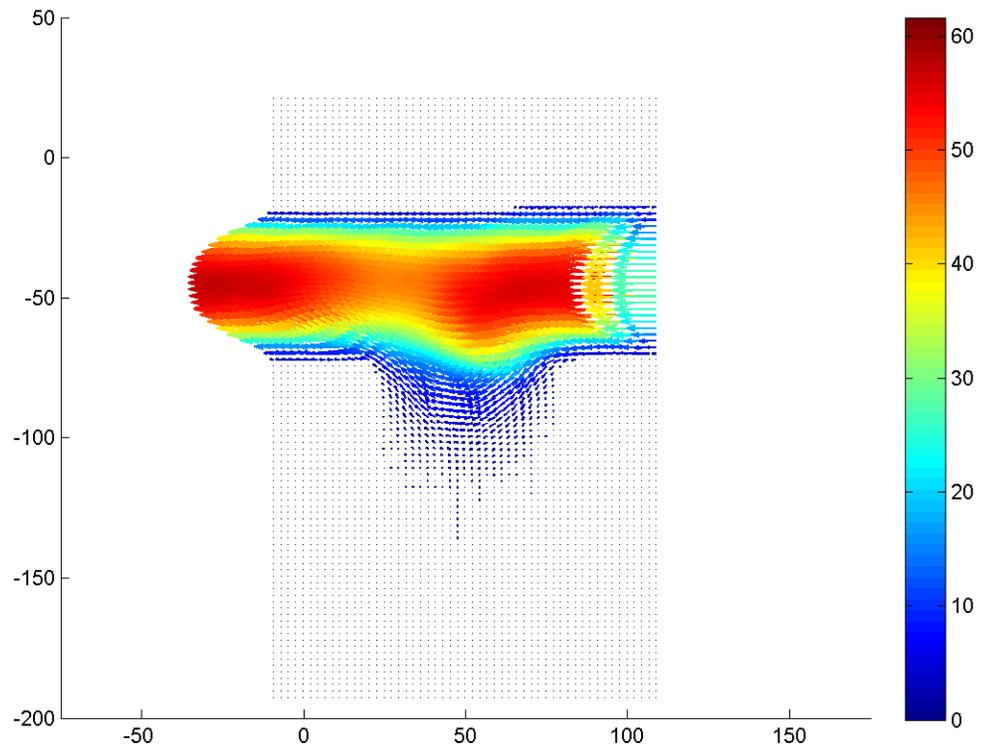


Figure F.240: Velocity field during phase increment 38 at 113.14 Hz with a Re of 0.1.

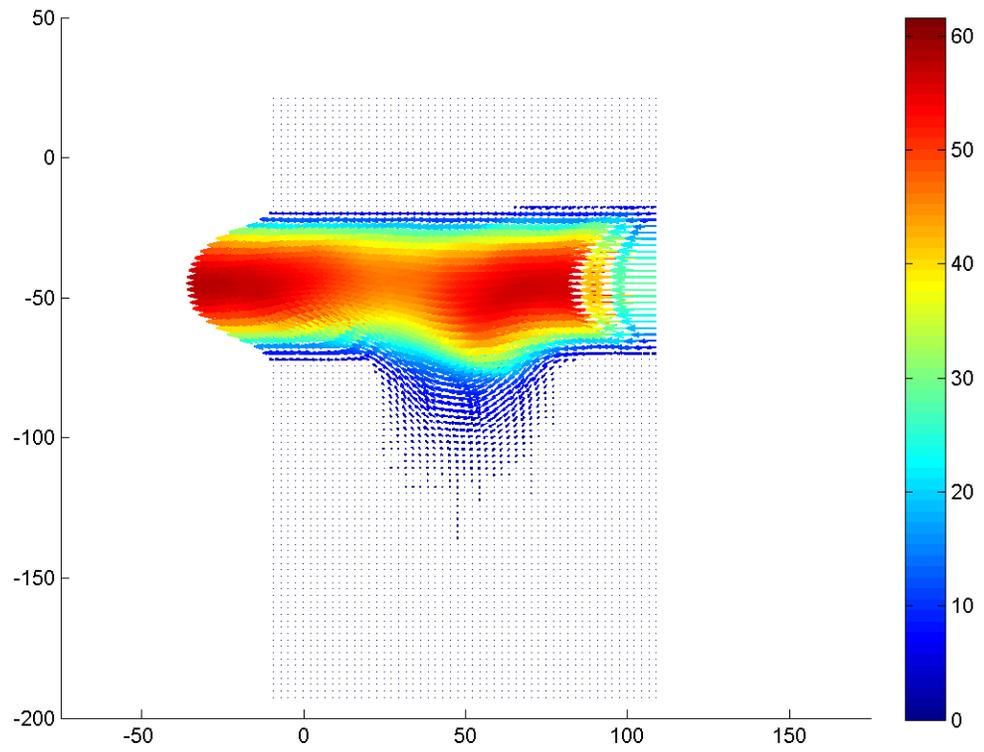


Figure F.241: Velocity field during phase increment 39 at 113.14 Hz with a Re of 0.1.

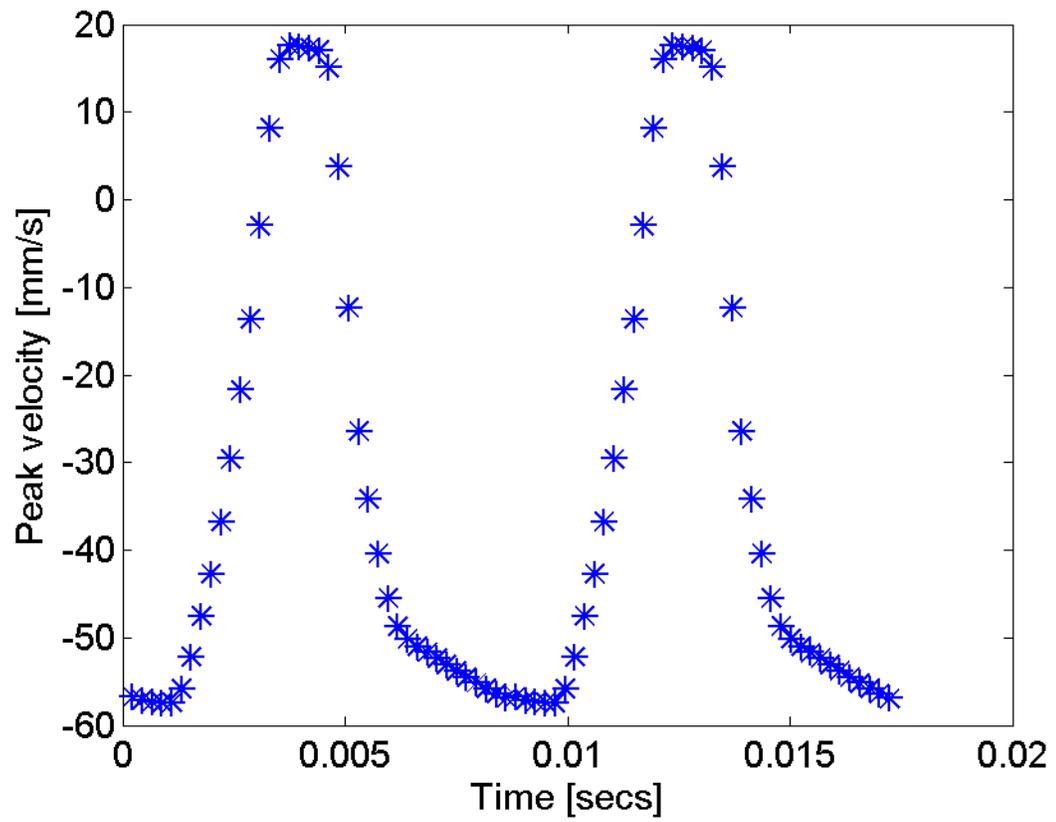


Figure F.242: The peak velocity in the free stream region in time at 113.14 Hz.

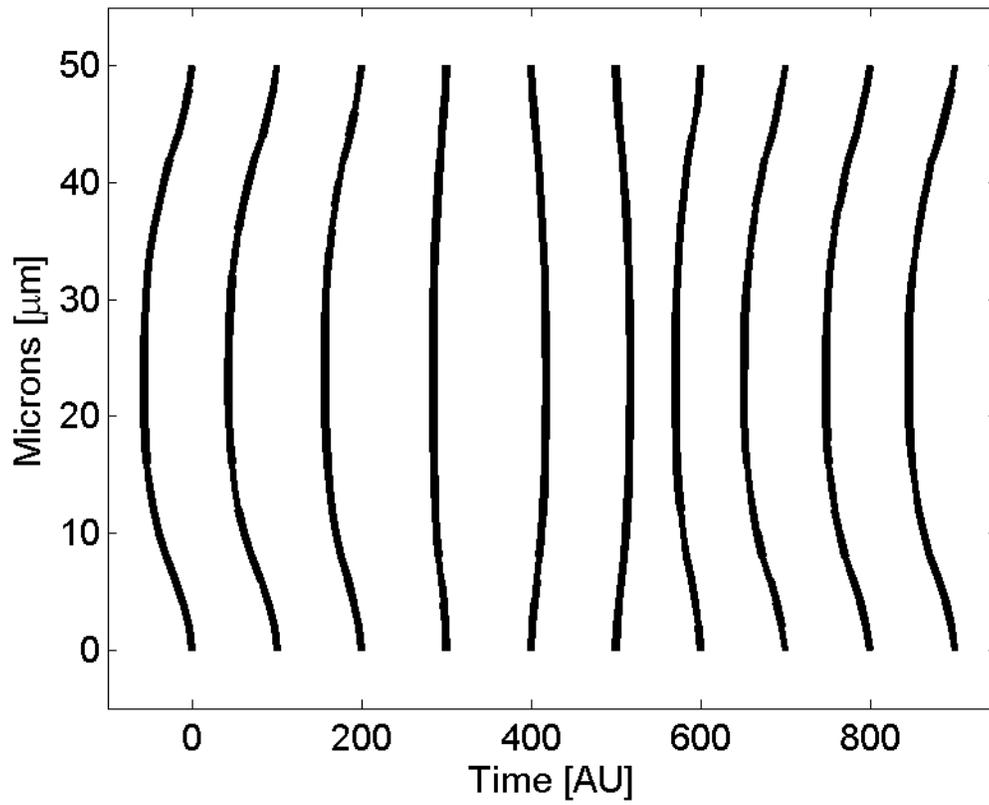


Figure F.243: The velocity profile in the free stream versus time at 113.14 Hz.

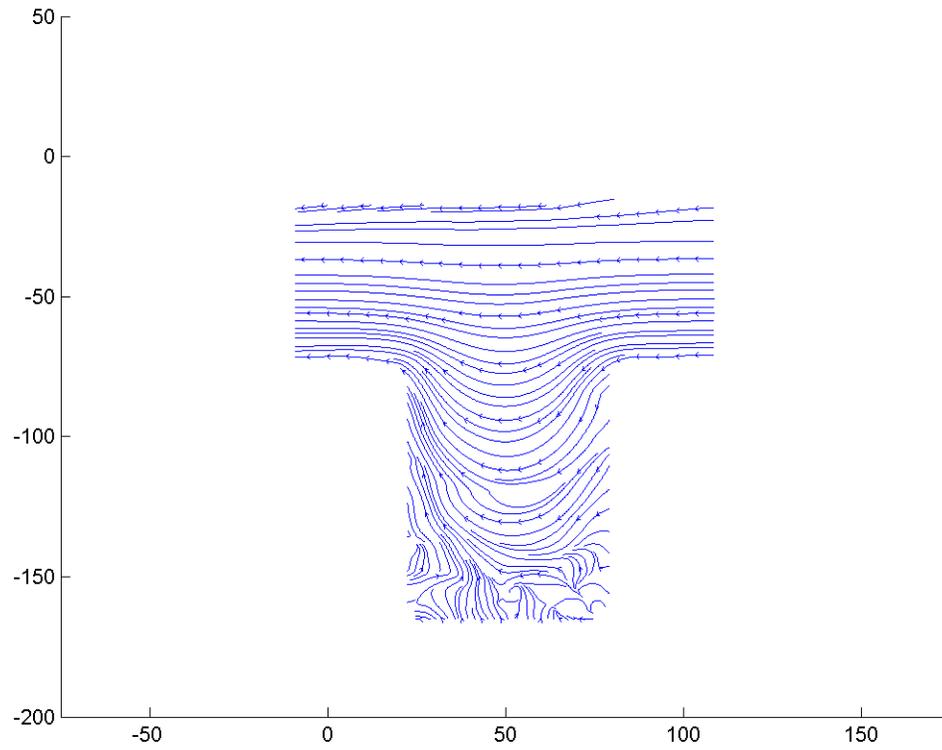
F.3.2 Streamline images at 113.14 Hz

Figure F.244: Streamline image during phase increment 1 at 113.14 Hz and a Re of 0.1.

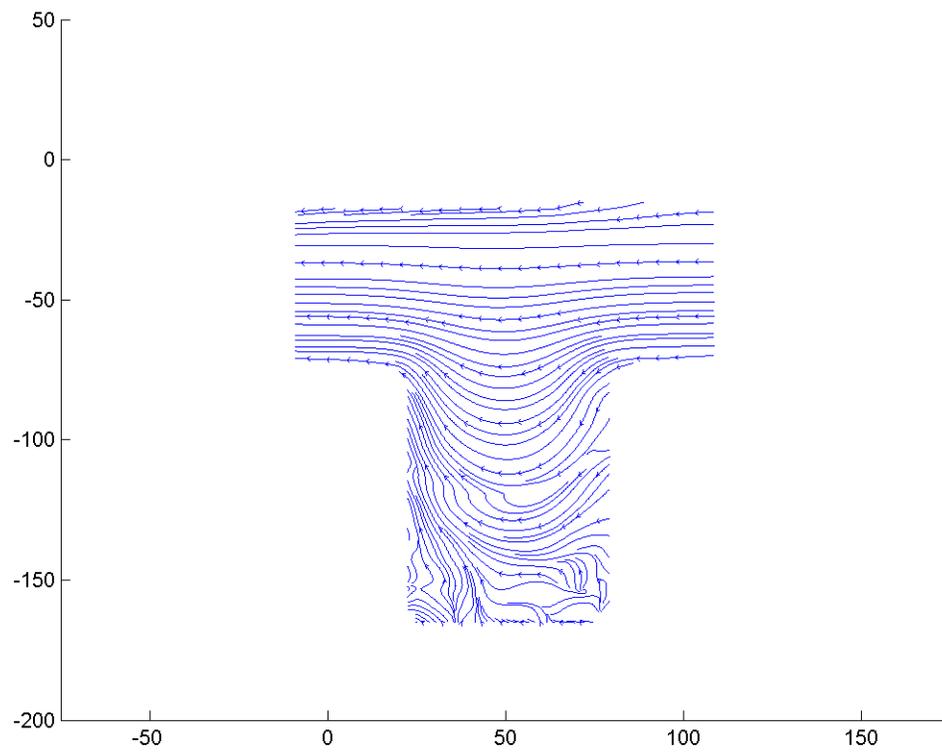


Figure F.245: Streamline image during phase increment 2 at 113.14 Hz and a Re of 0.1.

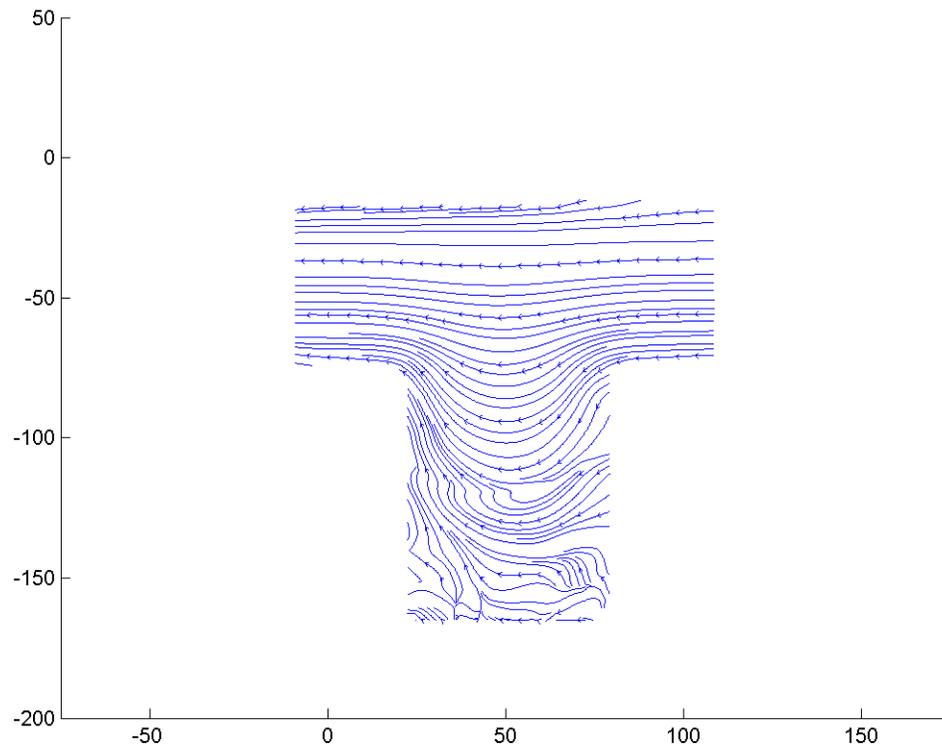


Figure F.246: Streamline image during phase increment 3 at 113.14 Hz and a Re of 0.1.

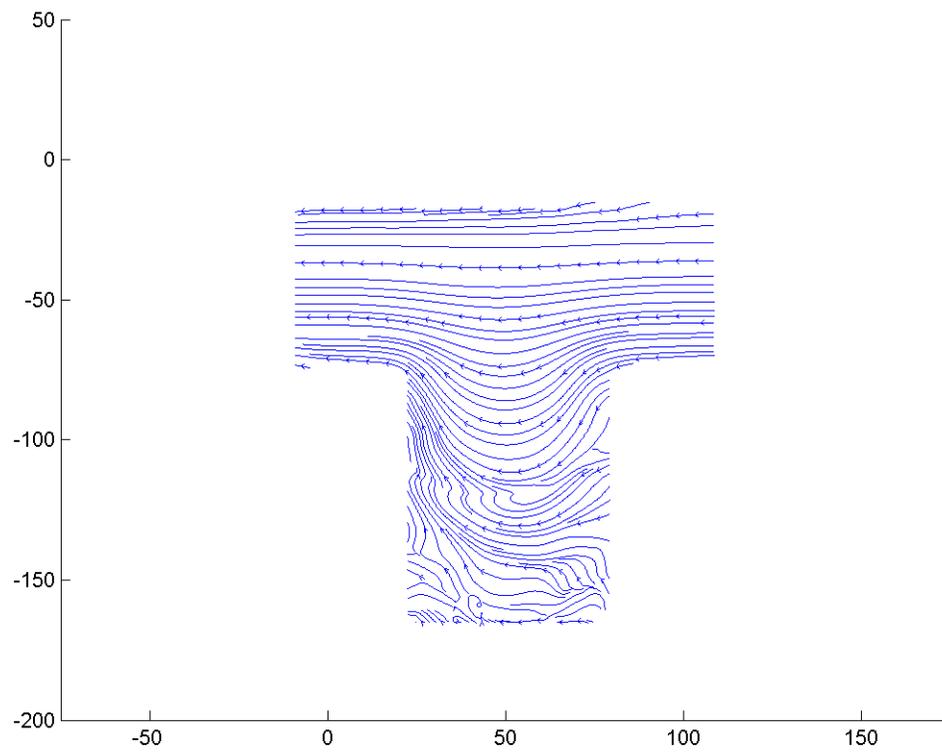


Figure F.247: Streamline image during phase increment 4 at 113.14 Hz and a Re of 0.1.

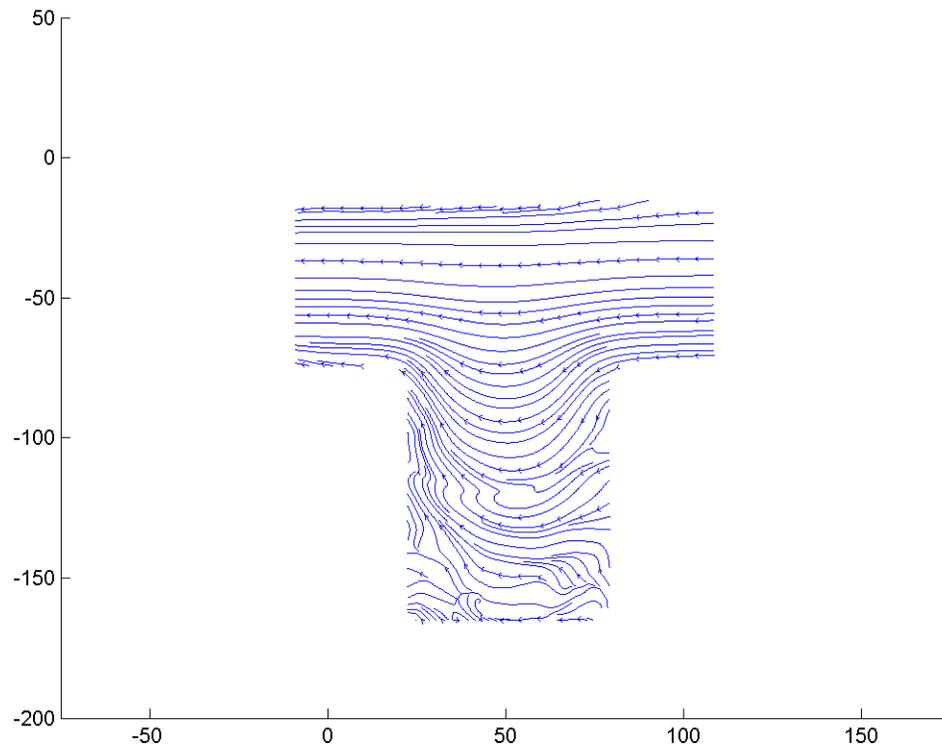


Figure F.248: Streamline image during phase increment 5 at 113.14 Hz and a Re of 0.1.

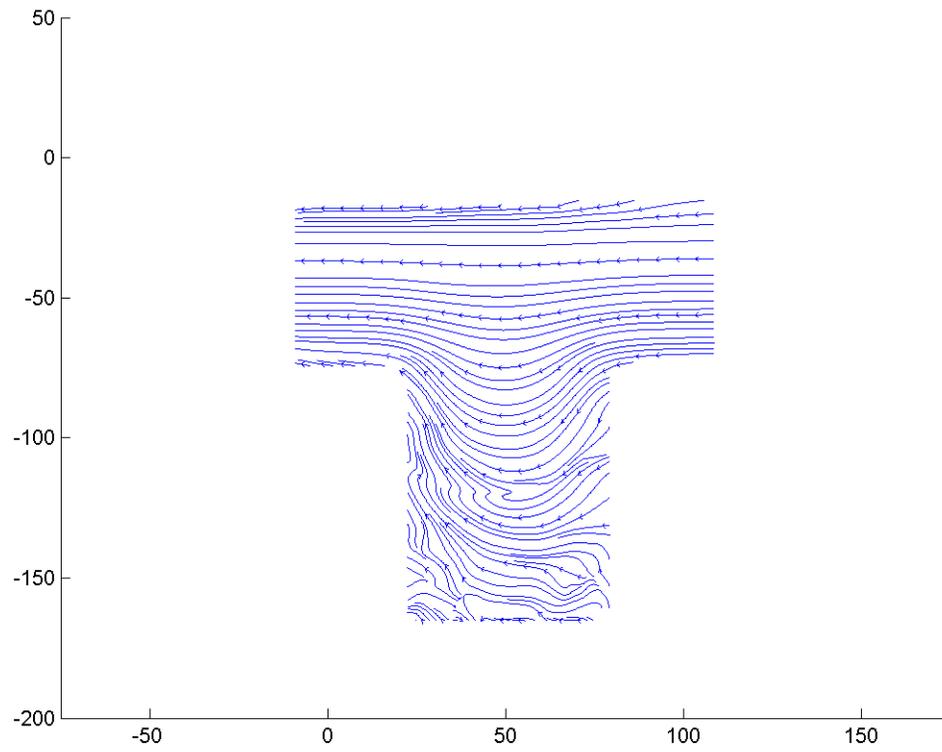


Figure F.249: Streamline image during phase increment 6 at 113.14 Hz and a Re of 0.1.

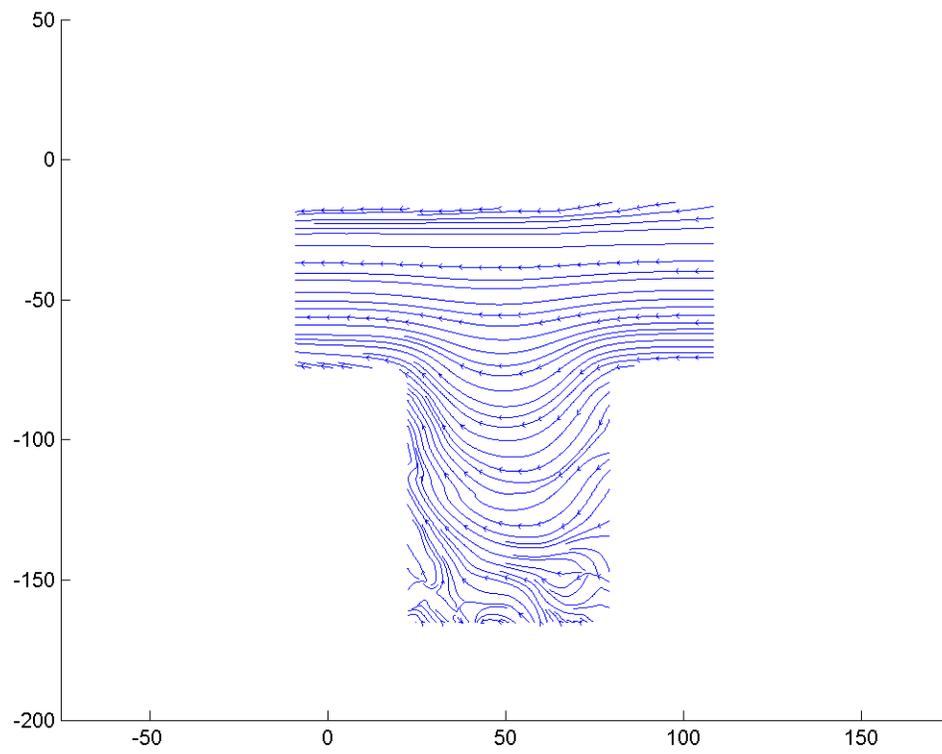


Figure F.250: Streamline image during phase increment 7 at 113.14 Hz and a Re of 0.1.

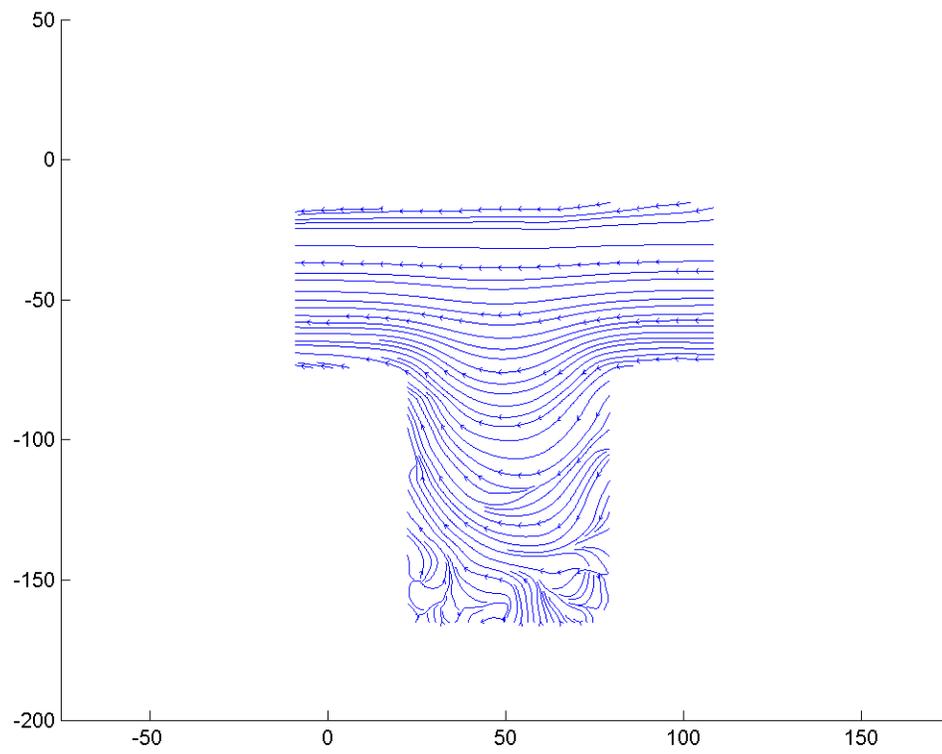


Figure F.251: Streamline image during phase increment 8 at 113.14 Hz and a Re of 0.1.

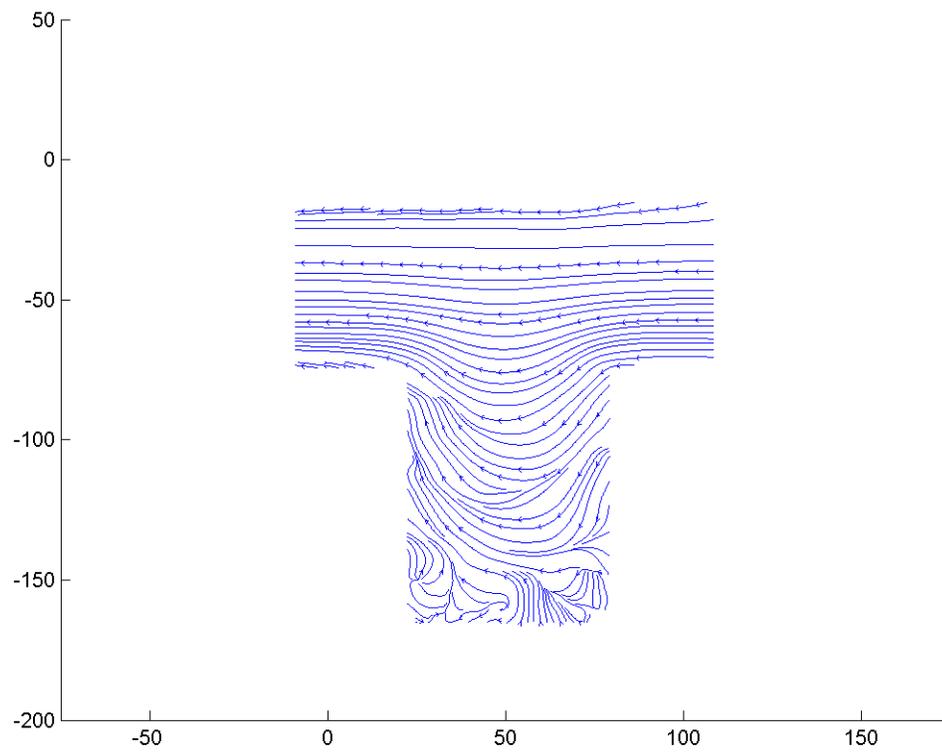


Figure F.252: Streamline image during phase increment 9 at 113.14 Hz and a Re of 0.1.

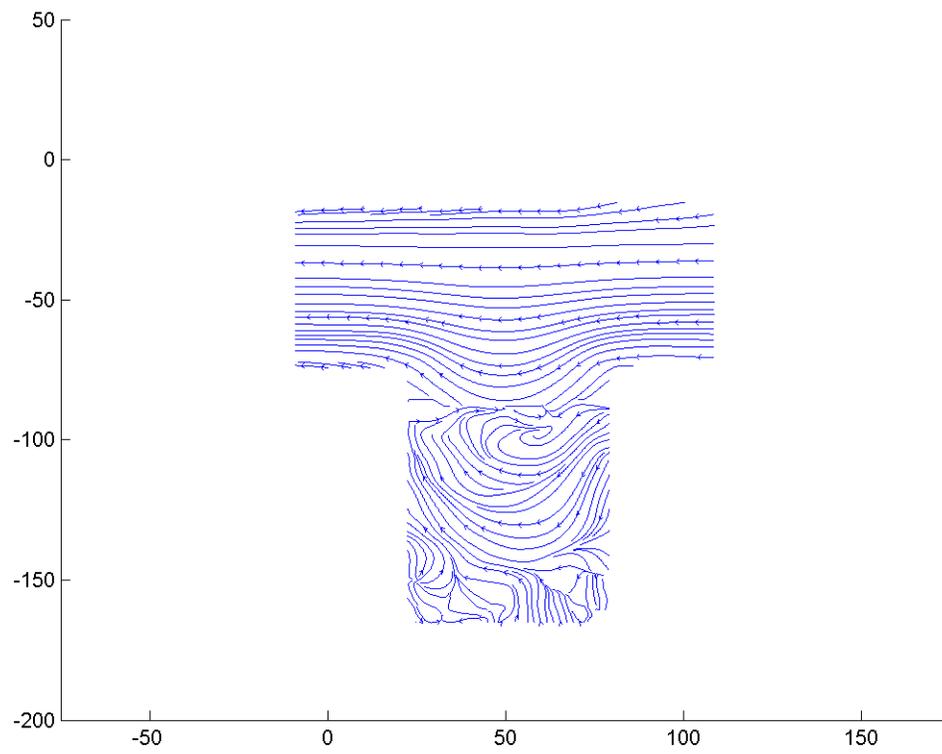


Figure F.253: Streamline image during phase increment 10 at 113.14 Hz and a Re of 0.1.

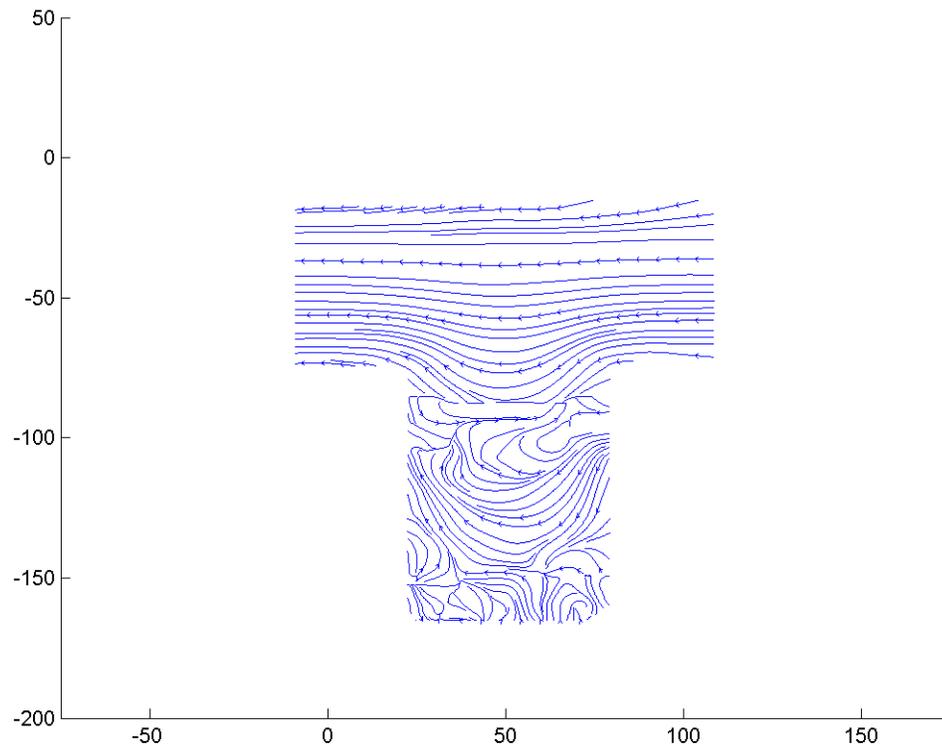


Figure F.254: Streamline image during phase increment 11 at 113.14 Hz and a Re of 0.1.

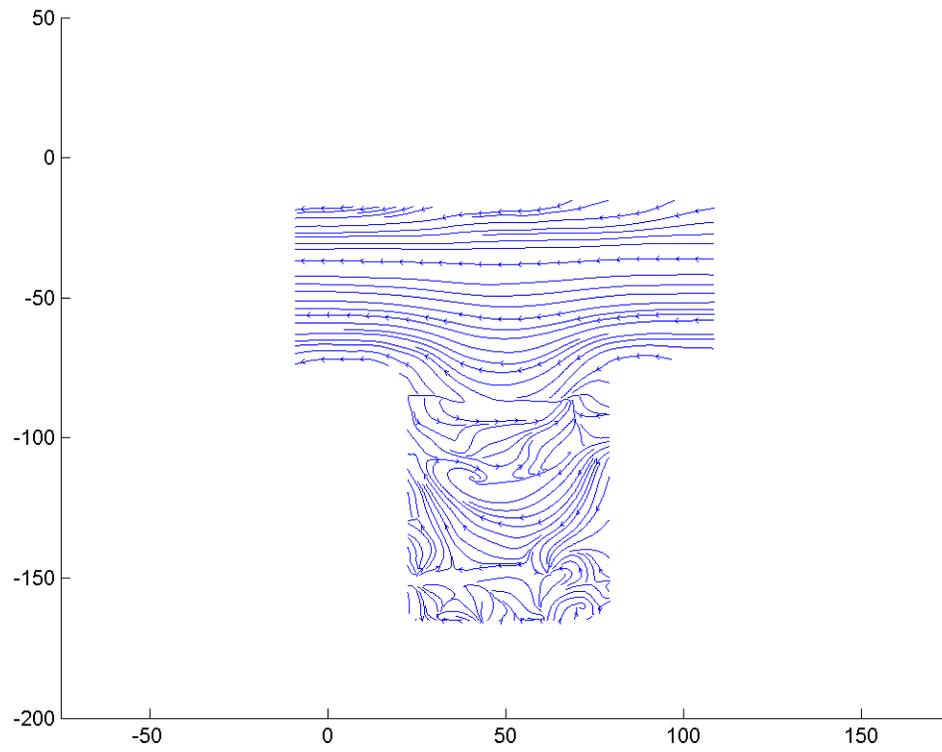


Figure F.255: Streamline image during phase increment 12 at 113.14 Hz and a Re of 0.1.

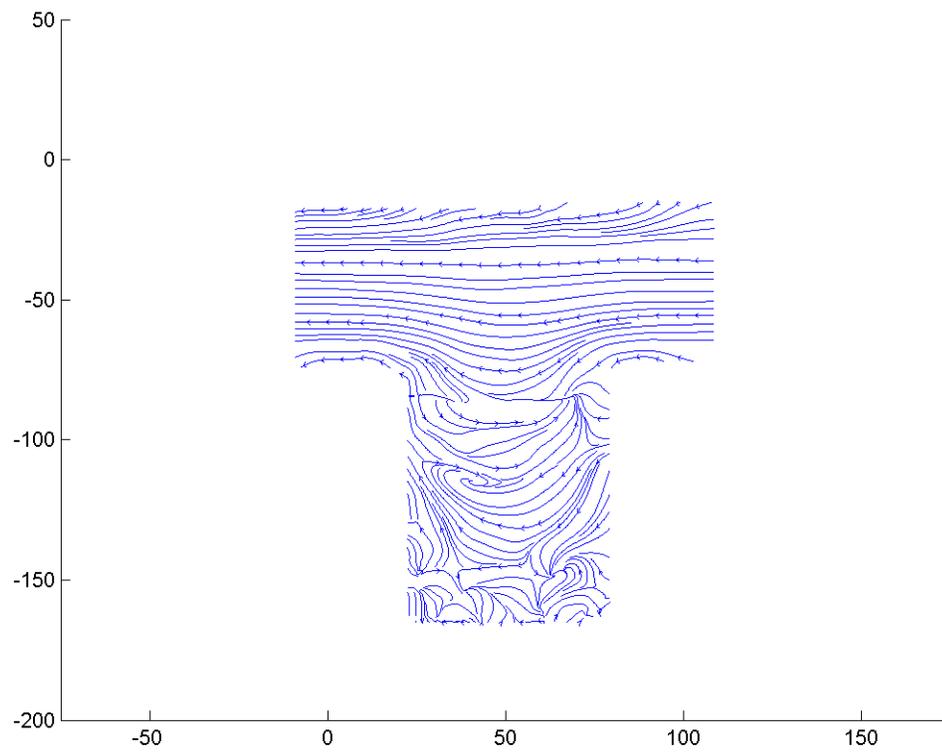


Figure F.256: Streamline image during phase increment 13 at 113.14 Hz and a Re of 0.1.

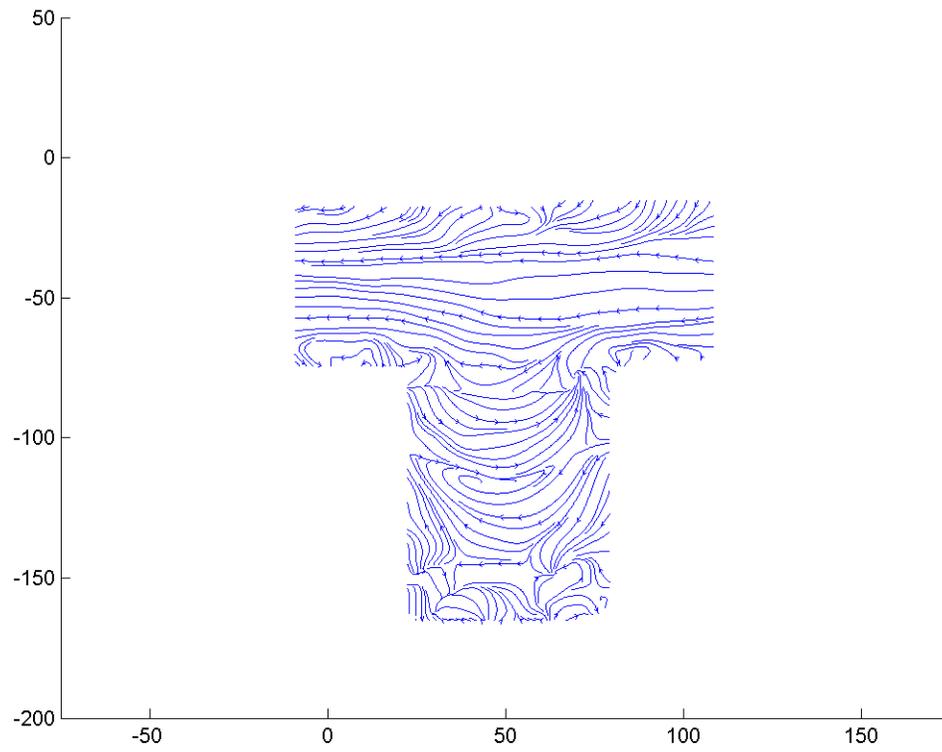


Figure F.257: Streamline image during phase increment 14 at 113.14 Hz and a Re of 0.1.

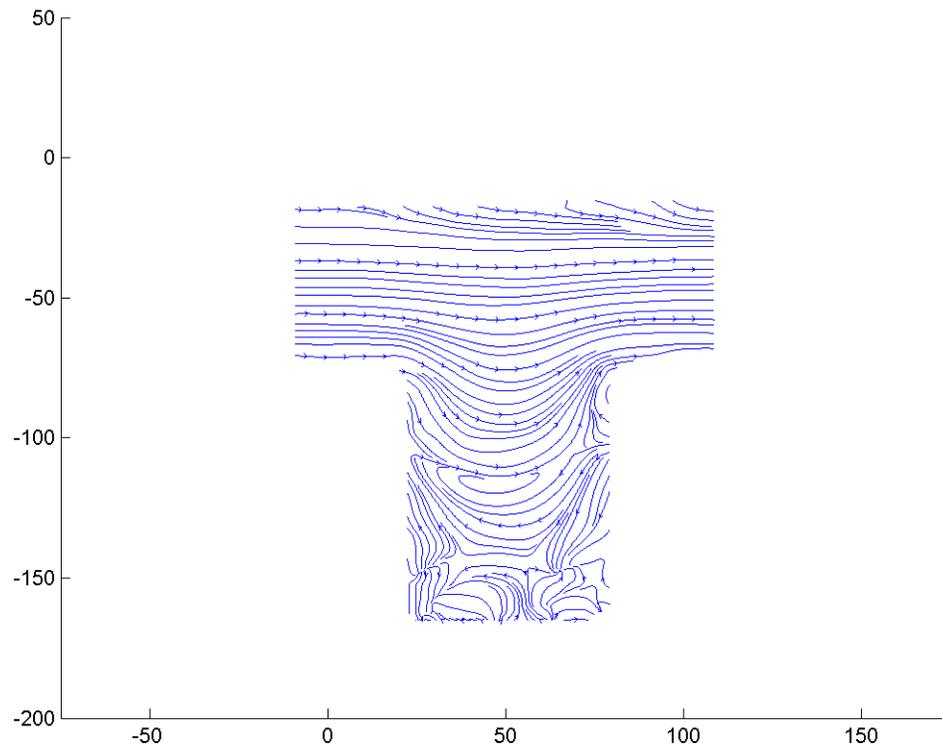


Figure F.258: Streamline image during phase increment 15 at 113.14 Hz and a Re of 0.1.

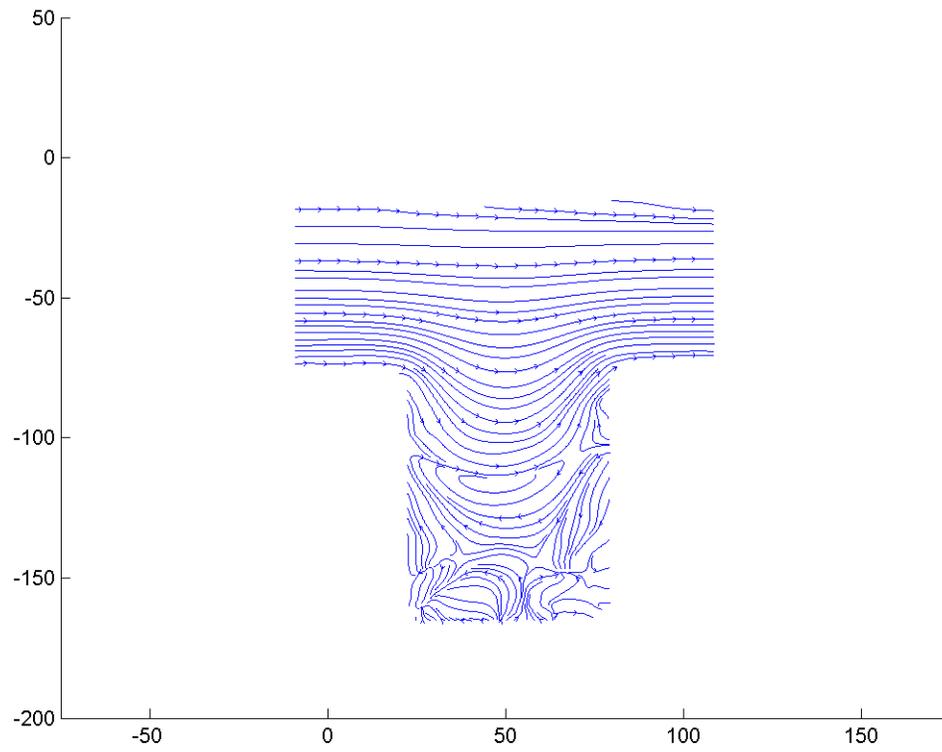


Figure F.259: Streamline image during phase increment 16 at 113.14 Hz and a Re of 0.1.

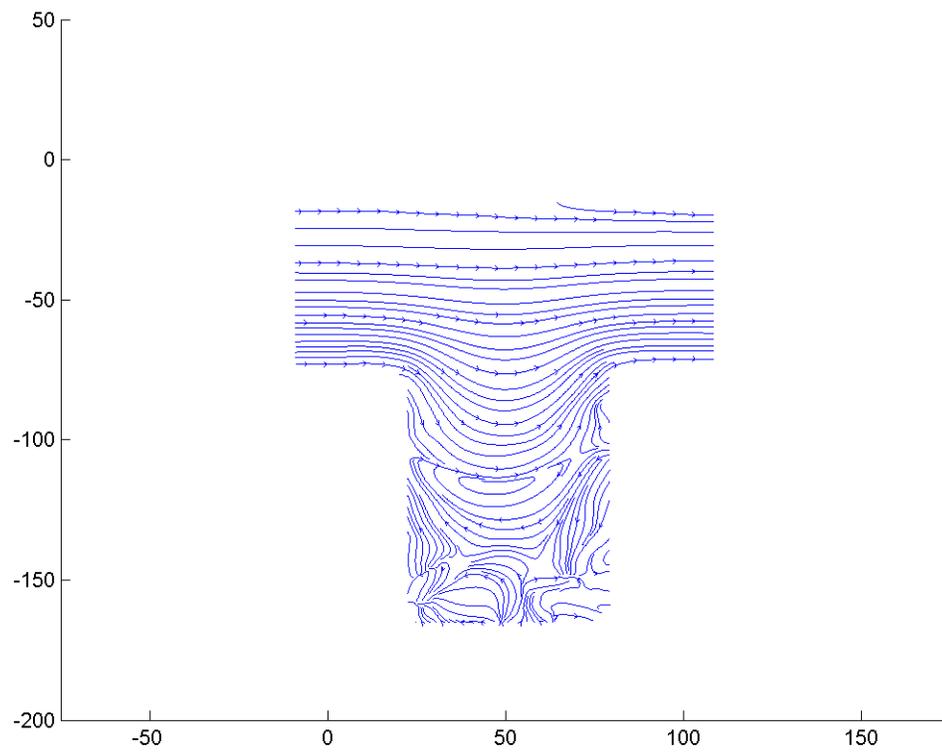


Figure F.260: Streamline image during phase increment 17 at 113.14 Hz and a Re of 0.1.

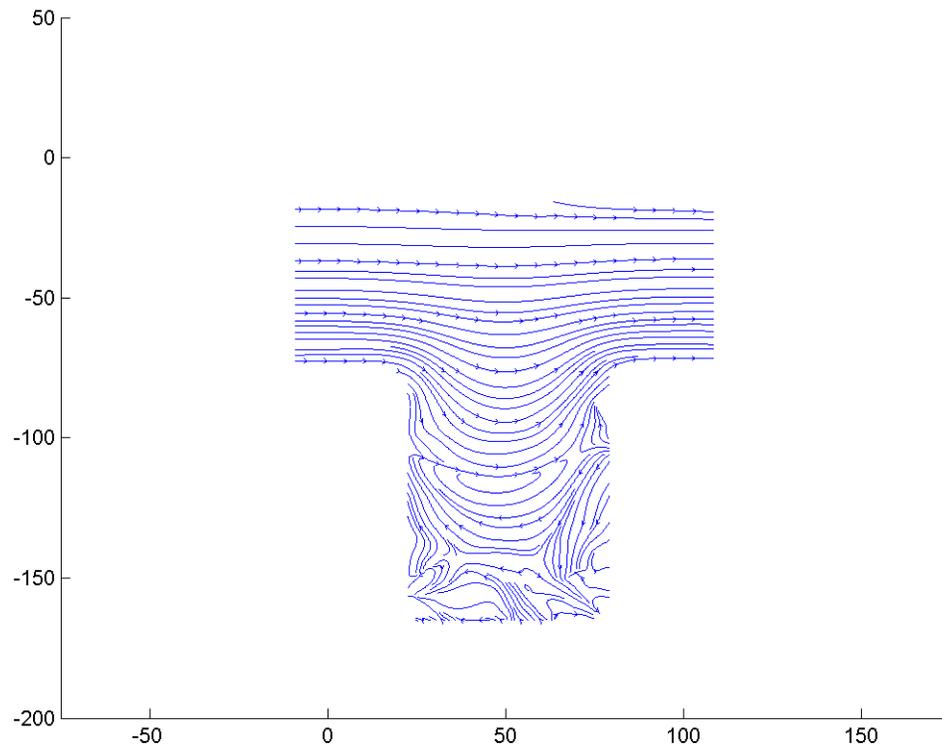


Figure F.261: Streamline image during phase increment 18 at 113.14 Hz and a Re of 0.1.

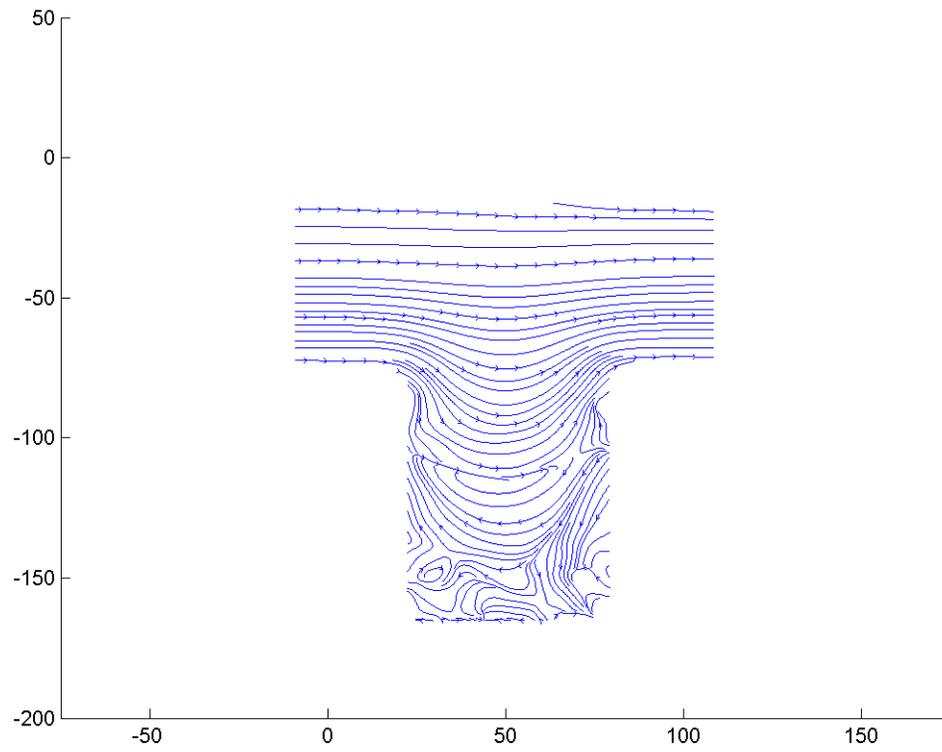


Figure F.262: Streamline image during phase increment 18 at 113.14 Hz and a Re of 0.1.

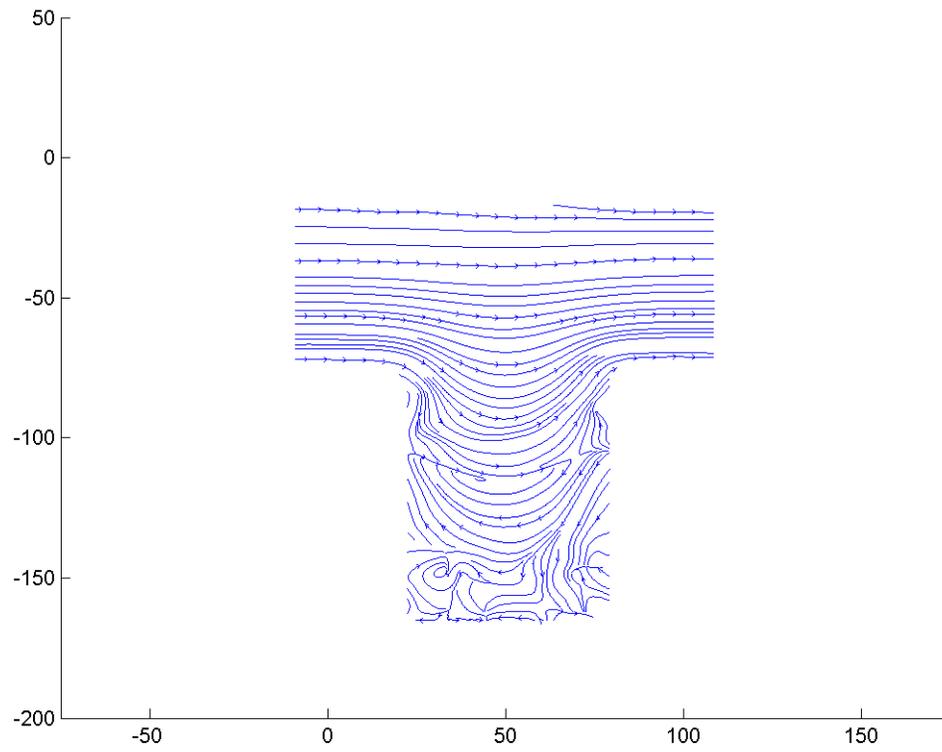


Figure F.263: Streamline image during phase increment 20 at 113.14 Hz and a Re of 0.1.

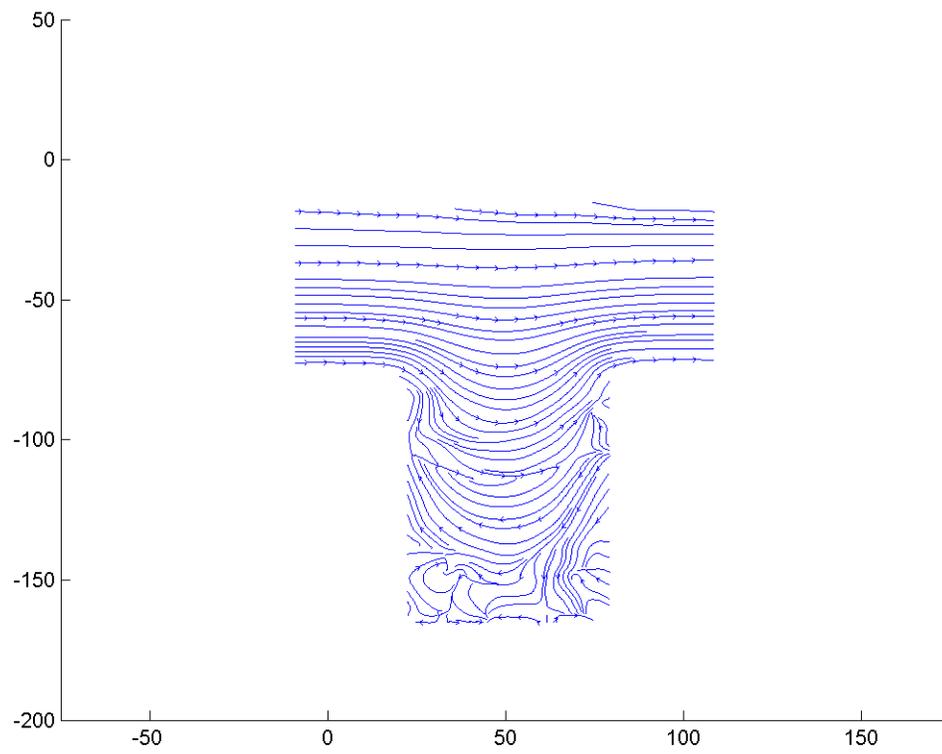


Figure F.264: Streamline image during phase increment 21 at 113.14 Hz and a Re of 0.1.

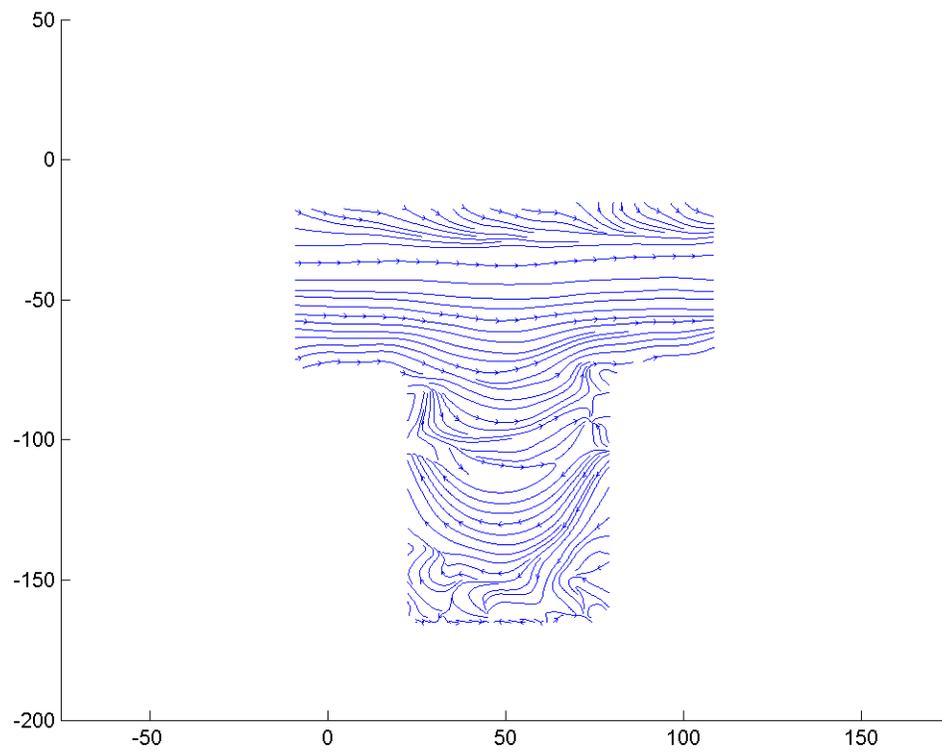


Figure F.265: Streamline image during phase increment 22 at 113.14 Hz and a Re of 0.1.

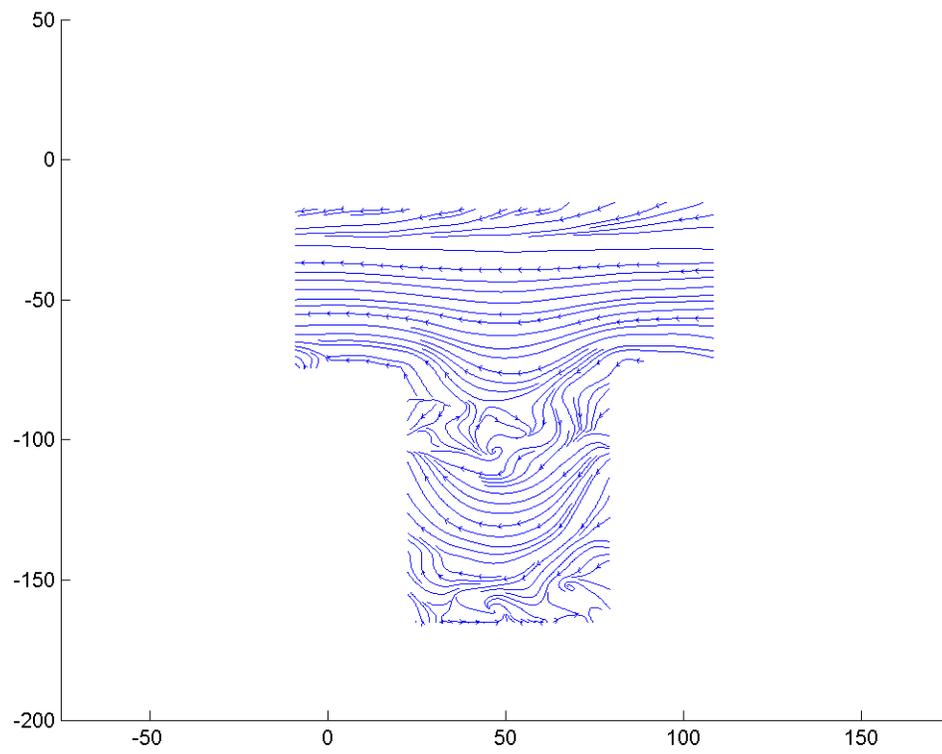


Figure F.266: Streamline image during phase increment 23 at 113.14 Hz and a Re of 0.1.

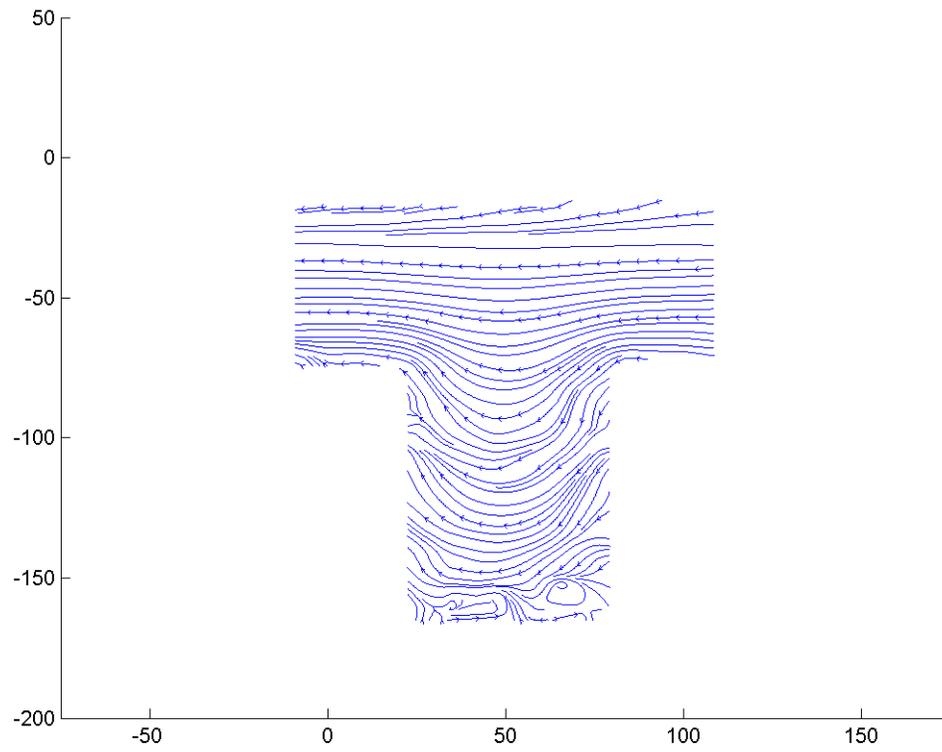


Figure F.267: Streamline image during phase increment 24 at 113.14 Hz and a Re of 0.1.

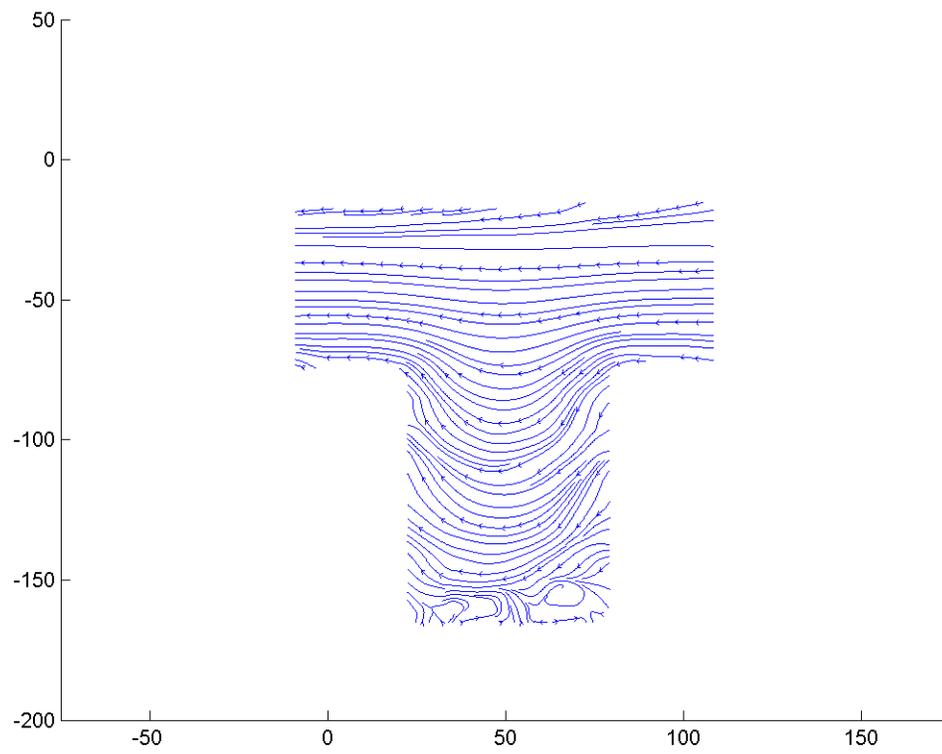


Figure F.268: Streamline image during phase increment 25 at 113.14 Hz and a Re of 0.1.

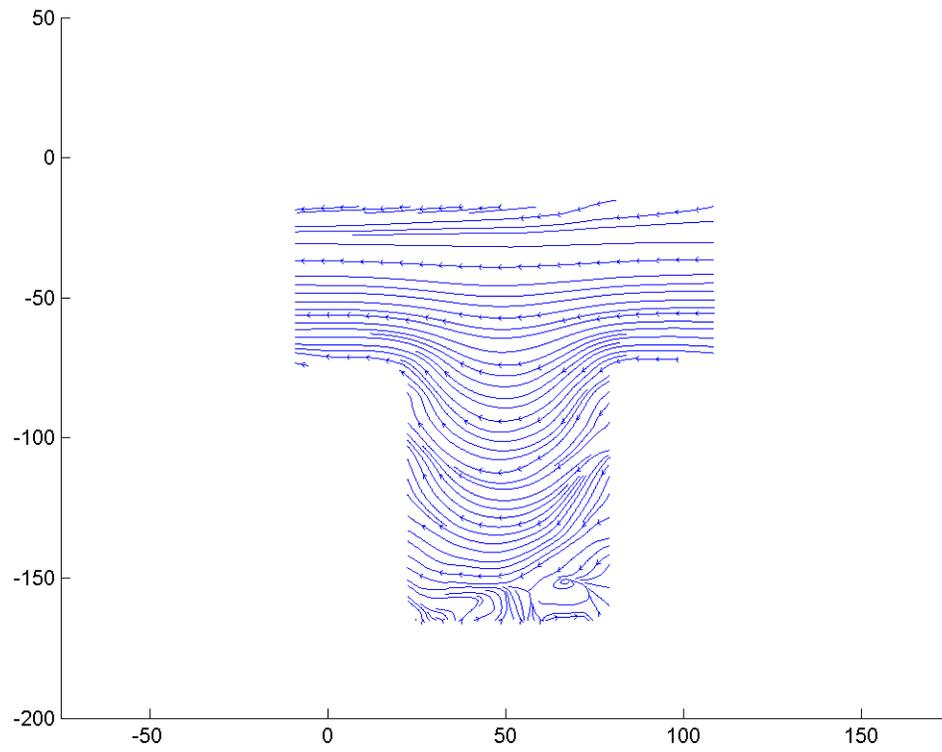


Figure F.269: Streamline image during phase increment 26 at 113.14 Hz and a Re of 0.1.

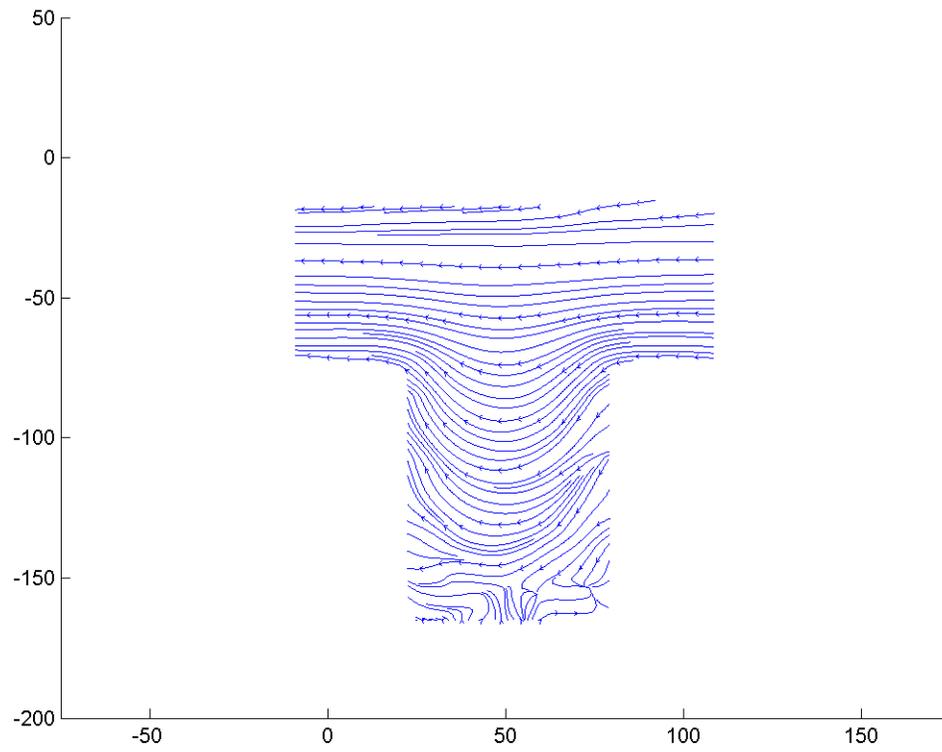


Figure F.270: Streamline image during phase increment 27 at 113.14 Hz and a Re of 0.1.

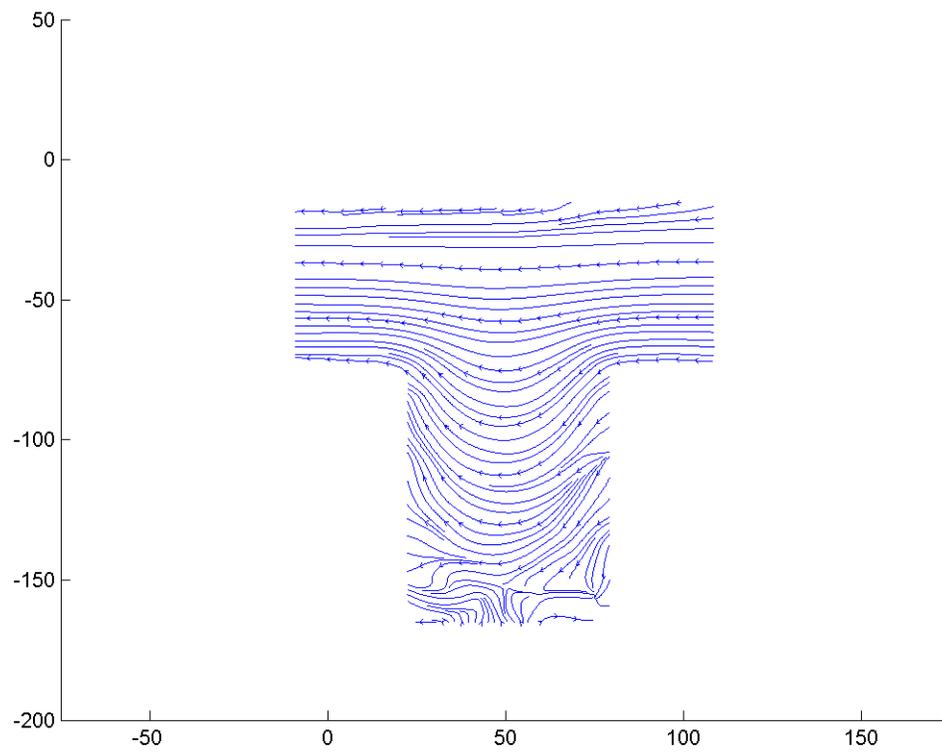


Figure F.271: Streamline image during phase increment 28 at 113.14 Hz and a Re of 0.1.

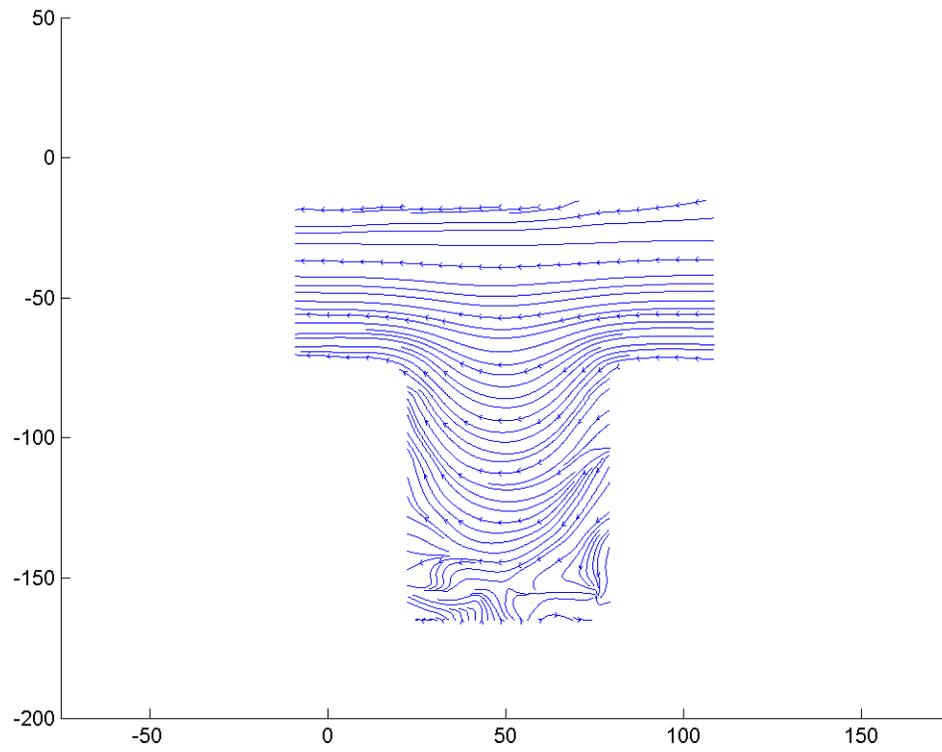


Figure F.272: Streamline image during phase increment 29 at 113.14 Hz and a Re of 0.1.

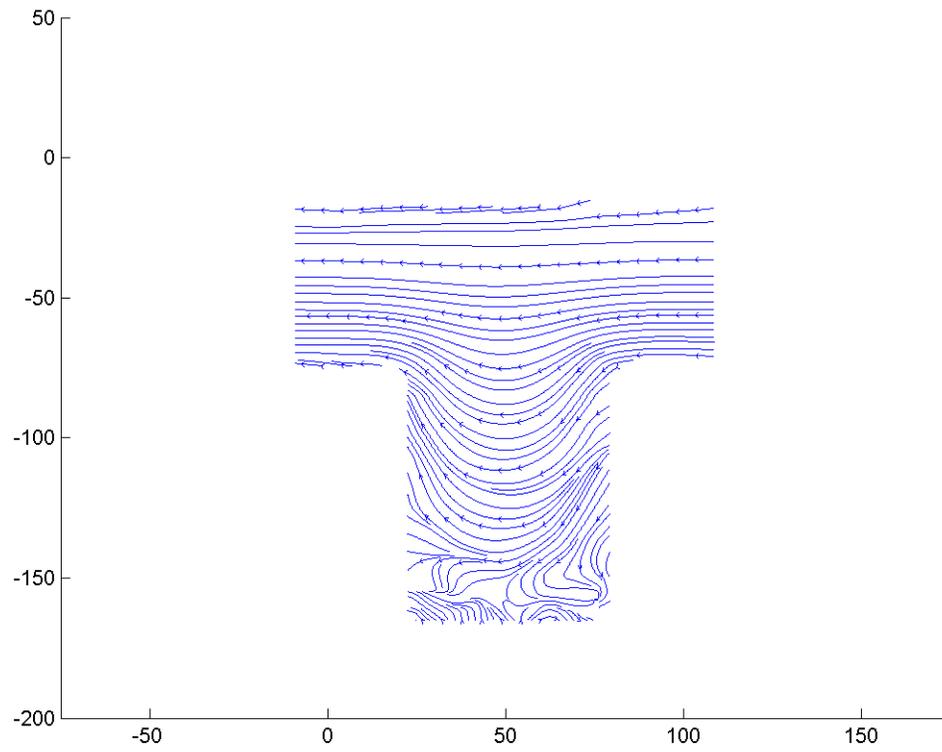


Figure F.273: Streamline image during phase increment 30 at 113.14 Hz and a Re of 0.1.

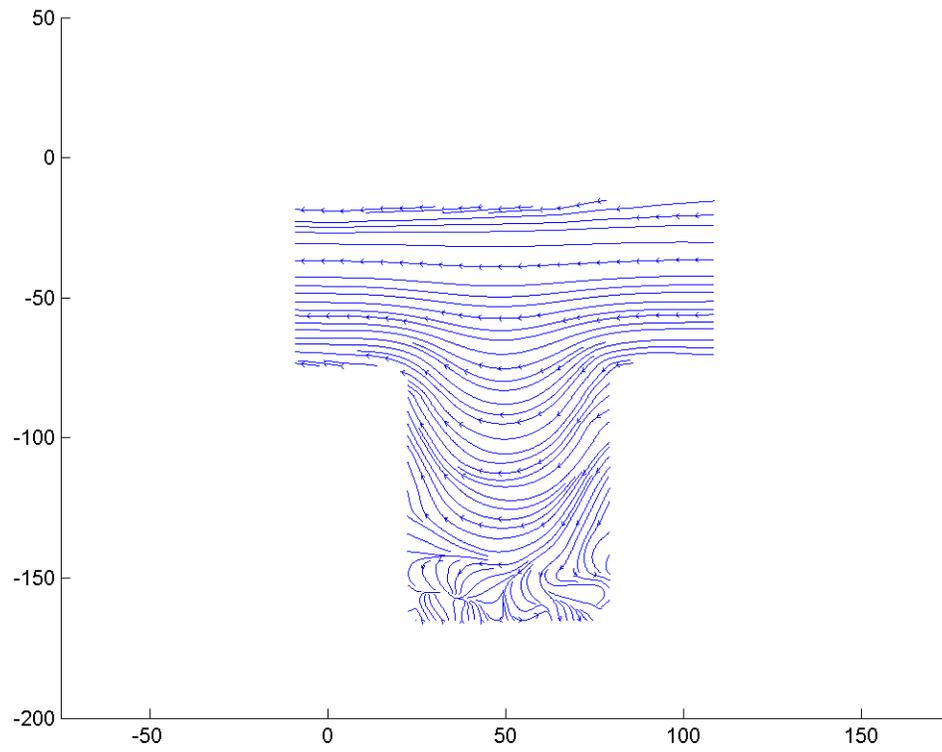


Figure F.274: Streamline image during phase increment 31 at 113.14 Hz and a Re of 0.1.

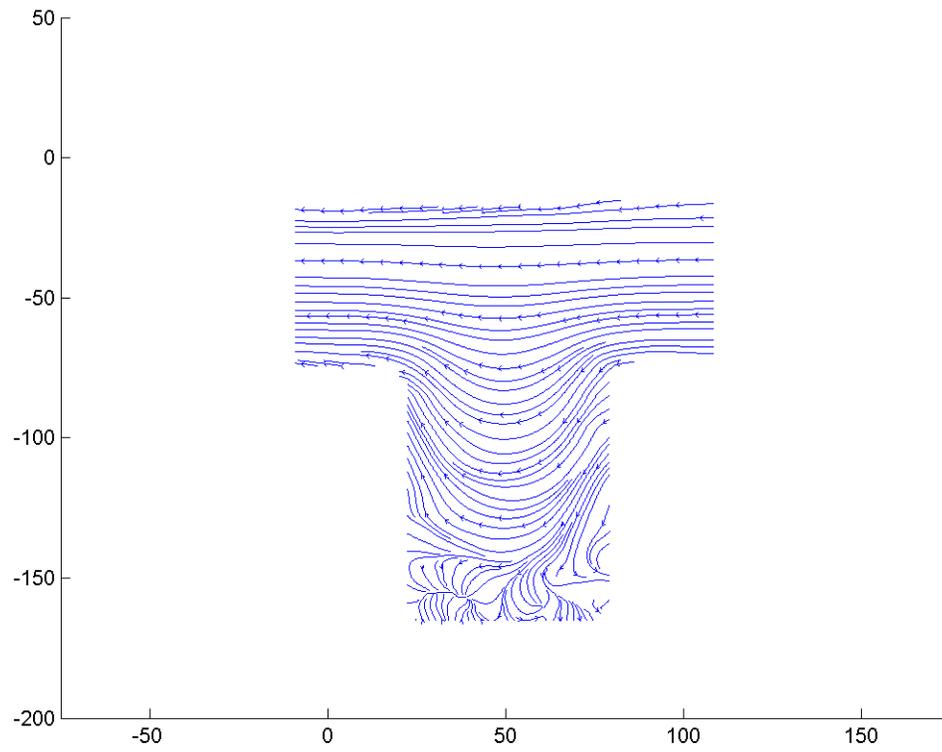


Figure F.275: Streamline image during phase increment 32 at 113.14 Hz and a Re of 0.1.

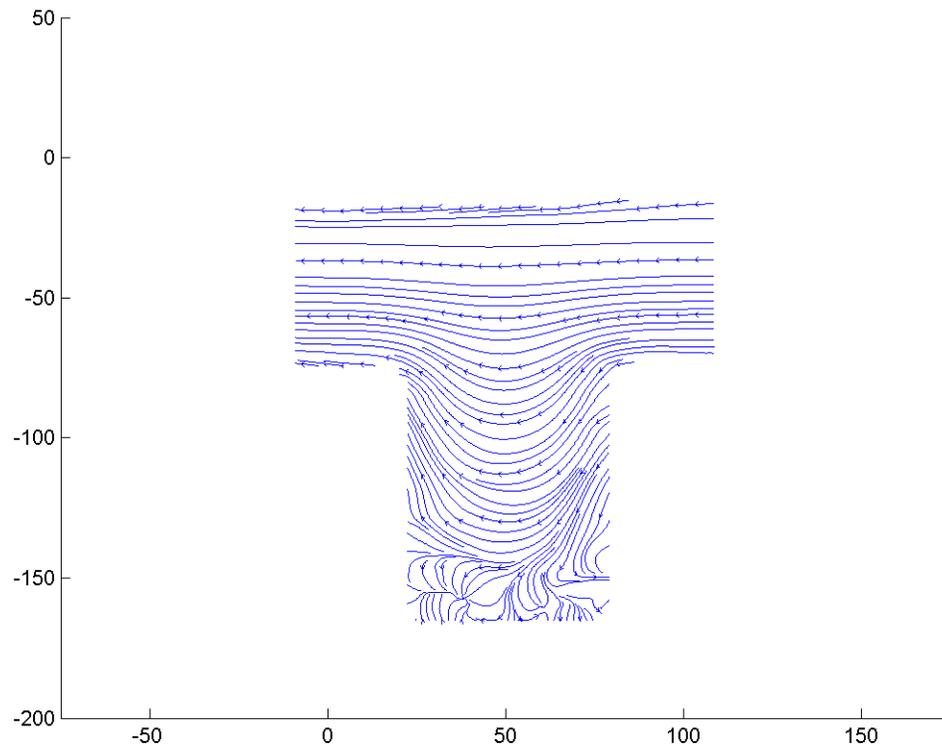


Figure F.276: Streamline image during phase increment 33 at 113.14 Hz and a Re of 0.1.

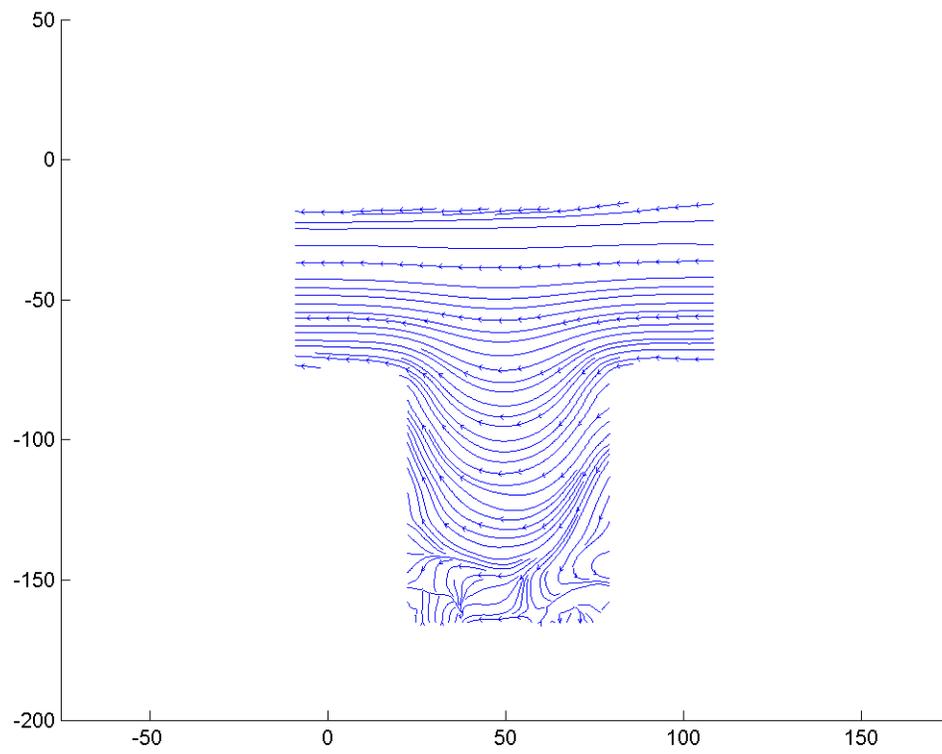


Figure F.277: Streamline image during phase increment 34 at 113.14 Hz and a Re of 0.1.

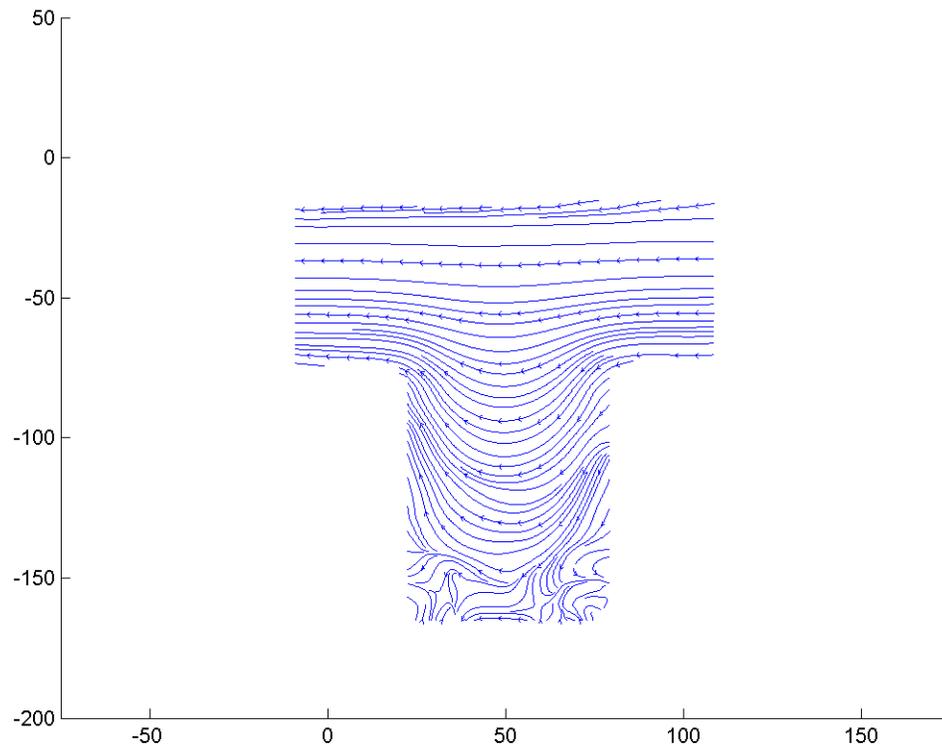


Figure F.278: Streamline image during phase increment 35 at 113.14 Hz and a Re of 0.1.

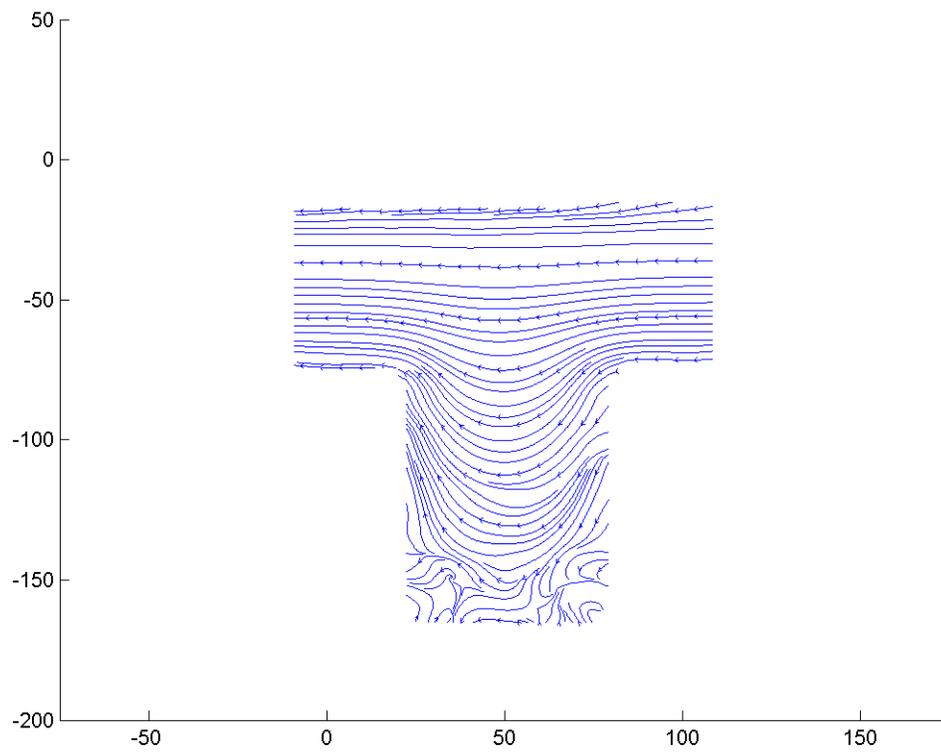


Figure F.279: Streamline image during phase increment 36 at 113.14 Hz and a Re of 0.1.

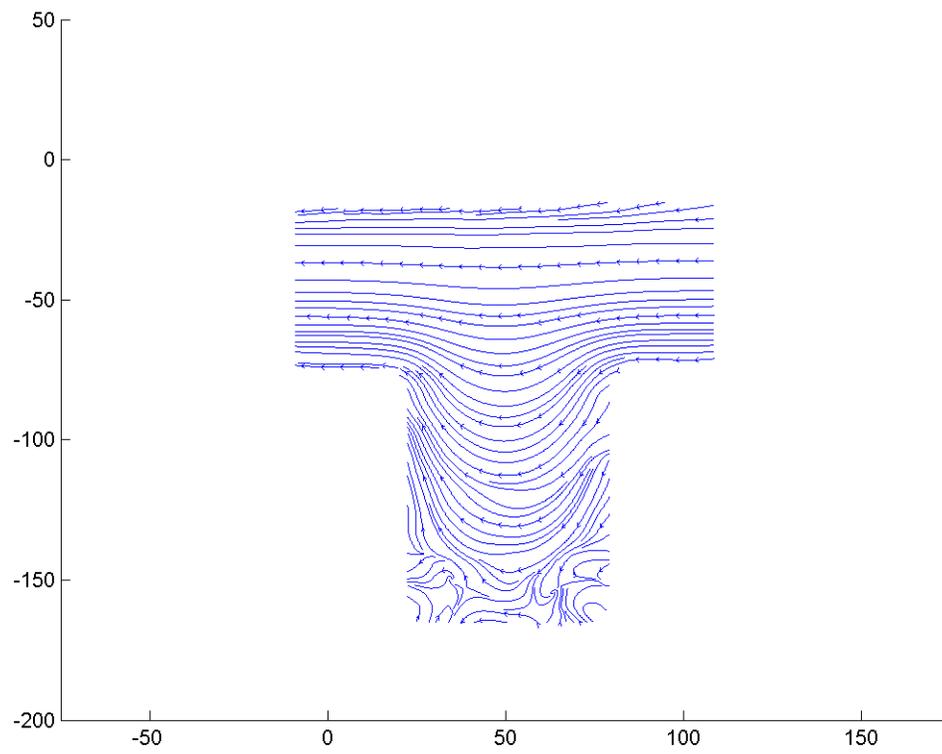


Figure F.280: Streamline image during phase increment 37 at 113.14 Hz and a Re of 0.1.

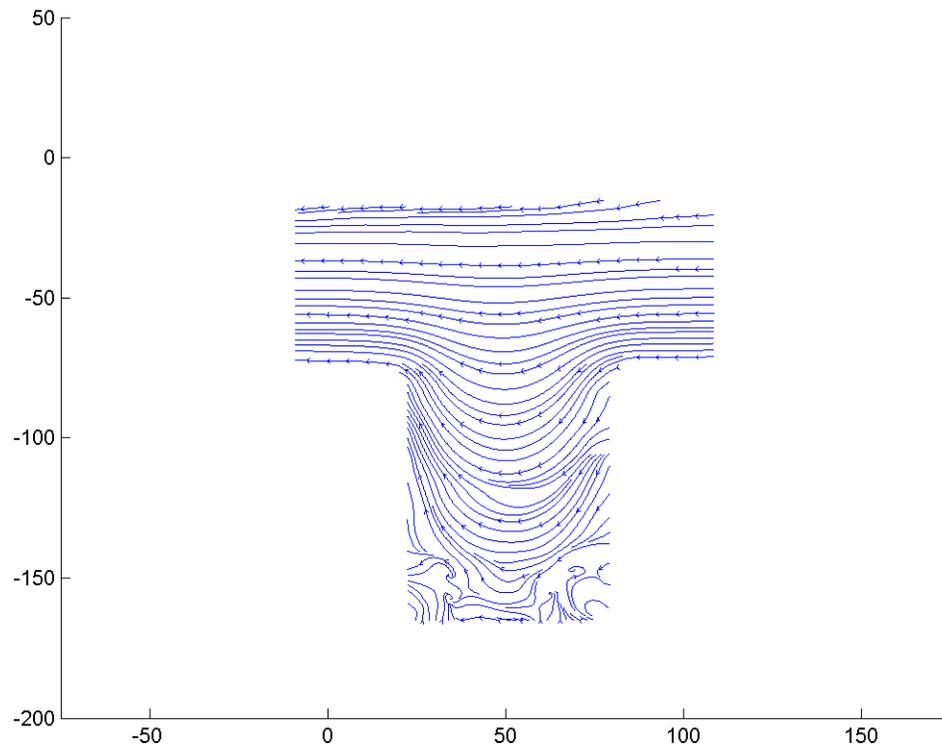


Figure F.281: Streamline image during phase increment 38 at 113.14 Hz and a Re of 0.1.

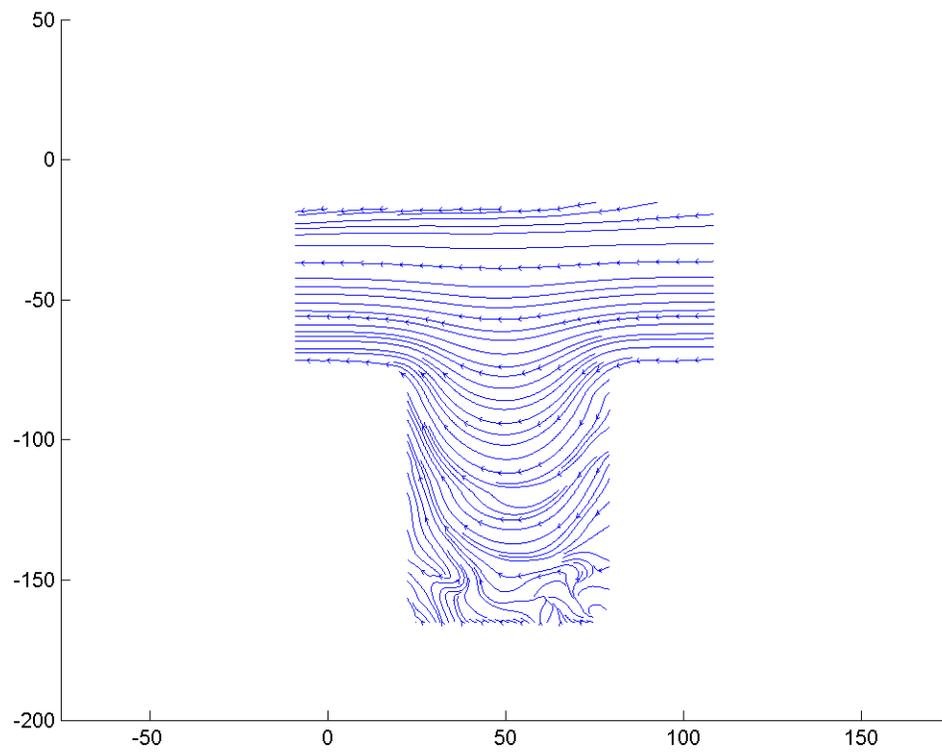


Figure F.282: Streamline image during phase increment 39 at 113.14 Hz and a Re of 0.1.

F.3.3 Residence time of particles in the cavity at 113.14 Hz

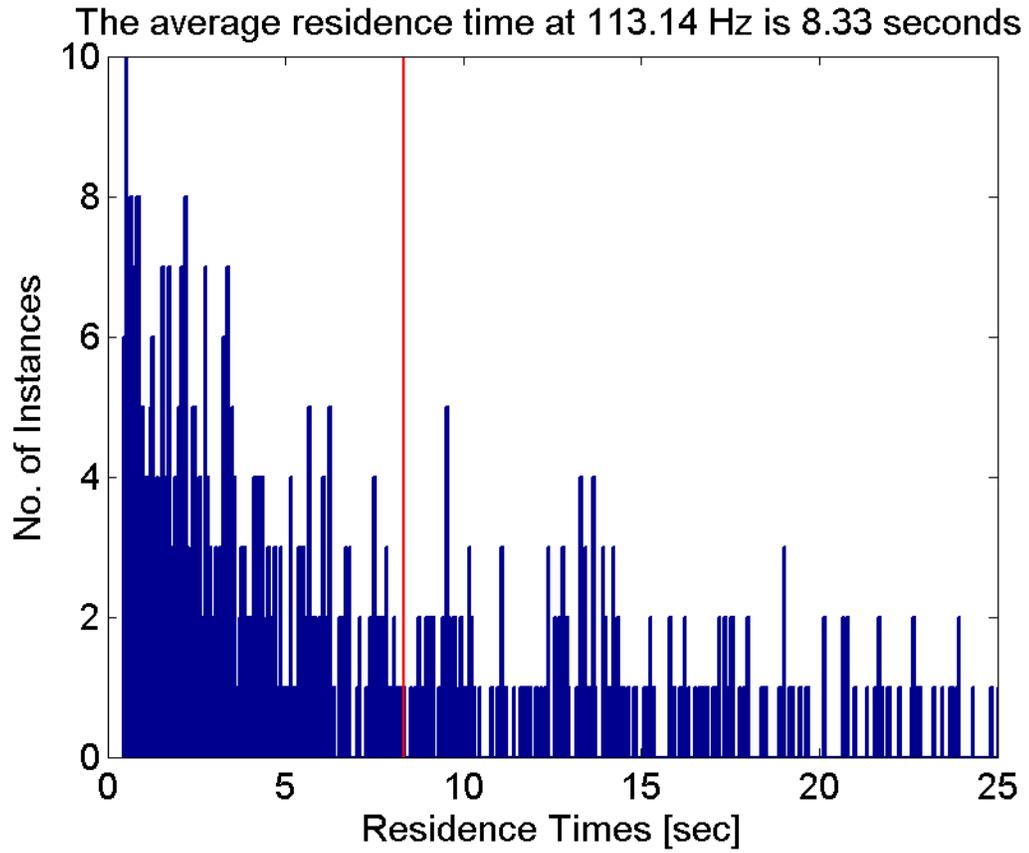


Figure F.283: The residence time distribution for the $AR = 0.5$ cavity at $Re = 0.1$ at 113.14 Hz. The average residence time is 8.33 secs.

F.3.4 Lagrangian coherent structures at 113.14 Hz

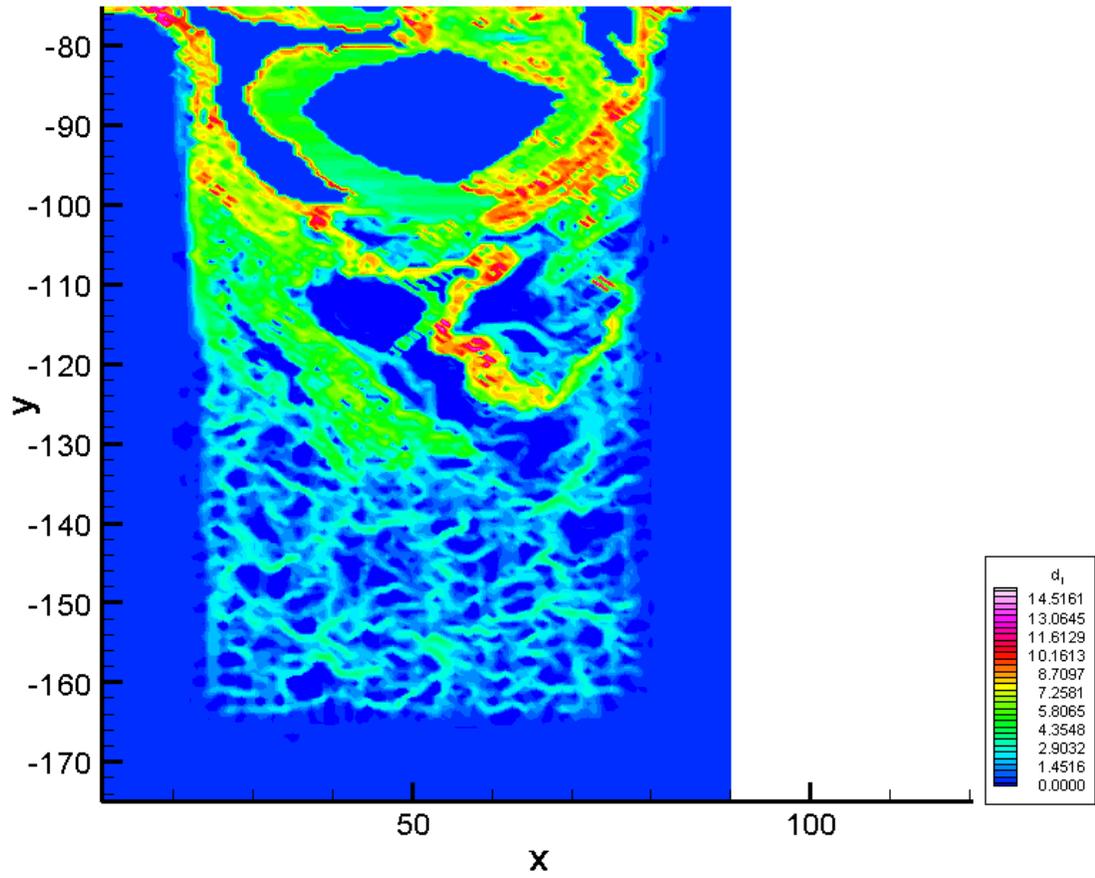


Figure F.284: The backward time LCS during phase increment 1 at 113.14 Hz.

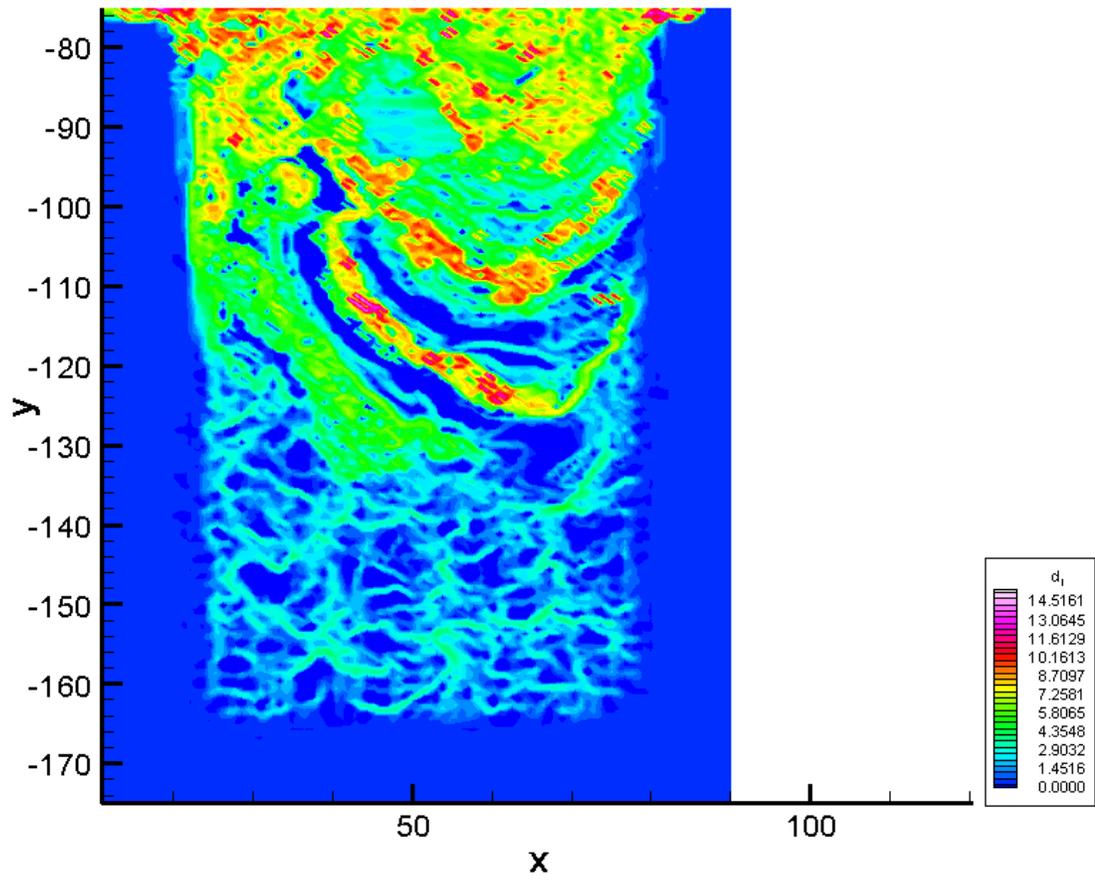


Figure F.285: The backward time LCS during phase increment 2 at 113.14 Hz.

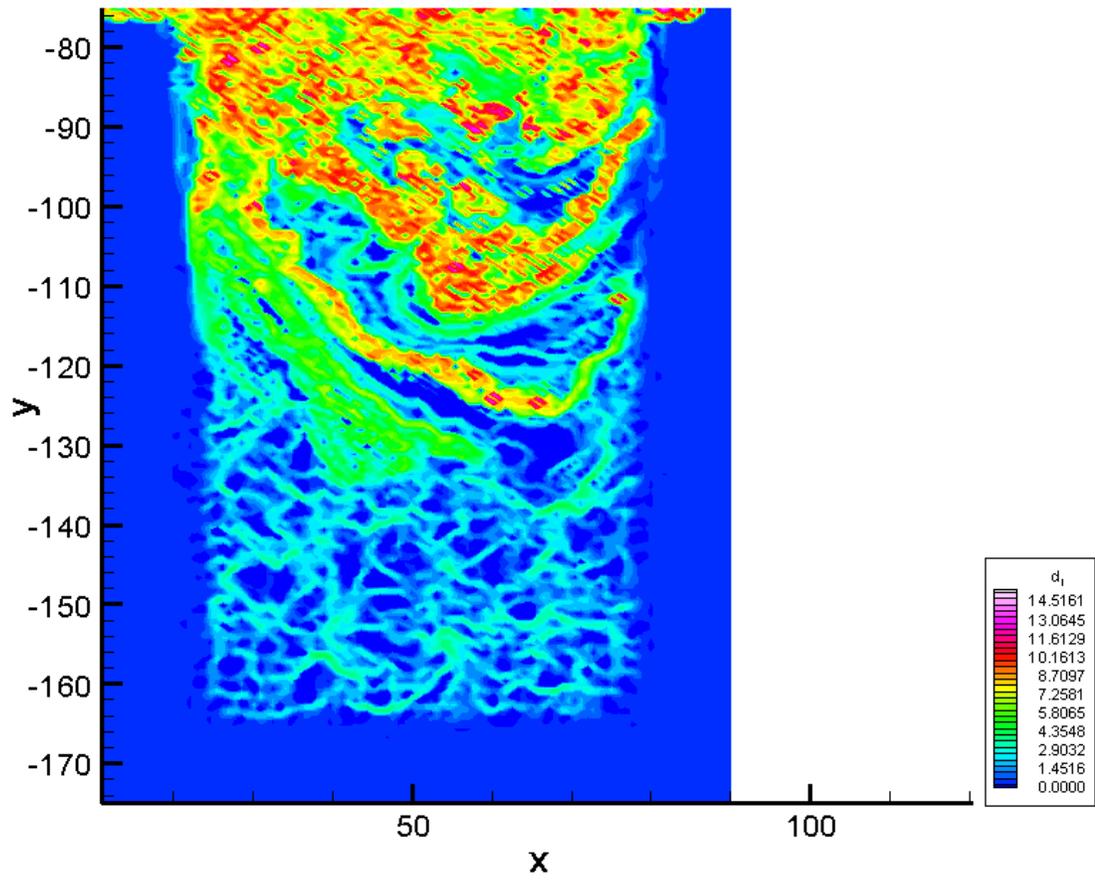


Figure F.286: The backward time LCS during phase increment 3 at 113.14 Hz.

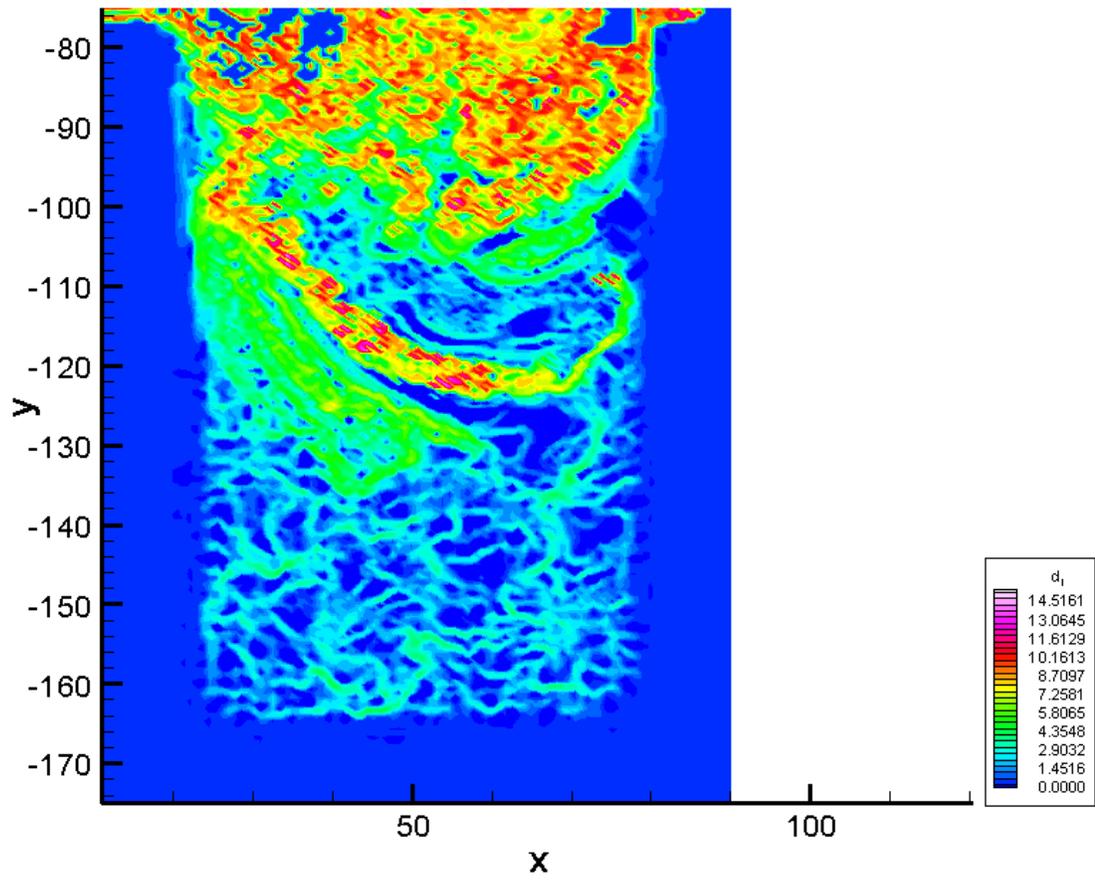


Figure F.287: The backward time LCS during phase increment 4 at 113.14 Hz.

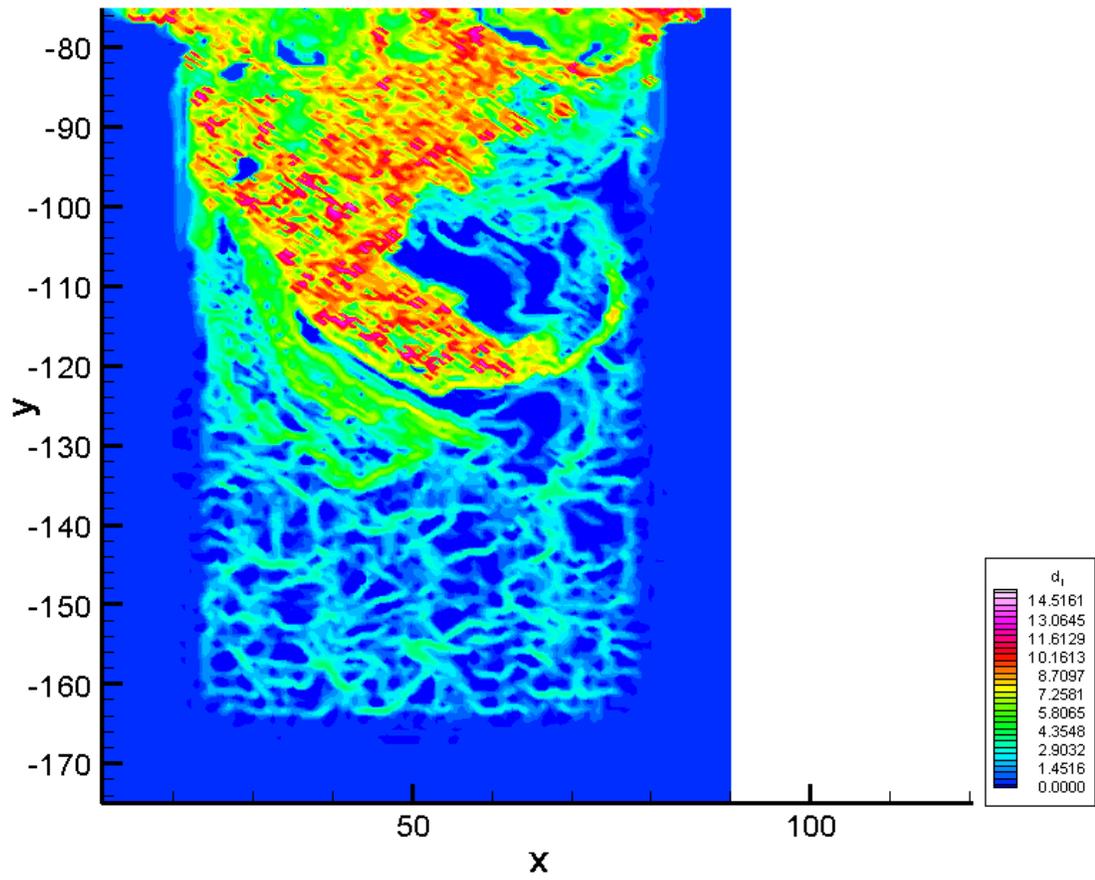


Figure F.288: The backward time LCS during phase increment 5 at 113.14 Hz.

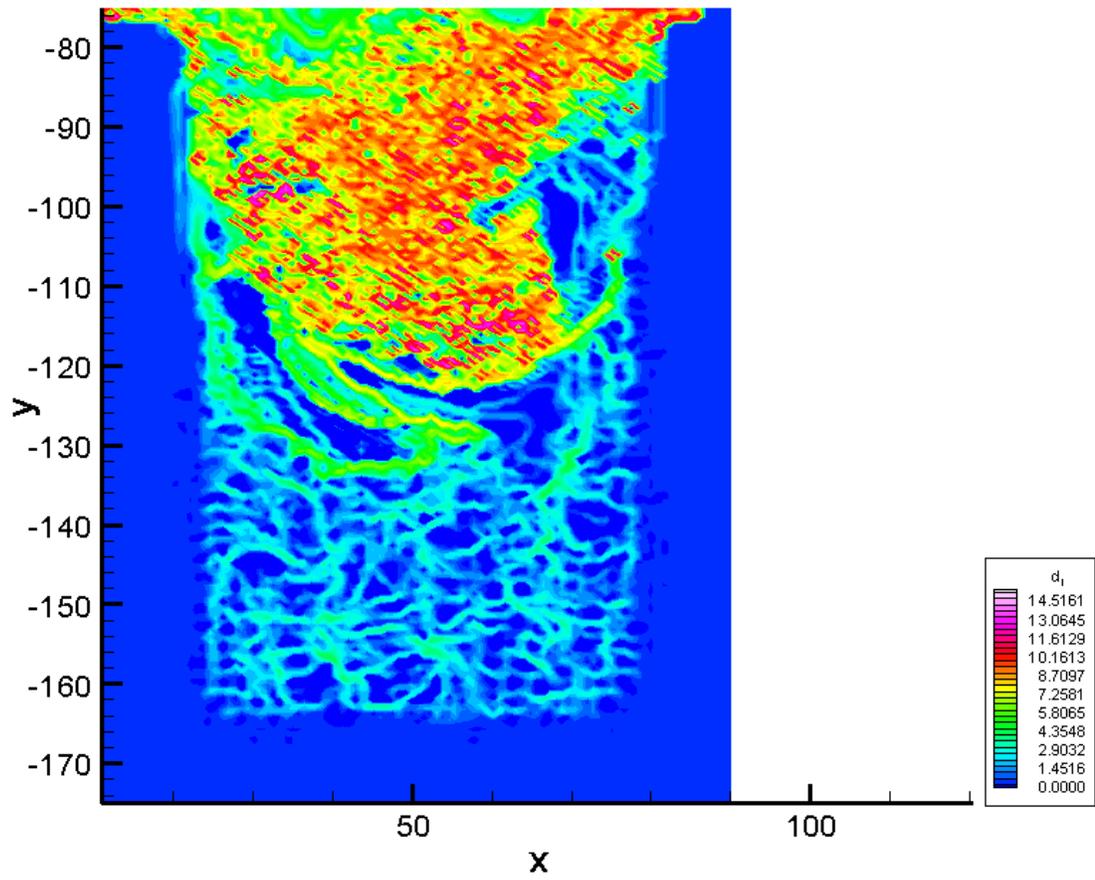


Figure F.289: The backward time LCS during phase increment 6 at 113.14 Hz.

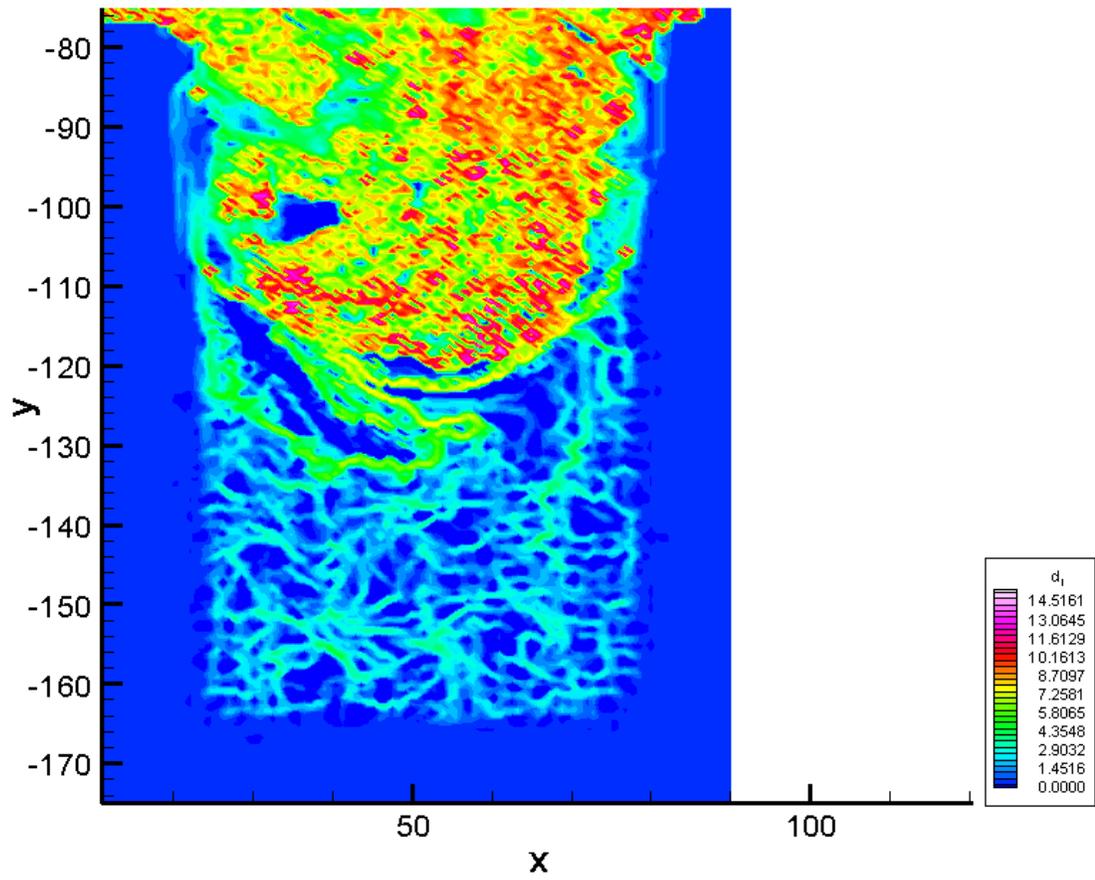


Figure F.290: The backward time LCS during phase increment 7 at 113.14 Hz.

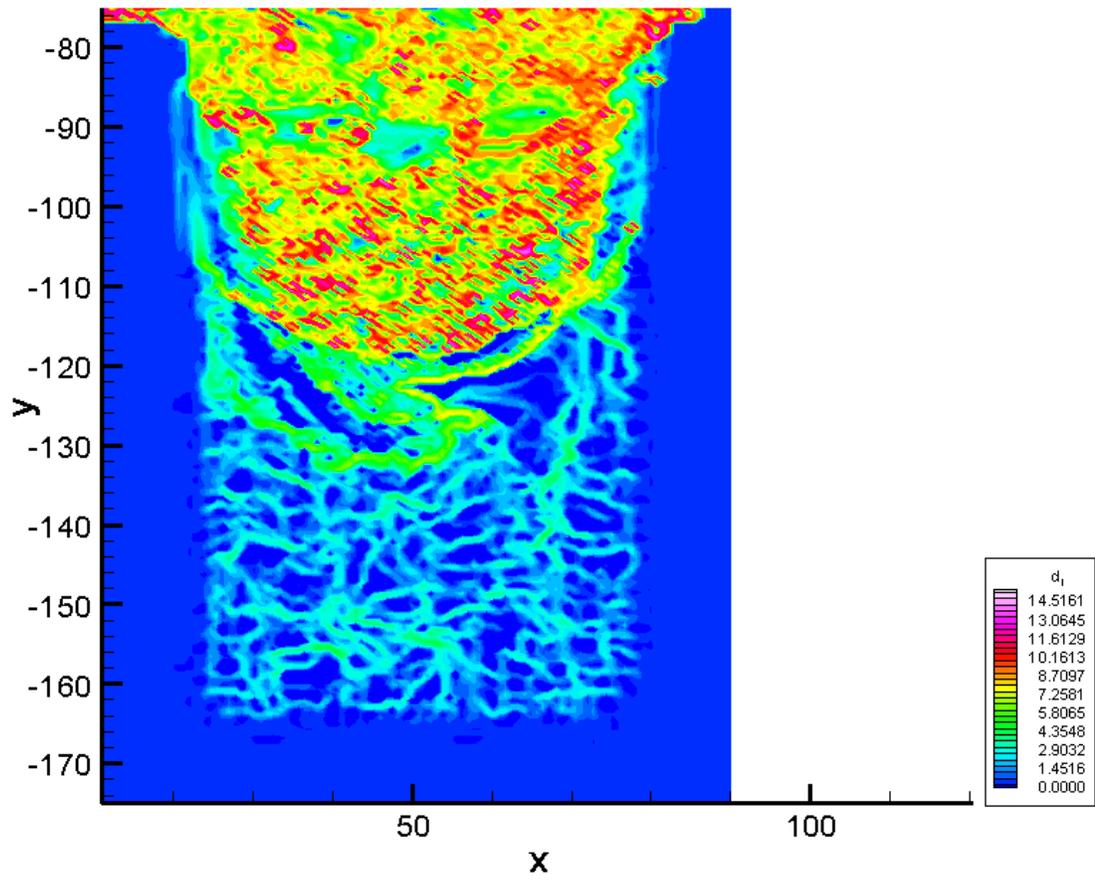


Figure F.291: The backward time LCS during phase increment 8 at 113.14 Hz.

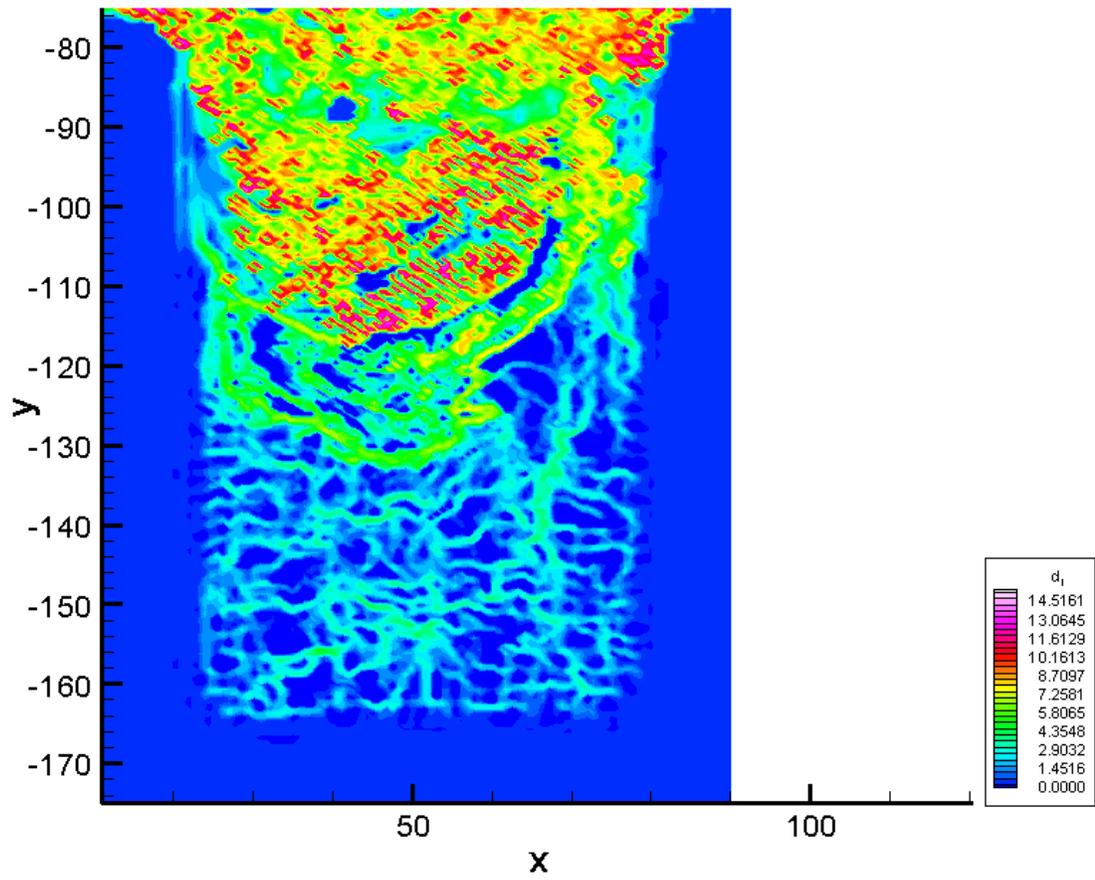


Figure F.292: The backward time LCS during phase increment 9 at 113.14 Hz.

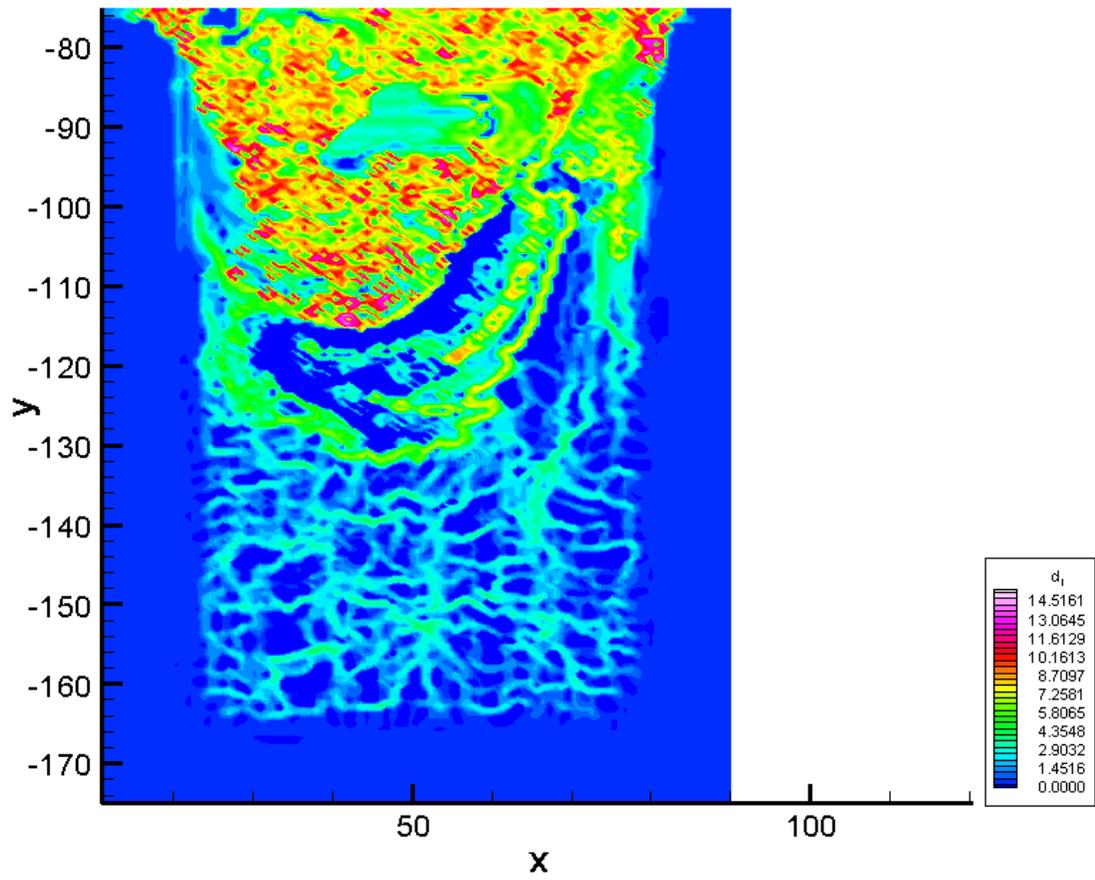


Figure F.293: The backward time LCS during phase increment 10 at 113.14 Hz.

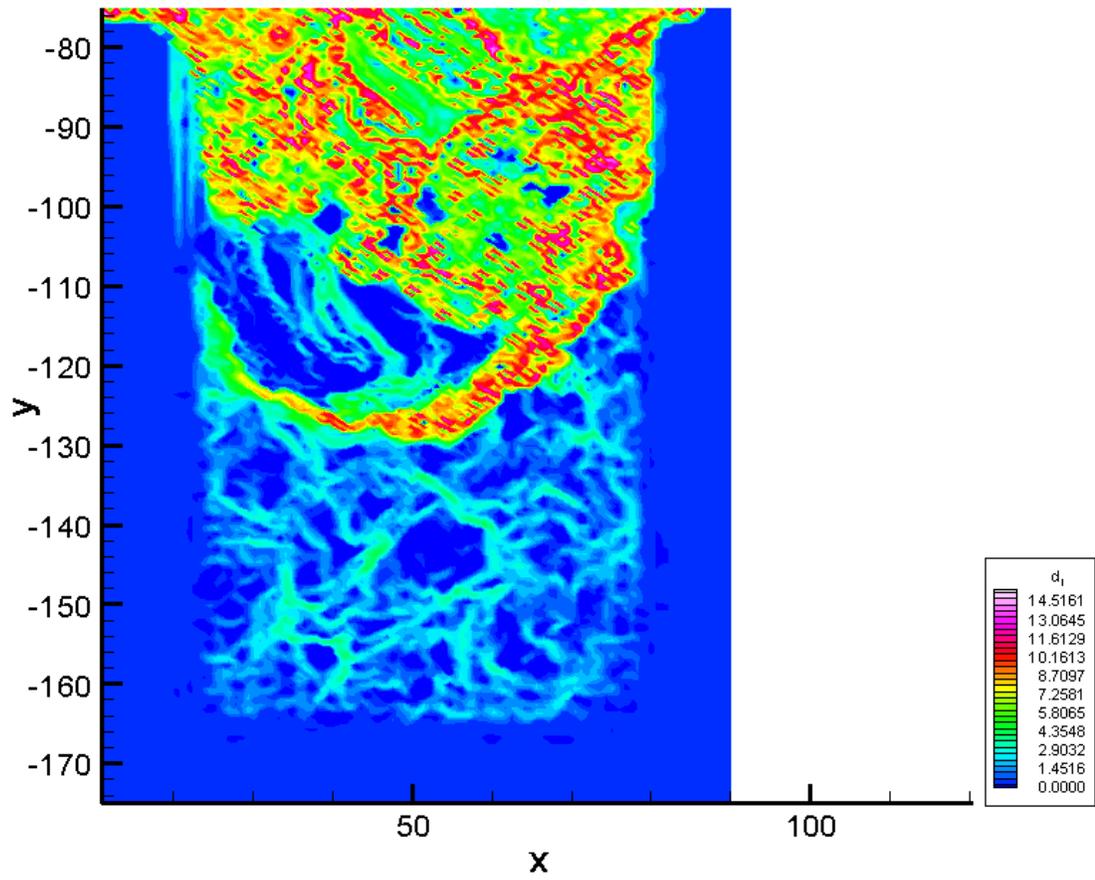


Figure F.294: The forward time LCS during phase increment 1 at 113.14 Hz.

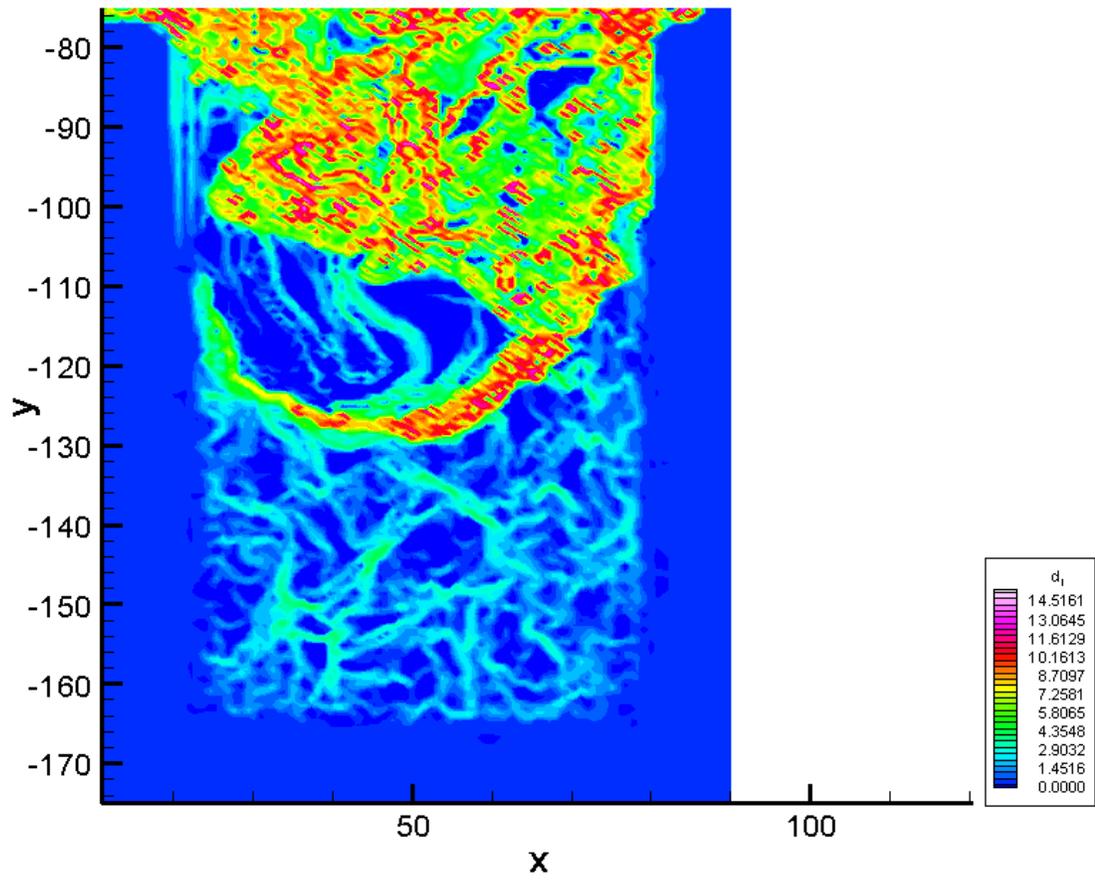


Figure F.295: The forward time LCS during phase increment 2 at 113.14 Hz.

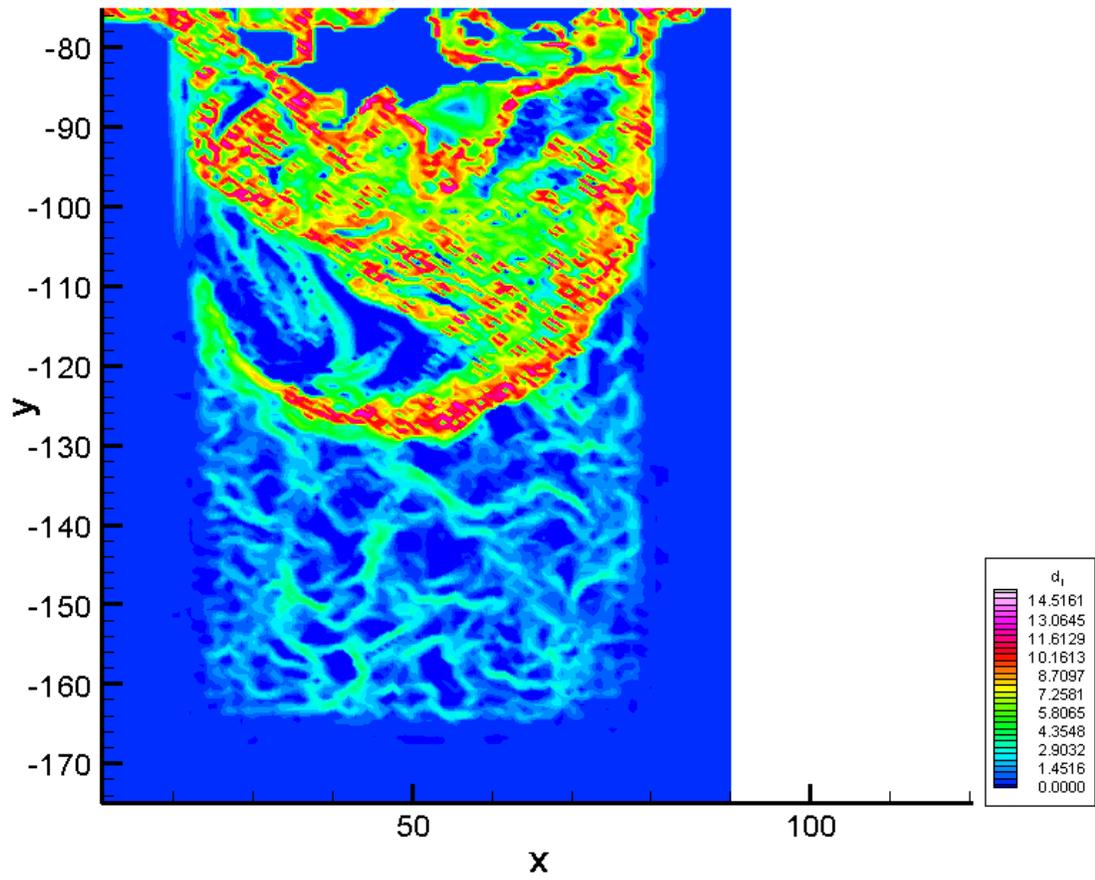


Figure F.296: The forward time LCS during phase increment 3 at 113.14 Hz.

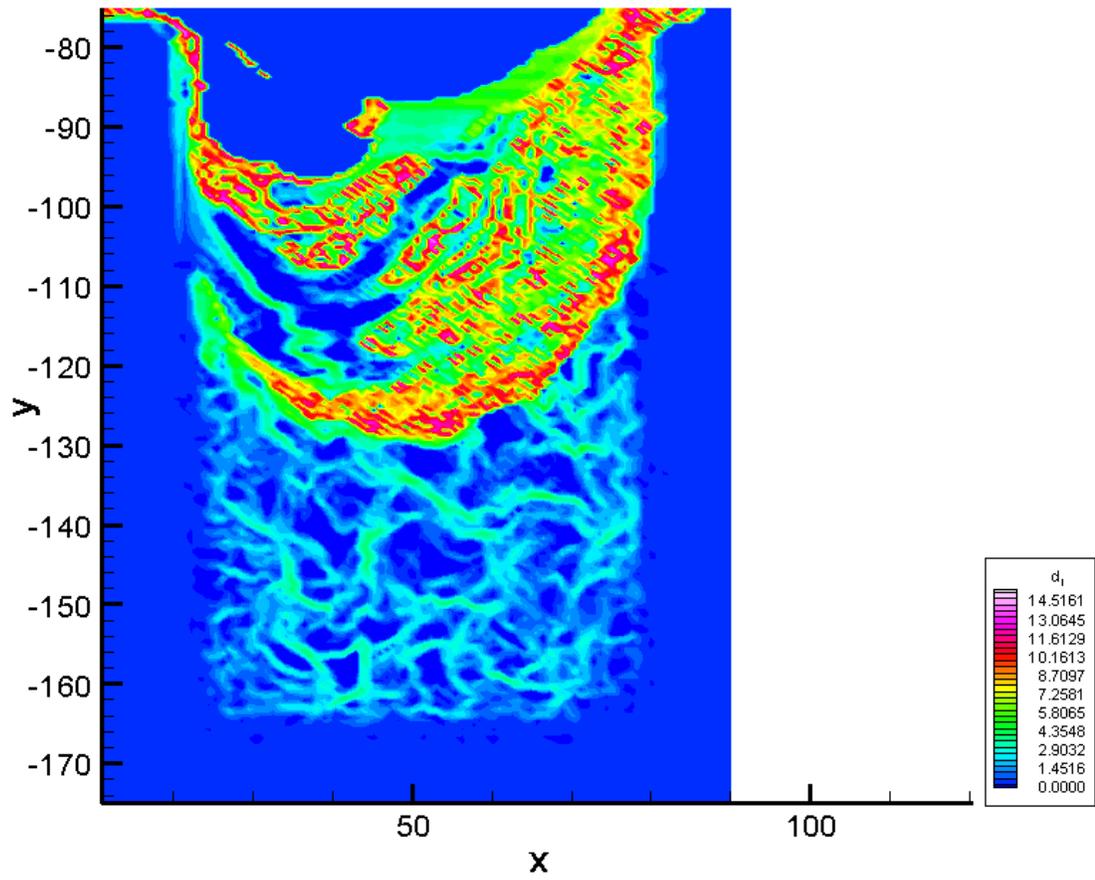


Figure F.297: The forward time LCS during phase increment 4 at 113.14 Hz.

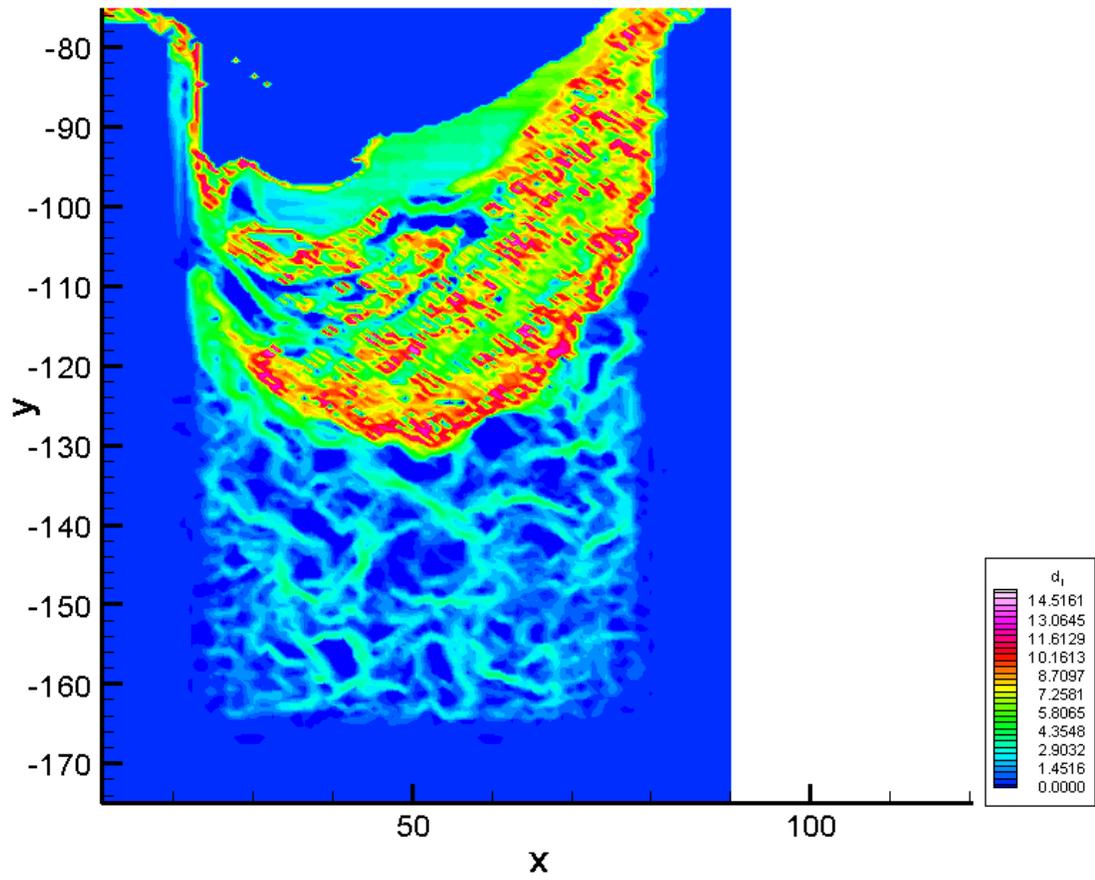


Figure F.298: The forward time LCS during phase increment 5 at 113.14 Hz.

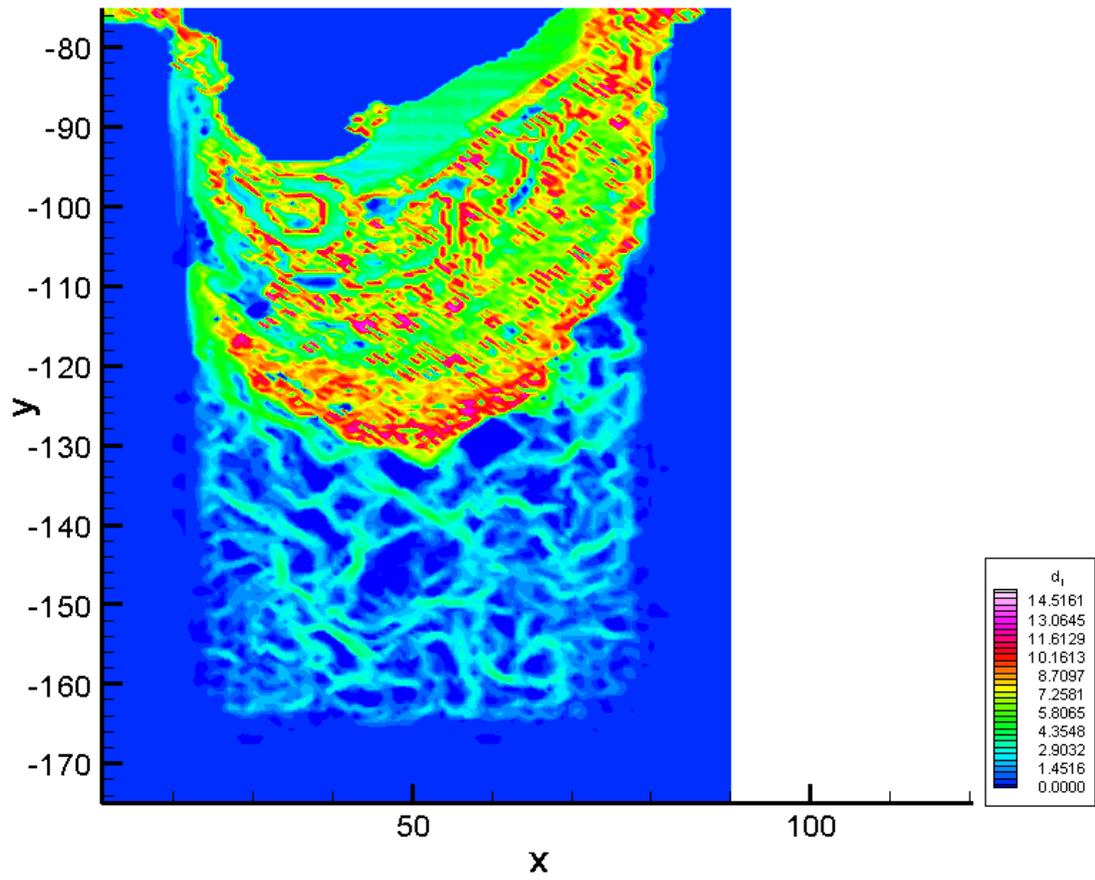


Figure F.299: The forward time LCS during phase increment 6 at 113.14 Hz.

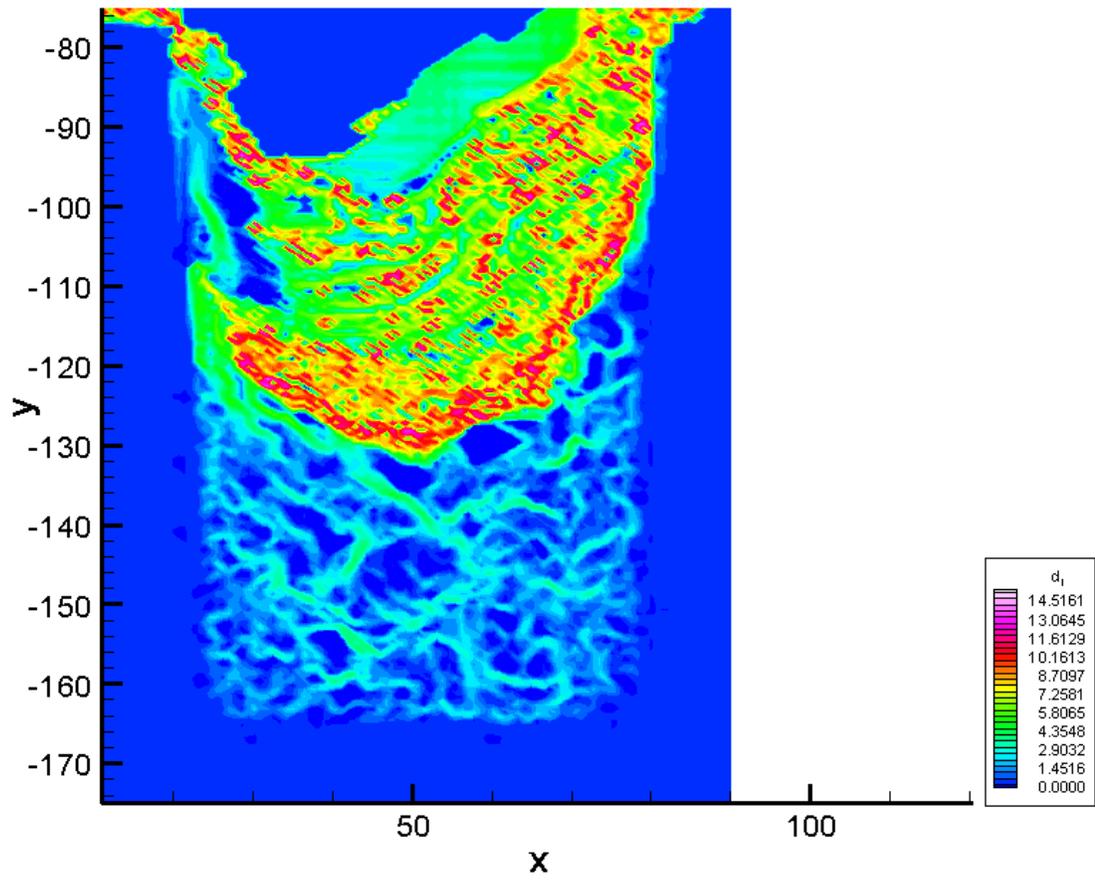


Figure F.300: The forward time LCS during phase increment 7 at 113.14 Hz.

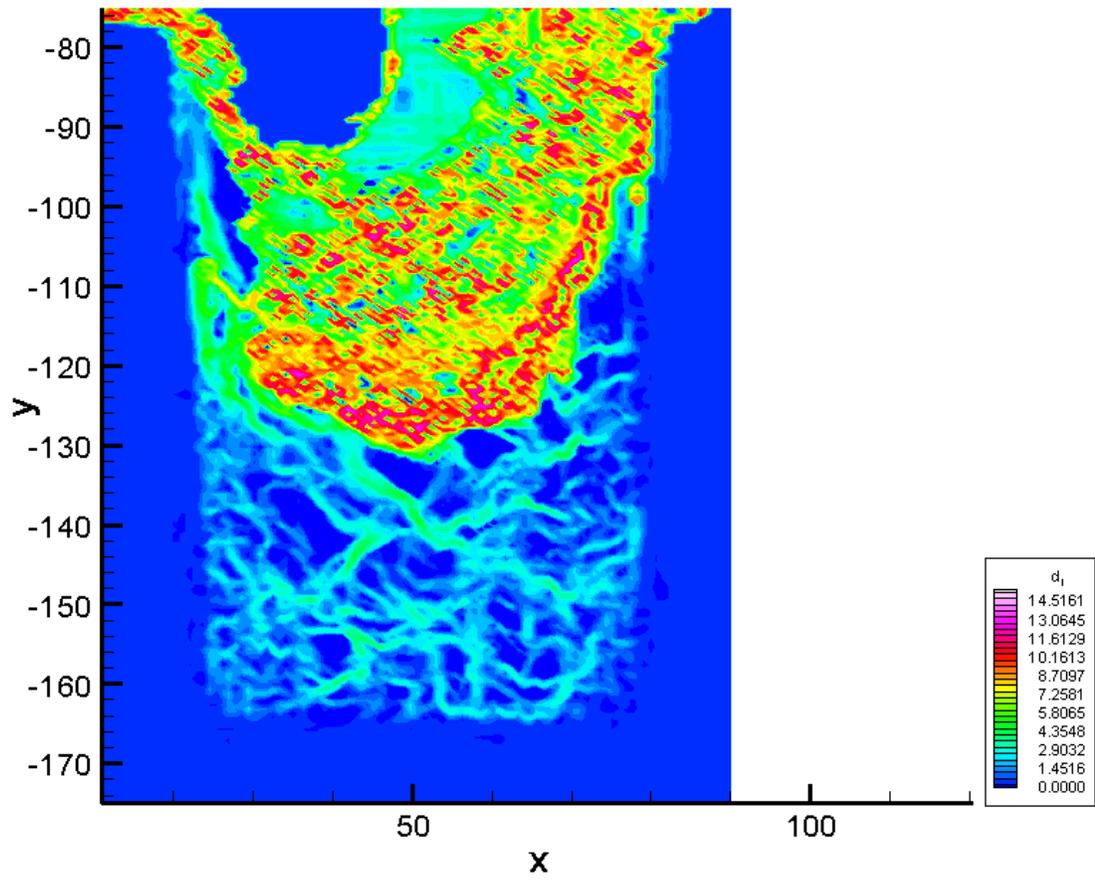


Figure F.301: The forward time LCS during phase increment 8 at 113.14 Hz.

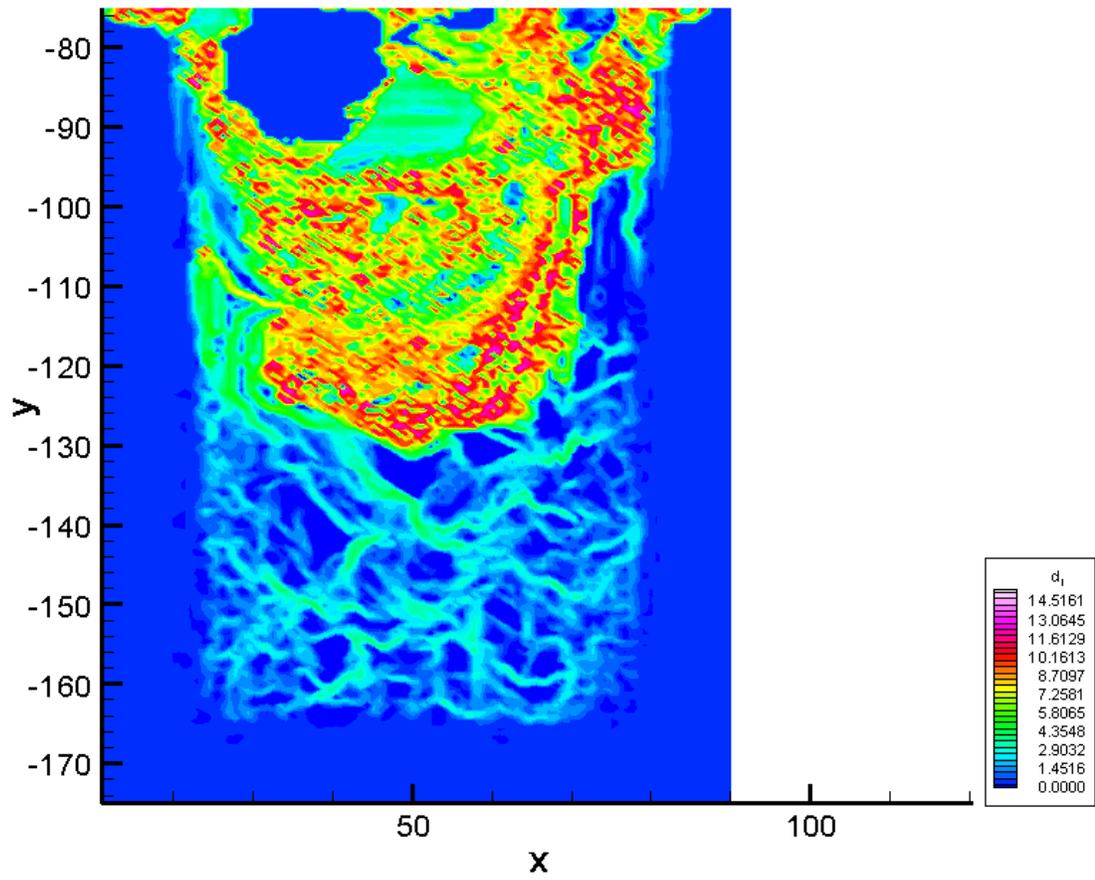


Figure F.302: The forward time LCS during phase increment 9 at 113.14 Hz.

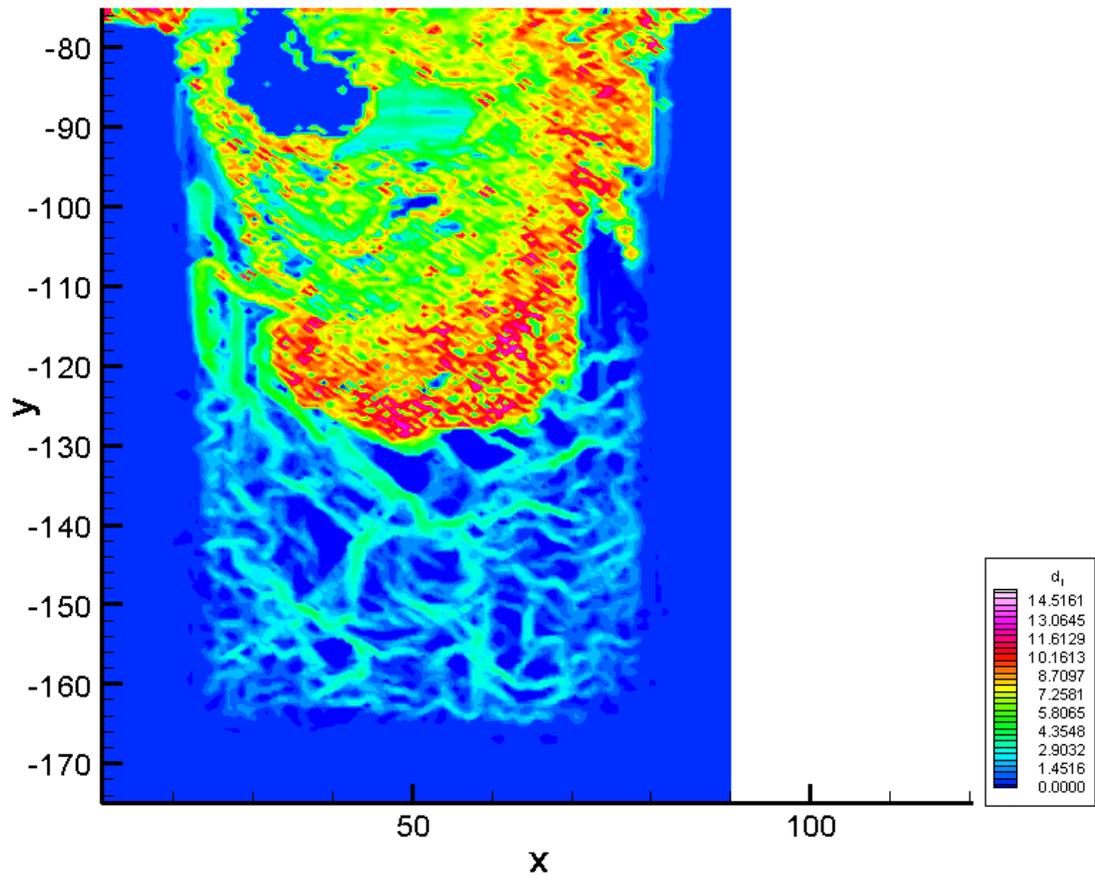


Figure F.303: The forward time LCS during phase increment 10 at 113.14 Hz.

F.4 113.14 Hz with an amplitude of 0.2 mm

F.4.1 Velocity field data at 113.14 Hz with an amplitude of 0.2 mm

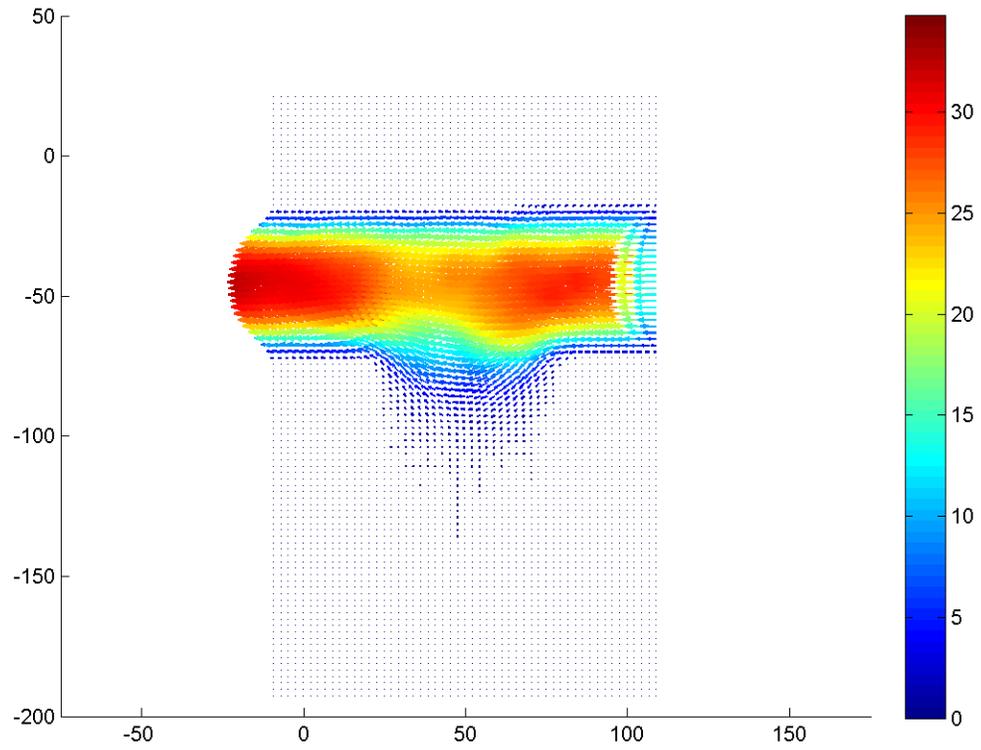


Figure F.304: Velocity field during phase increment 1 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

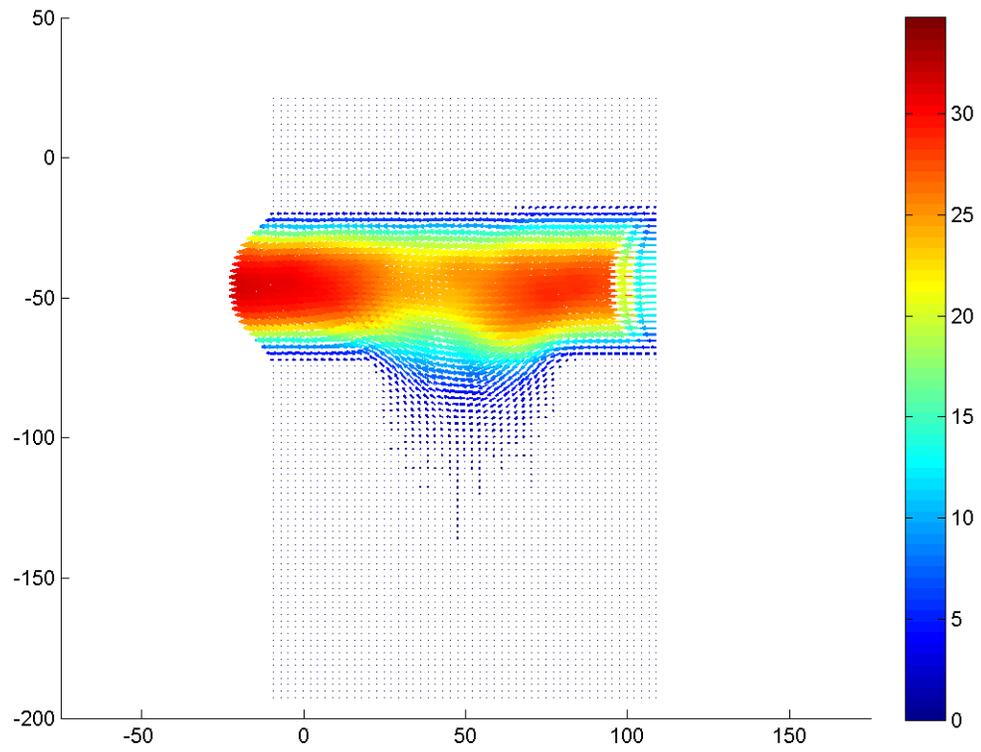


Figure F.305: Velocity field during phase increment 2 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

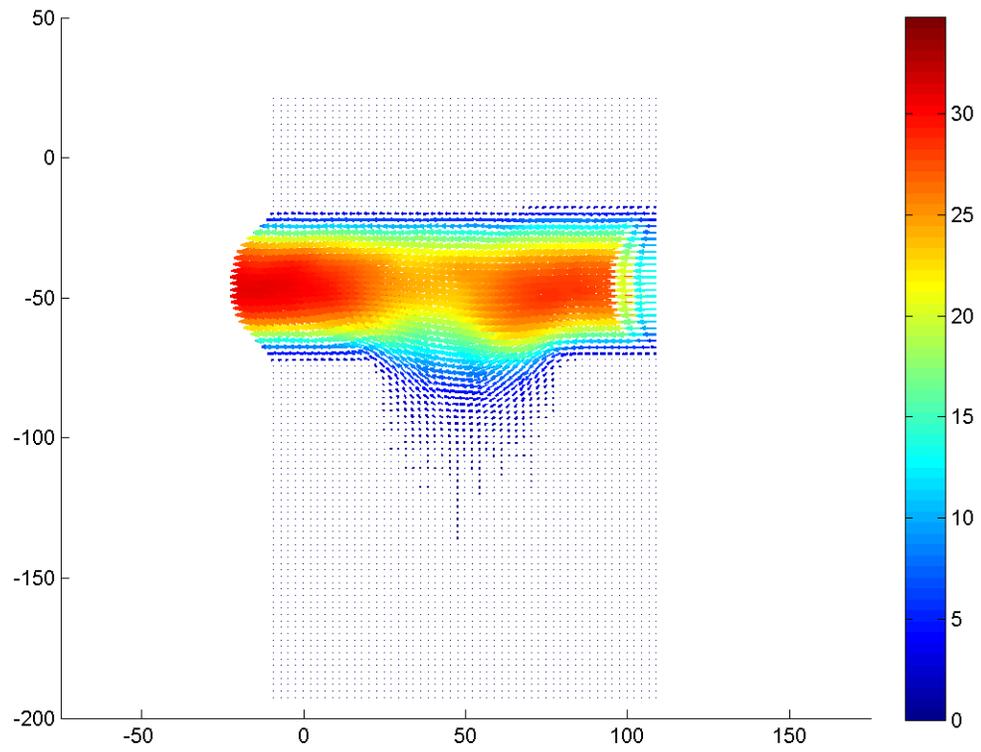


Figure F.306: Velocity field during phase increment 3 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

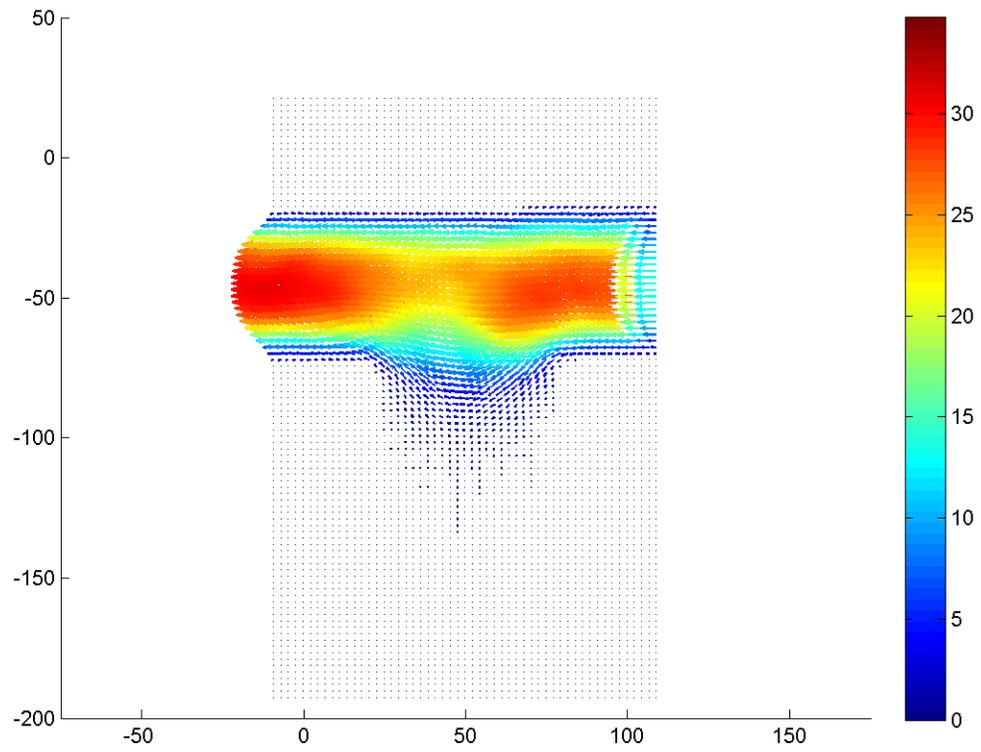


Figure F.307: Velocity field during phase increment 4 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

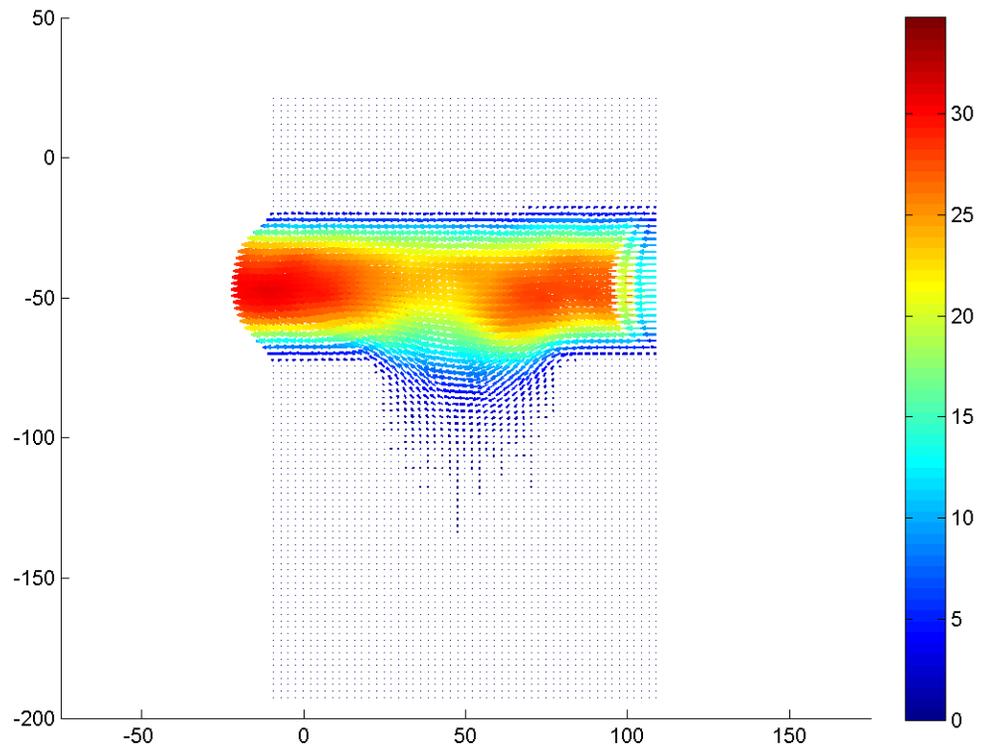


Figure F.308: Velocity field during phase increment 5 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

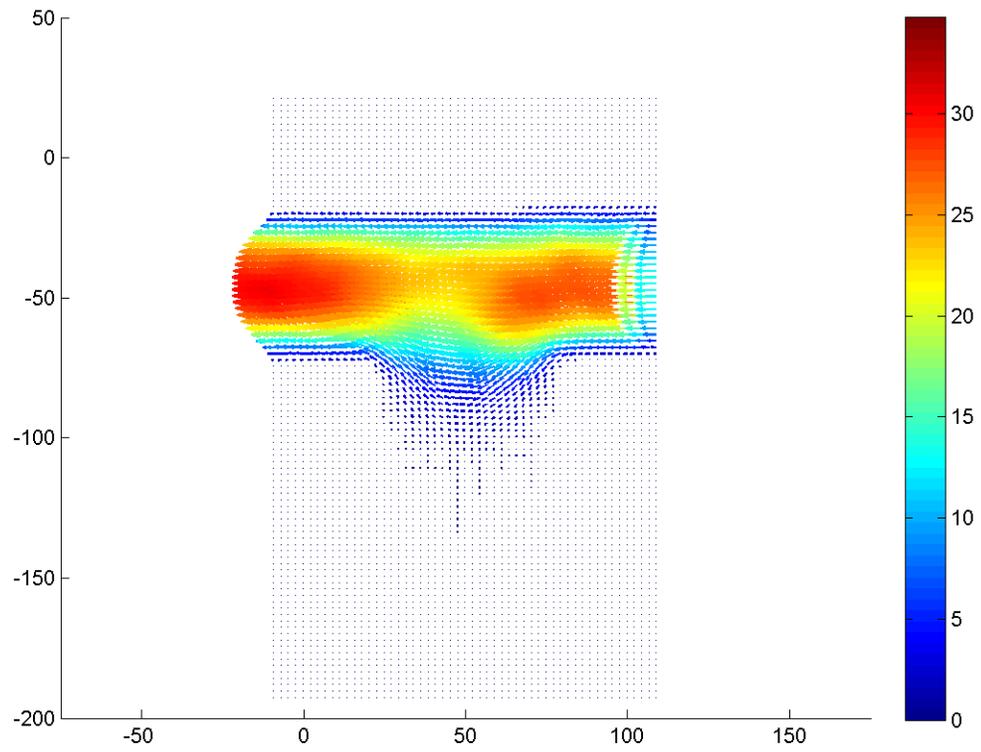


Figure F.309: Velocity field during phase increment 6 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

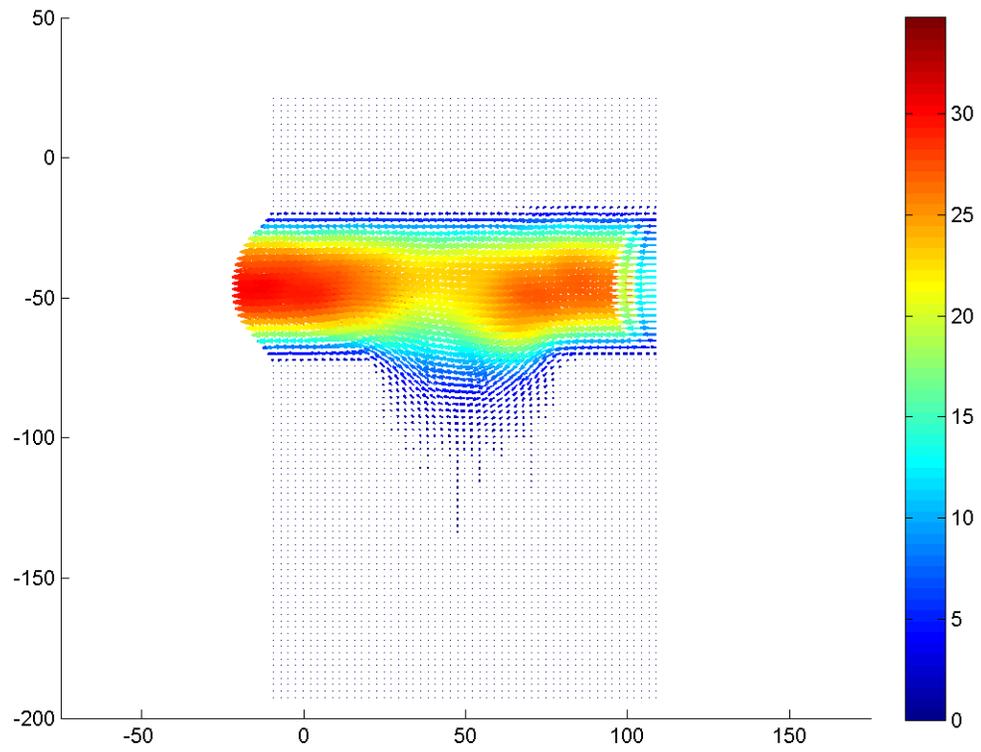


Figure F.310: Velocity field during phase increment 7 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

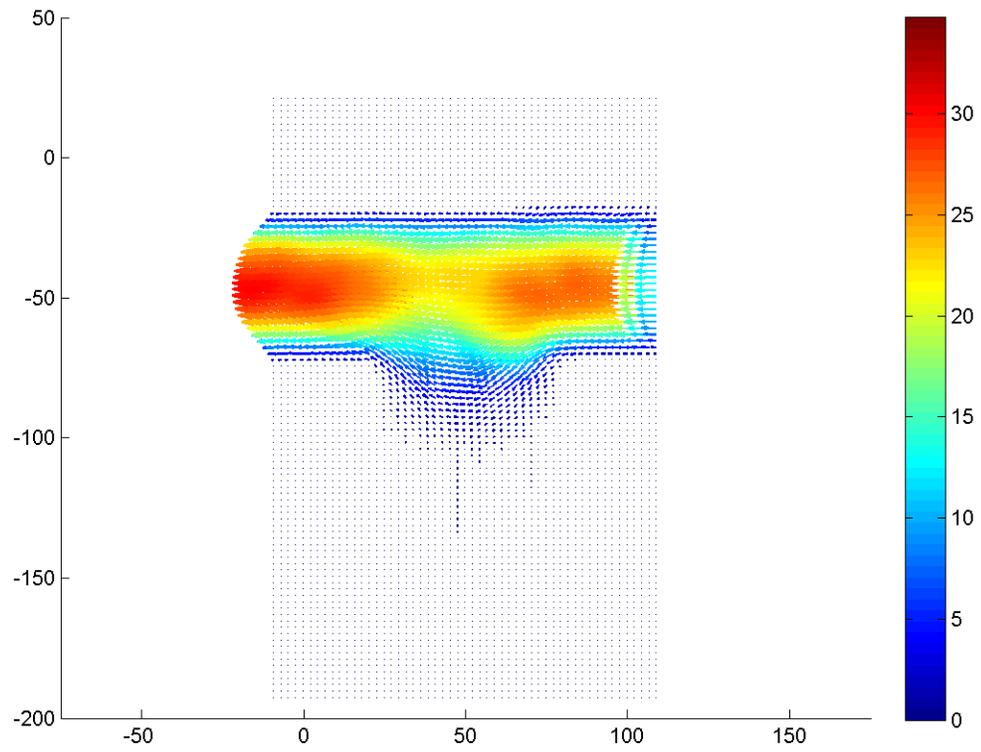


Figure F.311: Velocity field during phase increment 8 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

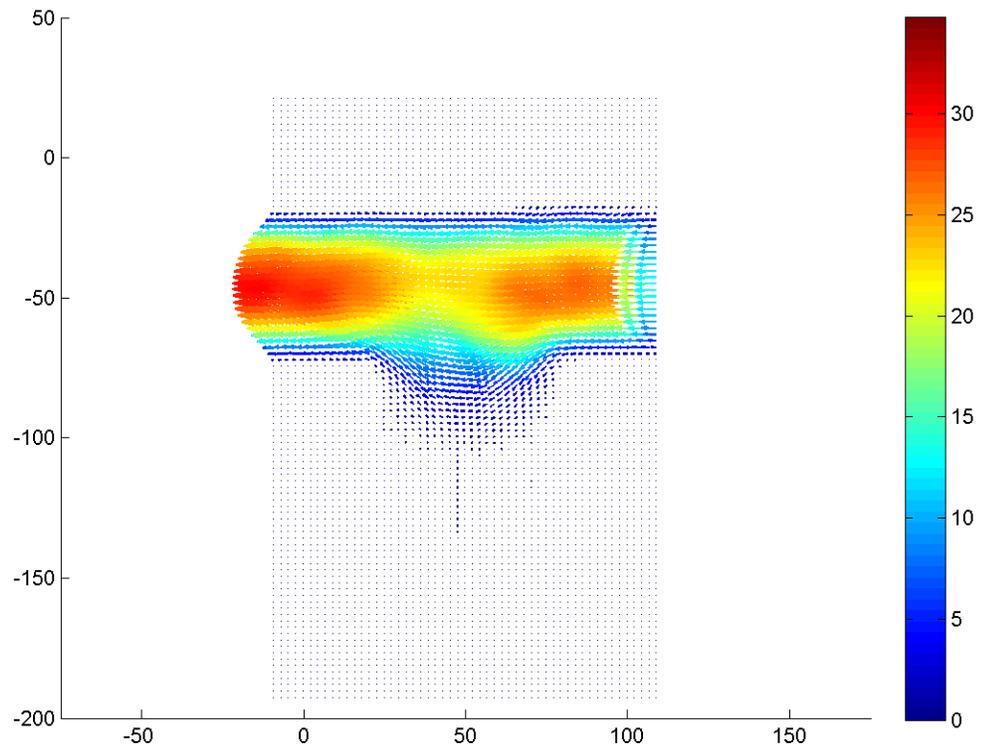


Figure F.312: Velocity field during phase increment 9 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

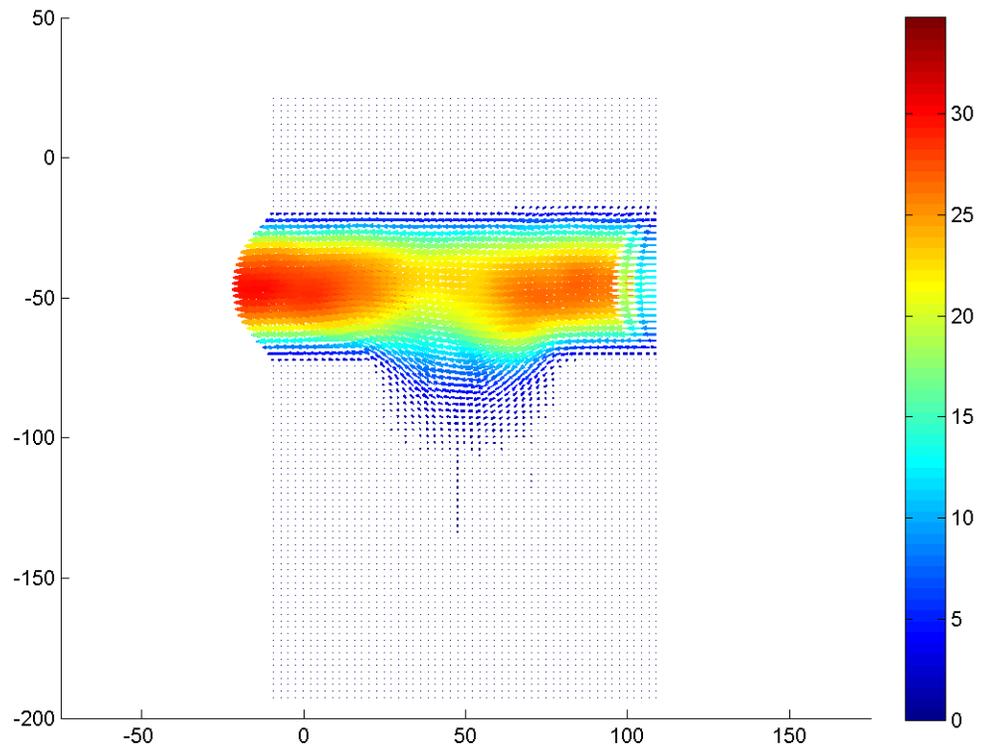


Figure F.313: Velocity field during phase increment 10 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

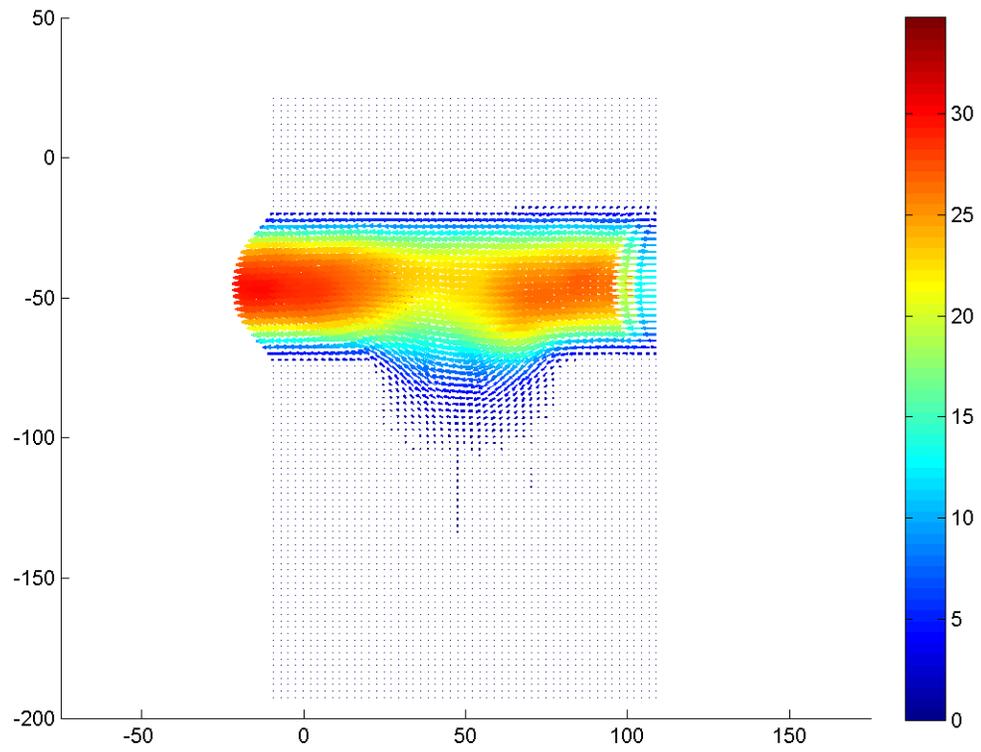


Figure F.314: Velocity field during phase increment 11 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

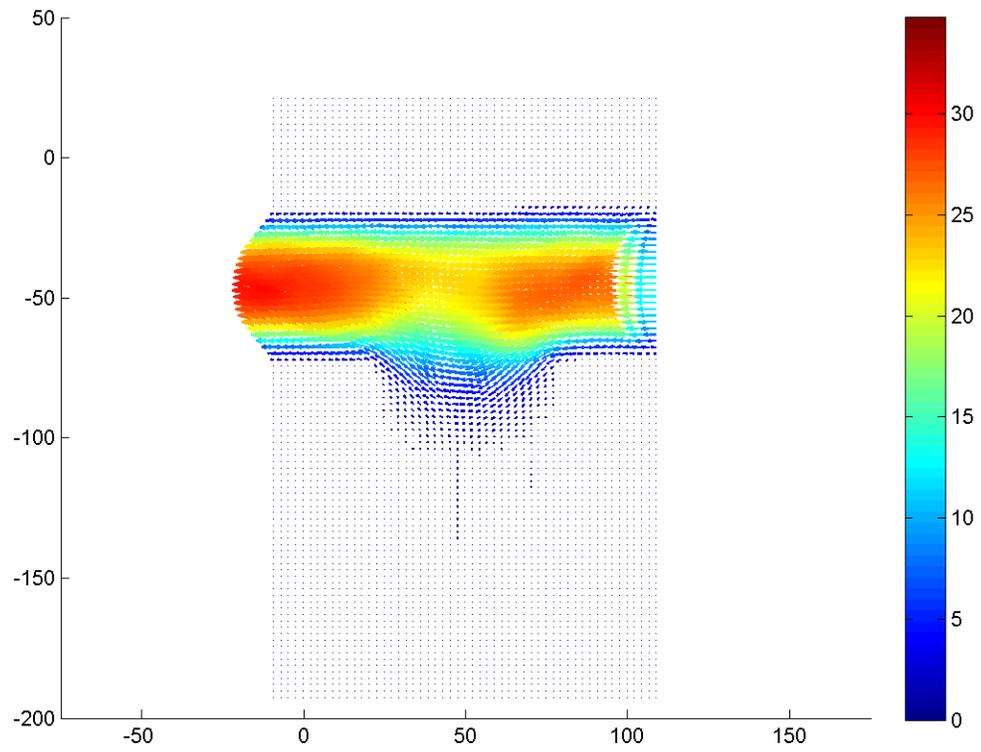


Figure F.315: Velocity field during phase increment 12 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

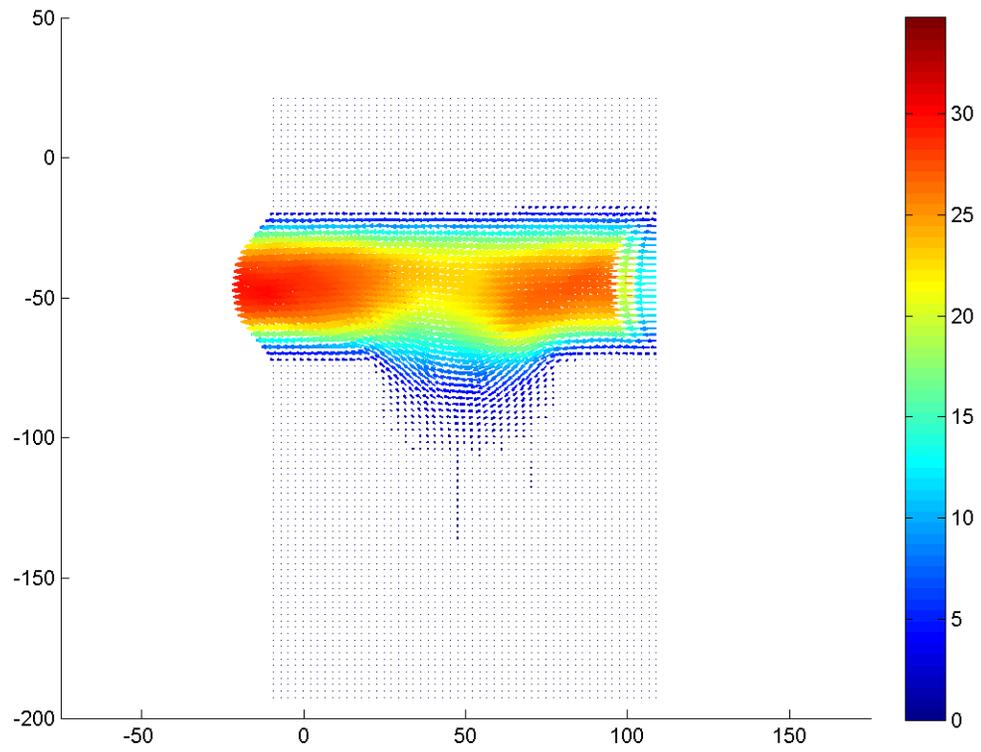


Figure F.316: Velocity field during phase increment 13 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

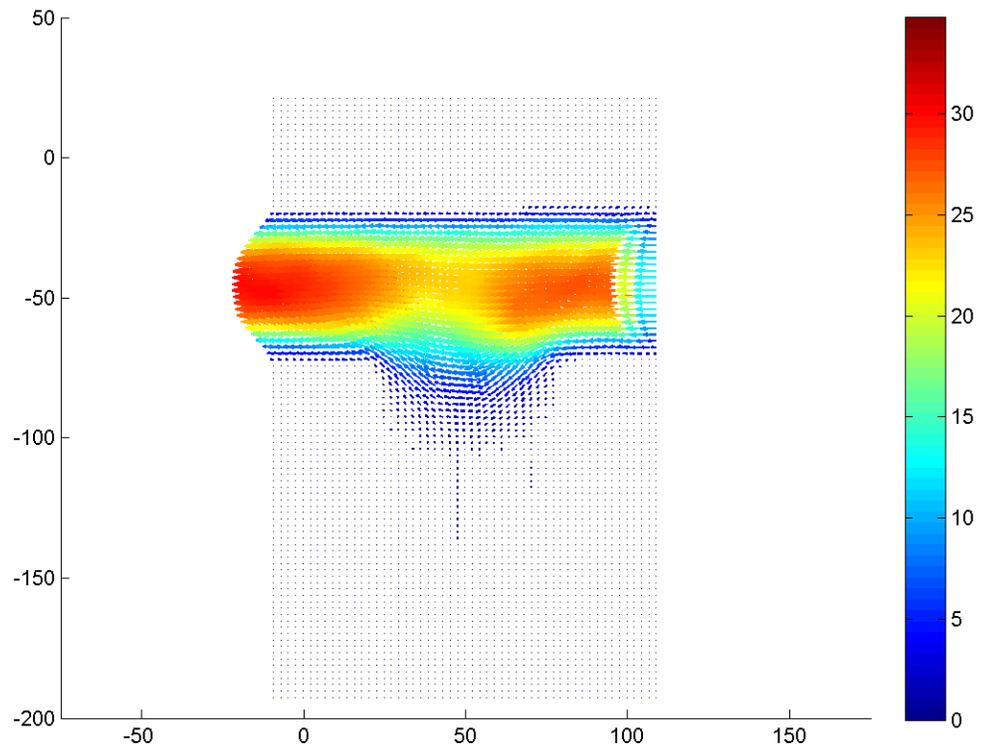


Figure F.317: Velocity field during phase increment 14 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

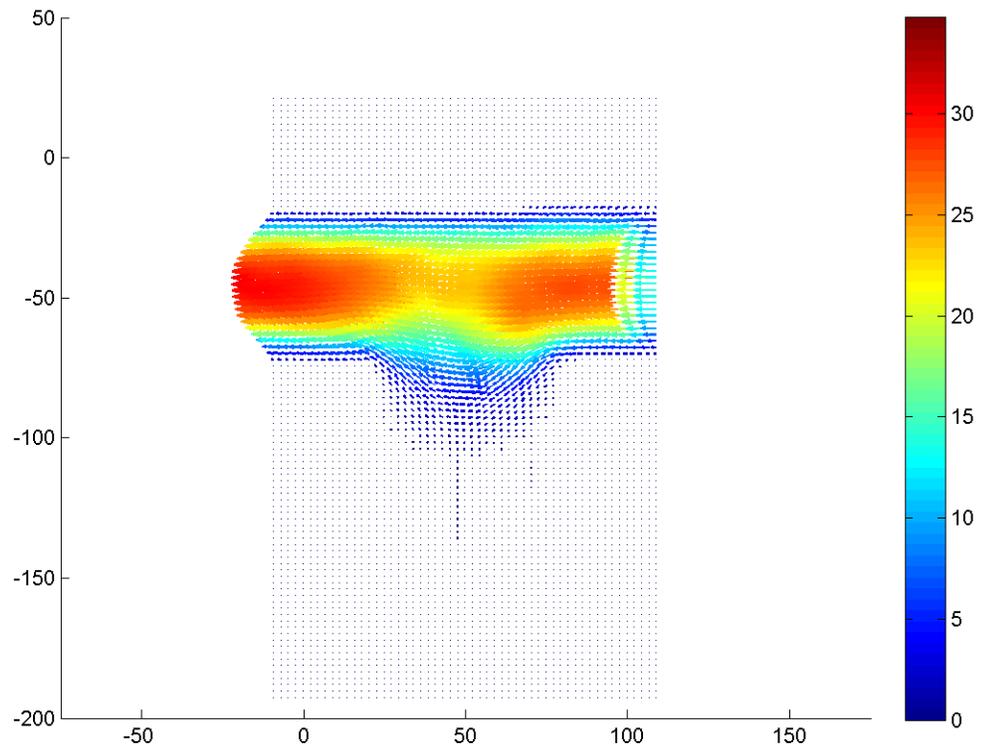


Figure F.318: Velocity field during phase increment 15 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

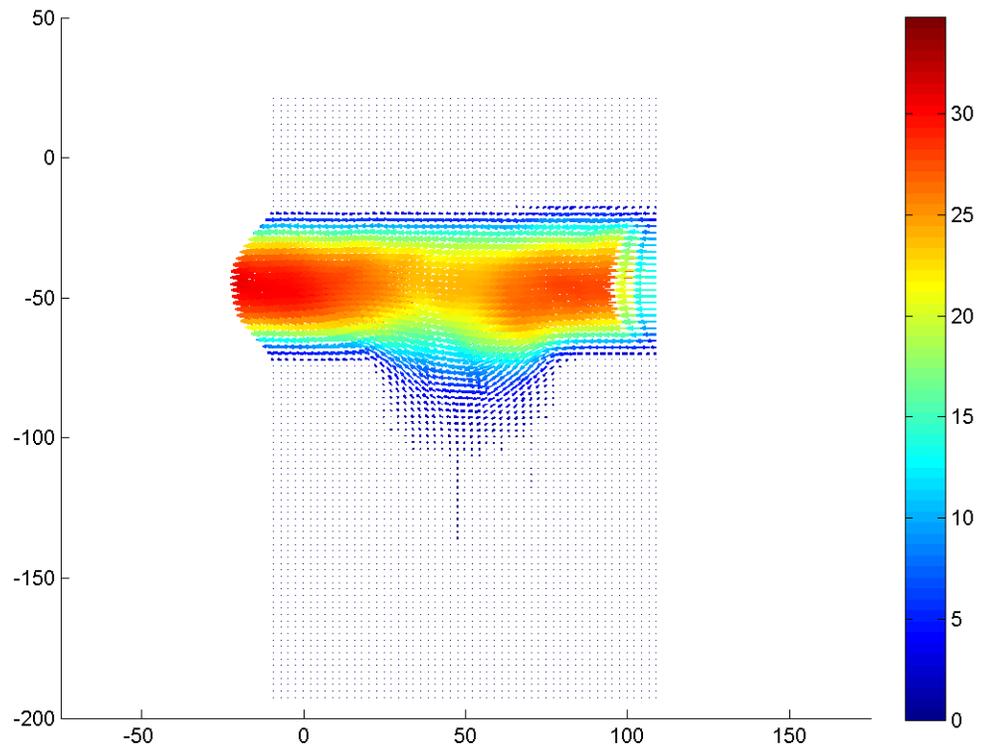


Figure F.319: Velocity field during phase increment 16 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

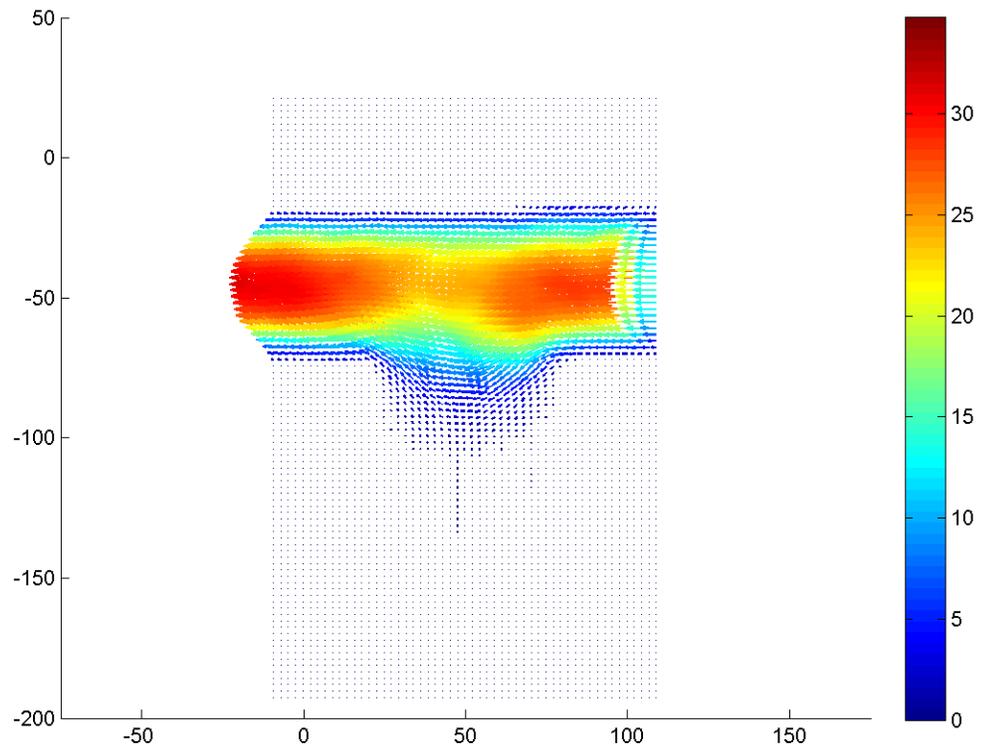


Figure F.320: Velocity field during phase increment 17 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

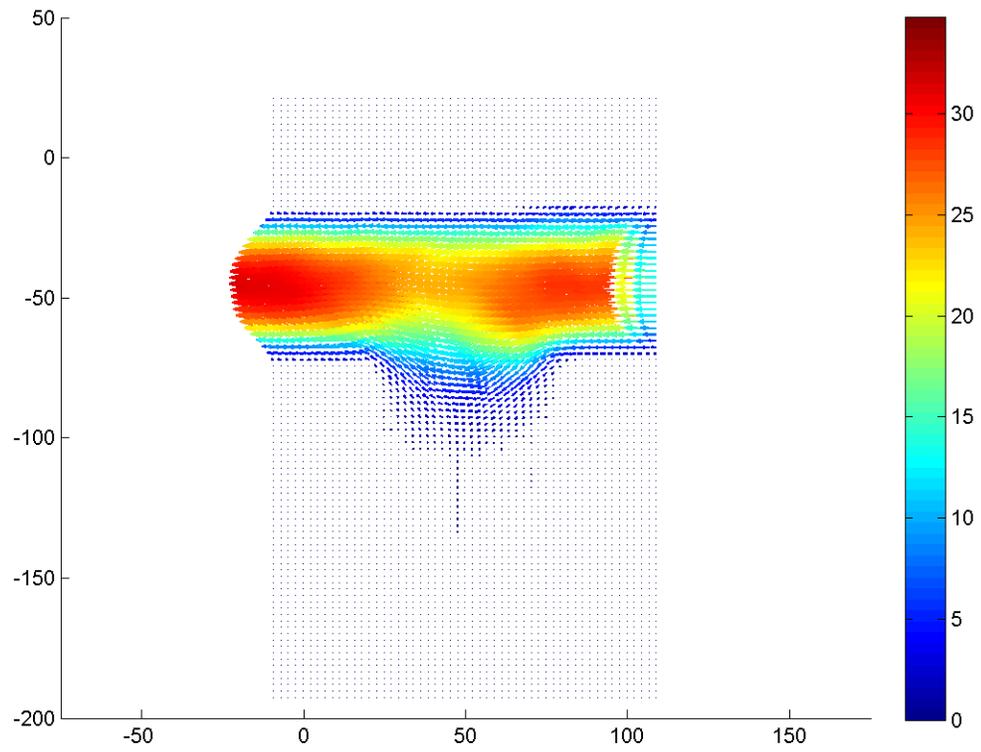


Figure F.321: Velocity field during phase increment 18 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

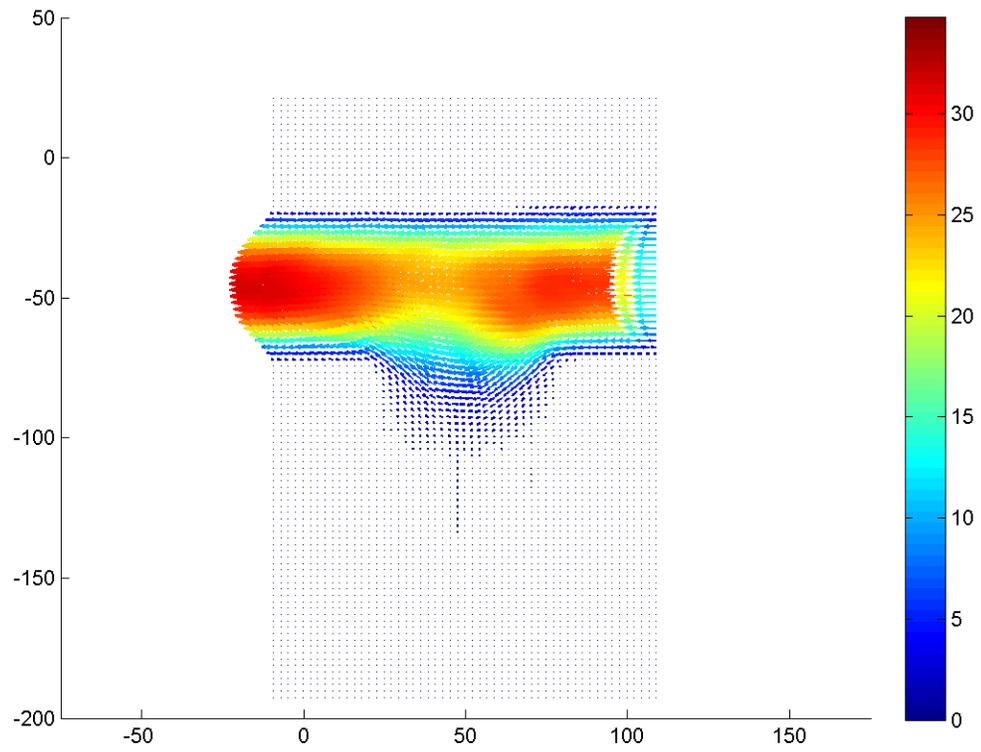


Figure F.322: Velocity field during phase increment 18 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

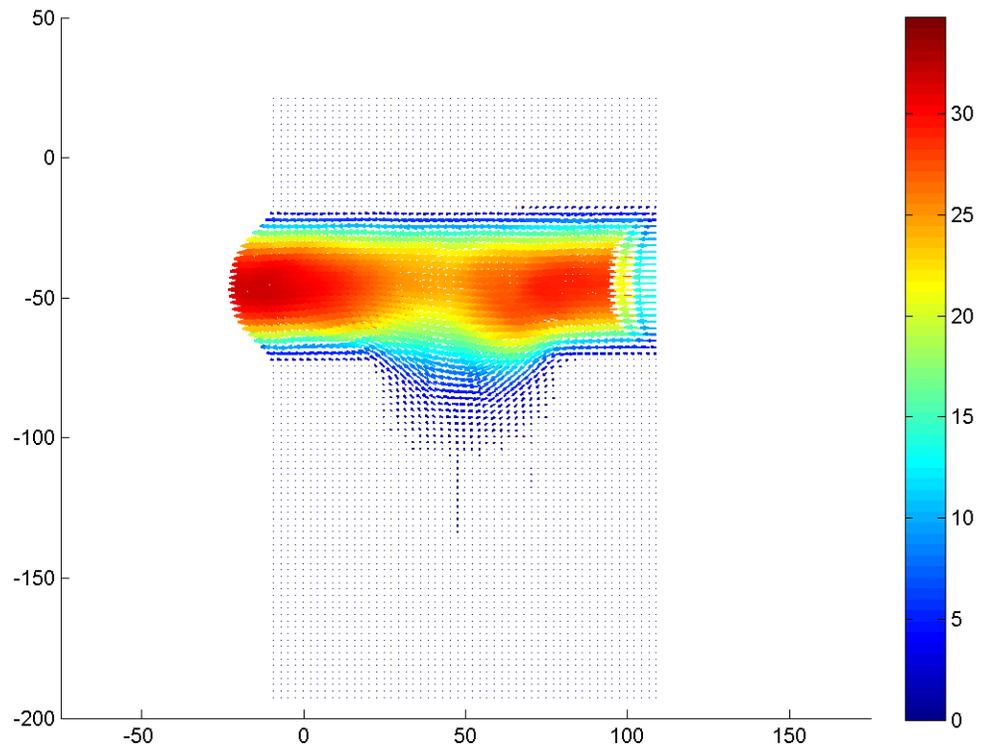


Figure F.323: Velocity field during phase increment 20 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

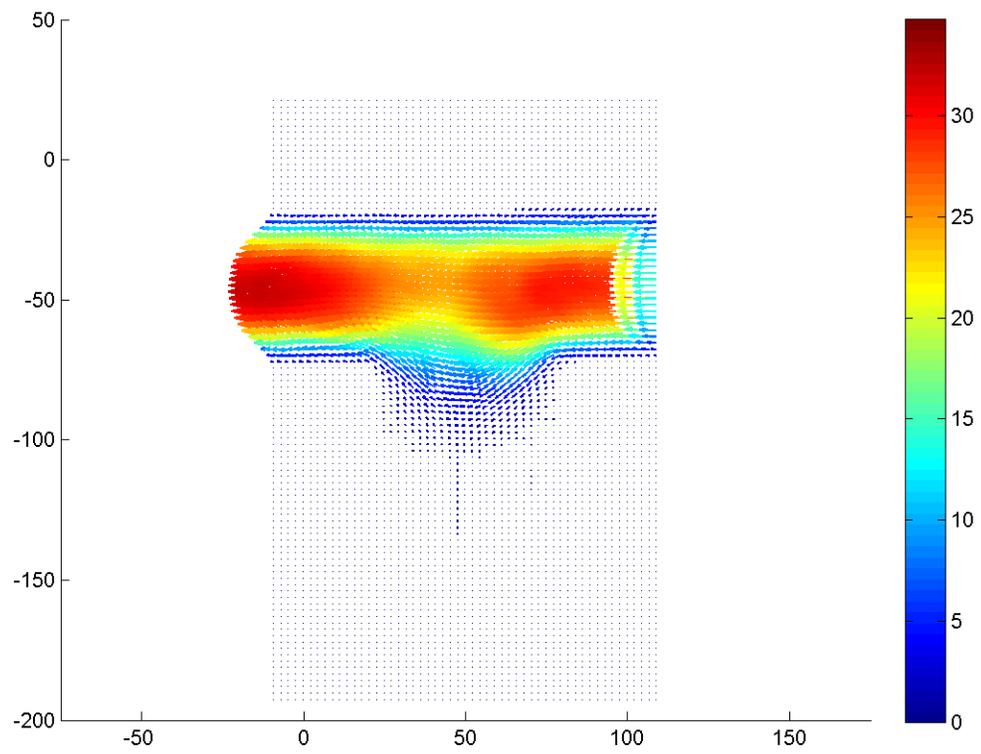


Figure F.324: Velocity field during phase increment 21 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

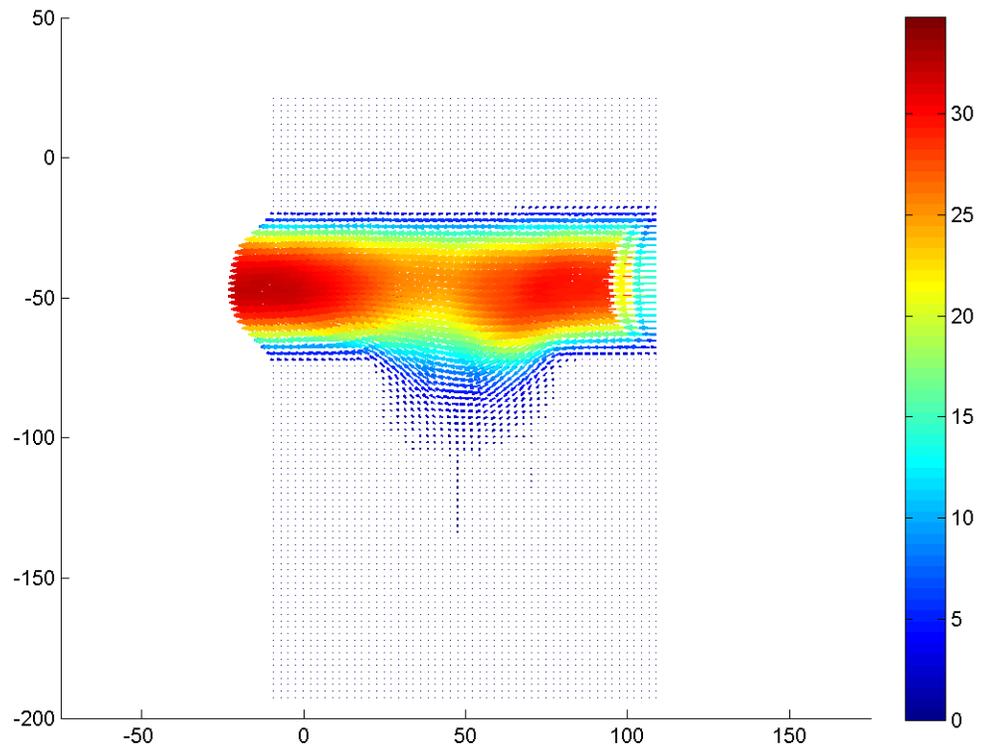


Figure F.325: Velocity field during phase increment 22 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

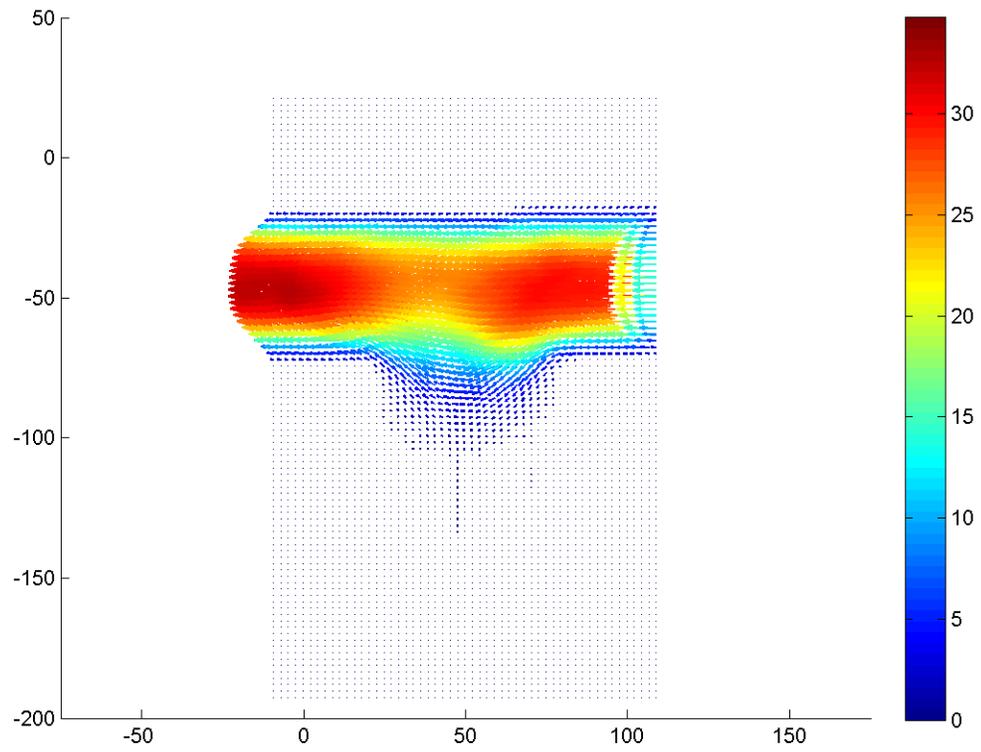


Figure F.326: Velocity field during phase increment 23 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

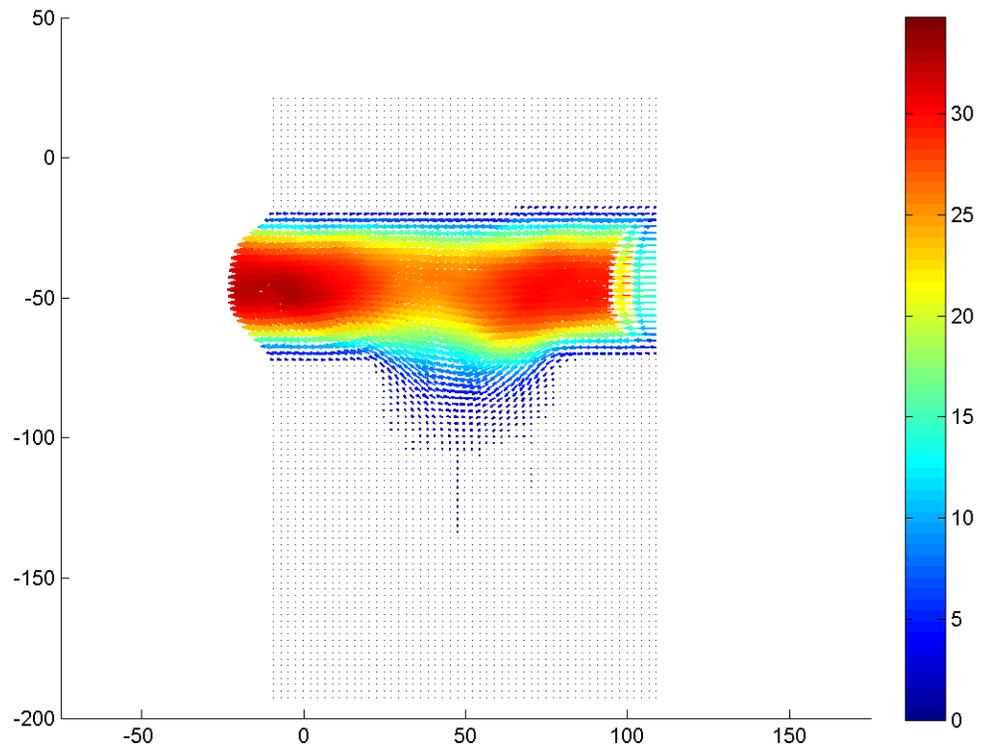


Figure F.327: Velocity field during phase increment 24 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

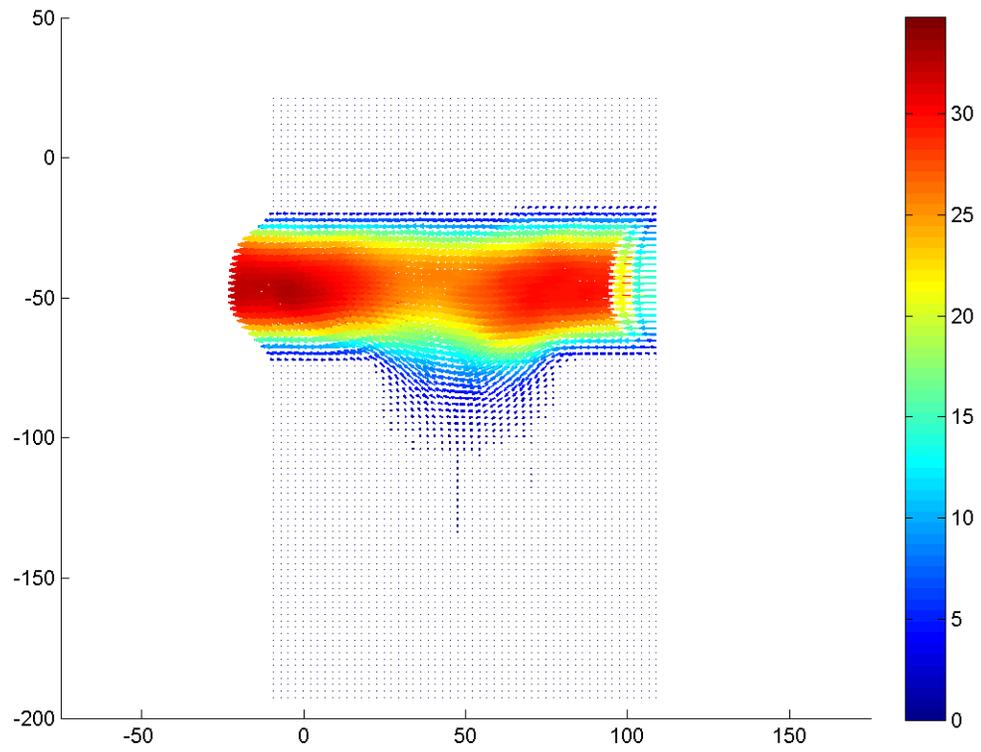


Figure F.328: Velocity field during phase increment 25 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

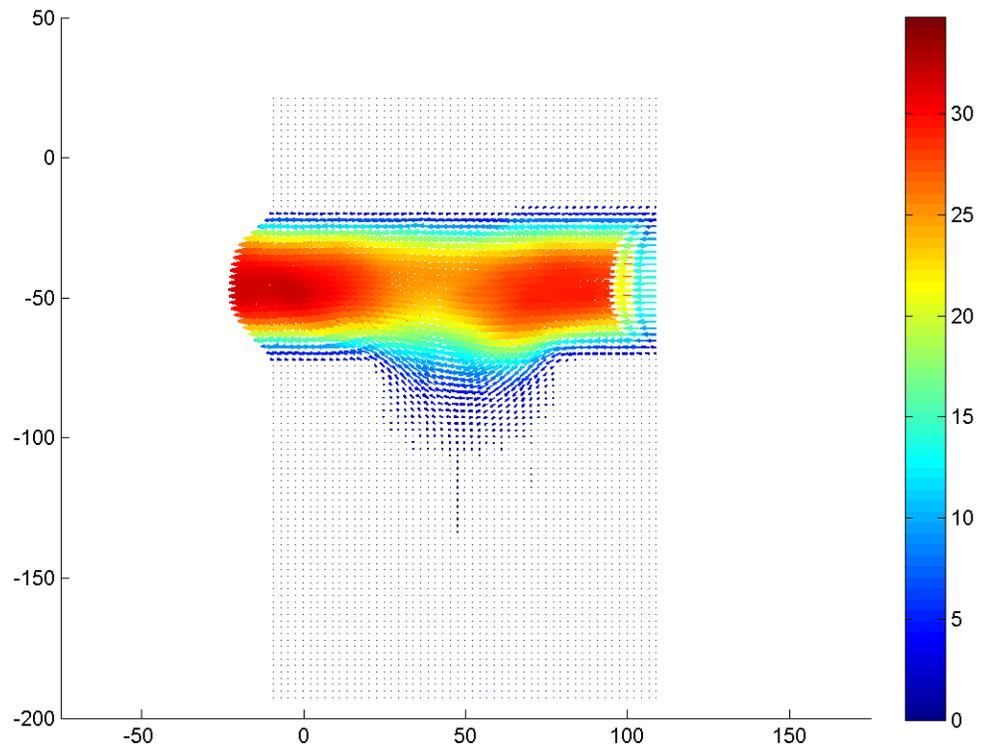


Figure F.329: Velocity field during phase increment 26 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

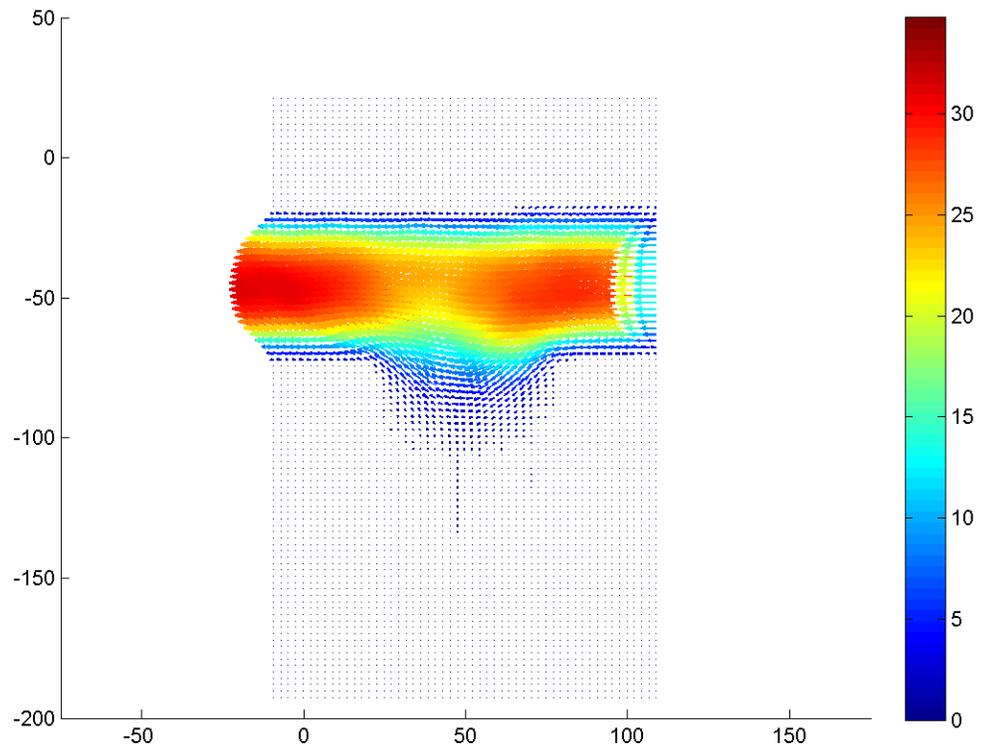


Figure F.330: Velocity field during phase increment 27 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

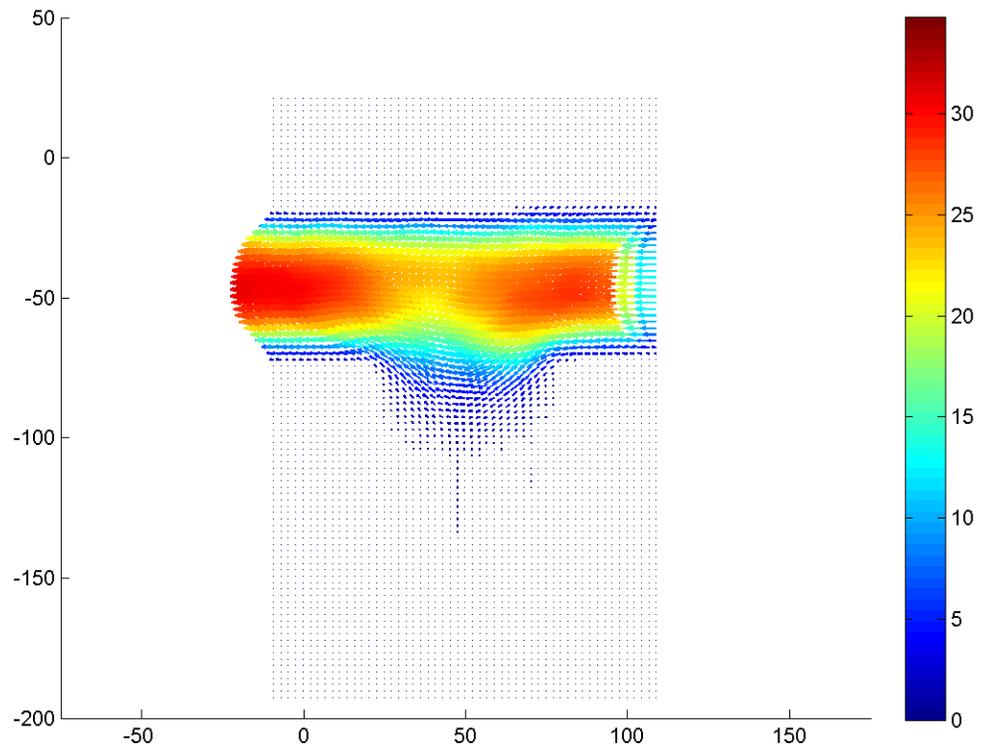


Figure F.331: Velocity field during phase increment 28 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

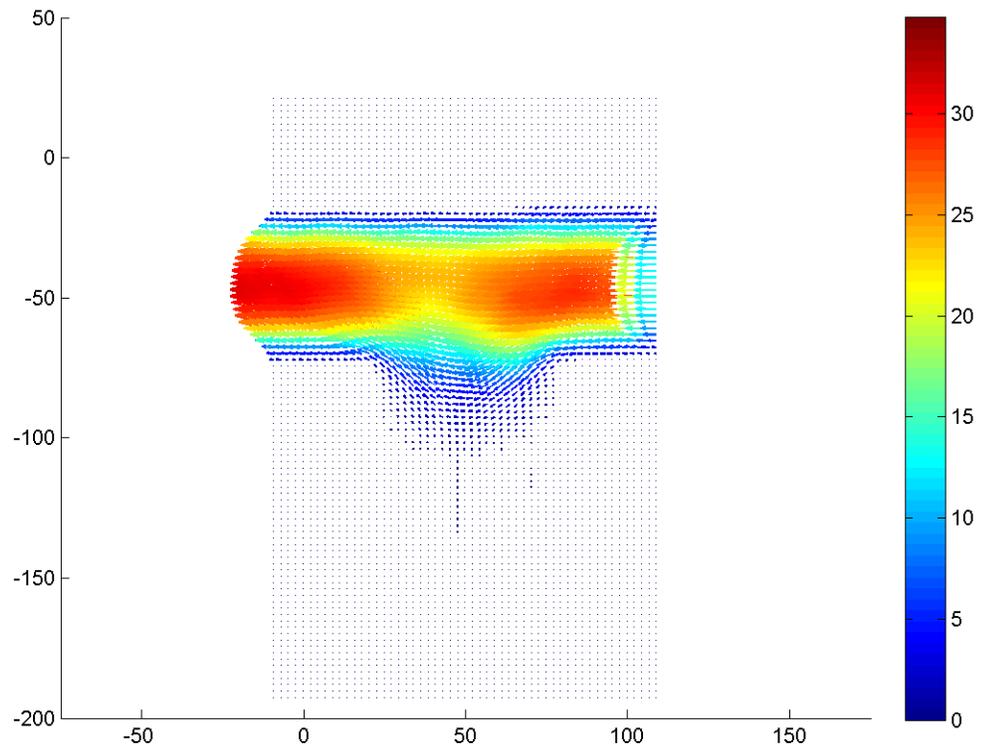


Figure F.332: Velocity field during phase increment 29 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

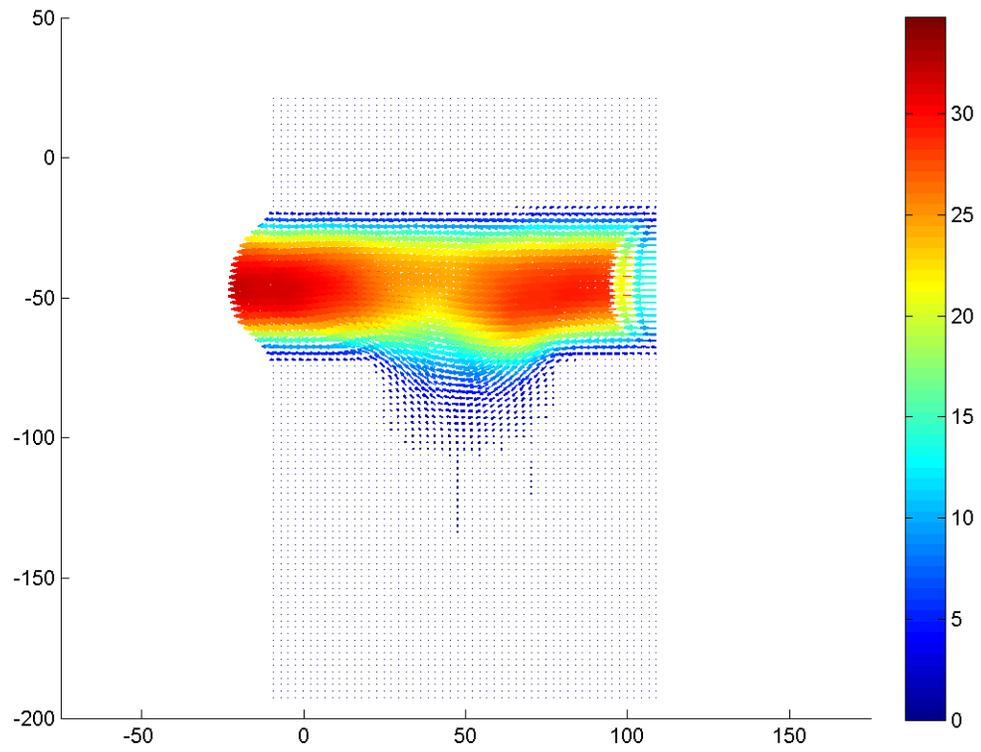


Figure F.333: Velocity field during phase increment 30 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

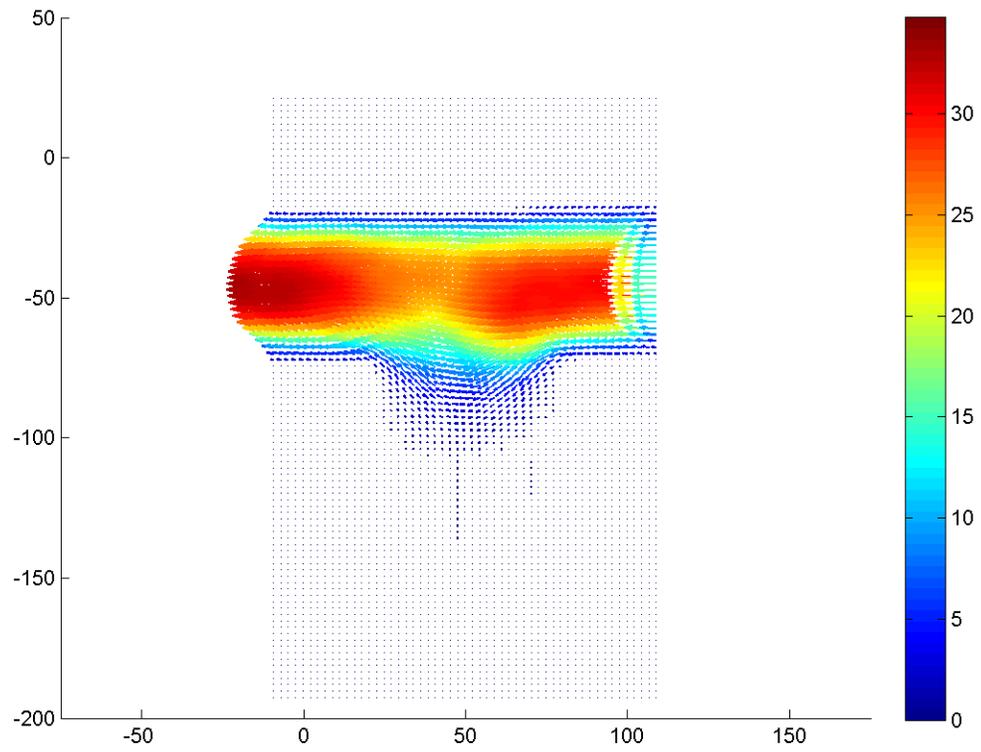


Figure F.334: Velocity field during phase increment 31 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

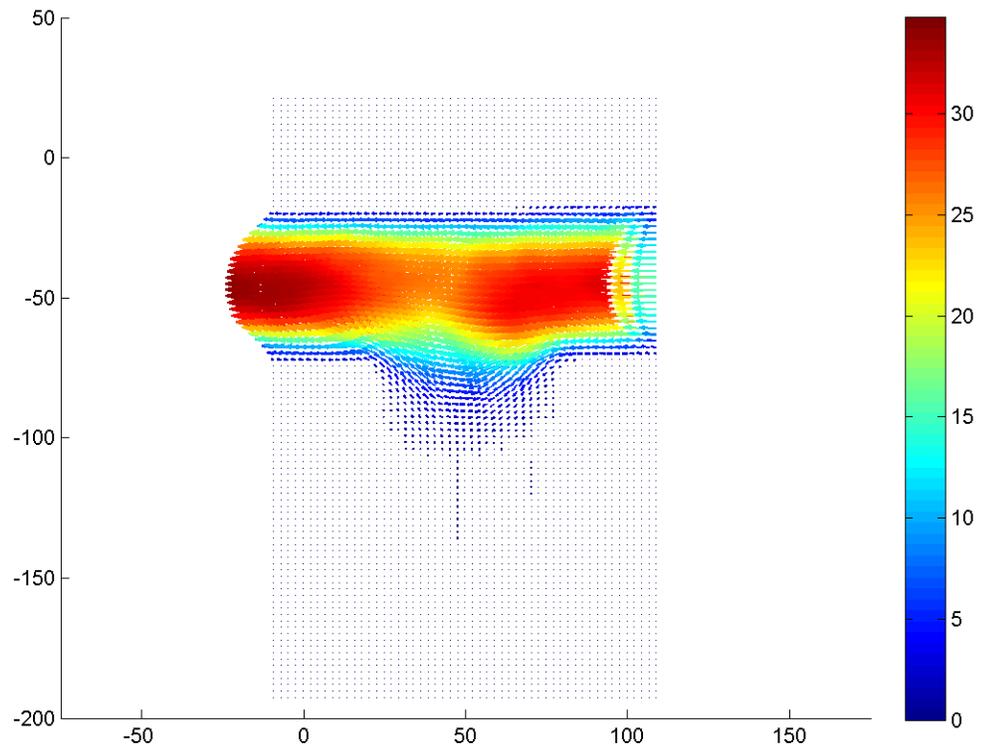


Figure F.335: Velocity field during phase increment 32 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

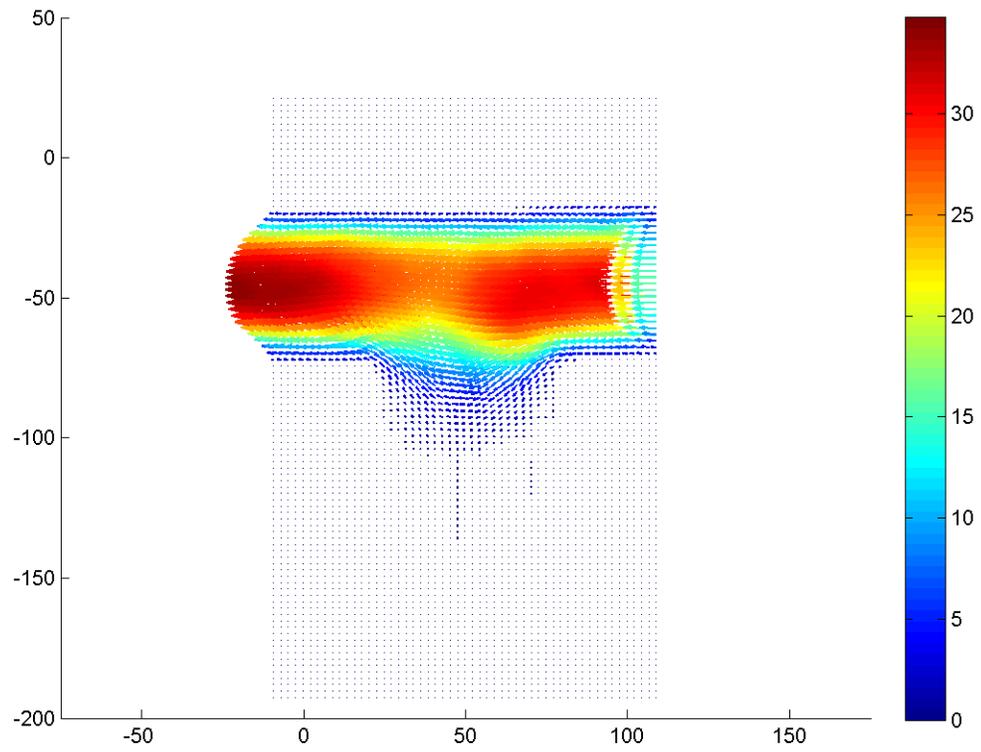


Figure F.336: Velocity field during phase increment 33 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

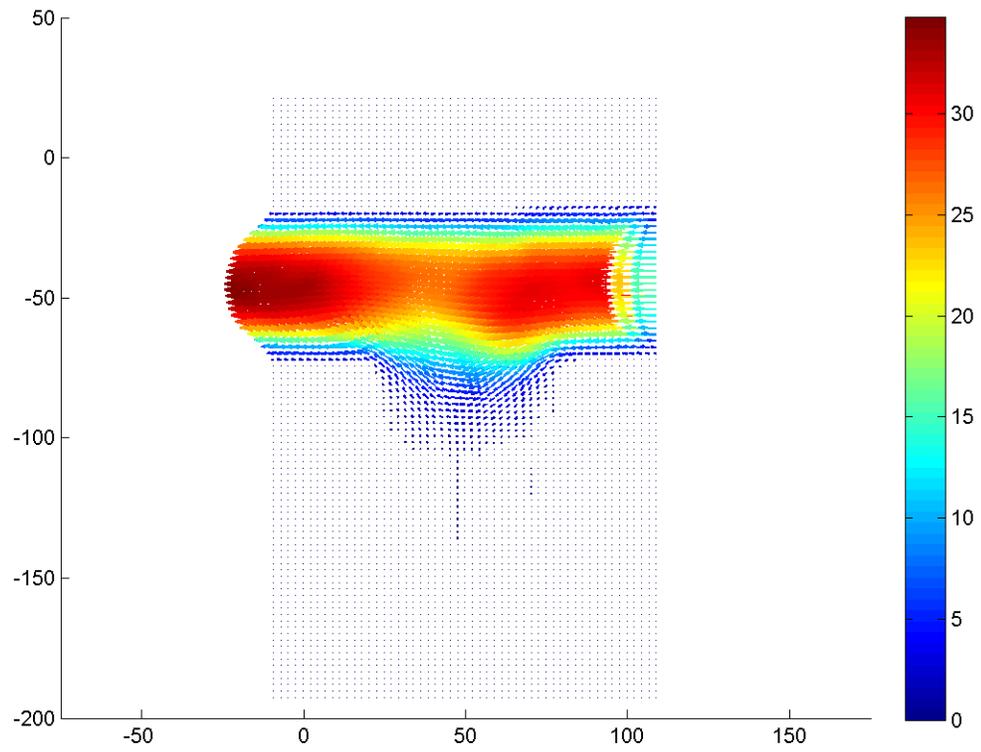


Figure F.337: Velocity field during phase increment 34 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

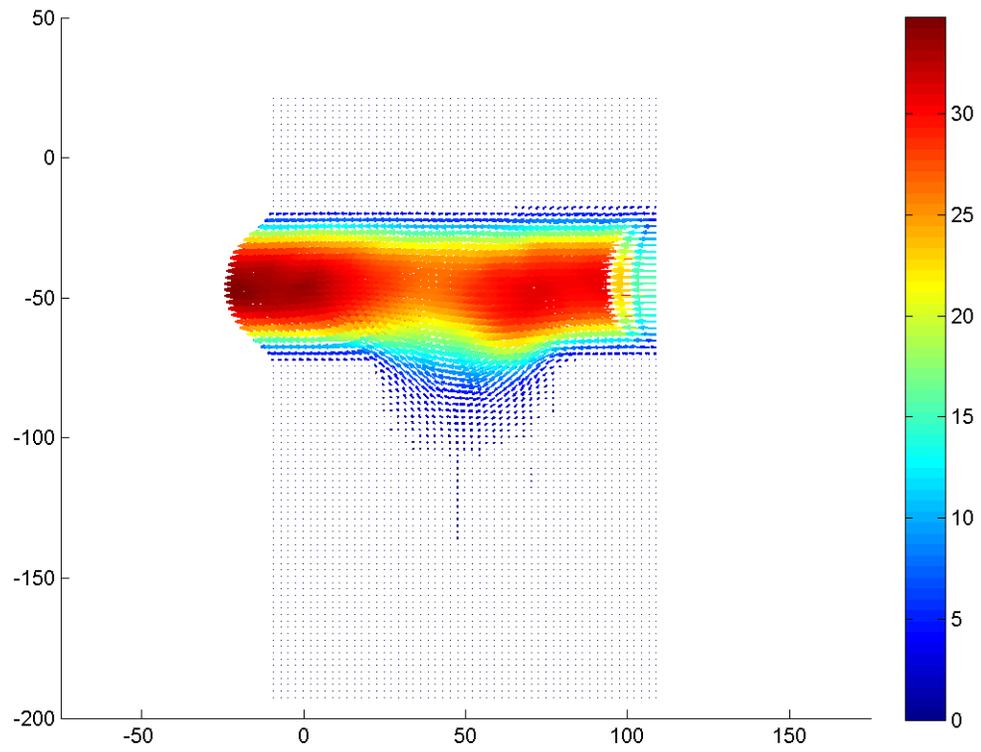


Figure F.338: Velocity field during phase increment 35 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

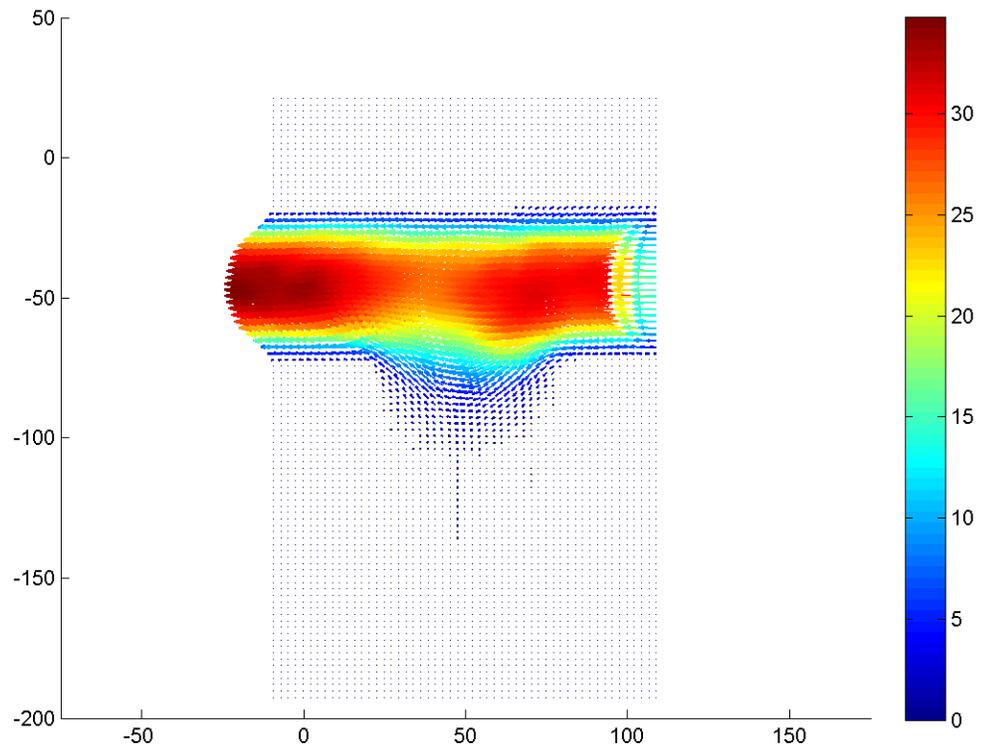


Figure F.339: Velocity field during phase increment 36 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

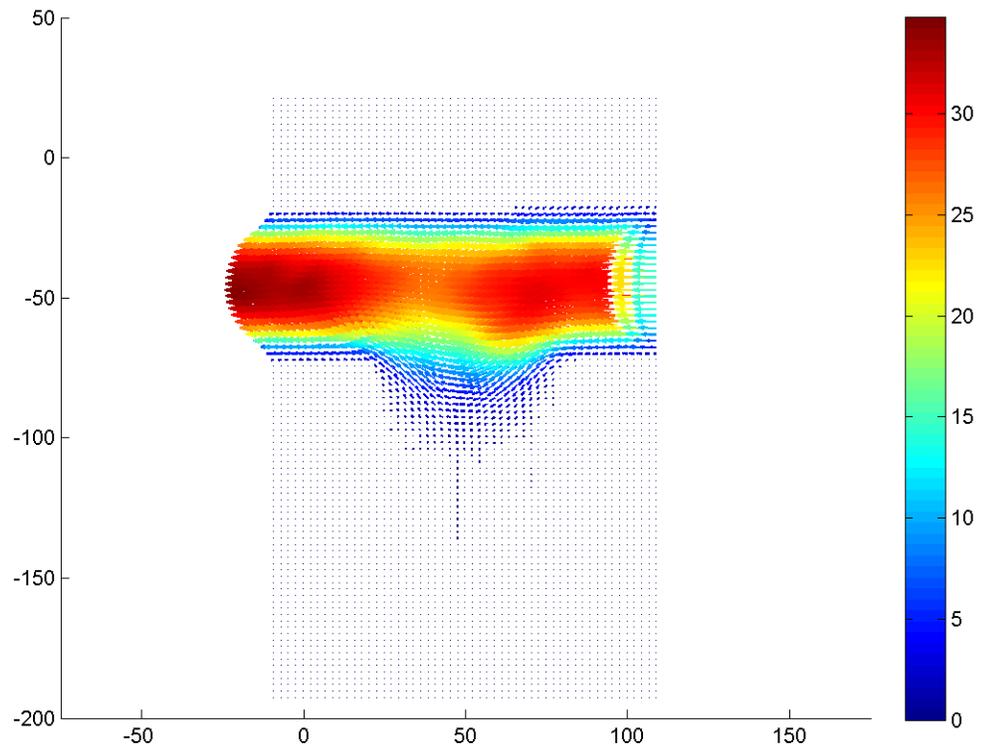


Figure F.340: Velocity field during phase increment 37 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

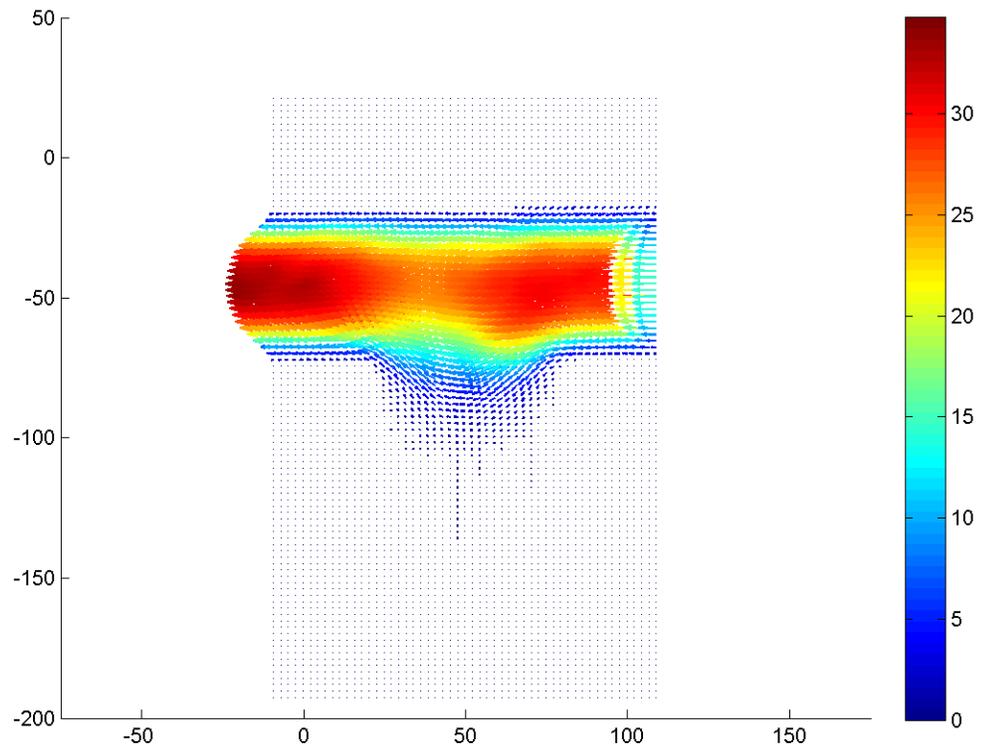


Figure F.341: Velocity field during phase increment 38 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

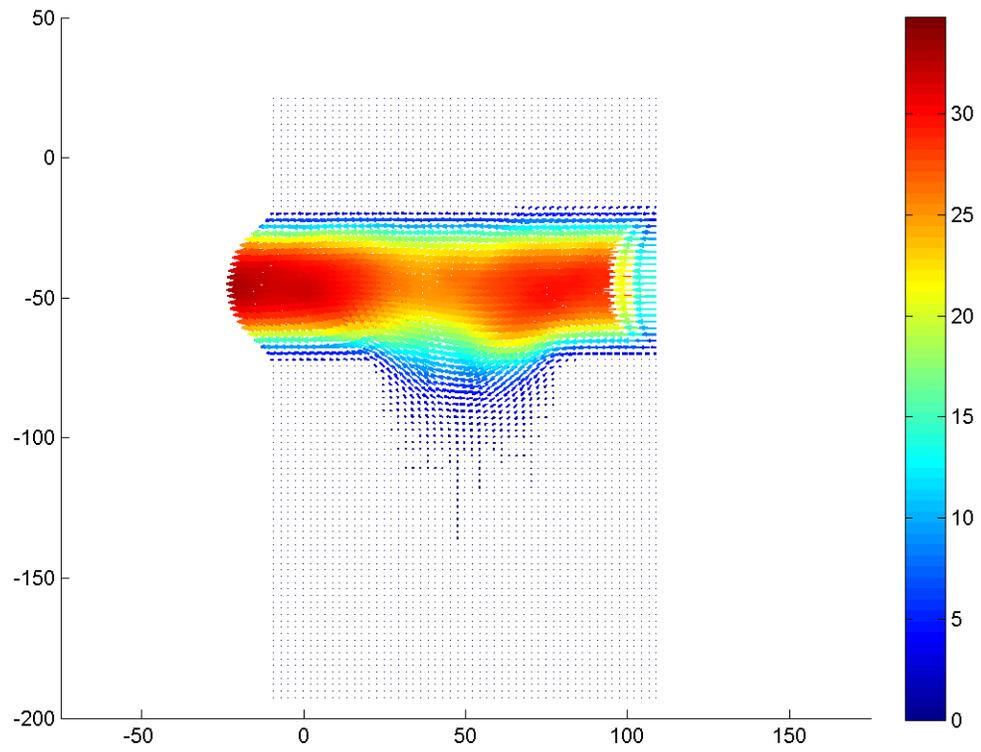


Figure F.342: Velocity field during phase increment 39 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

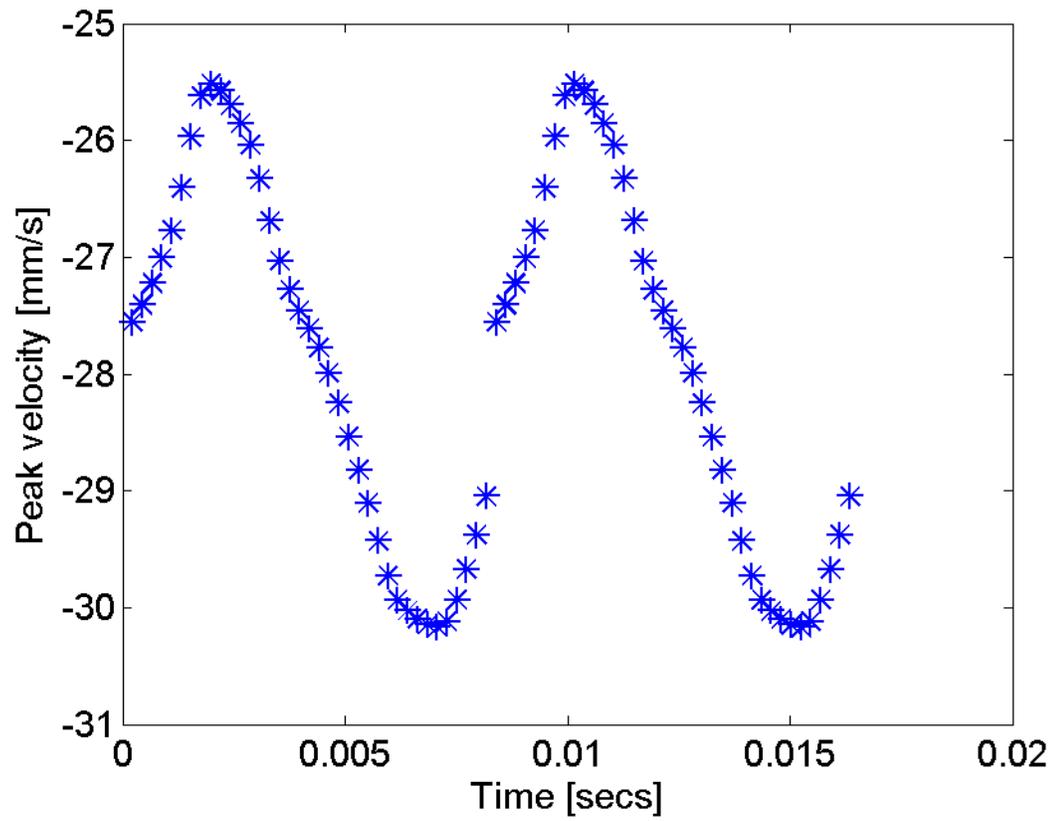


Figure F.343: The peak velocity in the free stream region in time at 113.14 Hz with an amplitude of 0.2 mm.

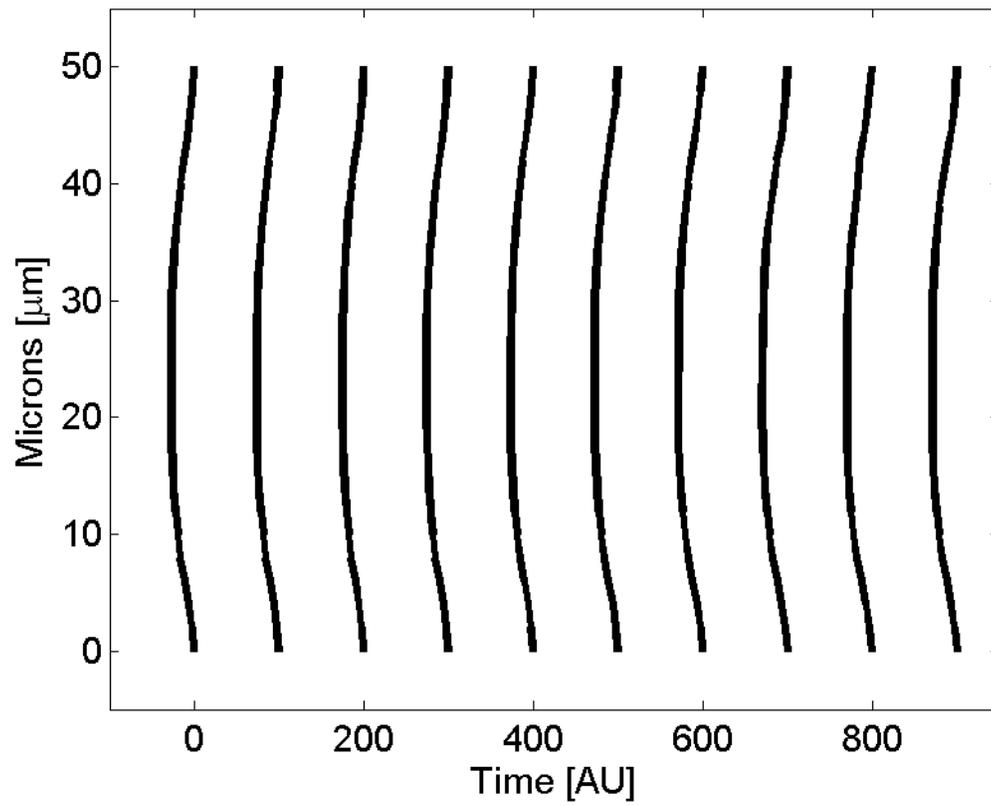


Figure F.344: The velocity profile in the free stream versus time at 113.14 Hz with an amplitude of 0.2 mm.

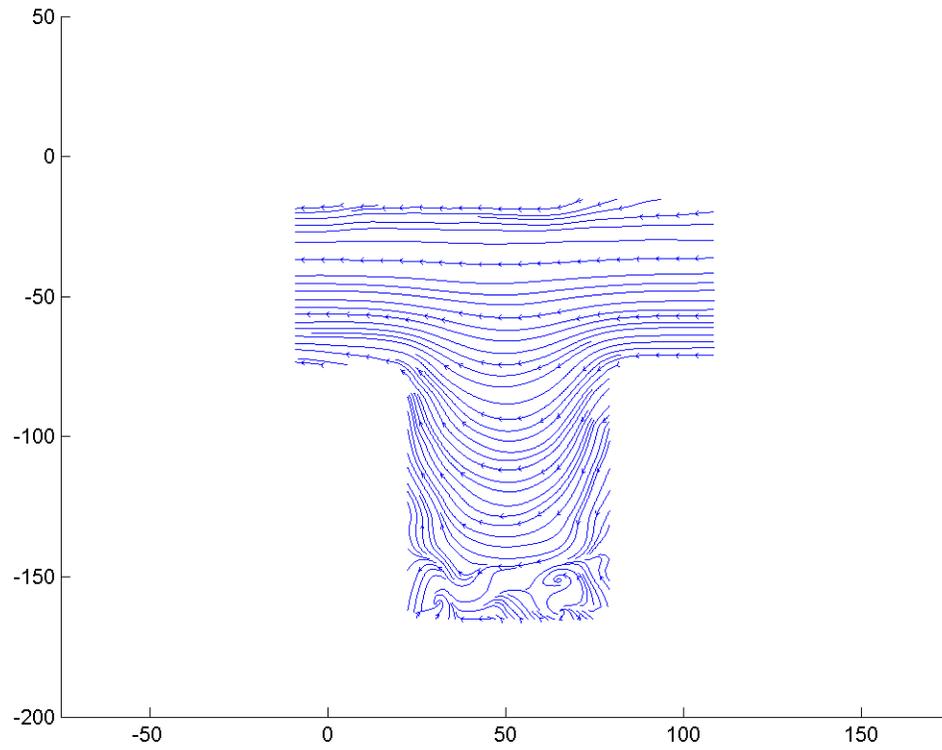
F.4.2 Streamline images at 113.14 Hz with an amplitude of 0.2 mm

Figure F.345: Streamline image during phase increment 1 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

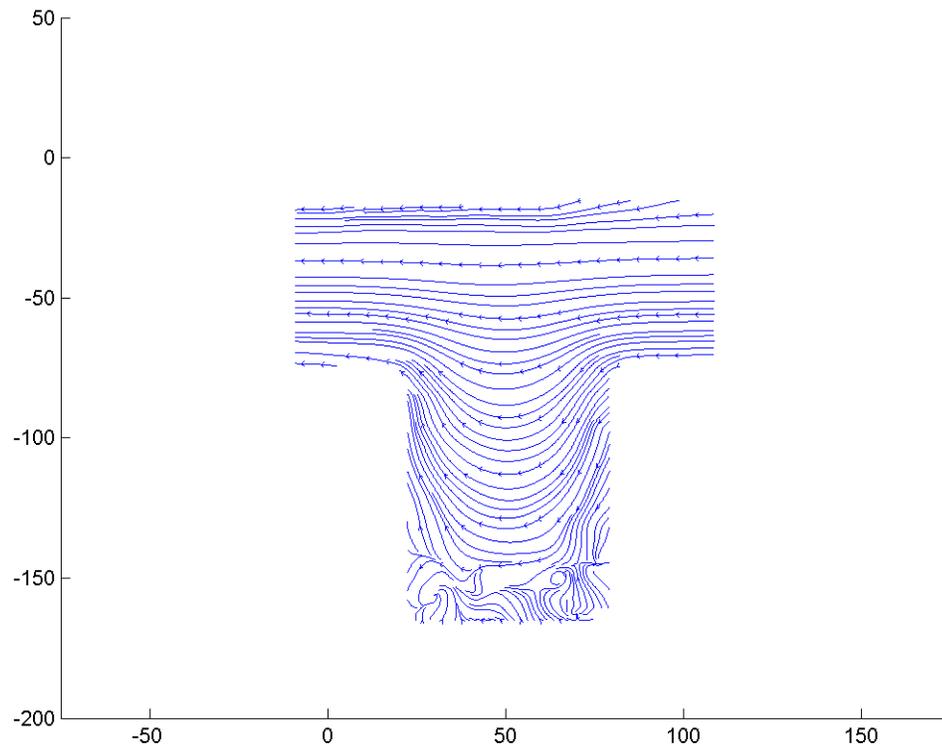


Figure F.346: Streamline image during phase increment 2 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

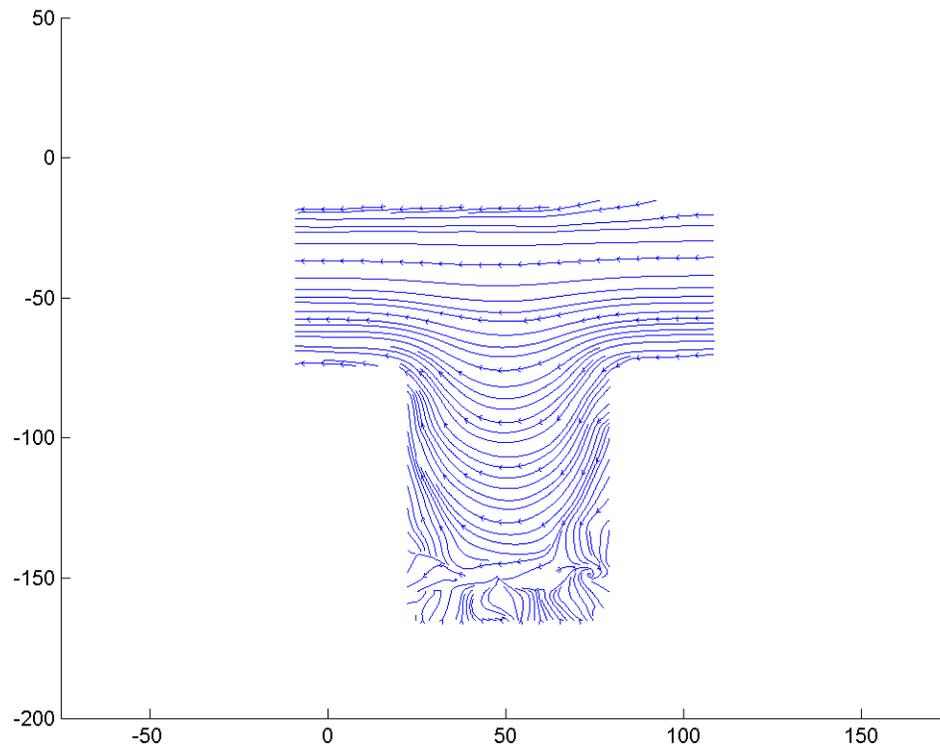


Figure F.347: Streamline image during phase increment 3 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

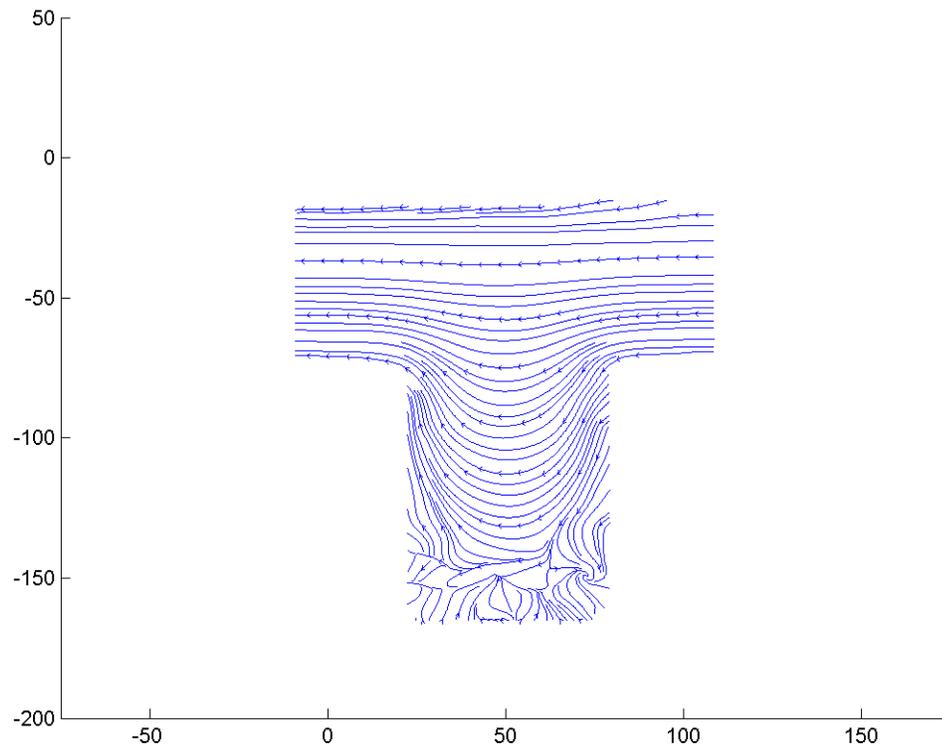


Figure F.348: Streamline image during phase increment 4 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

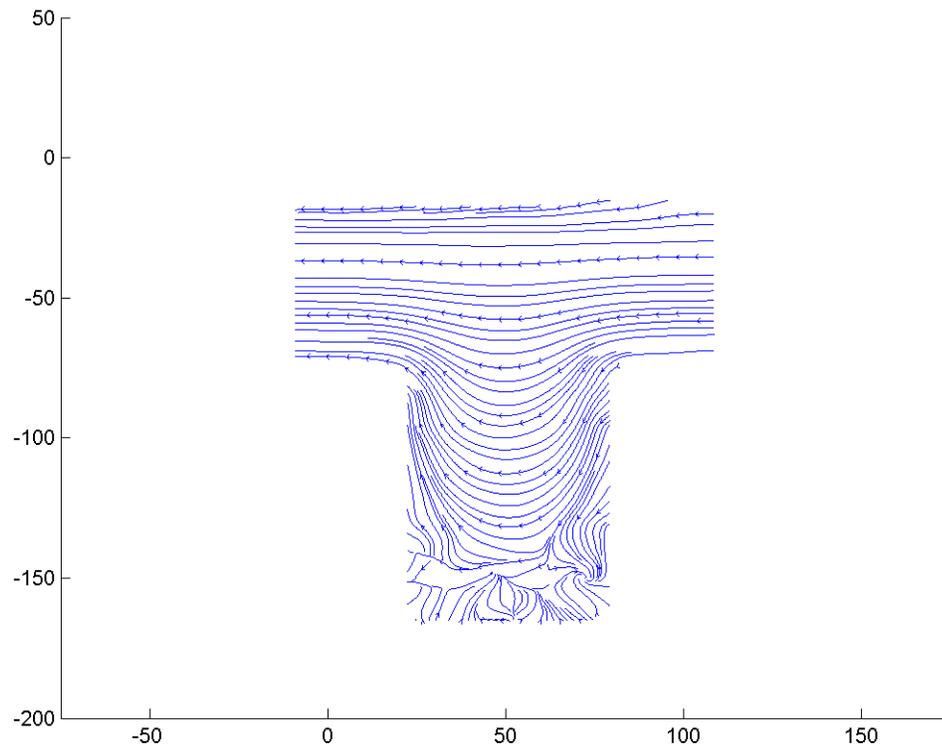


Figure F.349: Streamline image during phase increment 5 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

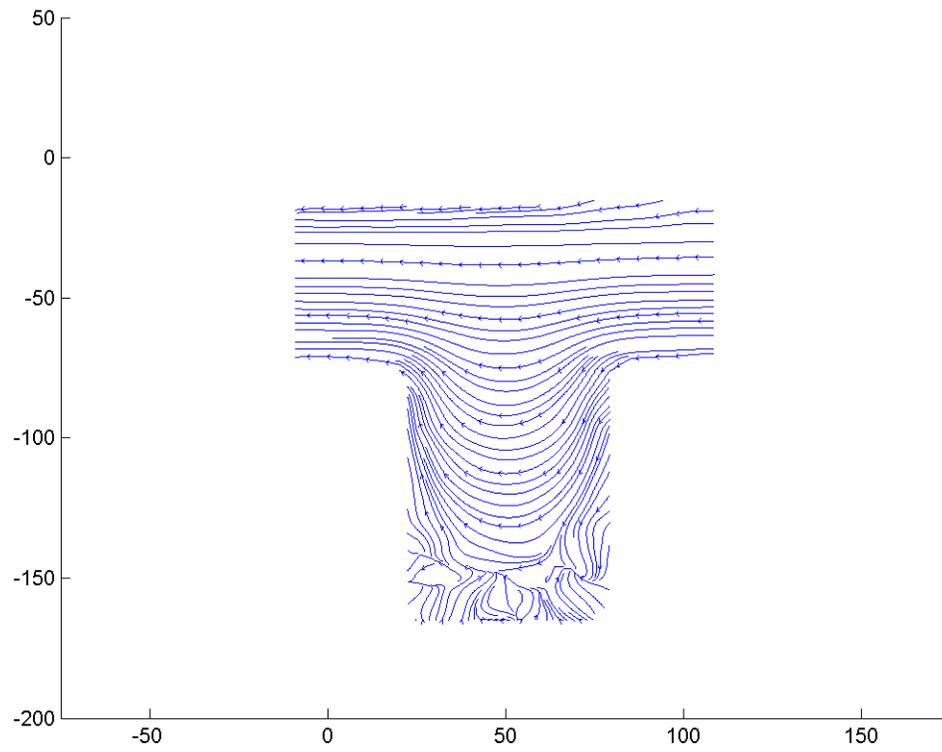


Figure F.350: Streamline image during phase increment 6 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

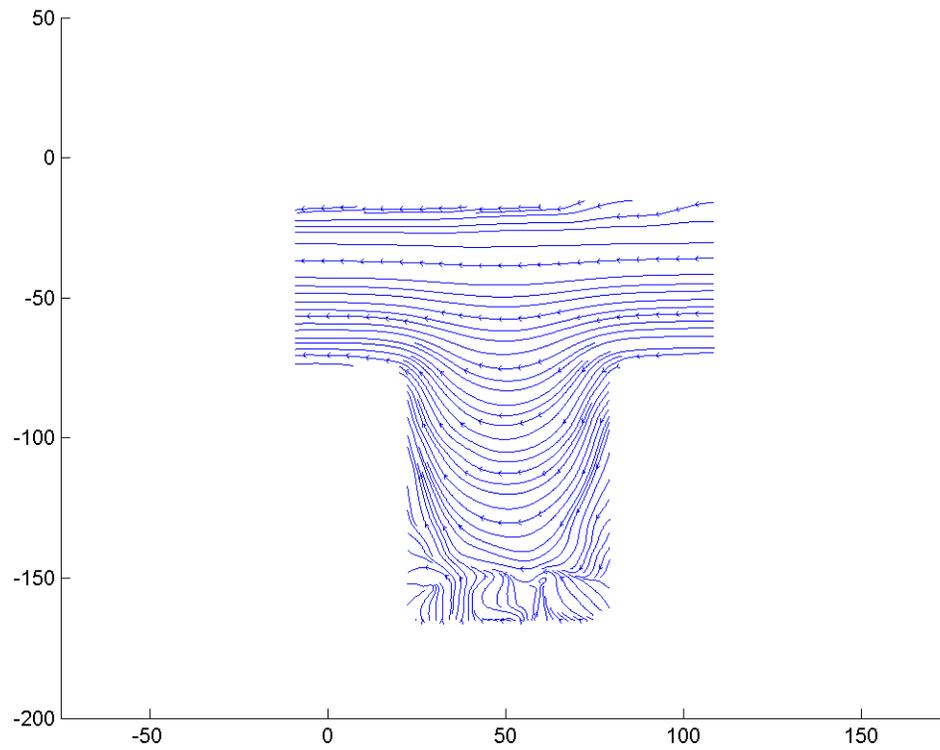


Figure F.351: Streamline image during phase increment 7 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

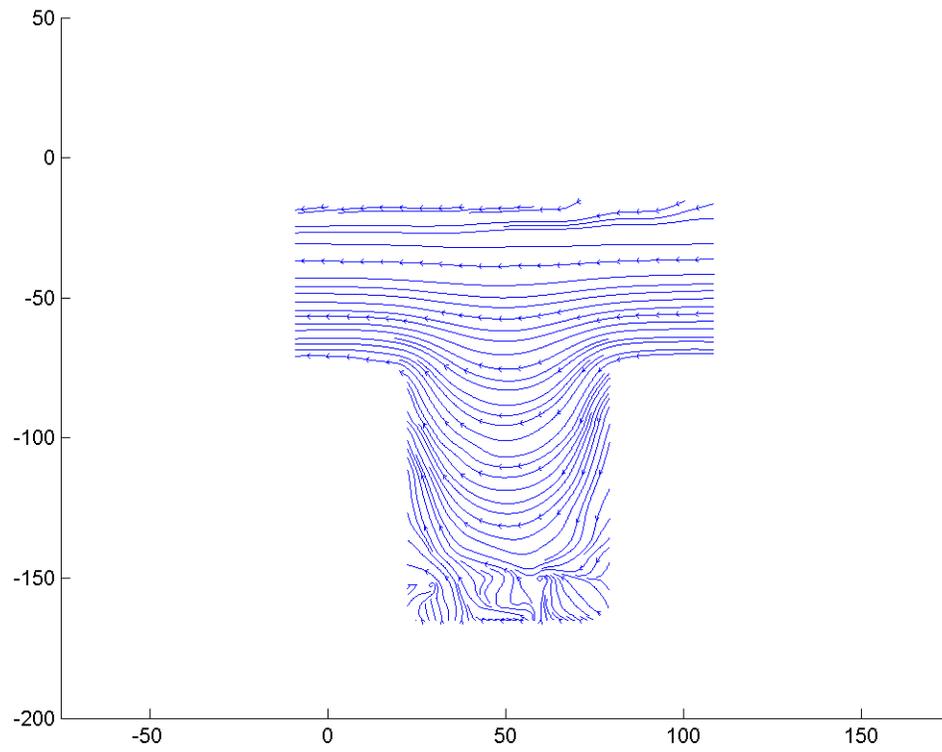


Figure F.352: Streamline image during phase increment 8 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

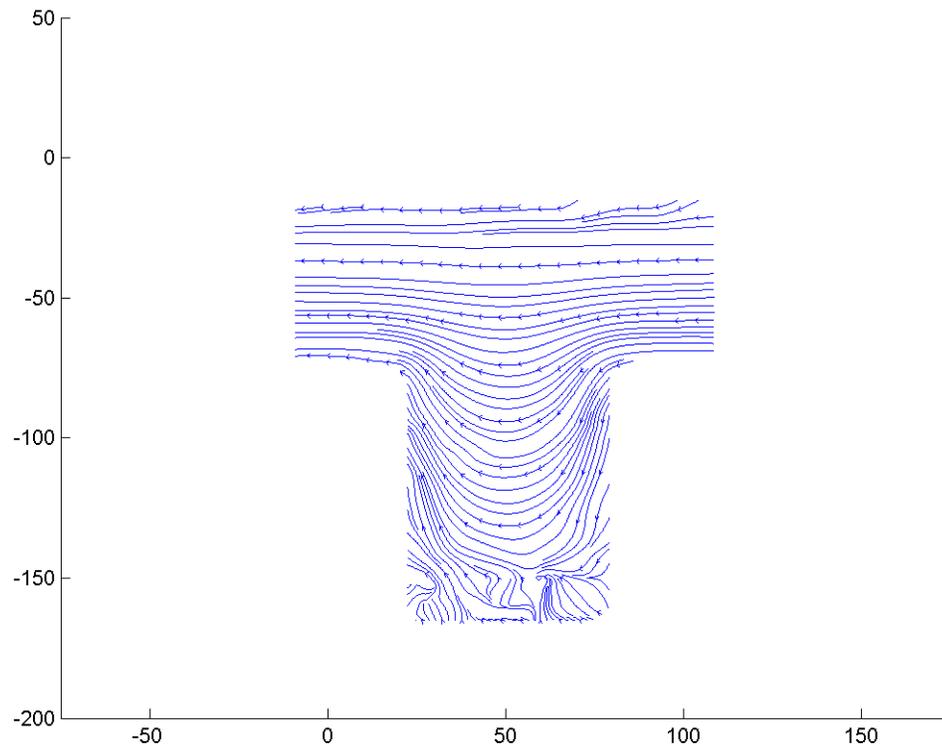


Figure F.353: Streamline image during phase increment 9 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

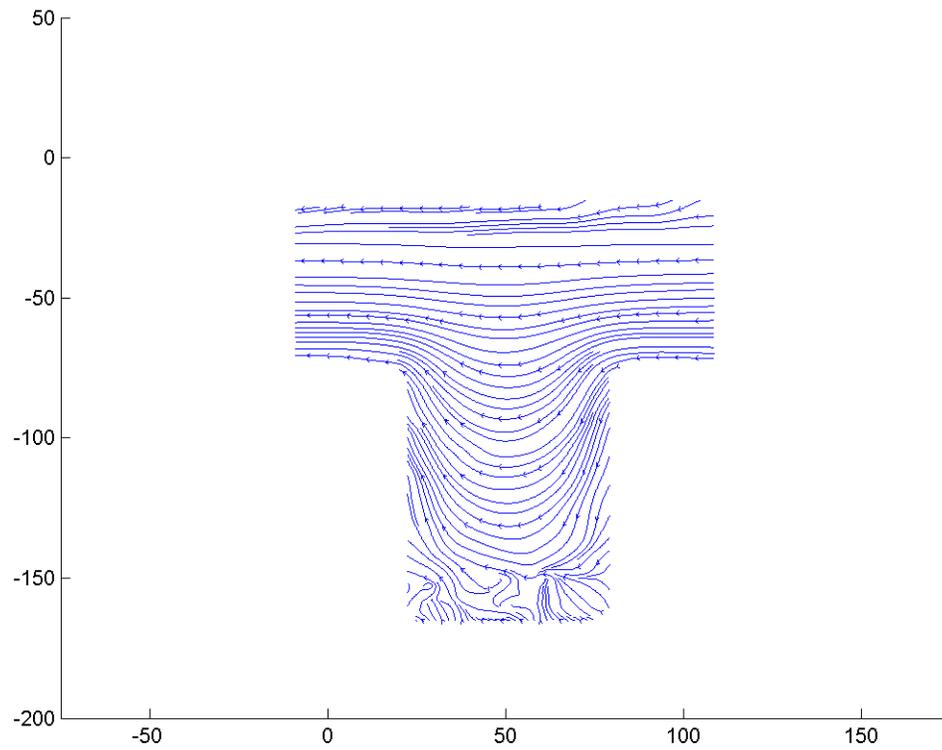


Figure F.354: Streamline image during phase increment 10 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

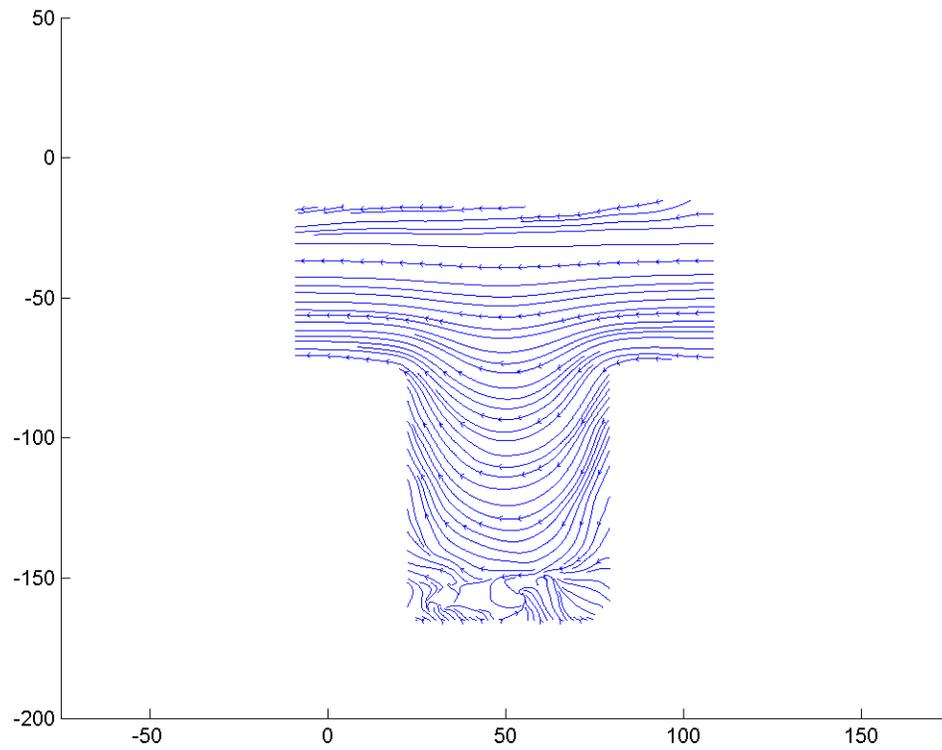


Figure F.355: Streamline image during phase increment 11 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

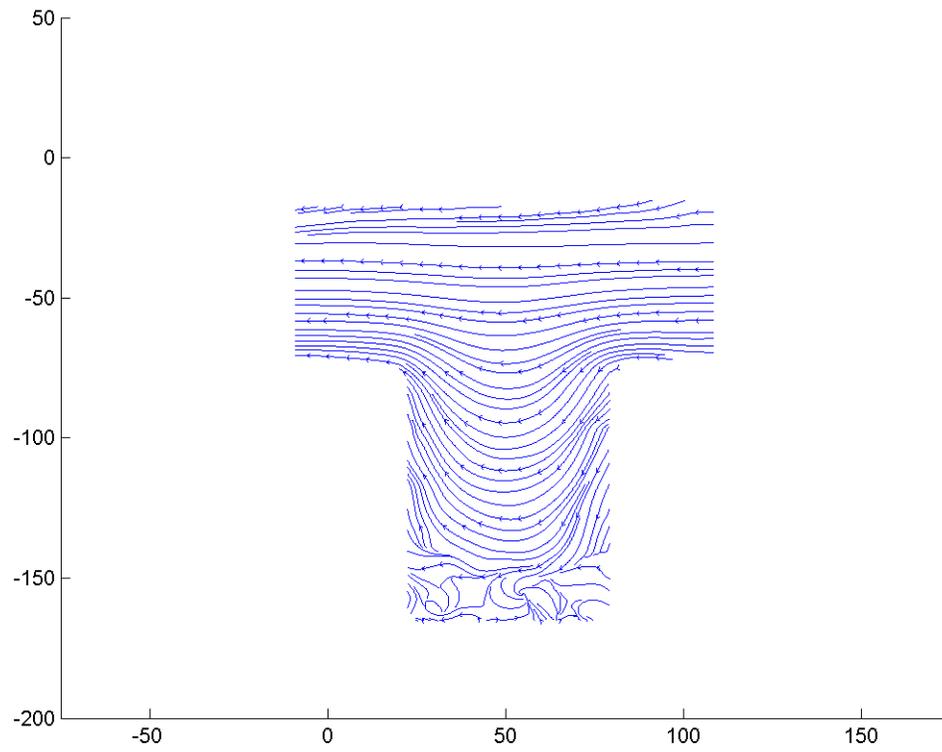


Figure F.356: Streamline image during phase increment 12 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

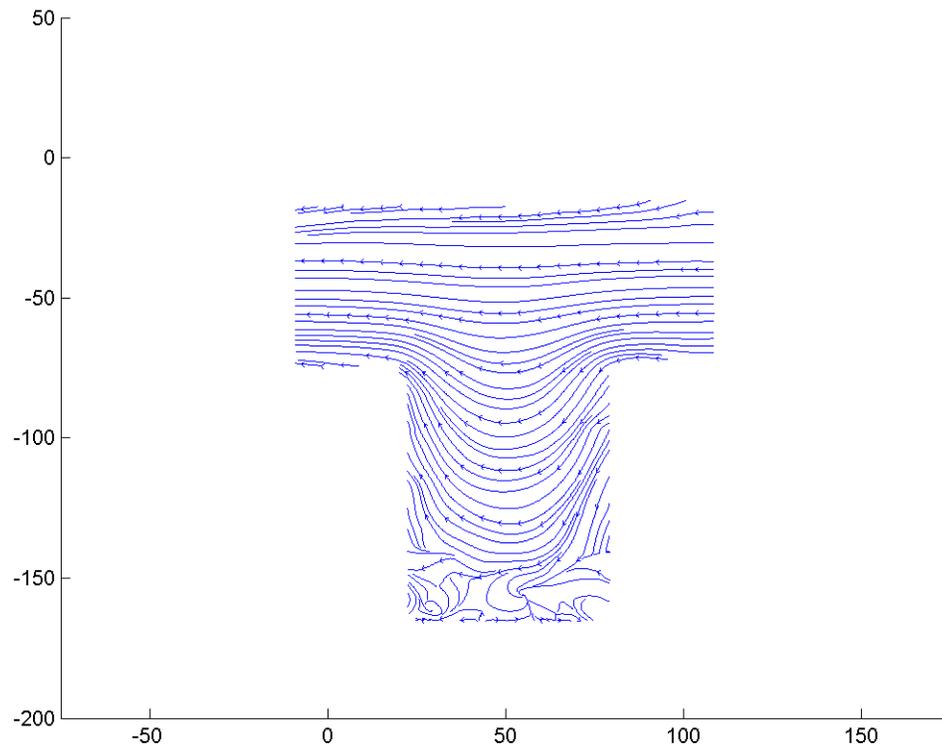


Figure F.357: Streamline image during phase increment 13 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

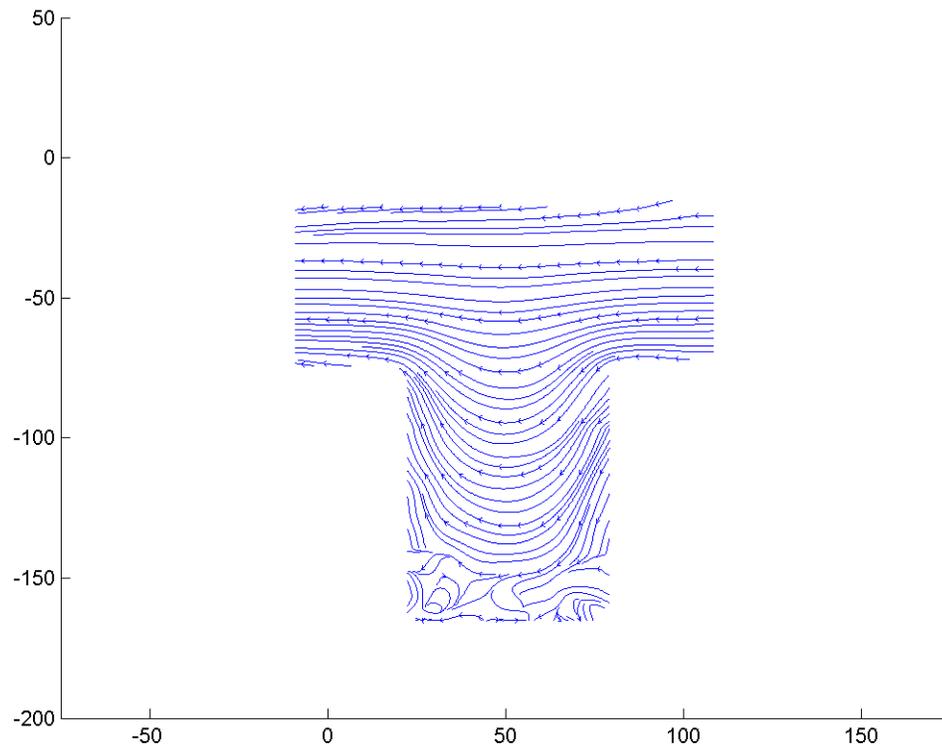


Figure F.358: Streamline image during phase increment 14 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

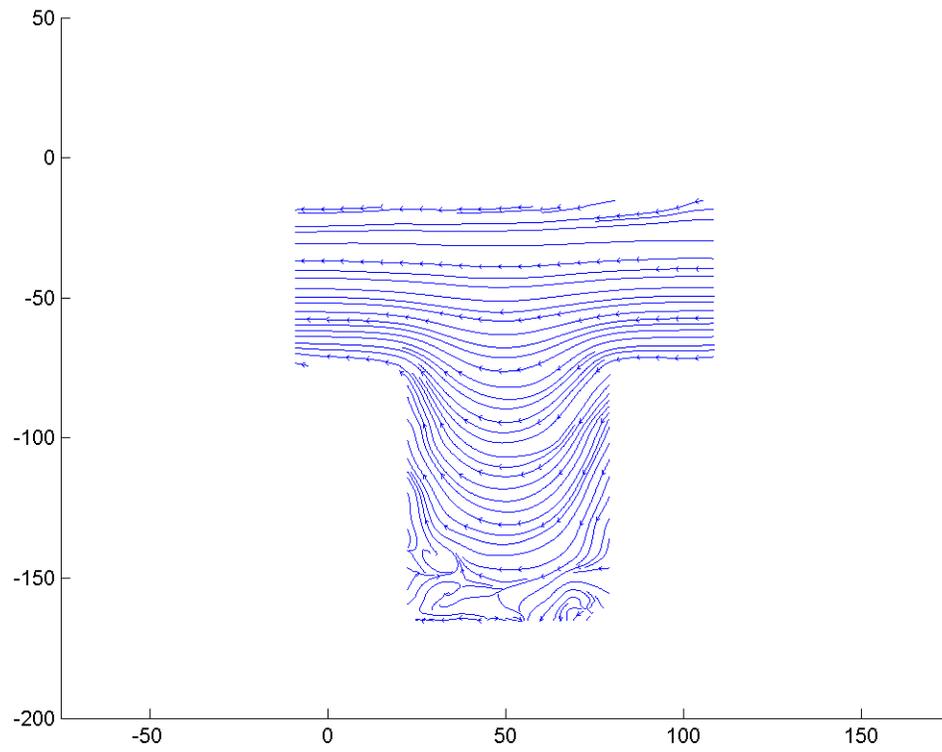


Figure F.359: Streamline image during phase increment 15 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

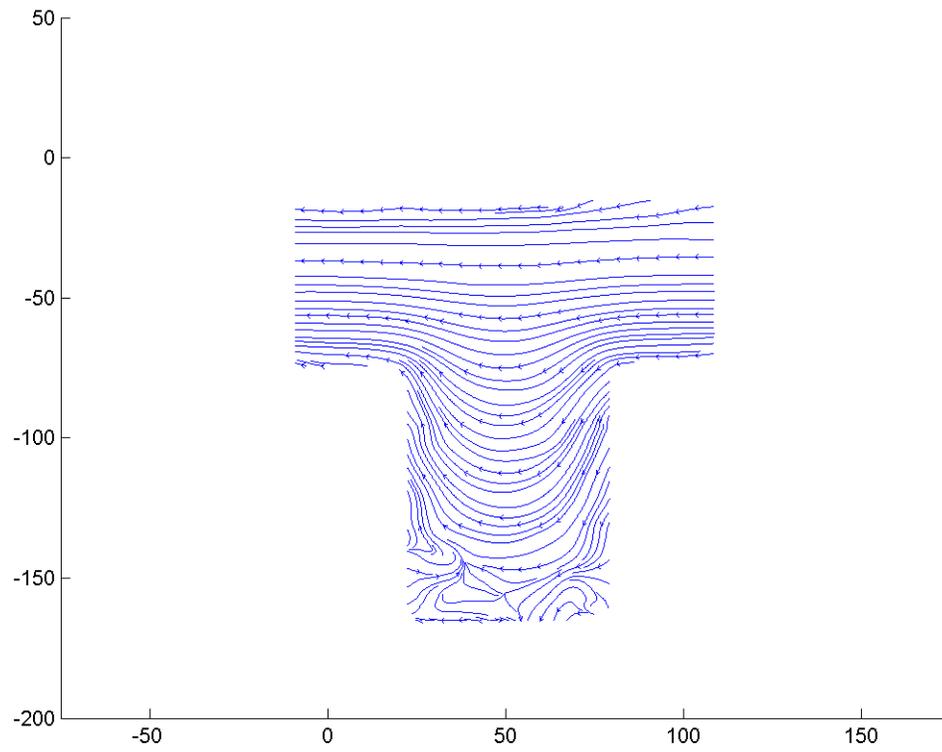


Figure F.360: Streamline image during phase increment 16 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

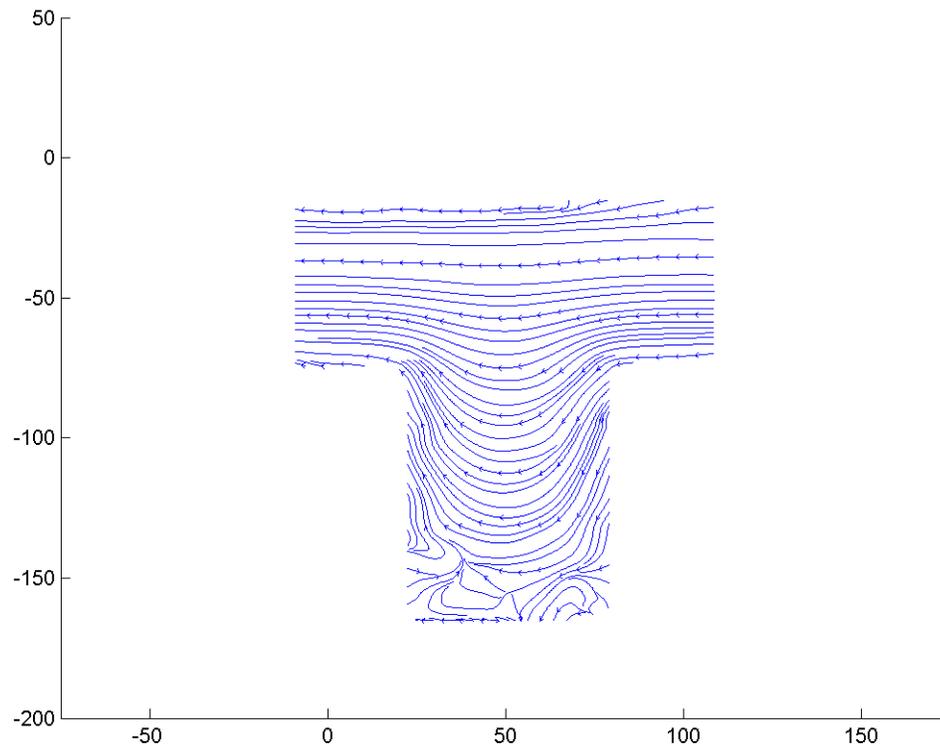


Figure F.361: Streamline image during phase increment 17 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

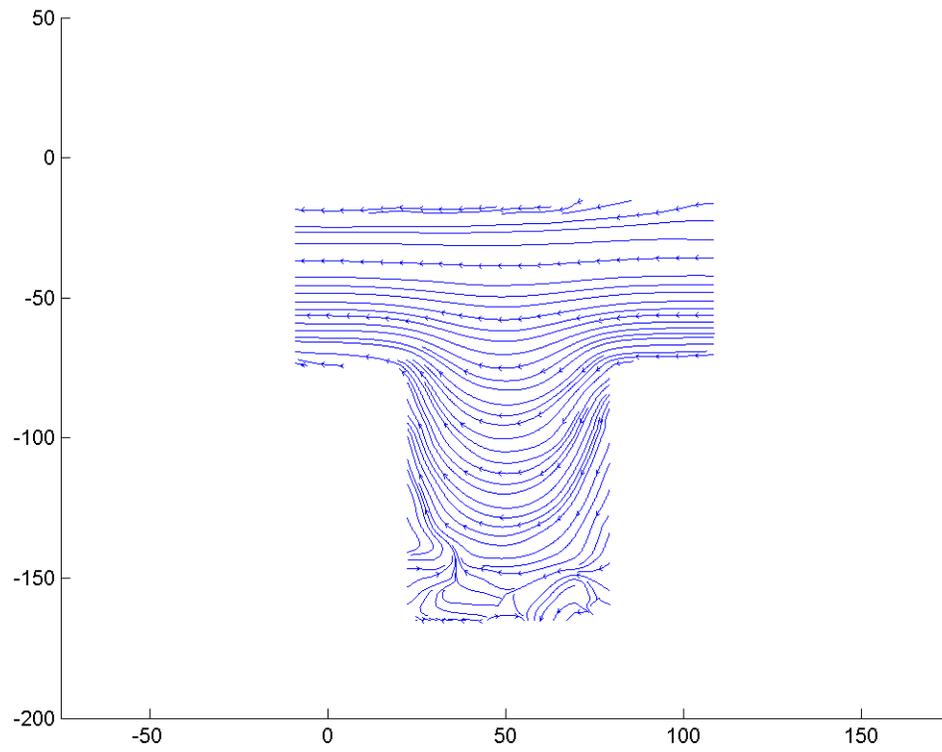


Figure F.362: Streamline image during phase increment 18 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

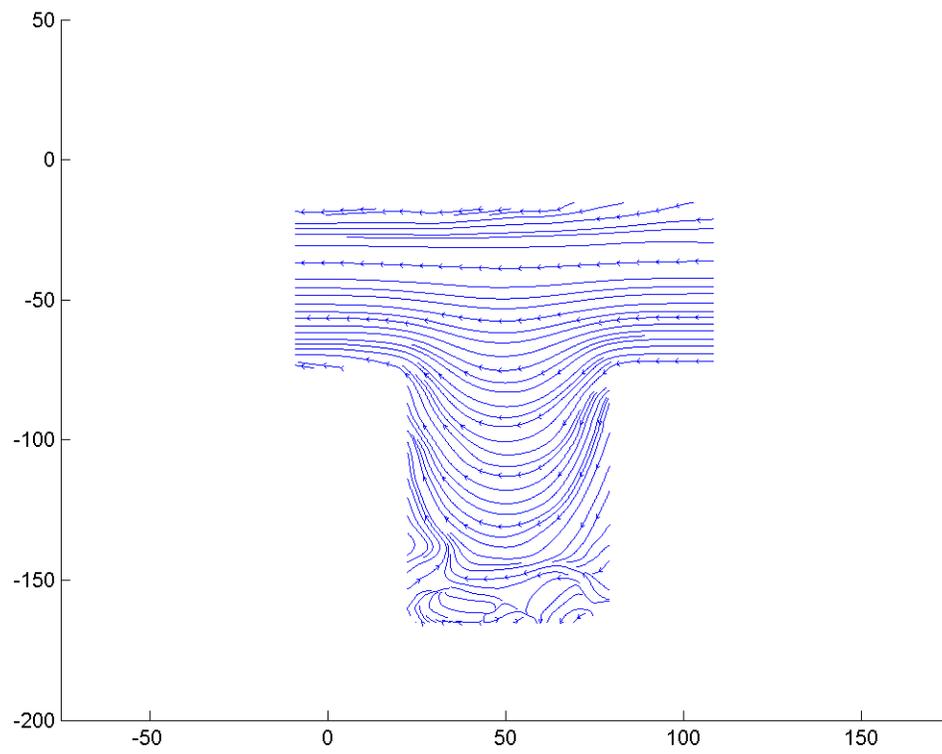


Figure F.363: Streamline image during phase increment 18 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

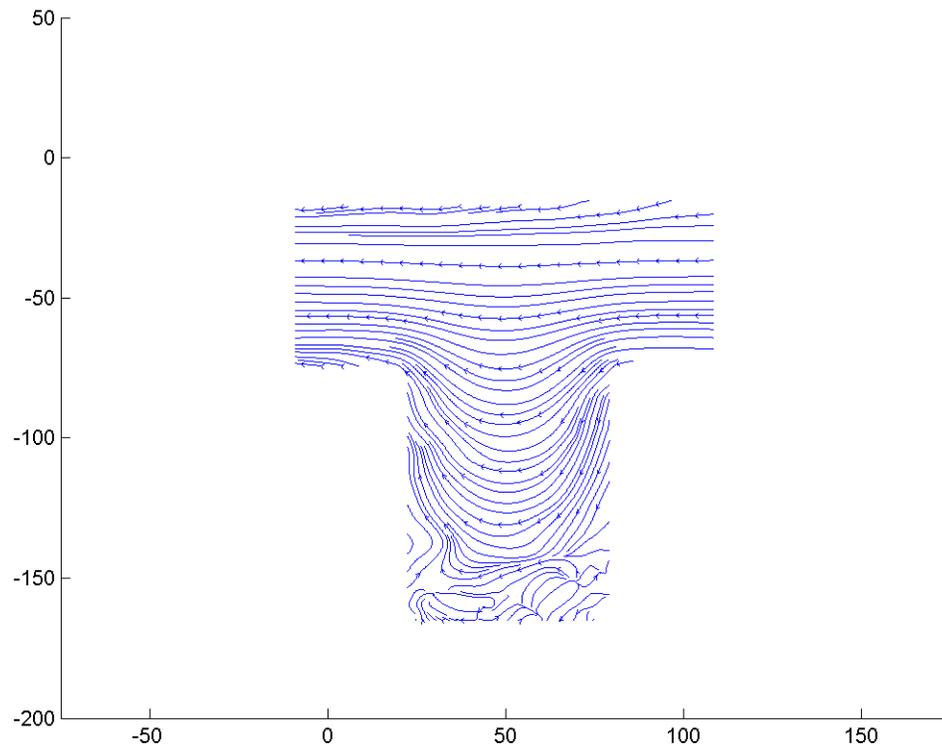


Figure F.364: Streamline image during phase increment 20 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

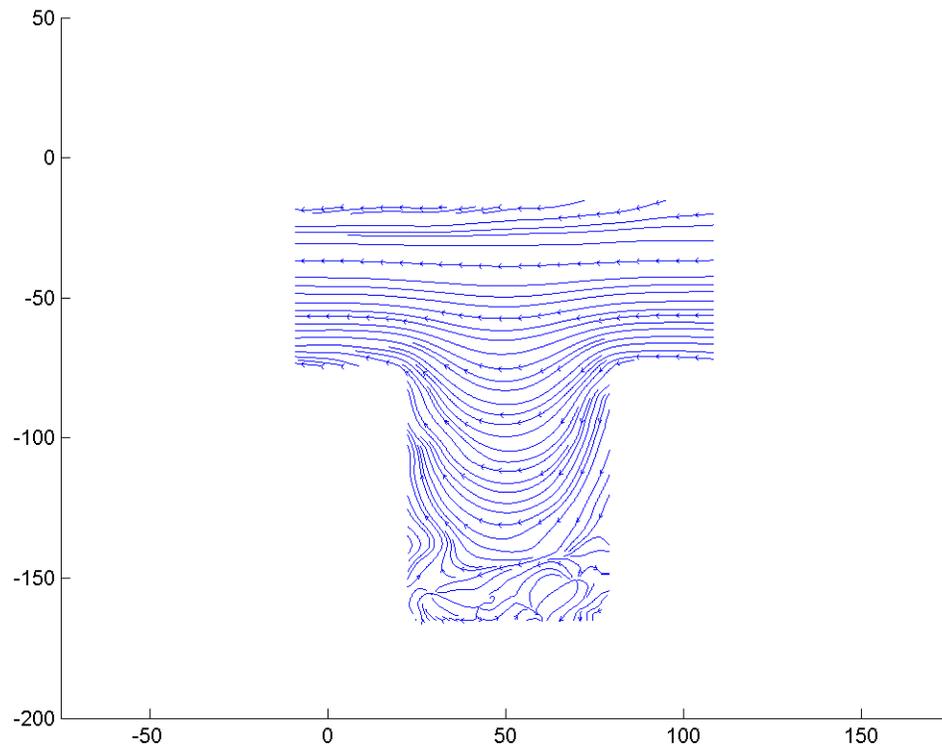


Figure F.365: Streamline image during phase increment 21 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

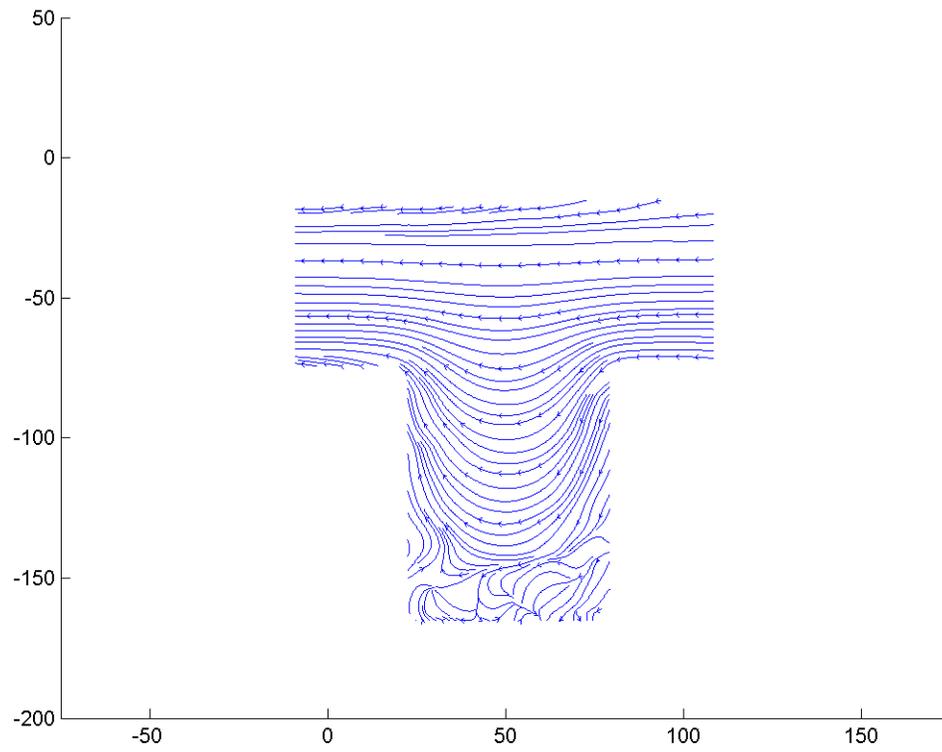


Figure F.366: Streamline image during phase increment 22 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

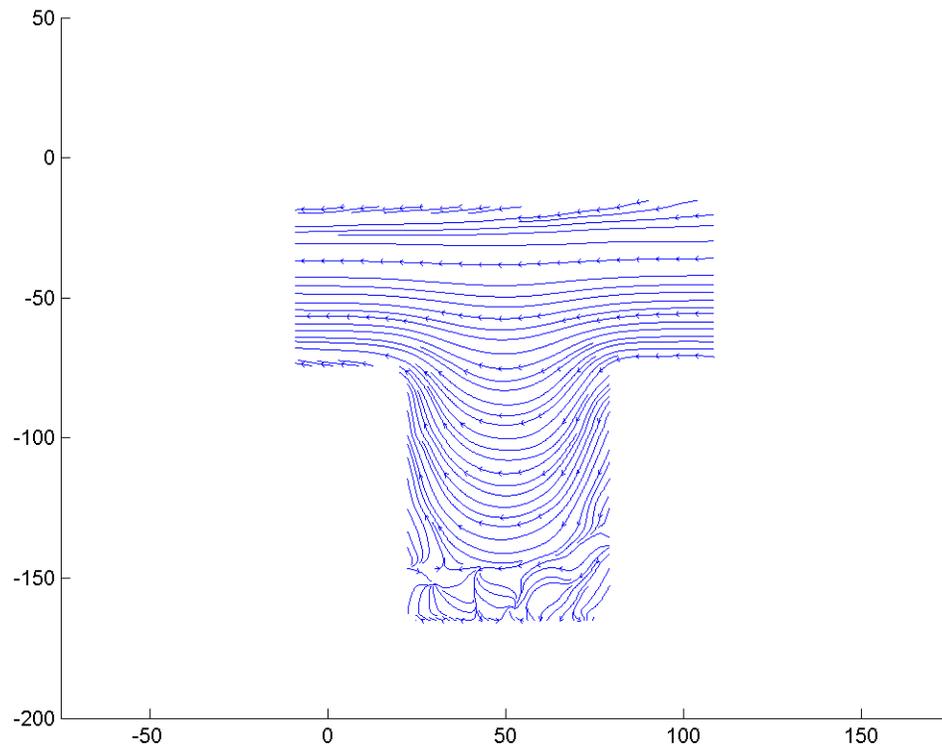


Figure F.367: Streamline image during phase increment 23 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

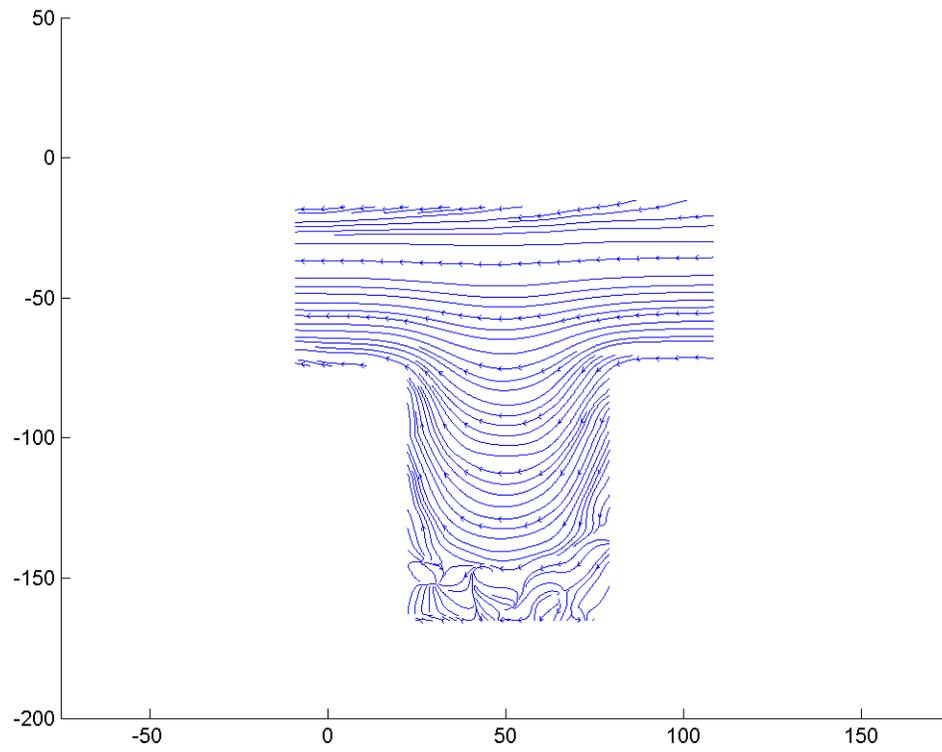


Figure F.368: Streamline image during phase increment 24 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

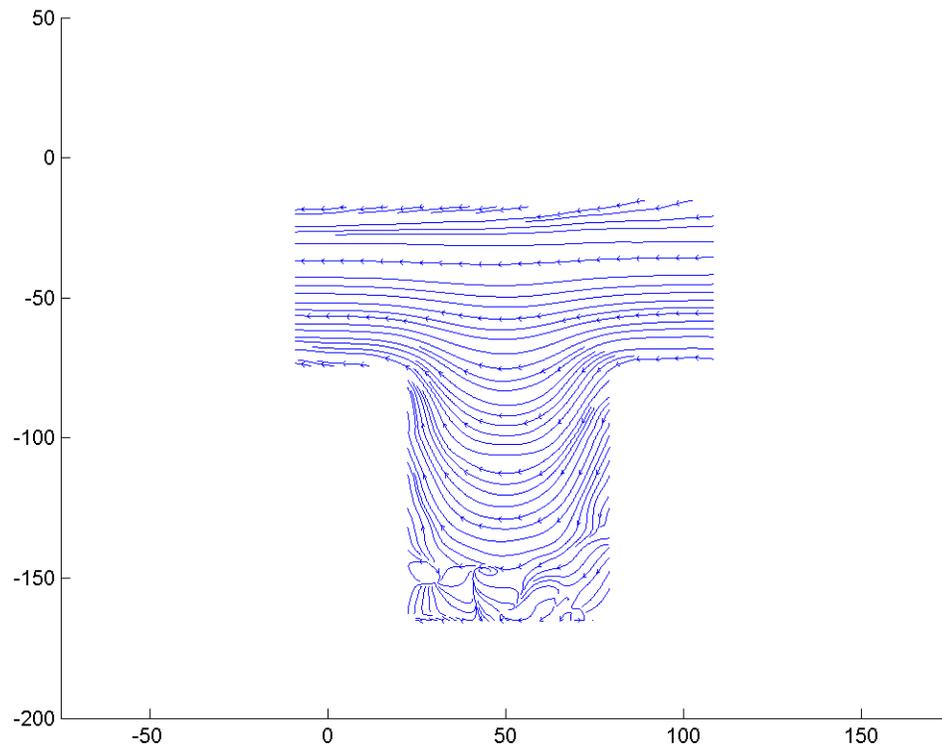


Figure F.369: Streamline image during phase increment 25 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

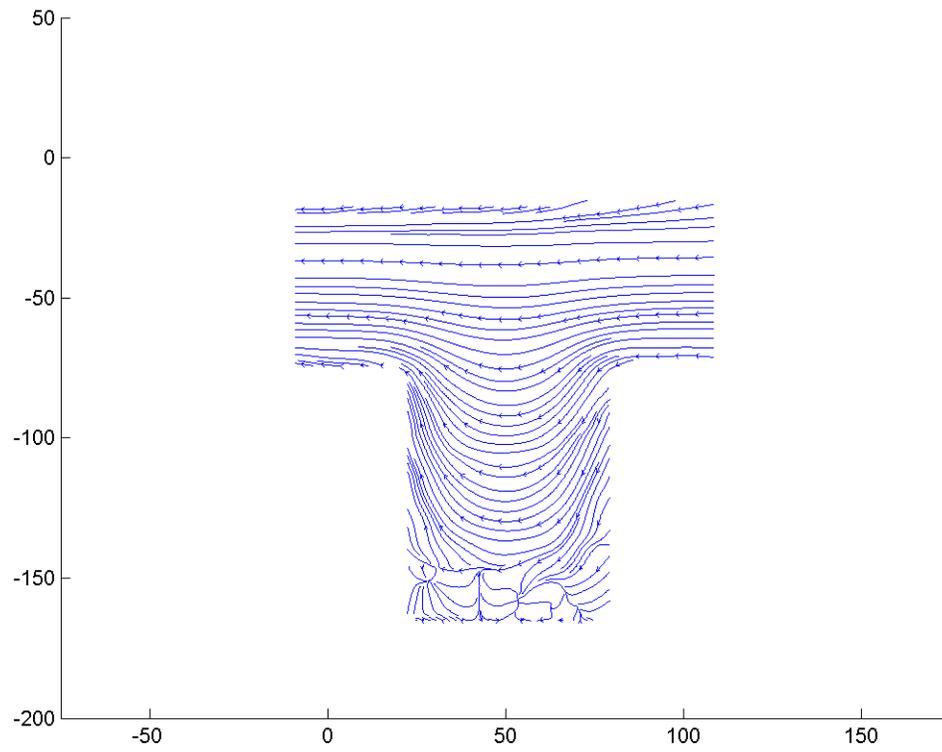


Figure F.370: Streamline image during phase increment 26 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

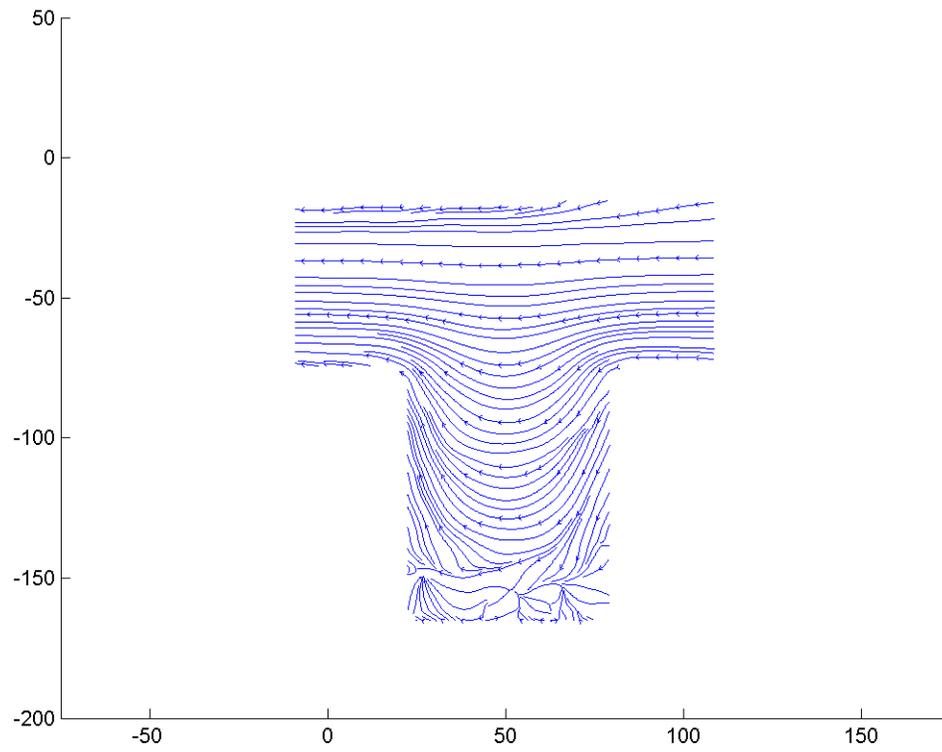


Figure F.371: Streamline image during phase increment 27 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

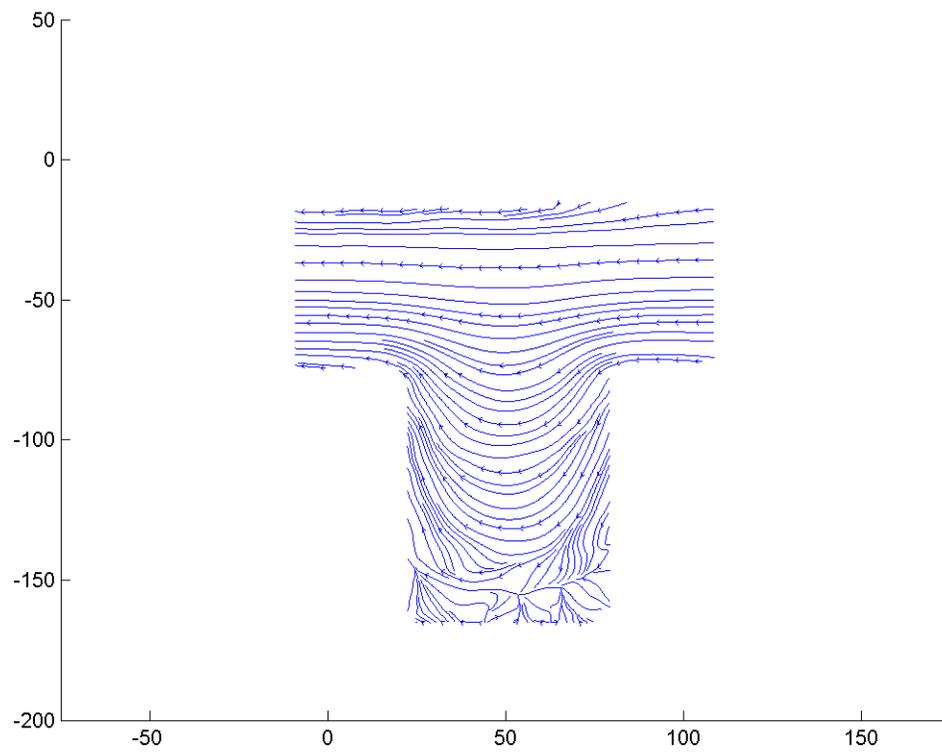


Figure F.372: Streamline image during phase increment 28 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

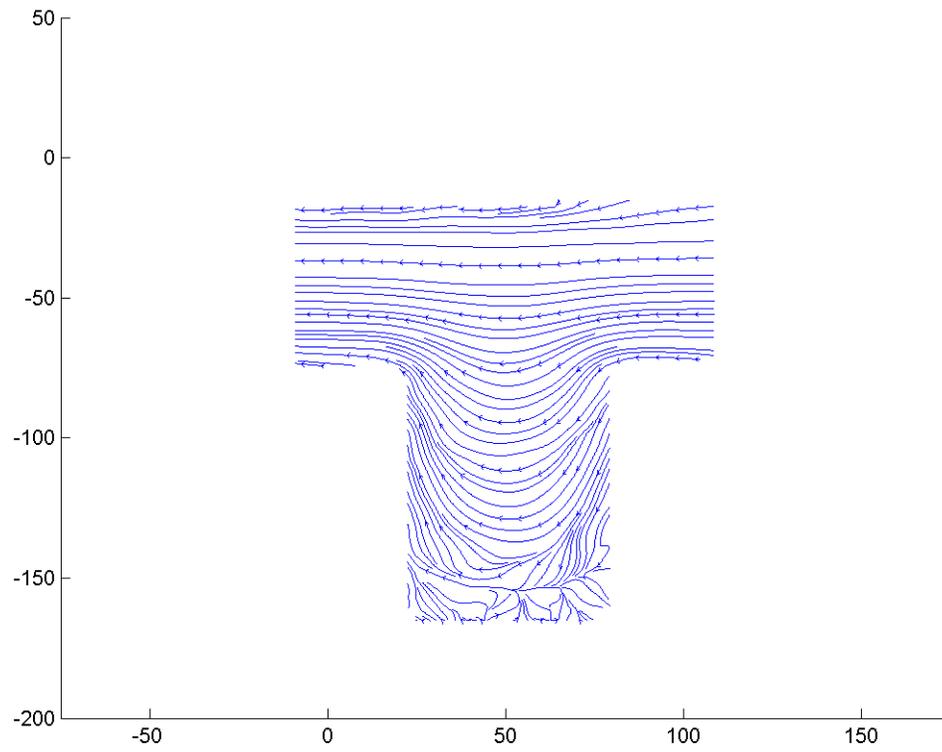


Figure F.373: Streamline image during phase increment 29 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

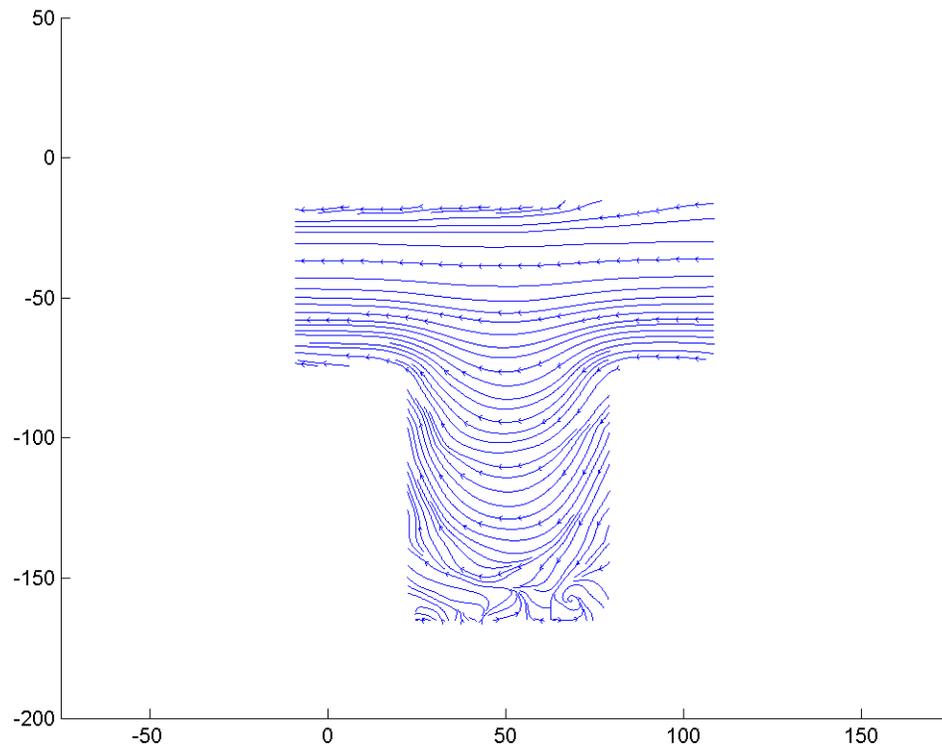


Figure F.374: Streamline image during phase increment 30 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

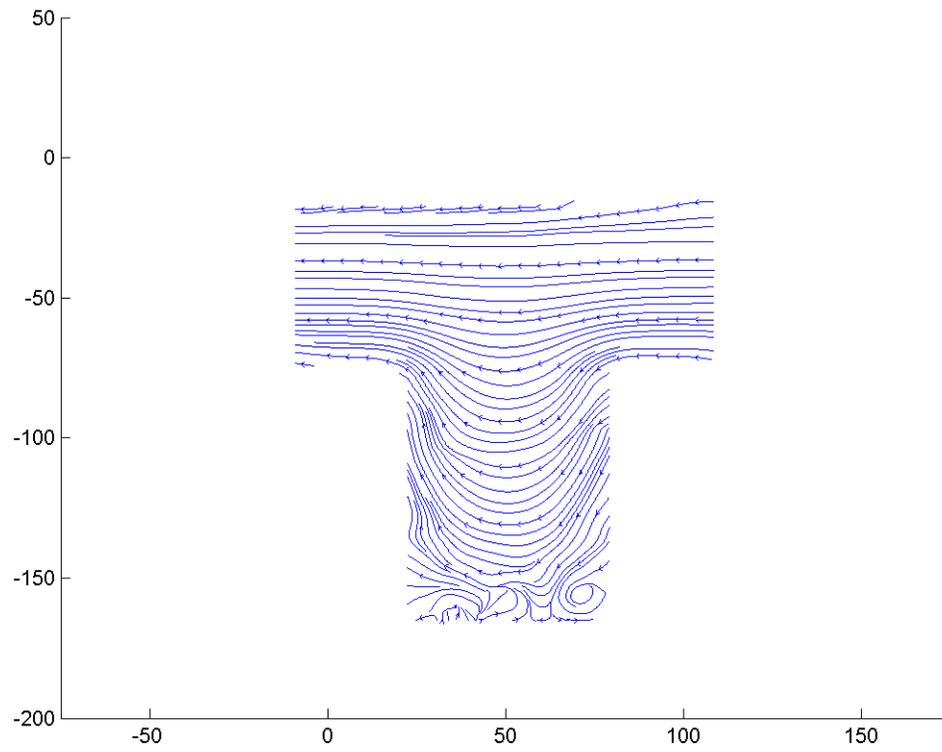


Figure F.375: Streamline image during phase increment 31 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

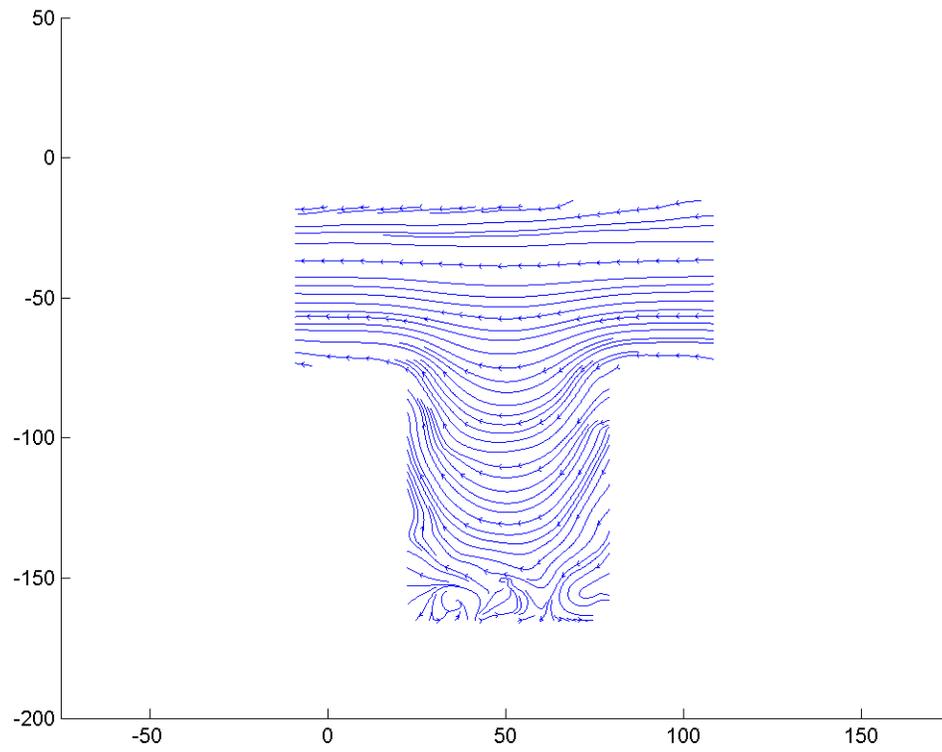


Figure F.376: Streamline image during phase increment 32 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

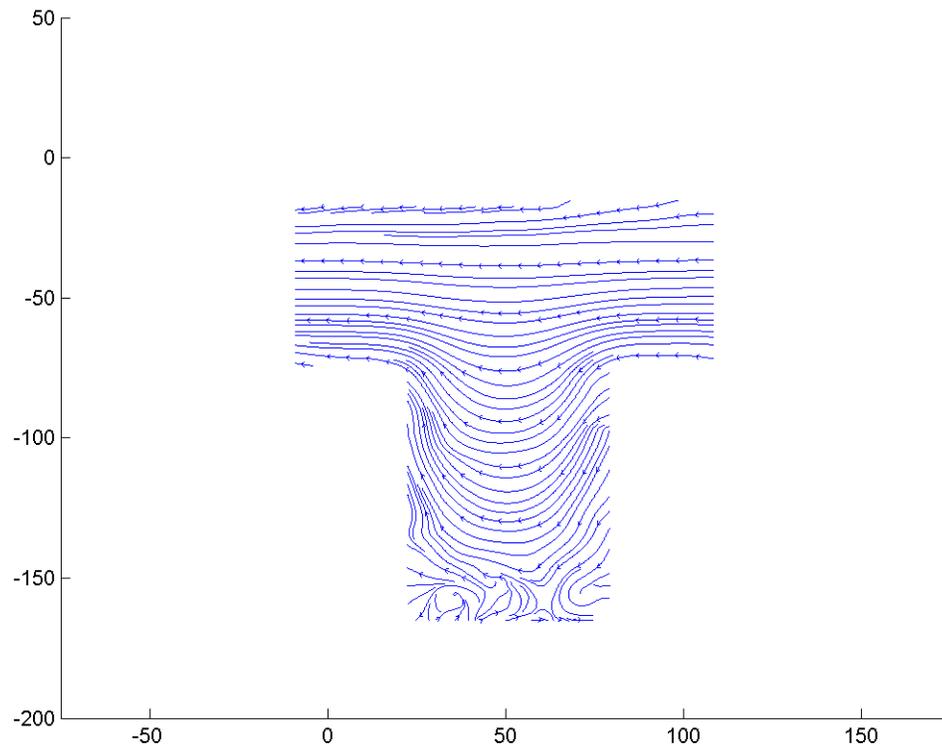


Figure F.377: Streamline image during phase increment 33 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

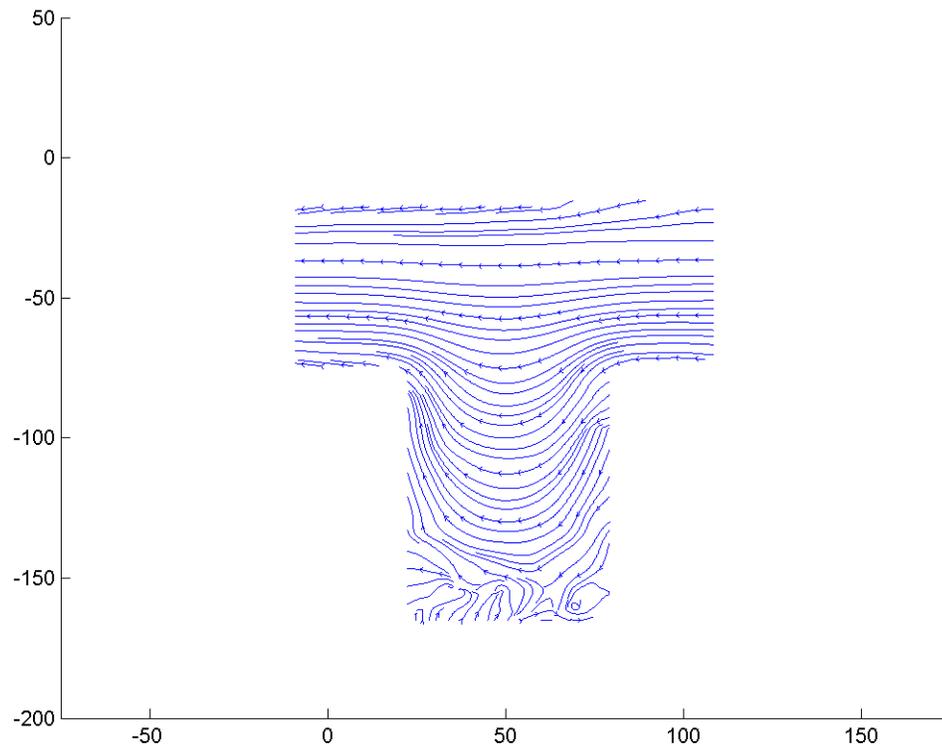


Figure F.378: Streamline image during phase increment 34 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

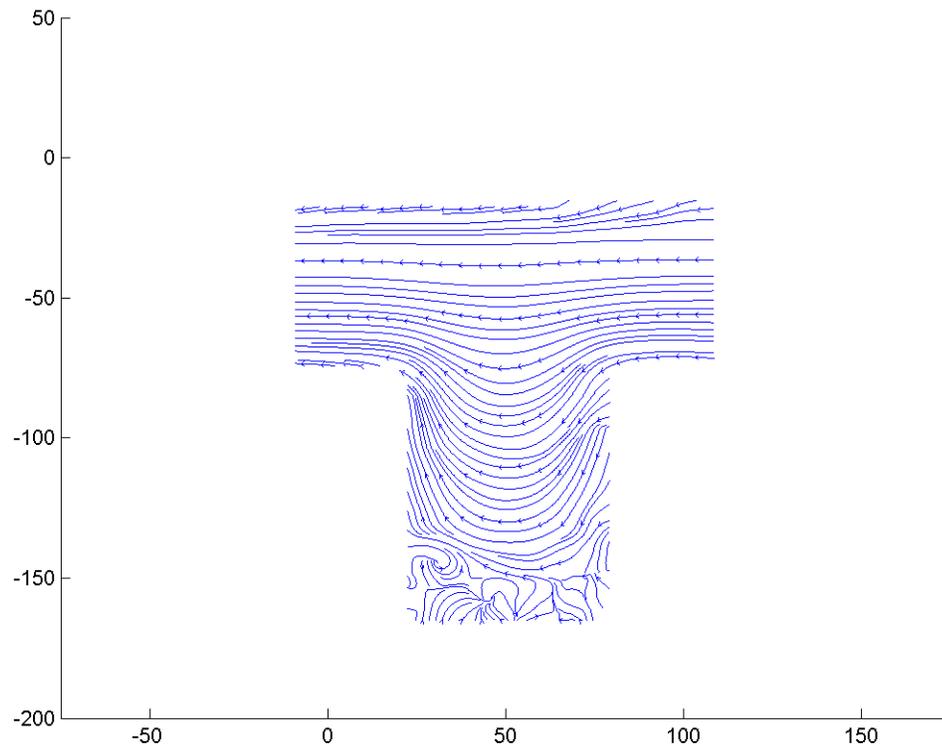


Figure F.379: Streamline image during phase increment 35 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

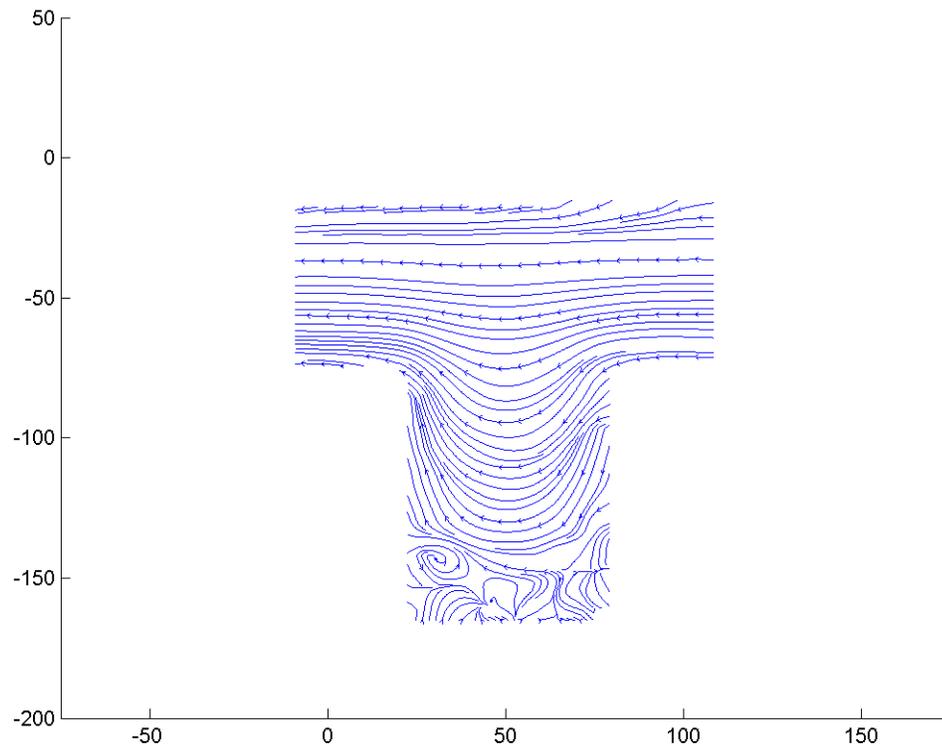


Figure F.380: Streamline image during phase increment 36 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

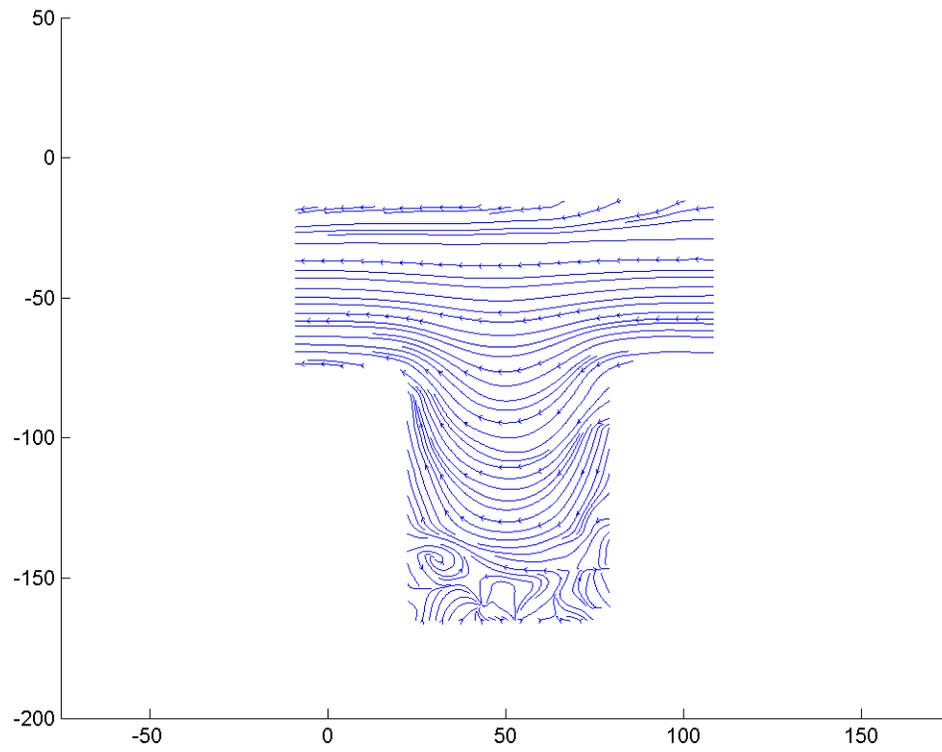


Figure F.381: Streamline image during phase increment 37 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

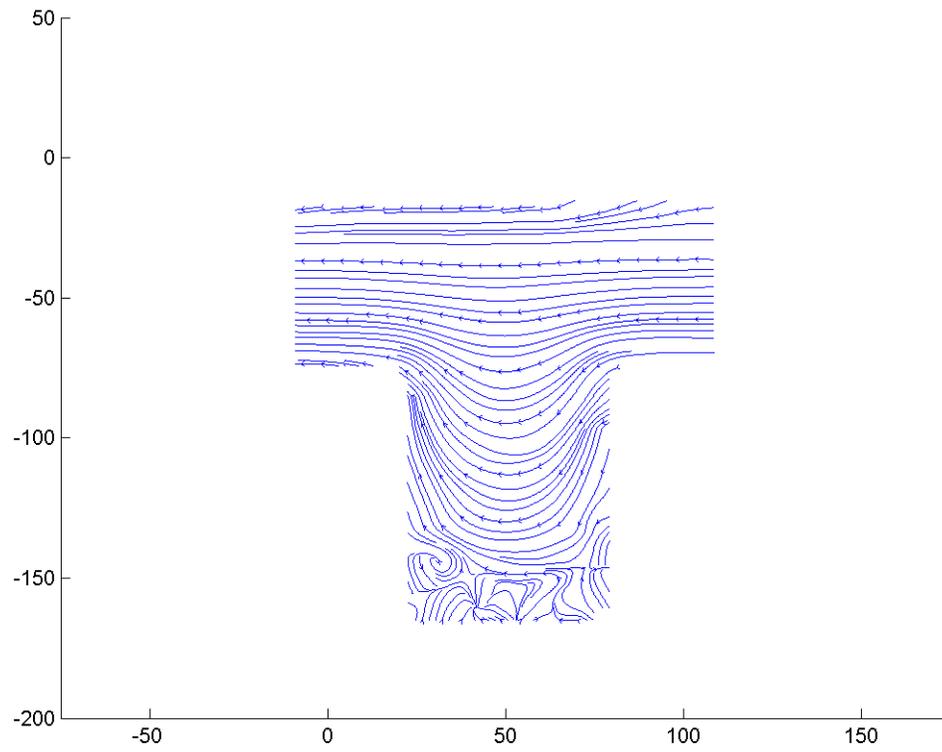


Figure F.382: Streamline image during phase increment 38 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

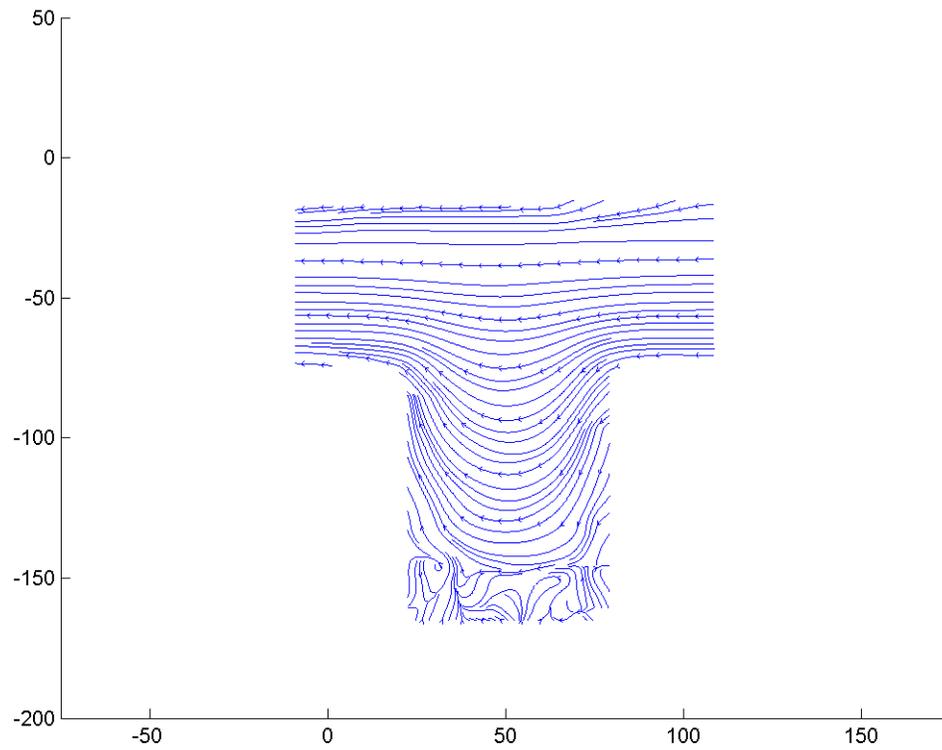


Figure F.383: Streamline image during phase increment 39 at 113.14 Hz with an amplitude of 0.2 mm and a Re of 0.1.

F.4.3 Residence time of particles in the cavity at 113.14 Hz with an amplitude of 0.2 mm

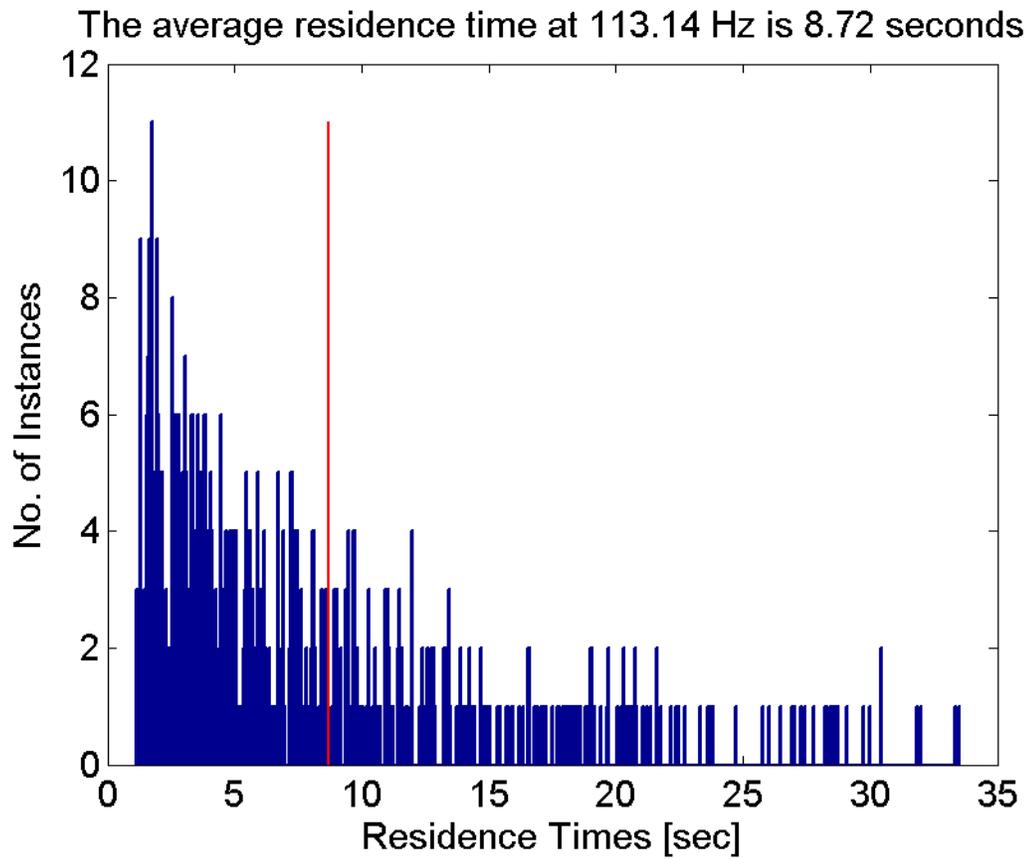


Figure F.384: The residence time distribution for the AR = 0.5 cavity at Re 0.1 at 113.14 Hz. The average residence time is 8.72 secs.

F.4.4 Lagrangian coherent structures at 113.14 Hz with an amplitude of 0.2 mm

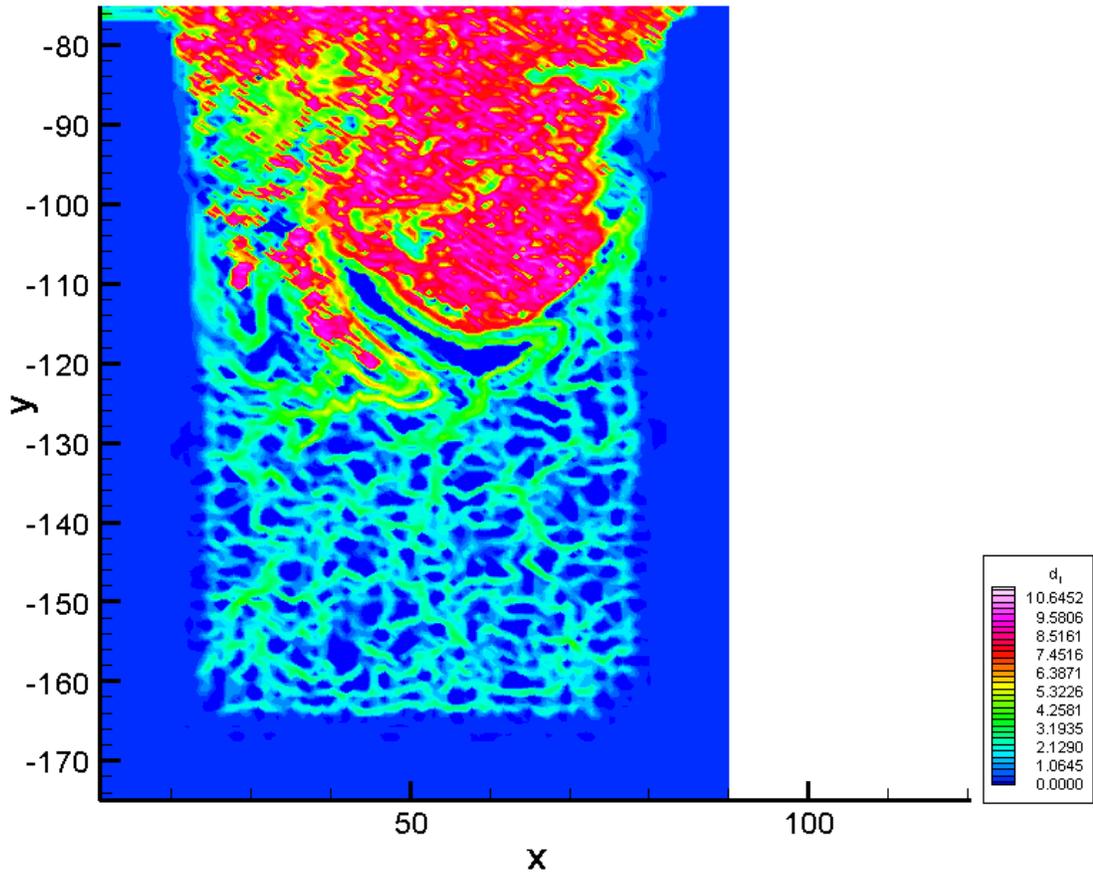


Figure F.385: The backward time LCS during phase increment 1 at 113.14 Hz with an amplitude of 0.2 mm.

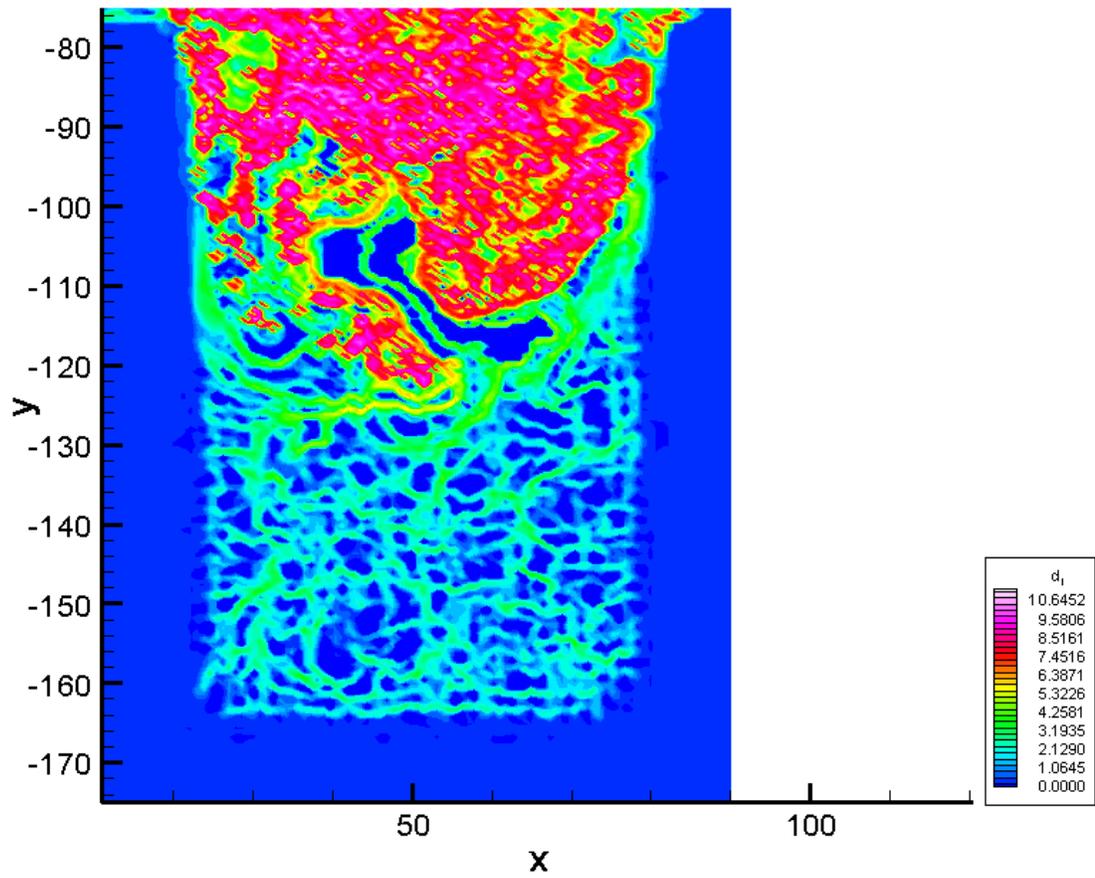


Figure F.386: The backward time LCS during phase increment 2 at 113.14 Hz with an amplitude of 0.2 mm.

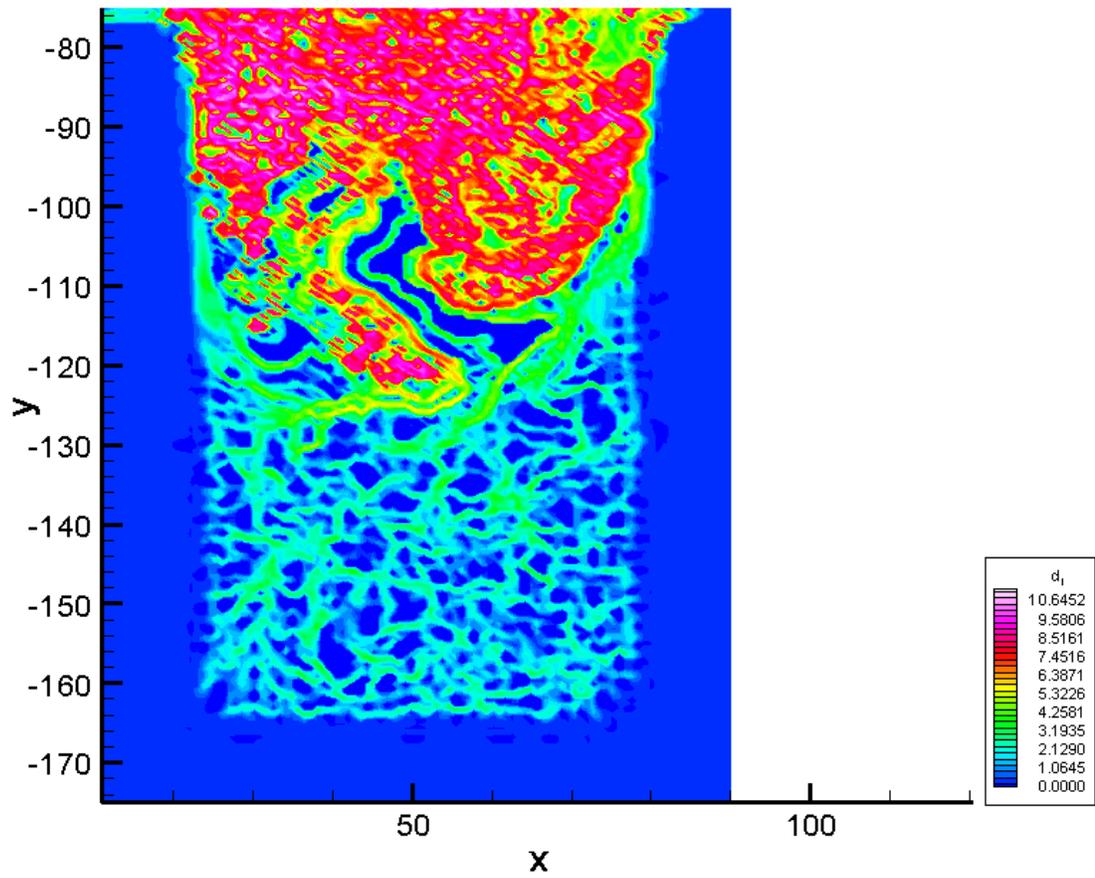


Figure F.387: The backward time LCS during phase increment 3 at 113.14 Hz with an amplitude of 0.2 mm.

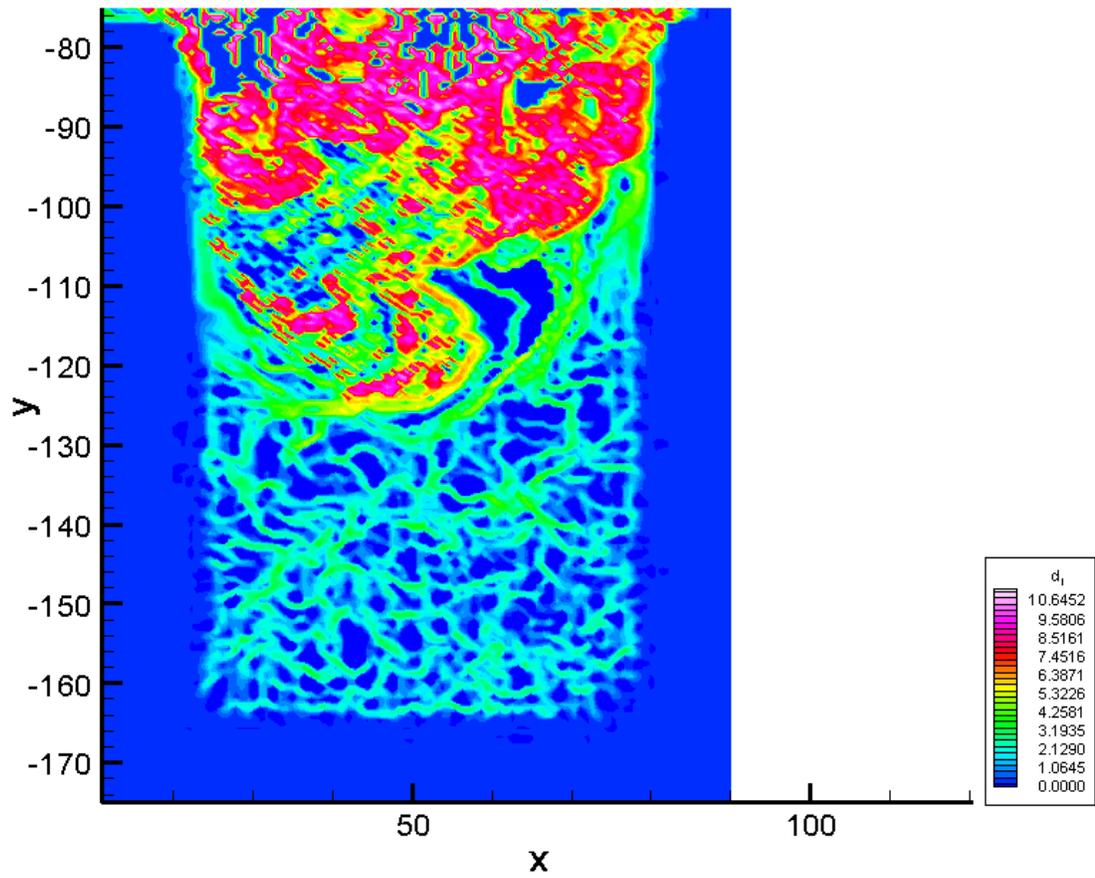


Figure F.388: The backward time LCS during phase increment 4 at 113.14 Hz with an amplitude of 0.2 mm.

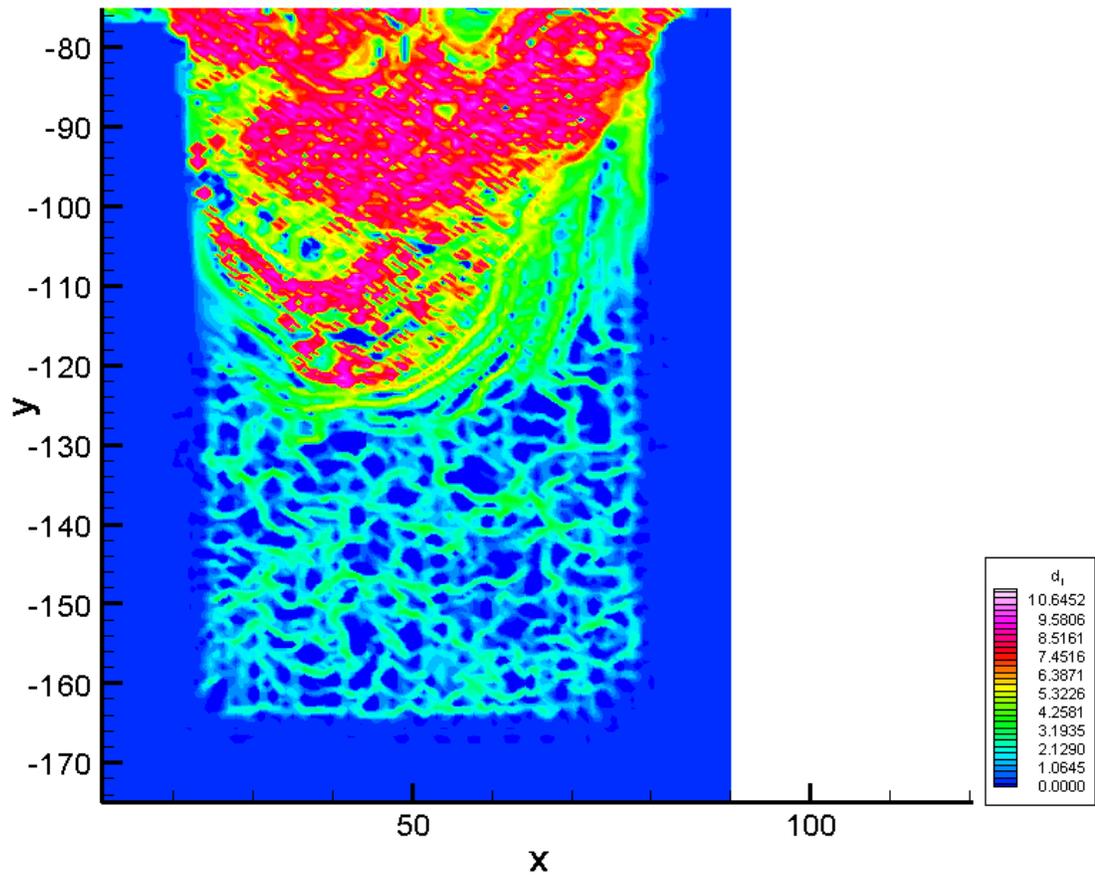


Figure F.389: The backward time LCS during phase increment 5 at 113.14 Hz with an amplitude of 0.2 mm.

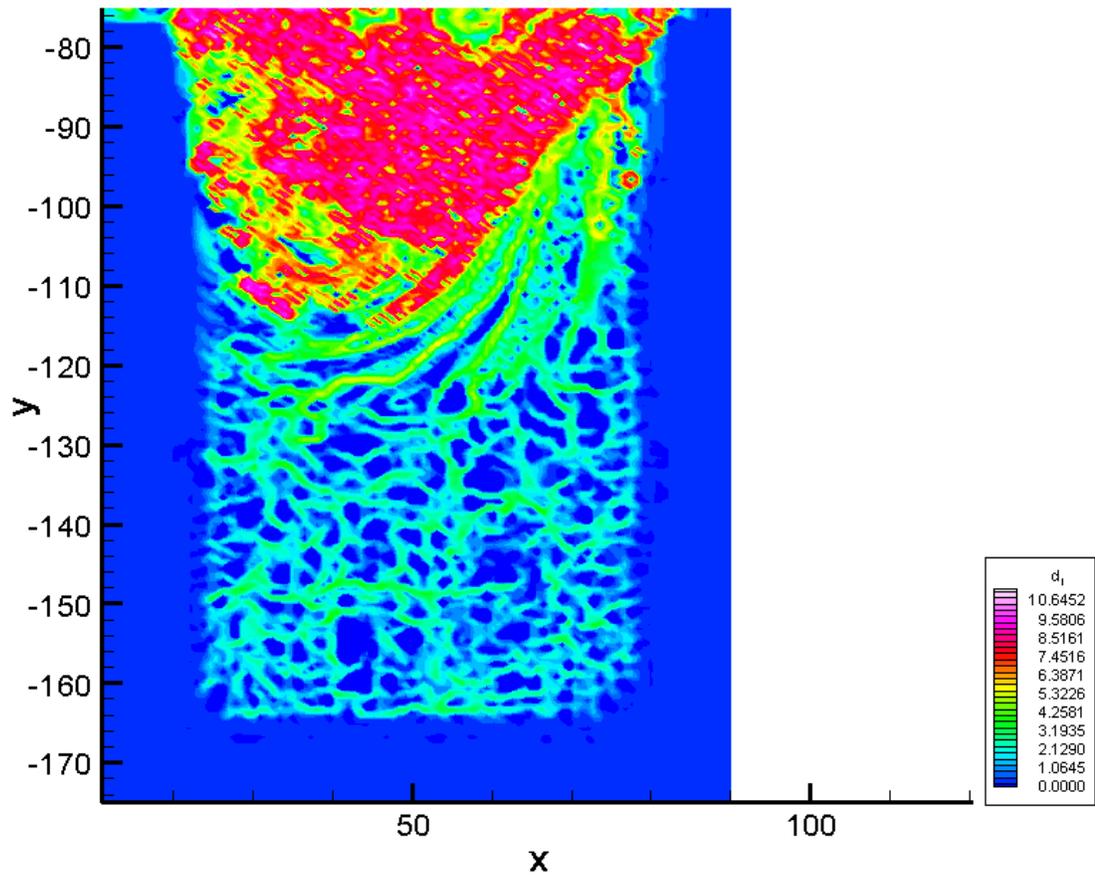


Figure F.390: The backward time LCS during phase increment 6 at 113.14 Hz with an amplitude of 0.2 mm.

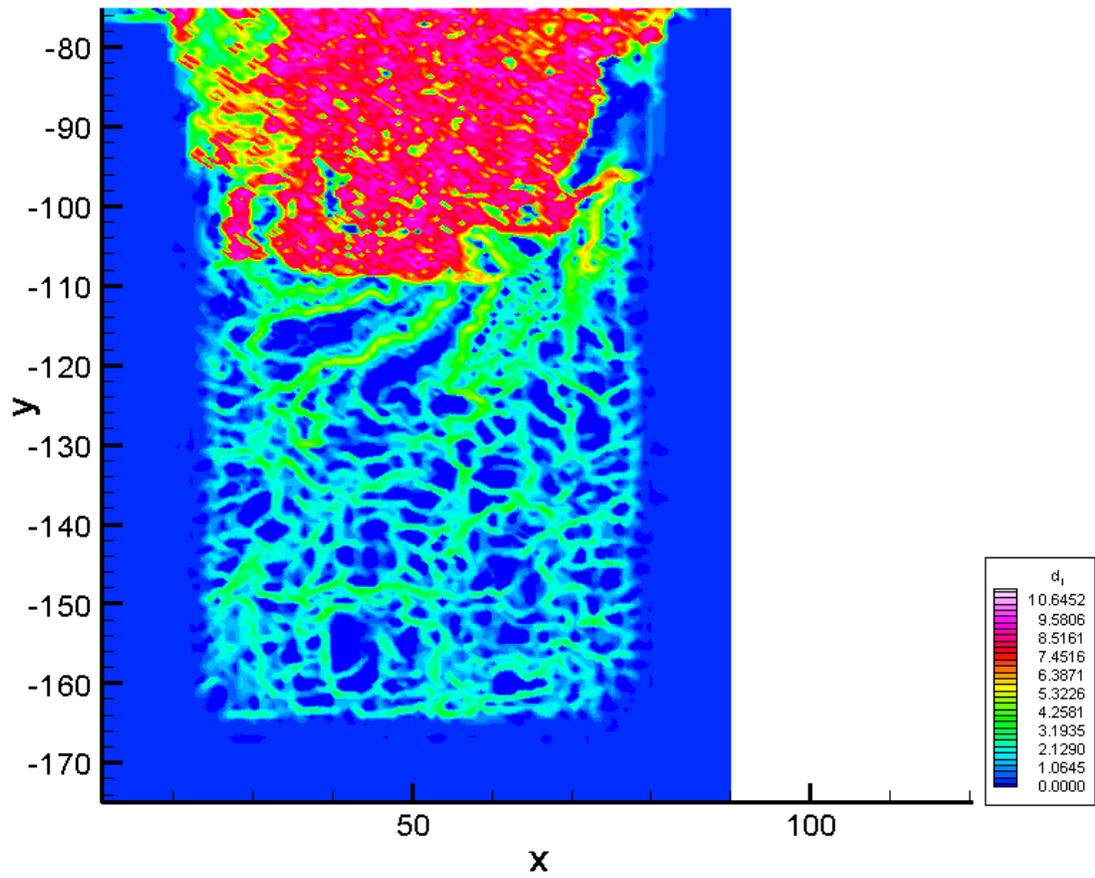


Figure F.391: The backward time LCS during phase increment 7 at 113.14 Hz with an amplitude of 0.2 mm.

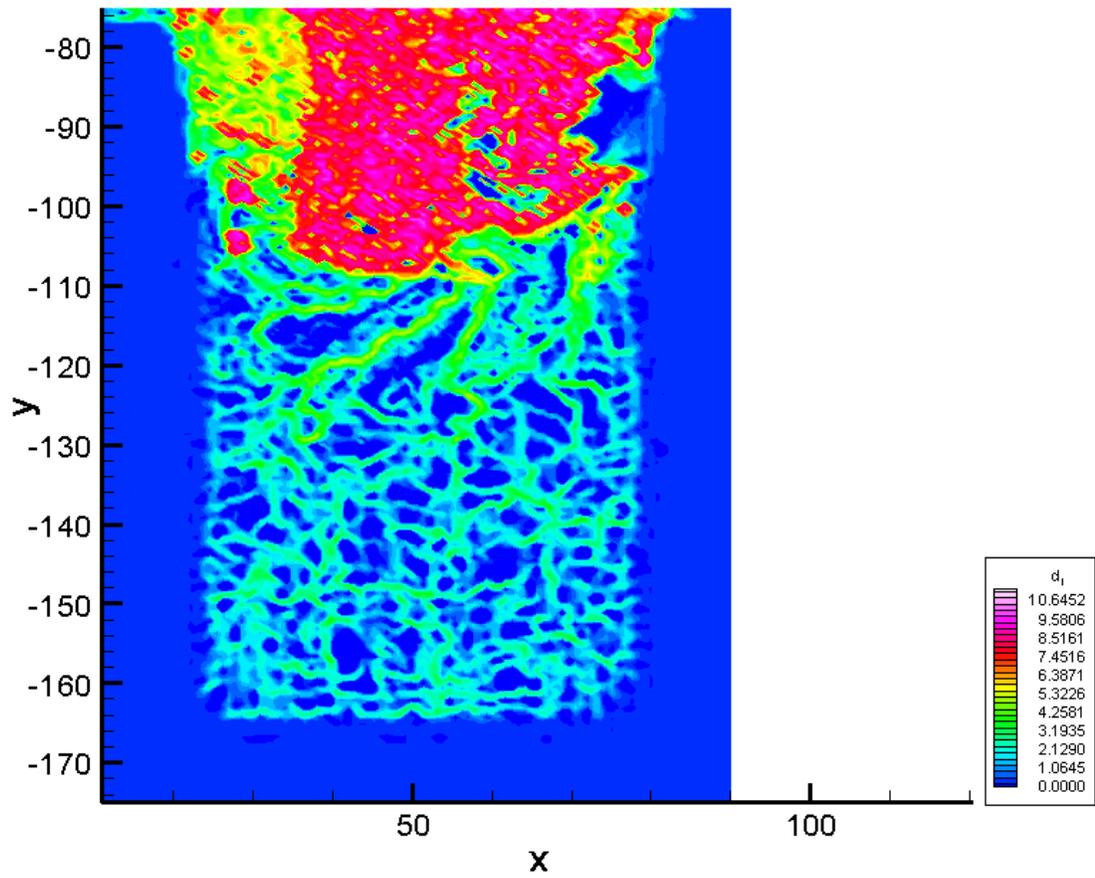


Figure F.392: The backward time LCS during phase increment 8 at 113.14 Hz with an amplitude of 0.2 mm.

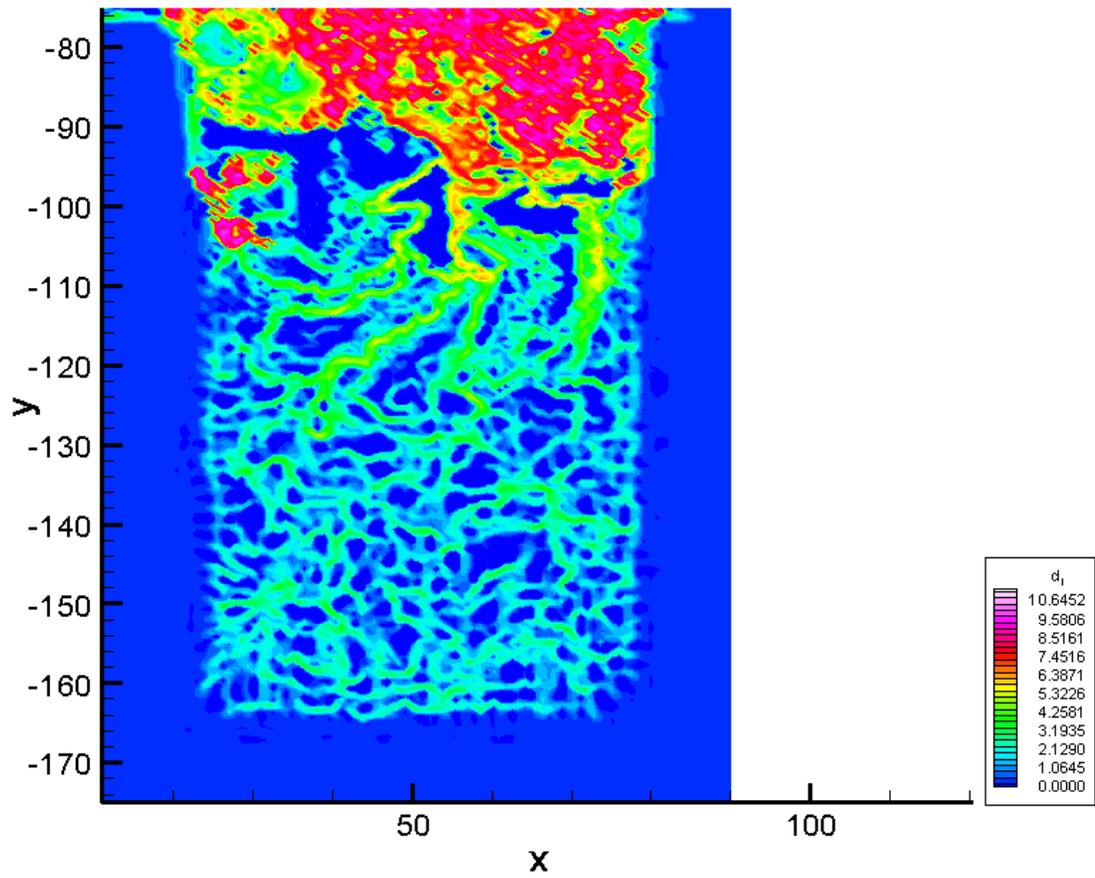


Figure F.393: The backward time LCS during phase increment 9 at 113.14 Hz with an amplitude of 0.2 mm.

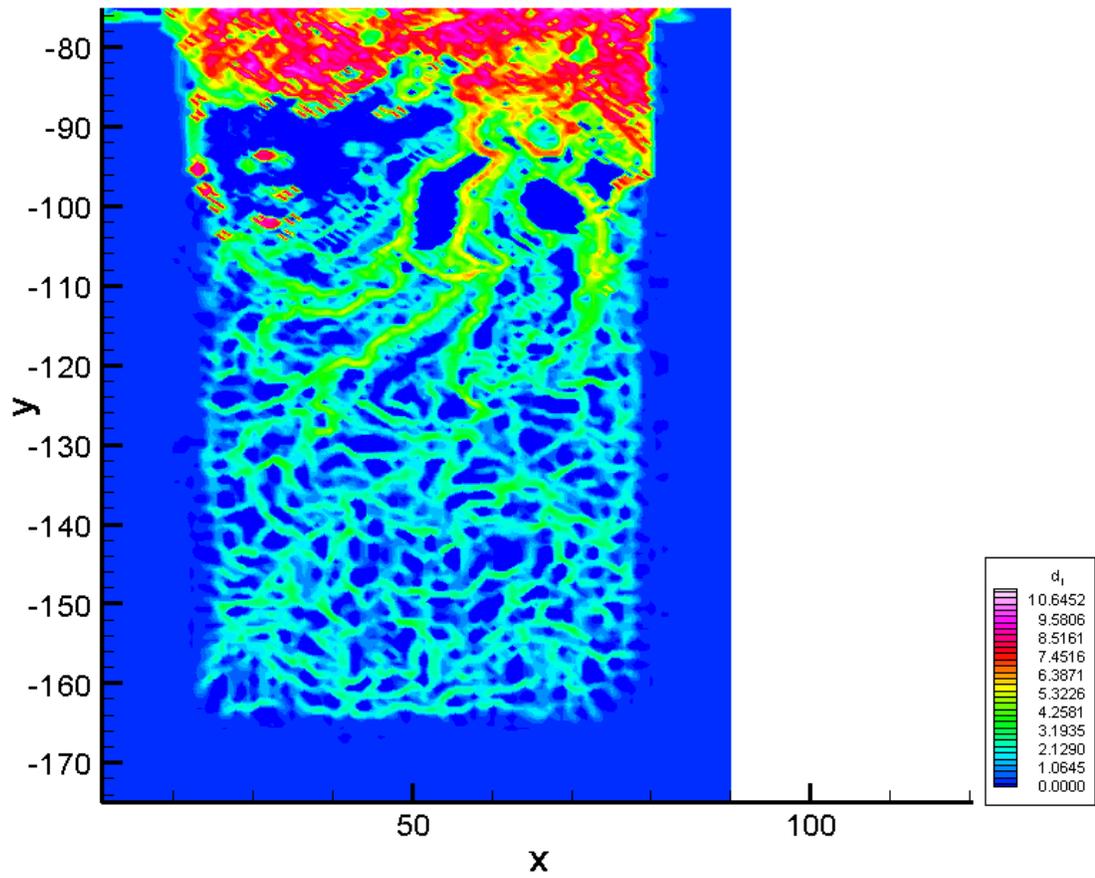


Figure F.394: The backward time LCS during phase increment 10 at 113.14 Hz with an amplitude of 0.2 mm.

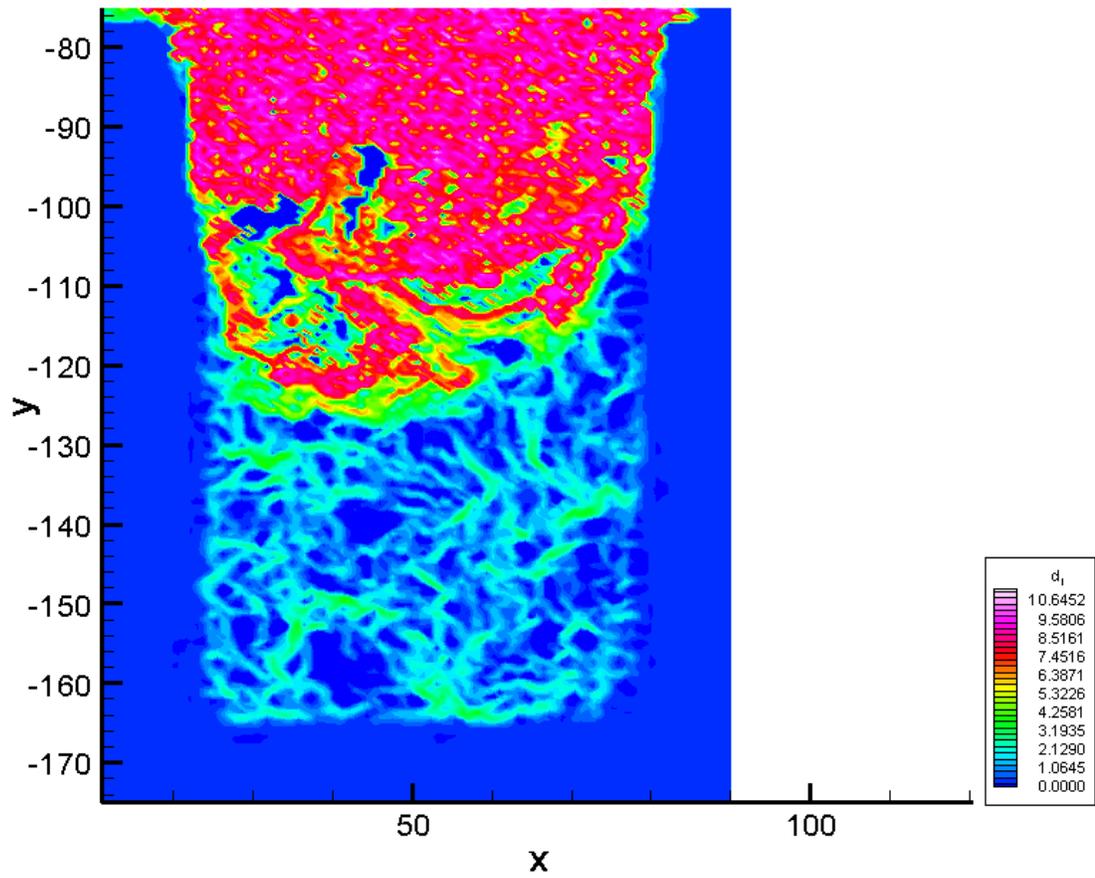


Figure F.395: The forward time LCS during phase increment 1 at 113.14 Hz with an amplitude of 0.2 mm.

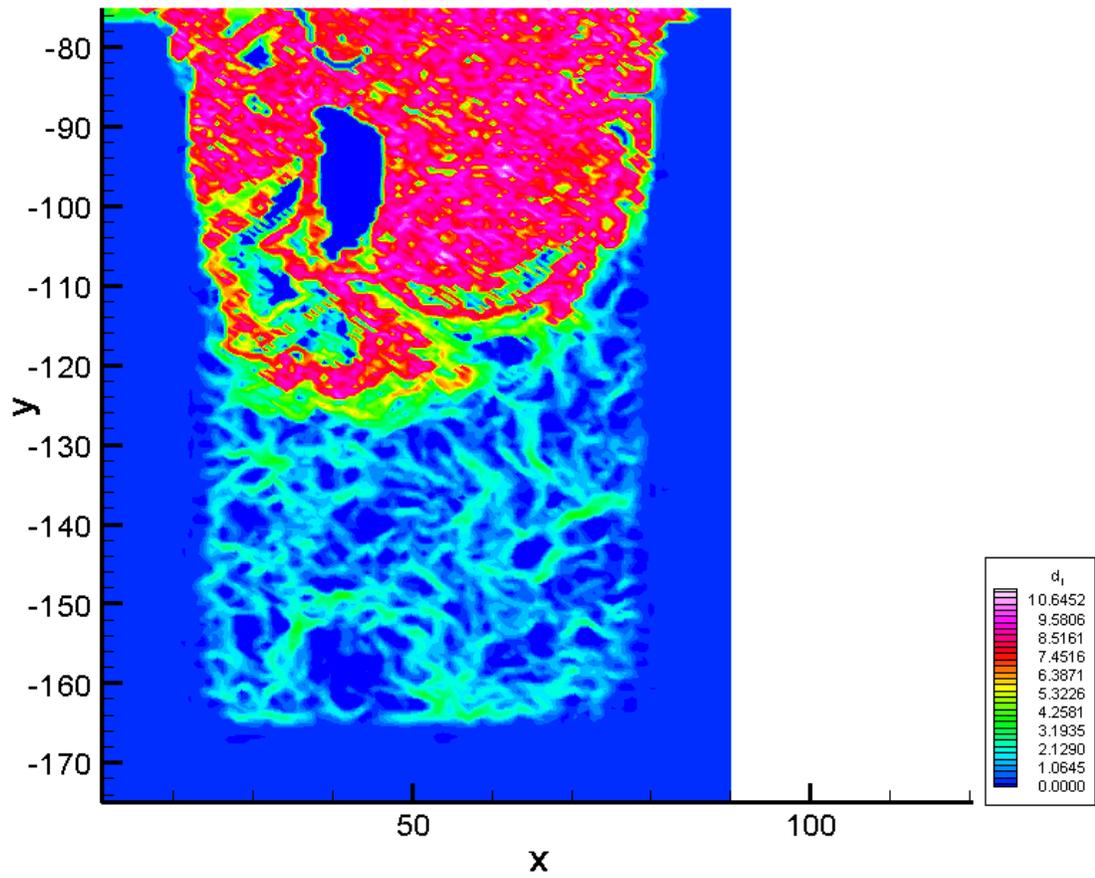


Figure F.396: The forward time LCS during phase increment 2 at 113.14 Hz with an amplitude of 0.2 mm.

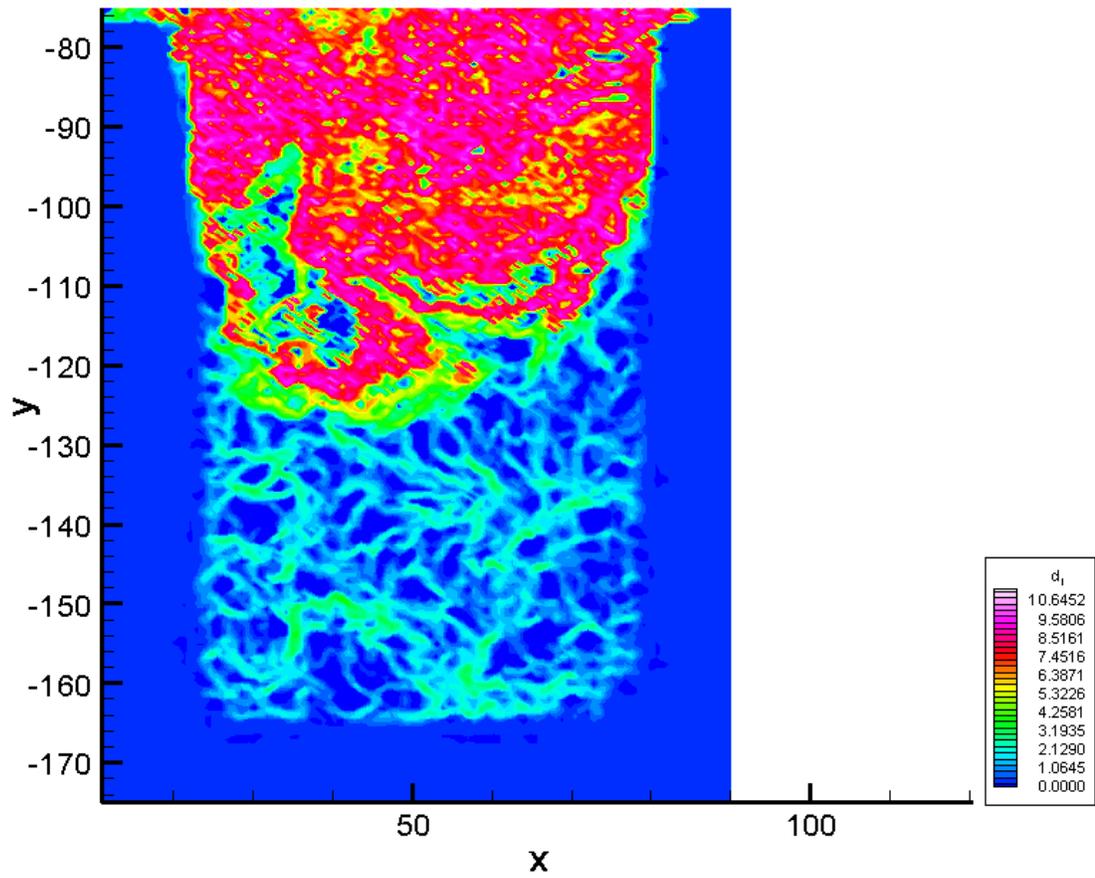


Figure F.397: The forward time LCS during phase increment 3 at 113.14 Hz with an amplitude of 0.2 mm.

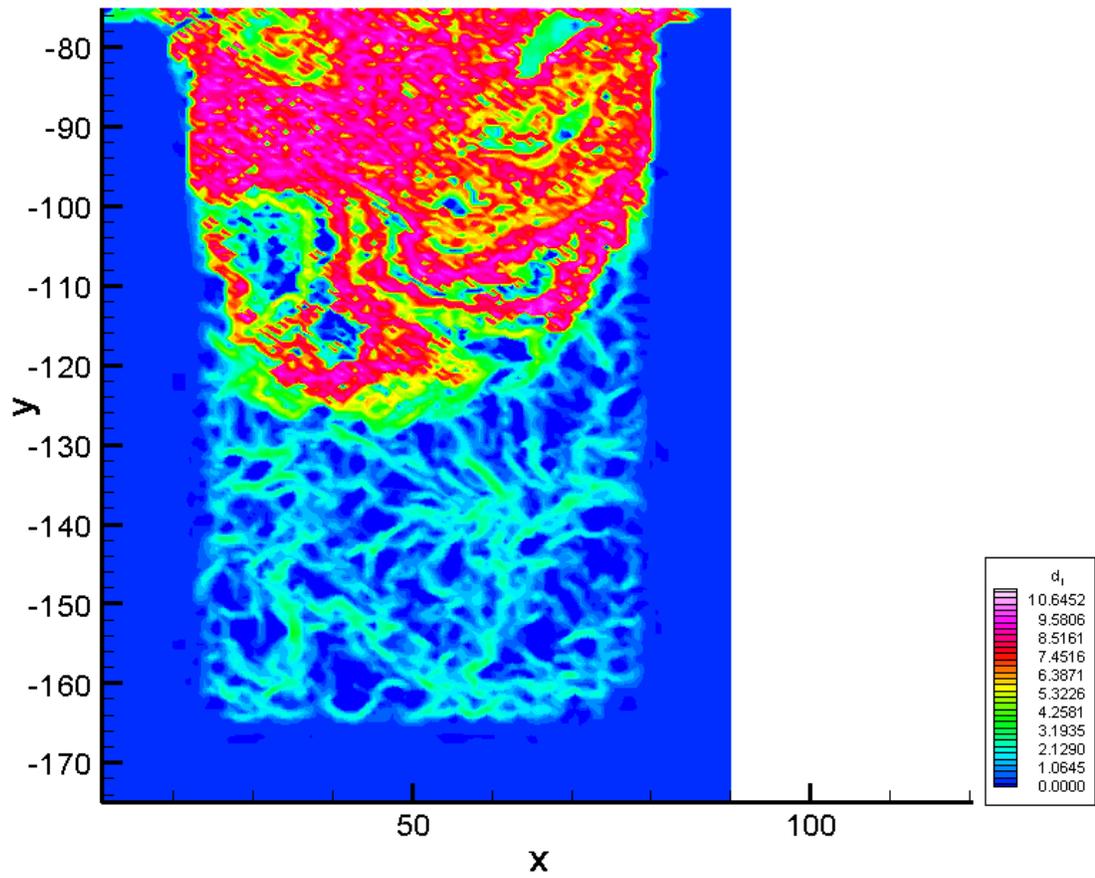


Figure F.398: The forward time LCS during phase increment 4 at 113.14 Hz with an amplitude of 0.2 mm.

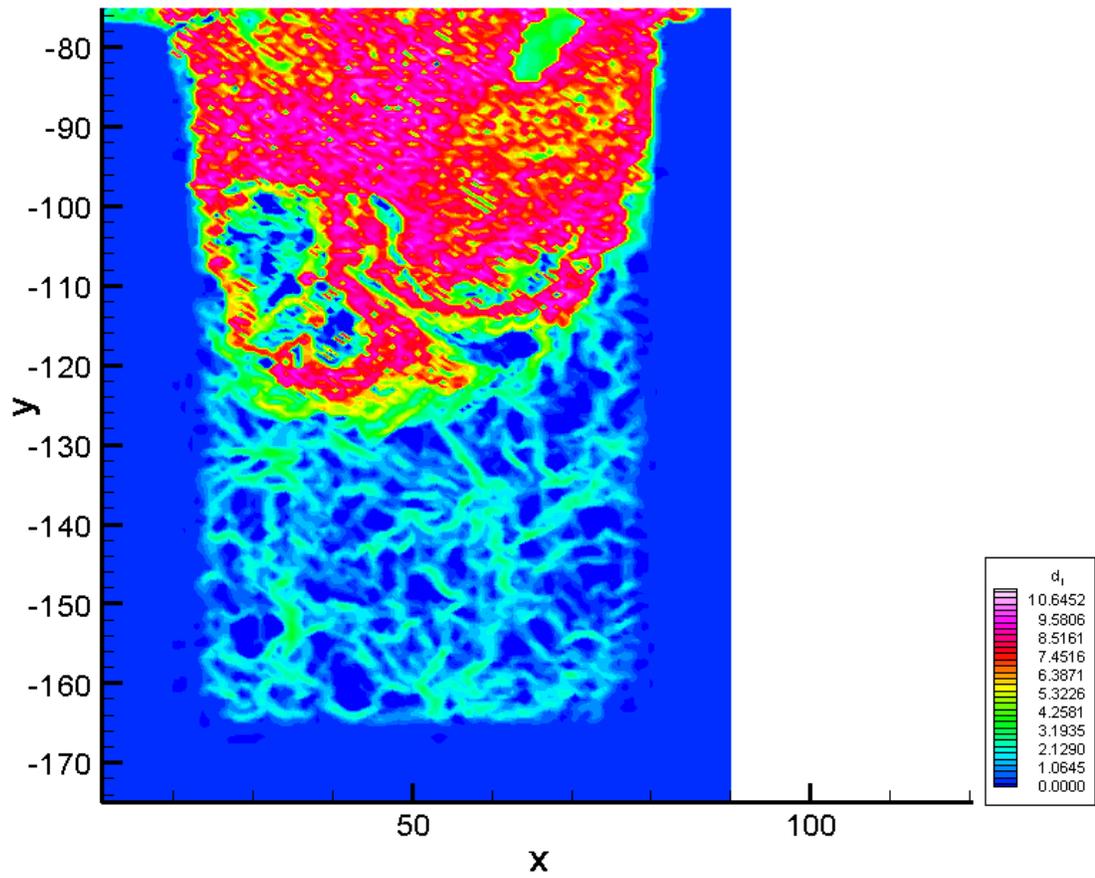


Figure F.399: The forward time LCS during phase increment 5 at 113.14 Hz with an amplitude of 0.2 mm.

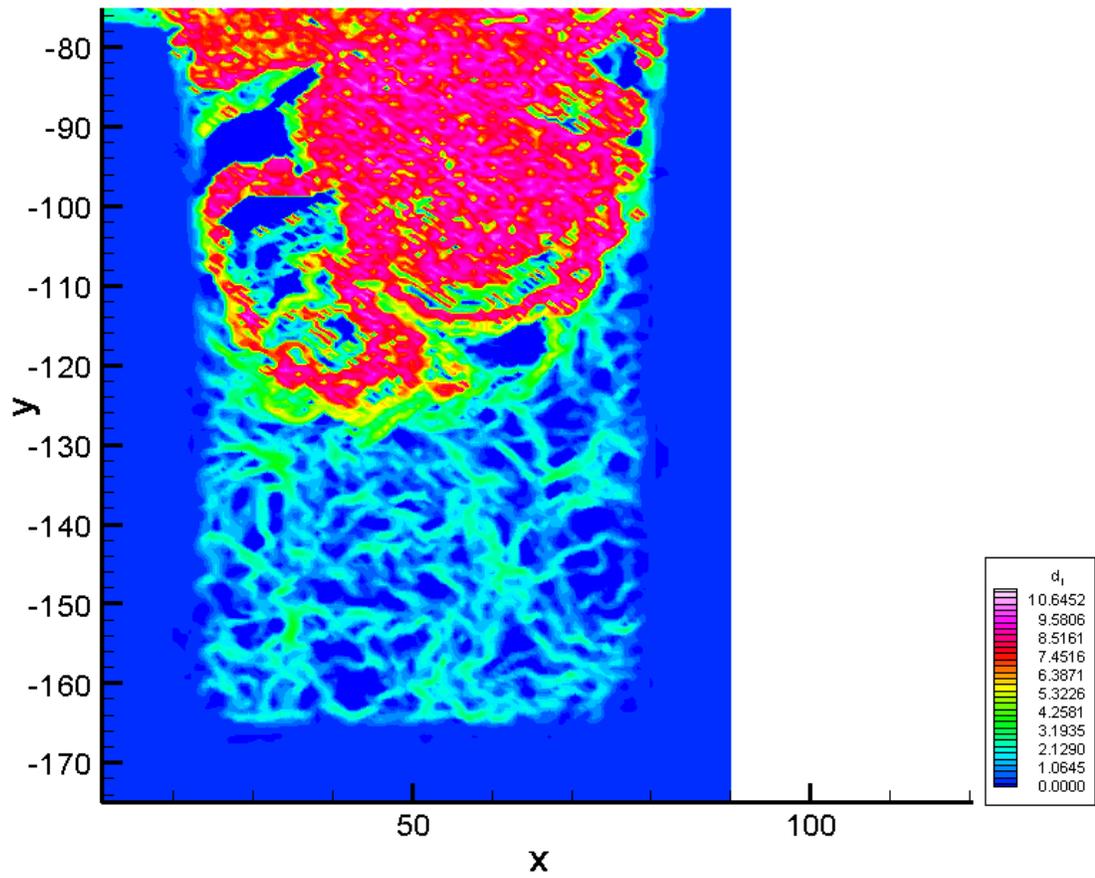


Figure F.400: The forward time LCS during phase increment 6 at 113.14 Hz with an amplitude of 0.2 mm.

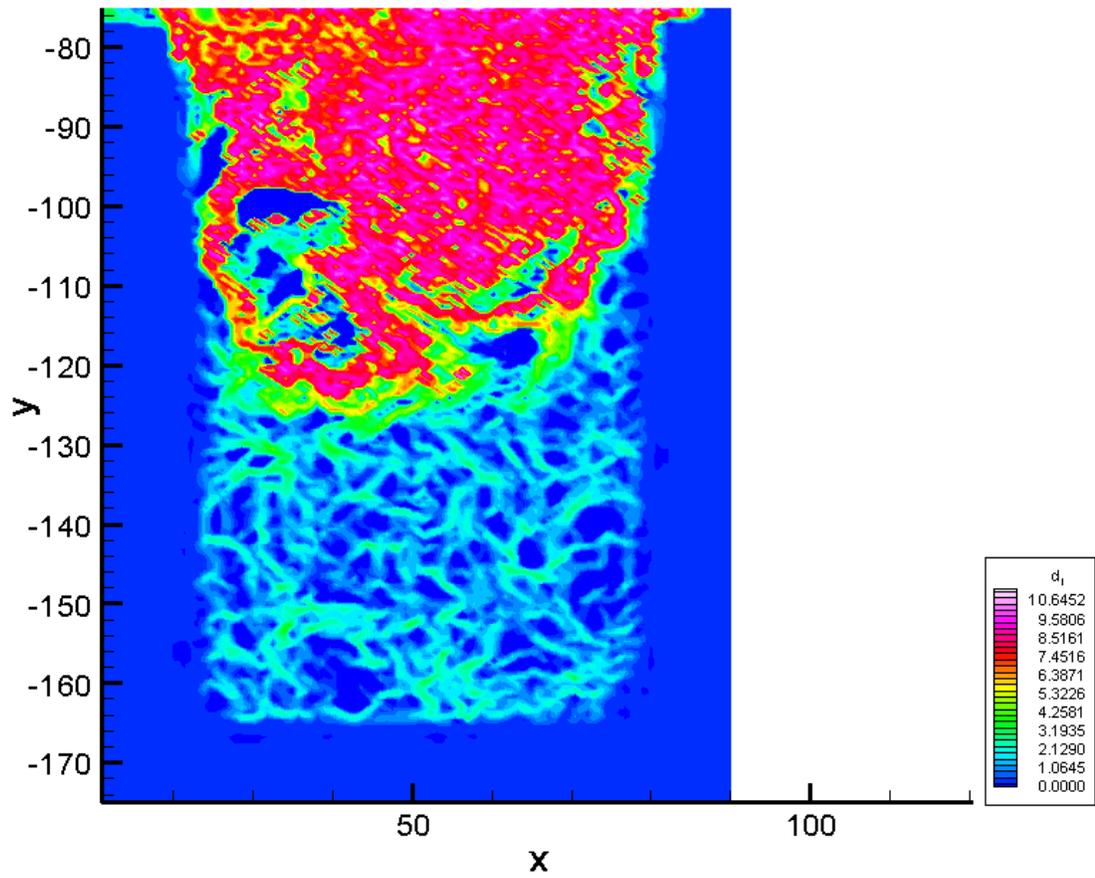


Figure F.401: The forward time LCS during phase increment 7 at 113.14 Hz with an amplitude of 0.2 mm.

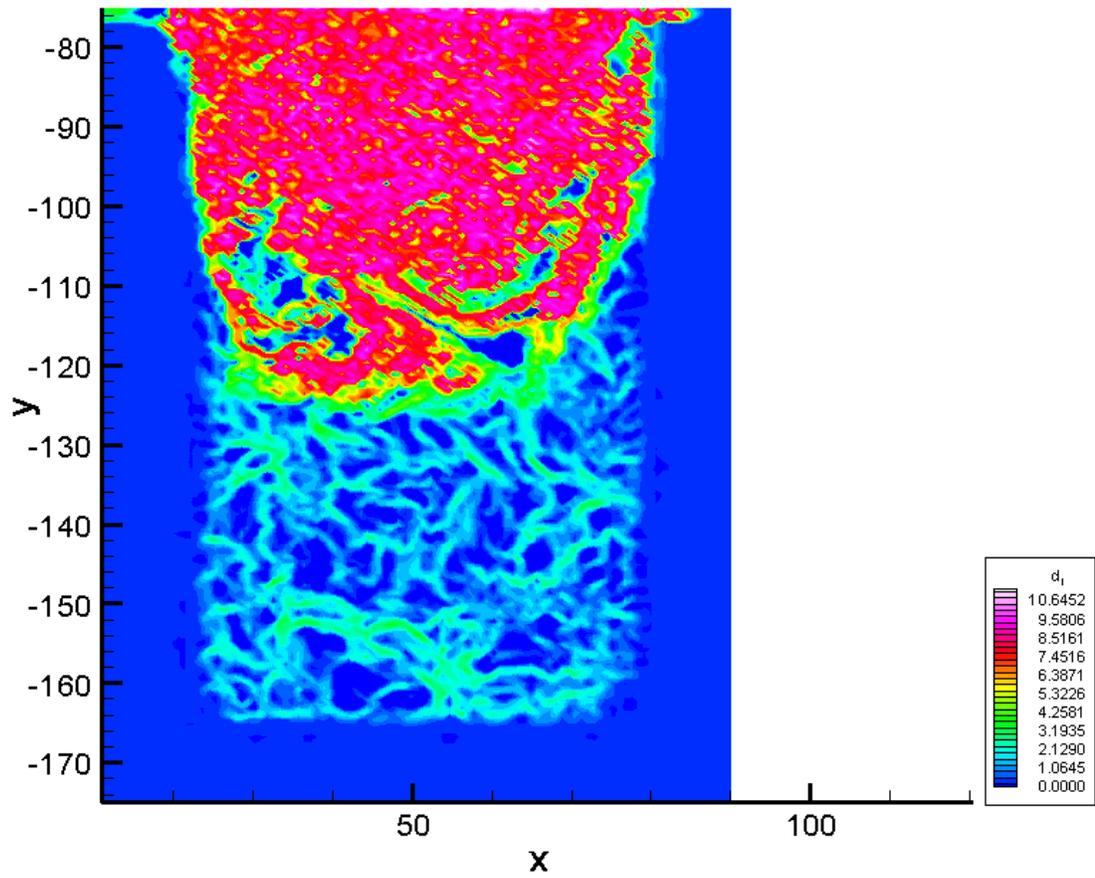


Figure F.402: The forward time LCS during phase increment 8 at 113.14 Hz with an amplitude of 0.2 mm.

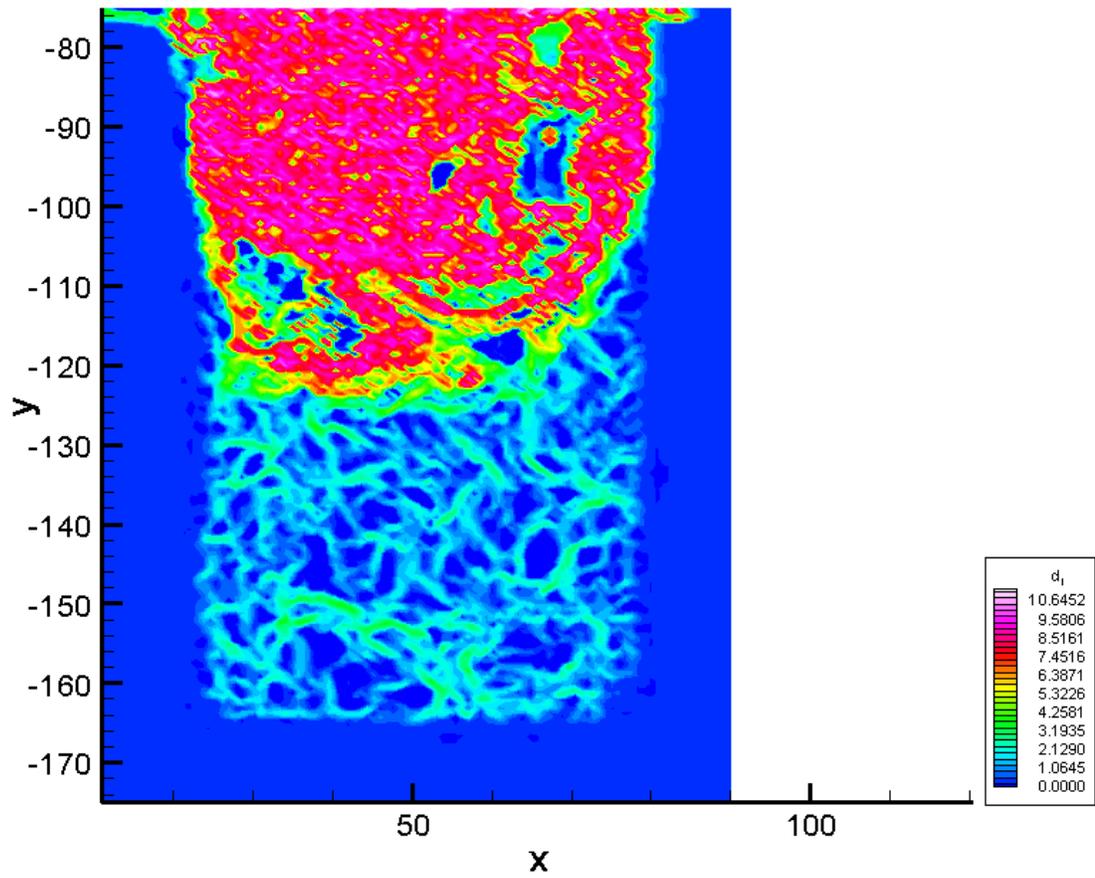


Figure F.403: The forward time LCS during phase increment 9 at 113.14 Hz with an amplitude of 0.2 mm.

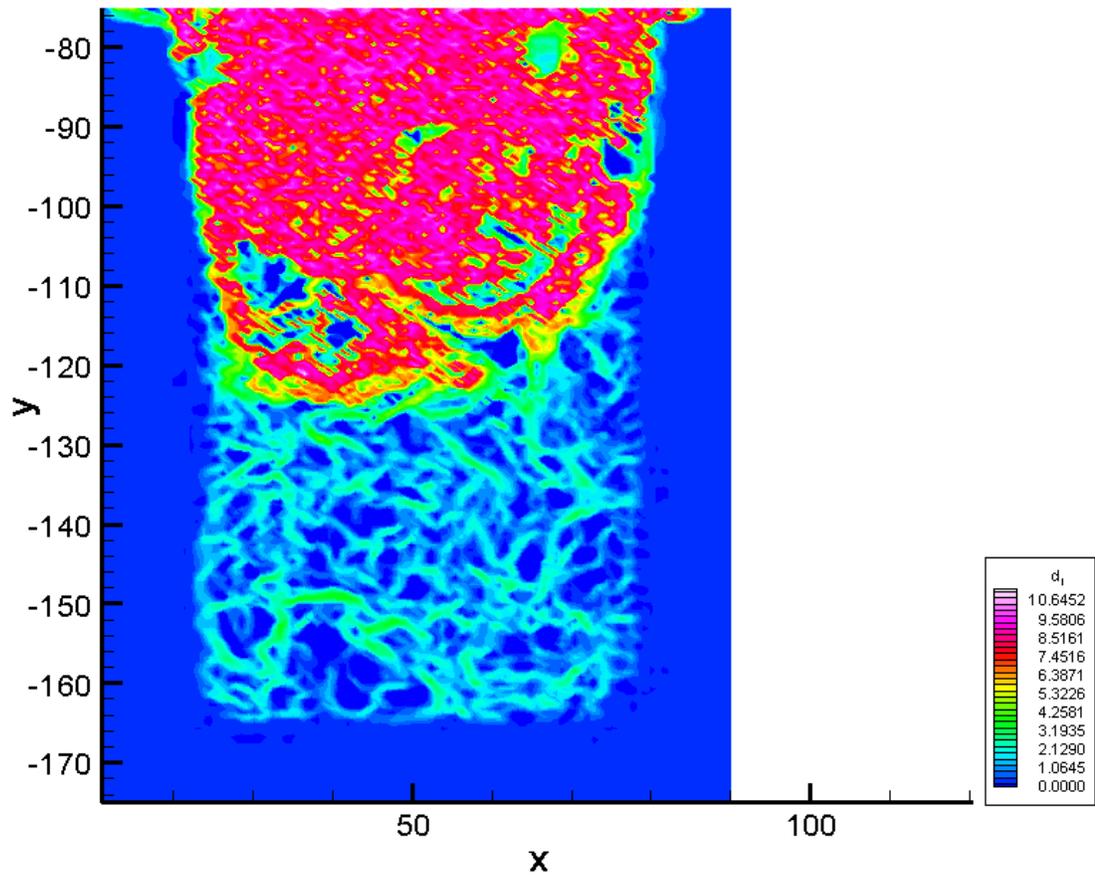


Figure F.404: The forward time LCS during phase increment 10 at 113.14 Hz with an amplitude of 0.2 mm.