



Reprint of Figure 5.1: (a) Shaded relief map of Rutford Ice Stream, West Antarctica, and surrounding area. Red box indicates the region shown in b–e. (b) Horizontal speed from Rignot *et al.*, 2011. Gray outline indicates the extent of the CSK observations used used in this study. (c) and (d) Surface and basal elevation in km relative to mean sea level, respectively. (e) Ice thickness in km. Magenta contour lines in c–e indicate smoothed horizontal surface velocity from (b) in 0.2 m/day increments. In all panels, irregular black lines indicate grounding zones. All geometric and grounding line data are from Bedmap2. (See Chapter 5 for bibliographical information)

Movie 1:

file: rutford_tidal_up.mp4

Vertical motion on Rutford Ice Stream inferred from 9 months of continuous SAR observations collected from CSK. Top left panel: Inferred vertical motion at M_2 (12.42-hour period). Thin, black contour lines show bathymetry in 200-m increments from Bedmap2. Top center panel: Inferred vertical motion at O_1 (25.82-hour period). Thin, black contour lines show secular horizontal speed in 20 cm/day increments. Top right panel: Total vertical motion for S_2 (12-hour period), M_2 and O_1 . S_2 values are calculated by assuming that the M_2/S_2 ratios for amplitude and phase are spatially constant and known from GPS observations over the ice shelf. Contour lines are the same as in the center panel. Bottom plot: Modeled vertical tidal displacement. Cascading effects in upper panels is due to erroneous phase values in regions with small amplitudes.

Movie 2:

file: rutford_tidal.mp4

Horizontal ice flow on Rutford Ice Stream inferred from 9 months of continuous SAR observations collected from CSK. (a) Total horizontal flow. Colormap indicates horizontal speed and vectors give flow direction. (b) Horizontal M_{sf} (14.77-day period) flow variability. Colormap indicates the along-flow component (negative values oppose flow) while vectors indicate direction of tidal variability. Contour lines give secular horizontal speed in 20 cm/day increments. (c) Horizontal M_{sf} (14.77-day period) flow variability and (d) total along-flow strain rate along transect shown by the blue line in (b). (e) Modeled vertical tidal displacement over the ice shelf.