COLD WAVE PHENOMENA

A 16 mm. Kodachrome Motion Picture of clouds, minatures, and weather maps.

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Naturally the thesis proper is the motion picture itself, but herein are contained data, suggestions, and corrections for the continuance of this work. As the introduction in the film explains, the purpose of this thesis is to correlate pictorially the weather conditions with the corresponding synoptic data, aerological soundings, and surface weather maps. It is hoped that the student will have some idea of the kind of weather to be encountered when flying in the Los Angeles area when the synoptic situation is similar to that photographed.

The pictures illustrate the forms and structures of the cloud systems accompanying cold wave invasions. And, too, the stop-motion scenes reveal the turbulence and shear forces operating in the clouds. The miniatures in the tanks duplicate the topography and the motion of the fluids simulate atmospheric phenomena as the cold and upper cold fronts.

This picture will enable the lecturer to present to the newcomer in Meterology a very interesting and understandable phase of the work to be expected. Too, the colorful and striking forms are of interest to those who do not intend to pursue Meteorlogical subjects.

In all of the photographing, including the titles and stop-motion, a Cine-Kodak (Eastman) was used. This is probably the best all purpose camera but presents some difficulty in filming close-ups because it is impossible to frame the scene directly. Thus, special apparatus would be desirable when considerable work is to be done with close ups. For stop-motion shots a camera which can be set to expose one frame at a time is preferable. This Kodak does not have that accomadation and consequently an undesirable pulsation of the light intensity tends to irritate the viewer. Also for miniature work

it is again advantageous to be able to vary the speed of the film motion so that slow motion pictures are possible. It so happens that the rapidity with which the cold wave moves is too great to allow the observer to appreciate the small turbulent flows. The Cine-Kodak is not equipped with this variable speed feature. These fluid movements should be photographed with a speed of 32 or 64 frames a minute.

Eastman's Kodachrome Film is used and is highly satisfactory. Occasionally, because of the highly complicated processing technique, the film is a little off color. It might be mentioned here that it is best to use a direct flat-lighting when photographing with this color film because of its very narrow latitude. When using black and white film more interesting and spectacular shots are obtained by using a side-lighting or a back-lighting. It follows from this that the best time of day for photographing black and white is in the morning or late afternoon. This is in contradistinction to Kodachrome where one must not photograph before 8:00 A.M. or after 4:00 P.M. because of the false coloring (more red) that sets in.

As an example of the proper exposure for Kodachrome, normal speed (16 frames per minute) and f.16 stop aperture gives a good normal exposure at noon in the month of March when flying above the clouds at an elevation of 10,000 feet. Shooting at the ground under similar light conditions requires an aperture opening of f.8. If the light is not too brilliant and if the time is four hours before or after noon, then the aperture opening is f.11.

When photographing from an airplane and it is desired to include a portion of the airplane and still maintain a sharp focus on the clouds at infinity, set the focus adjustment to 25 feet.

The length of time to allow for a scene should never be less than a count of ten; when panning this can be considerably more. It is well to read the directions accompanying the camera in regard to this. Remember that it can always be cut but nothing can be added.

The miniatures and fluid shots were made at normal speed and aperture f.8 when the light was brightly shining directly on the subject. Here it may be mentioned that a good photoelectric light meter should be used in all of this work.

For the maps and charts either sun light or artificial light can be used but remember to use the appropriate Kodachrome for particular color temperature light employed. Again use a meter here.

As for the construction of the miniatures there are probably as many different ideas as there are people who make them. I used a mixture of paraffin and cement coloring for the mountains and general terrain. The tank is a wooden box with a piece of plate glass on the front side. A partition separates the miniature scene from the other end of the tank which contains a mixture of ink, water, and common table salt. The mixture was 25 cc of blue-black writing ink and 18 cubic inches of salt in one cubic foot of tap water; and the clear liquid over the models, of course, was tap water.

It is well to review the good and bad points of this film so that others may profit by this first endeavor. In the first place Los Angeles does not provide the clouds that Texas, Florida, and other locales do. Thus the towering cumulus are out of the question. That is a point to remember,--pick your clouds; be sure that the feature that they are to illustrate is readily seen. For stop-motion shots use a camera as described before and make a shot every half second when photographing fast moving clouds. Also it is not satisfactory to combine black and white film with Kodachrome. The reasons for this are two-fold: first, the thicknesses of the two films are different and sometimes trouble is experienced in projecting; second, psychologically the effect is not too entertaining. Care must be experienced to see that the camera is not panned too rapidly and that it is not done on every shot. Too, it is a good trick to finish a panoramic shot with a stationary shot well composed. If possible jot down notes pertaining to wind directions and velocities and any other pertinent data. The lecturer can then point

out salient features as the film is being projected. Here, I suggest that more stop-motion pictures be made for all types of clouds. Much can be learned about winds at different levels, shear forces, turbulence, anticyclonic motion, convective activity, and vertical motions.

This thesis provides a basis for further experimentation in this phase of motion pictures. This is merely a scratch on the surface of illimitable possibilities in pictorial Meteorlogy. Considering this thesis only, it can be improved by adding more miniatures and stop-motion shots and cutting out some of the less interesting cloud shots. In general, there is an infinitude of work to be done. A few of the subjects are mentioned now. Stop-motion shots of warm fronts, cold fronts, occluded fronts from their first appearance to their complete passage would be very educational to both student and forecaster. Animation, too, would be a great aid in depicting the movements of fronts and pressure systems. The Army Air Corps and commercial air lines are more and more realizing the importance of this means of teaching and research.