(TO be presented in Conference on Weather Analysis and Forecasting, March 4-6, Taipei)

Real time QPF forecast experiment over California

Su-Tzai Soong
University of California, Davis

ABSTRACT

The complex topography in California has a strong influence on airflow and precipitation. During the rainy season of the winter months, the lifting effect of the mountains can release the instability of storms and produce heavy precipitation on the west side and a pronounced rain shadow on the east side. The rain and snow, on the one hand, fill the dams and increase the depth of snow cover over the mountains, providing the water supply for the dry summer months. On the other hand, heavy and prolonged precipitation may cause floods, mud slides, and even loss of life. One recent example is the flooding over northern California in February 1986, which caused hundreds of millions of dollars in property damage. Accurate quantitative precipitation forecast (QPF) is crucial for water resources management and flood control in California.

University of California, Davis and Lawrence Livermore National Laboratory have developed a Mesoscale Atmospheric Simulation (MAS) model for QPF in California. The model includes the following physical processes: explicit representation of the microphysical processes with cloud, rain, ice, snow, and graupel; the Delta-Eddington solar radiation; the modified broadband infrared radiation; Kuo's cumulus parameterization; and the OSU soil and boundary layer module. The unique feature of this model from other models is the adaptation of a third order advective scheme designed by Arakawa and his students (Takacs 1985, Hsu and Arakawa 1990). This scheme preserves the peak values well and produces no phase error and little computational oscillations. The steep and complex topography over our area of interest is the major factor in generating these computational oscillations. If they are not dealt with properly, these oscillations may either generate false clouds or cause computational instability.

From 1 November 1994 to 31 March 1995, the MAS model was run once a day over California and neighboring states using 00 UTC Eta model data as the initial and boundary conditions. The results were transmitted to Weather Service Offices at Sacramento and Monterey for operational reference and verification. This period includes two major flood events: one on January 10, which caused the flood over Roseville, and the other on March 10, which caused the flood in the Salina's Valley. This paper will compare the modeled precipitation with observations over selected stations in California. In addition, the effect of microphysical processes on radiation and surface temperature will also be discussed.