RH Differences Between Models - The Case of April 5-6, 1997

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The 03 and 12 UTC runs of the eta model suite and NGM on the morning of 5 April showed conflicting information to the forecaster. The main concern for both the aviation and public forecaster at the NWSFO Reno was the amount of cloudiness to put into the forecast for the following morning in southwest and southern Nevada.

All models showed essentially the same moisture pattern on the morning of 5 April. As each model progressed in the forecast, the eta model suite began to diverge from the NGM. Figs. 1-4 show the 700mb relative humidity (RH) fields for the NGM, eta48, eta29, and eta10, respectively.

By around 12 UTC on 6 April, the NGM forecast 700mb RH field (Fig. 5) was very different than the eta model suite Figs. 6-8 . The forecasters from Reno discussed the differences with Las Vegas in the coordination call at 1 PDT on 5 April. Las Vegas changed their affected area forecasts for the next day to partly cloudy from sunny, and appropriate forecasts were issued for the TAFs and TWEBs for locations between Reno and Las Vegas by both offices.

The next morning the models were again compared for verification. The models all showed dry 850mb RH fields, with a shallow moisture layer at 700mb in southern Nevada. The NGM was again on the drier side (Figs. 9 and 10) , with the eta model suite showing both the drier 850mb layer and the increased moisture at 700mb (Figs. 11-16) . Observations taken at Desert Rock (DRA) between 05-18 UTC reported mostly overcast to broken skies. The moisture was evident in southwestern Nevada, but only in DRA was it clearly evident by the hourly observatons. Tonopah (TPH) and Las Vegas (LAS) reported between 0-20% cloud coverage during that same time period.

Terrain and/or convectively driven convergence in the eta has been observed over the central and southern Sierra on numerous occasions. In this case, a weak 850mb circulation also formed near the southern Sierra on the afternoon of 5 April. During the afternoon hours, the eta model suite all began moistening the 850-700mb levels over the southern Sierra and California desert, which could be explained by the convective processes mentioned above. However, the 700mb forecast RH fields continued to moisten, expand, and shift with a mean west-northwest wind into southern Nevada through the next morning (6 April). The concerns by the forecasters were that this enlargement in the 700mb RH field was erroneous. But, based on observed convection along the west slopes of the southern Sierra in the late afternoon (5 April), it was given some weight over the dry NGM forecast. While overdone in areal coverage and depth, the eta model suite had a significantly better forecast for southern Nevada.

In addition to stronger forcing in the eta models, the Eta cloud scheme could have played a role. The eta models are the only NCEP models that explicitly forecast cloud water and cloud ice. In the absence of forcing, the cloud scheme causes drier relative humidity forecasts in the Eta model (Staudenmaier 1997). However, in this case, the orographic and dynamic lift may have led to an increase in the model cloud water/ice. The cloud water scheme could then increase the relative humidity through evaporation below cloud base. In this case, the higher resolution terrain of the Sierra mostly likely contributed to the moistening and the subsequent expansion of the model over the Great Basin. Further investigation into this is warranted.

This case presents the differences between the NGM and the eta model suite moisture fields for the case of 5-6 April. The forecasters had more confidence in the eta models than the NGM, and forecasts were changed based on available data. Verification of the models showed that the eta models were more

correct at identifying the amount of moisture up to 33h in advance.