7.5 DEVELOPMENT AND ANALYSIS OF FINE-SCALE GRIDDED CLIMATE DATA FOR ARIZONA AND NEW MEXICO

Andrew C. Comrie* and David P. Brown
University of Arizona, Tucson, Arizona

1. INTRODUCTION

The nature and causes of climate variability at the sub-regional level are of great importance in the Southwest United States due to a variety of impacts upon human activity and natural resources. As part of the Climate Impact Assessment for the Southwest (CLIMAS), we have developed a fine-scale gridded data set for winter precipitation and temperature in Arizona and New Mexico.

2. APPROACH

Gridded data were produced using a combination of multiple regression and interpolation techniques. Several grid resolutions from 1x1 to 9x9 km were evaluated. Terrain-based predictor variables (e.g., elevation, slope) were derived from a digital elevation model and selected via stepwise regression on 1961 to 1990 winter averages of 662 temperature stations. The same predictor variables were used in a precipitation regression based on 572 station averages. Kriging was used to interpolate the temperature residuals and inverse distance weighting (IDW) was used for precipitation.

3. RESULTS

The final 1x1 km temperature model after regression and interpolation of non-terrain residuals explained 98% of the variance in independent data, while the final 1x1 km precipitation model explained 63% of the variance. Time series of 1 km resolution temperature and precipitation maps from 1961-1999 were created for Arizona and New Mexico based on this approach. We performed diagnostic studies on the links between these fine-scale data and indices of the controlling atmospheric circulation and related teleconnections, in the form of sub-regional correlation and compositing analyses. We are currently applying this methodology to produce monthly maps of 1 km temperature and precipitation for Arizona and New Mexico.

4. FURTHER INFORMATION

For further details on the project, as well as animations of the winter temperature and precipitation maps for the last 40 years, please see our supporting website at http://geog.arizona.edu/~comrie/climas/anim.htm.

5. ACKNOWLEDGEMENTS

CLIMAS is supported by the National Oceanic and Atmospheric Administration, Office of Global Programs (NOAA-OGP).

Corresponding author address: Andrew C. Comrie, University of Arizona, Dept. of Geography and Regional Development, Tucson, AZ 85721-0076; e-mail: comrie@climate.geog.arizona.edu