Improving climatic maps of temperature by means of satellite IR images and mesoscale simulations

J.A. Guijarro (1), M.A. Jiménez (2), A. Luque (2), A. Mira (2)

(1) Instituto Nacional de Meteorología, CMT en Illes Balears, Palma de Mallorca, Spain, (2) Meteorology Group, Dept. of Physics, Balearic Islands University, Palma de Mallorca, Spain. (jaguijarro@inm.es)

The spatial resolution of climatic maps has always been severely limited by the density of the observing networks. Moreover, as the majority of weather stations are located in airports, towns or villages, unpopulated places as mountains or other natural areas are commonly undersampled, and hence spatial interpolation methods used by GIS yield poor results in these zones.

A traditional approach to improve the quality of the maps has been the development of regression models that relate the climatic variables to physiographic parameters as altitude, steepness, distance to the sea or to major mountain ranges, etc. (Some of these relations, though statistically significant, may lack physical background, and therefore should be discarded). These models may be applied to obtain a "deterministic" climatic map of the variable over which the spatial interpolation of the residuals (the "not explained" portion of the variance) may be added to obtain the final map. But both the model and the residual interpolation are still affected by the lack of measurements in areas with great orographic complexity.

In this work, two additional sources of data are explored to improve temperature maps: 1) Satellite infrared images, and 2) Mesoscale meteorological model outputs, from selected situations with clear skys and weak pressure gradients. The tests have been performed on the Majorca island (Western Mediterranean), and both methods have proved useful for climatic cartography. Their results are compared, and their advantages and disadvantages discussed.