EMS Annual Meeting Abstracts
Vol. 8, EMS2011-321-3, 2011
11th EMS / 10th ECAM

Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Monthly rainfall maps for Tenerife (Canary Islands): comparing interpolation methods under local climate conditions

F.J. Pórtoles, L. Torres, J. Ribalaygua, R. Monjo, and C. García Angulo
Climate Research Foundation, Spain

Key words: Rainfall, Interpolation Methods, Thin Plate Splines, Kriging, Canary Islands.

Tenerife, the largest of the seven Canary Islands, has the highest elevation of Spain, the Teide volcano (3.718 m. – the third largest volcano in the world from its base). Its climate is hard influenced both for its tropical latitude and for its exposition to the Trade Winds (alisios), which blow from the northeast for almost the whole year. These two key facts (an island with such a high hill, which implies not only high peaks in a small area, but also strong slopes all over the territory; and a climate strongly influenced for the prevalent Trade Winds) interact together producing a very special local climate – the most specific phenomenon is the sea of clouds, which happens at mid-heights when the air moisture condenses for the Trade Winds pushing of the air against the hilltops. This causes a special distribution of the rainfall all over the island (for the land facing the Trade Winds, and for the lands isolated of that winds because of the hills), a special distribution which must be taken account in a project for the creation of a set of monthly rainfall maps – like ours.

As the input data, we have used the daily series of precipitation registered at the Spanish Meteorological Agency (AEMET) rain gauges located in the island, for the 1.951-2.010 period (where available). All these data must be aggregate in monthly data for trying different interpolation techniques. We have tried both Kriging (in its ordinary version) and Thin Plate Splines (in its 2-dimension version, 3-dimension version, and its version with dependence of a covariance). For determing the best method, we have used a cross-validation leave-one-out simulation and we have compared the simulated values against the observed ones. For the measure of the similitude, we have used not only measures based in central measures (BIAS, MAE, correlation, slope, Model Efficiency,... between observed and simulated data) but also goodness-of-fit tests (Kolmogorov-Smirnov, Anderson-Darling) and the comparison between the transects of the simulated data against the observed.

Our results show that the use of the relationship between elevation and precipitation do not increase the accuracy of the interpolation (no matter what method is used), but the division of the island in climatic zones does. That is, we have divided the island in three climatic zones (the one facing the Trade Winds, in which the sea of clouds causes a special rainfall; the one isolated of the Trade Winds but exposed to the Sub-Tropical Cyclones; and the zone in the highest places, which has mountain climate - even snow) with geographical / climatic criteria, then we have interpolated the data corresponding to the rain gauges existing in that areas into a 200 x 200 m. grid, and finally we have fused the simulated data in the borders between the defined climatic zones. At the end, we have achieved 12 monthly maps of accumulated rainfall and one map of annual rainfall.

This study was funded by the Biodiversity Foundation, a public foundation of the Spanisn Government.