Geophysical Research Abstracts,
Vol. 11, EGU2009-11149, 2009
EGU General Assembly 2009

Neurocomputing and raingauge network measurements: low cost spatiotemporal analysis of 10-days singletons to attempt high resolution inference

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Precipitation is an environmental random process whose realization is highly stochastic in nature. An analysis of raingauge network measurements by means of a non linear statistical model is here provided attempting to provide data suitable for applications in soil science. A three layers FFBP (Feed-Forward Back-Propagation) neural network with topology 11:11:1 is used to address the space time analysis at 10-days time step of 158 stations per 1200 decades (1 decade=10 days) representing the historical data for Campania region (south Italy). This network prototype is used to build ensembles which at most combines 100 neural network components using the bootstrapping technique. Three alternative groups of models at rising topological complexity are built: (i) a single 11:11:1 network, (ii) random ensembles in which the number of neural network components increases from 5 to 100, and (iii) ensembles with less than 100 neural network components, in which networks are selected according to two optional methods (genetic algorithms or percentiles of MSE) and are aggregated with average or PCR (Principal Component Regression). There are about 30 model variants to be compared.
The I/O mapping functions created each by a model variant are fed with low cost 11 input variables. There are six geospatial covariates, that is Easting, Northing, sea distance, distance from orographic barriers considering more heights, modified aspect and elevation. To account for temporal variability of rain, five time dependent variables are used: four anchorage stations and time measured as a particular function of ordinal decade number within year. It is showed the ability of neurocomputing in producing multitemporal spatial maps for Campania region and the ability to address precipitation analysis in smaller areas, such as the Cilento case study characterized by very little raingauge network. Furthermore it is highlighted the limits of using not many stations which cause a spatial map to be further manipulated with a geostatistical indicator filter to account for outermost values (nonrainy stations at bottom and extreme values at top).