Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09817, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09817
EGU General Assembly 2008
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Physiographical space-based interpolation as a tool for predictions in ungauged basins

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A new and very interesting approach to the prediction of floods and low-flows in ungauged basins is the application of geostatistical procedures, which were originally developed for the spatial interpolation of point data (kriging, see e.g., Kitanidis, 1997). The literature proposes two different techniques. The first performs the spatial interpolation of the desired hydrometric variable (e.g., annual streamflow, peak flow with a certain return period, etc.) in the bidimensional space of geomorphoclimatic descriptors (Chokmani and Ouarda, 2004). The x and y coordinates of the bidimensional space are derived from an adequate set of n>1 geomorphologic and climatic descriptors of the river basin, through the application of multivariate techniques, such as the canonical correlation analysis (Shu and Ouarda, 2007). The second technique, named Topological kriging or Topkriging, uses a grid-based description of the morphology of the study area and spatially interpolates the considered streamflow index (e.g., flood, low-flow) on the cells belonging to the drainage network (Skoien et al., 2006, Skoien and Bloschl, 2007). This paper focuses on the first technique and further investigates its applicability for the prediction flood quantiles in ungauged basins. In particular, the analysis considers the estimation of the probability weighted moments of annual maximum series of flood flows and applies several techniques that are either deterministic (e.g., inverse distance, Voronoy diagrams or Thiessen polygons, etc.) or geostatistical (e.g., Kriging).

The study area consists of 58 unregulated catchments located in northern-central Italy, for which several geomorphological and climatic descriptors are available. The reliability of each technique is first assessed through a comprehensive cross-validation

procedure that focuses on the estimation of the 10-, 50- and 100-year flood quantile, and secondly compared with the reliability of a regionalisation procedure based upon multiple regression.

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