

1961-90 high-resolution minimum, mean, and maximum temperature grids for Italy obtained by means of three different spatial interpolation models

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Starting from a long term, quality-checked, and brand new temperature database, we developed three different spatial models that led to the construction of climatologies for the Italian area and the Alpine Area. The final database is made of 1,494 Mean Temperature and 1,138 Minimum and Maximum Temperature monthly normals related to 1961-90 reference period. We collected such data from more than 20 regional, national and European datasets. Using a high-resolution digital elevation model (horizontal resolution: 30-arc-sec), we constructed monthly grids for 4 temperature variables: mean temperature, minimum temperature, maximum temperature and daily temperature range. The first model deals with a Multiple Linear Regression (temperature versus elevation, latitude, and longitude); the residuals are studied using a knowledge-based methodology that accounts for sea influence, lake effect, cold air pooling, top-valley effect, solar radiation, urban heat island, macro-exposition of the mountain ridges, and land cover effects; after the stepwise evaluation of the listed effects, residuals are further interpolated with a moving-window geographical weighting technique that uses elevation, radial distance and continentality index as predictors. The second model is a regression kriging: elevation, latitude, and longitude are used as external drifts and an ordinary kriging scheme based on monthly exponential semi-variograms is implemented to grid temperature residuals. The third model is a Local Weighted Linear Regression of temperature versus elevation with weights including elevation, radial distance, aspect, slope and sea distance weights. The first two models were validated using a k-fold cross validation, the last one by a jack-knife methodology. All the three models are unbiased and characterised by monthly mean absolute errors lower than 1.0 °C. Root mean square errors are higher than 1.2°C only in the Alpine Area, because of its complex orographic features, whilst in Central and Southern Italy they hardly exceed 1.0°C. In this presentation we discuss the three interpolation models in details, with particular attention to the differences between them. 12 monthly maps and 1 average yearly map are presented for the 4 temperature variables under examination. We also show comparisons between the final grids for January and July. Last, we present the limits and the strengths of the three models and we discuss further improvements and perspectives for updating the Italian temperature climatologies to 1971-00 and 1981-2010.