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Constructing gridded hourly air temperature dataset

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Air temperature is one of the most important meteorological element, with major impact on the earth-atmosphere energy balance. The characteristics of the surface air temperature in locations without surface meteorological measurements are usually acquired by employing spatial statistics methods. Gridded surface meteorological data are essential for evaluating the performance of climatological models, for applying statistical downscaling methods and as input data for hydrological and agrometeorological models.

In this work, we tested two categories of statistical methods (spatial and spatio-temporal) used for interpolating ground-based hourly air temperature data. The main input dataset used in this work was the quality controlled and homogenized hourly air temperatures measured between 2016 and 2017, obtained from four networks: Romanian National Meteorological Administration (ANM), National Network for Monitoring Air Quality (RNMCA), Regional Basic Synoptic Network (RBSN), and Meteorological Terminal Aviation Routine Weather Report network (METAR).

The principal covariate used in the spatial interpolation procedures was the gap filled hourly LST data over Romania, available between 2016 to 2017, based on MSG-Seviri satellite images, which is an operational product of the Land Surface Analysis – Satellite Application Facility (LSA-SAF). The other predictors were derived from SRTM (Shuttle Radar Topography Mission) data and from CORINE Land Cover 2018 product. The gridding was performed in a Romanian National Grid (Stereo 70), at 1000 m × 1000 m spatial resolution.

The results of the tested methods show that the mean absolute errors (MAE) and root mean square errors (RMSE) of space–time predictions are considerably lower than those of the pure spatial estimation.

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