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A high-resolution 1961-1990 monthly temperature climatology for the greater Alpine region

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The objective of the ECSN/HRT-GAR project (for details see the English project web page http://www.zamg.ac.at/forschung/klimatologie/klimamodellierung/ecsn_hrt-gar) was the creation of a high-resolution monthly temperature climatology for the greater Alpine region (GAR, 4–19 E and 43–49 N). At the aimed spatial resolution of 30 arc-seconds (approximately 1 km), temperature distribution is linked to the physiographical features of the earth's surface. This necessitated a dense and high-quality temperature dataset. Remarkable efforts have been devoted to multinational data collection, as well as to correction procedures, especially due to inhomogeneities caused by different methods of means estimation. As a side effect, a large and quality-checked database of 1,726 temperature series was set up and an amount of erroneous data, as well as imprecise station coordinates, were corrected.

This dataset was subjected to spatial temperature interpolation based on multilinear regression techniques regarding elevation, longitude, latitude and distance from the coast. This was done for seven horizontal and vertical subregions. An essential advance in comparison with many hitherto existing temperature climatologies consists in the efforts that have been made to account for mesoclimatologic effects. Systematic comparison of the station data with preliminary grids permitted the identification of further important relations between temperature and geographical and morphological variables. Significant model improvements could be reached by adjusting for mesoscale effects in cold air pools, coastal and lakeshore belts, urban areas and on slopes. This allowed for a stepwise minimising of the standard error to a value largely below 1 °C. The residual error is due to a number of causes, such as local station peculiarities, uncertainties of station environments, instrumental errors, inhomogeneous station coverage and remaining model shortcomings.

The high-resolution monthly temperature fields for the GAR, which are regarded to serve as a profound base for a wide range of scientific and planning applications, are digitally available for interested researchers. Maps and data can be downloaded from the project web page.