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HISTALP – historical instrumental climatological surface time series of the Greater Alpine Region

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Abstract:

This paper describes the HISTALP database, consisting of monthly homogenised records of temperature, pressure, precipitation, sunshine and cloudiness for the 'Greater Alpine Region' (GAR, 4–19 °E, 43–49 °N, 0–3500m asl). The longest temperature and air pressure series extend back to 1760, precipitation to 1800, cloudiness to the 1840s and sunshine to the 1880s. A systematic QC procedure has been applied to the series and a high number of inhomogeneities (more than 2500) and outliers (more than 5000) have been detected and removed. The 557 HISTALP series are kept in different data modes: original and homogenised, gap-filled and outlier corrected station mode series, grid-1 series (anomaly fields at $1^\circ \times 1^\circ$, lat × long) and Coarse Resolution Subregional (CRS) mean series according to an EOF-based regionalisation. The leading climate variability features within the GAR are discussed through selected examples and a concluding linear trend analysis for 100, 50 and 25-year subperiods for the four horizontal and two altitudinal CRSs. Among the key findings of the trend analysis is the parallel centennial decrease/increase of both temperature and air pressure in the 19th/20th century. The 20th century increase (+1.2 °C/+1.1 hPa for annual GAR-means) evolved stepwise with a first peak near 1950 and the second increase (1.3 °C/0.6hPa per 25 years) starting in the 1970s. Centennial and decadal scale temperature trends were identical for all subregions. Air pressure, sunshine and cloudiness show significant differences between low *versus* high elevations. A long-term increase of the high-elevation series relative to the low-elevation series is given for sunshine and air pressure. Of special interest is the exceptional high correlation near 0.9 between the series on mean temperature and air pressure difference (high-minus low-elevation). This, further developed via some atmospheric statics and thermodynamics, allows the creation of 'barometric temperature series' without use of the measures of temperature. They support the measured temperature trends in the region. Precipitation shows the most significant regional and seasonal differences with, e.g., remarkable opposite 20th century evolution for NW (9% increase) *versus* SE (9% decrease). Other long- and short-term features are discussed and indicate the promising potential of the new database for further analyses and applications. Copyright © 2006 Royal Meteorological Society

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