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Original measured data as "ground truth" for hydrological applications? A review of two decades of experience in the field of homogenizing instrumental climate data

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Measured data are usually regarded as the "truth" against which model results regionally interpolated climate fields and climate proxies and verified. In fact measured climate data do not contain climate alone. The "real climate" information is overlain by short term noise in the form of erroneous outliers and—in particular if longer time series are regarded—-by breaks or even longterm trends produced through relocations, technological progress, urbanization and other non climatic factors. It can be shown that one often heard argument that such non climatic inhomogeneities can be regarded as random and vanish if the average of a larger sample of time series is used for analysis, is not true. There are also systematic inhomogeneities which bias even larger regional climate datasets. We have evidence that an average time series is infected by such breaks every 20 to 30 years—-a sample length near the lower limit defined by the necessities for significance at the given high frequent variance of climate.

The majority of these arguments are specifically severe for hydrological applications. They often afford time series at daily or subdaily resolution and precipitation is the climate element of highest interest. As spatial coherence decreases with higher time resolution and precipitation fields are among those already having stronger spatial decorrelation than other climate parameters, the current situation in regard to a well homogenized longterm climate database is not the best.

The lecture is going to discuss this at the basis of the experience of the climate research department of ZAMG which has among its principal focal points the question of homogeneity of climate data in the "greater alpine Region". The general state of the art is tested against the frame of practical basics given by factors like existing network densities, series lengths, metadata availability, mathematical tools and an outlook to oncoming improvements based on current plans and projects is given.