

Variability of the Alpine precipitation climate: A challenge for data analysis and climate modeling.

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In regions of complex topography, the climate of precipitation can exhibit considerable variations over a broad range of space scales. The Alpine ridge is one of the large-scale mountain ranges of the world where such variations are most accurately monitored by high-resolution rain-gauge observations. The complexity of precipitation variability poses a challenge to climate data analysis, such as the development of climatologies or the quantification of long-term variations and trends. Moreover, it is this variability and the related processes in the atmosphere, which call for the application of regional climate models to derive future climate change scenarios.

The purpose of this contribution is to illustrate the complexity of the precipitation variability in the Alpine region and to describe some of the historic and modern developments to deal with the pertinent challenges to data analysis. Example developments include the use of regression techniques for the interpolation of point observations (e.g. for deriving high-resolution climate maps) and the statistical exploitation of the space-time covariance to reconstruct long-term climate variations. In a third example the skill of regional climate models in representing the mesoscale precipitation variability, including the occurrence of heavy precipitation, is documented from a recent model inter-comparison in the Alps. Illustrations will be based on data and analysis from the high-resolution rain-gauge networks of all Alpine countries, encompassing more than 6000 records over several decades.

The illustrations pinpoint to the need of both, accurate and dense observations as well as sophisticated methodologies, to derive data products for practical and scientific use.