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Height dependency of meteorological extremes – a contribution to assess the vulnerability of infrastructure

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What is the likelihood of days with extremely high or low temperature occurring in an area with complex topography? Are there future developments relevant for the operation, maintenance or vulnerability of infrastructure in such a terrain, e.g., concerning the days with frost/thaw-transitions or high winds? In a nutshell, this presentation is about the representativity of meteorological parameters, paricularly of their *extremes*, taken at individual spots in different heights above sea level and yet required for large areas.

It is possible to derive relationships which extract additional information from the spatially sparse data sources. Basically, the meteorological parameter is subjected to an analysis of the vertical behaviour so that it can be expressed by just this one variable: height above sea level – reducing the dimensionality of the problem. A similar approach is frequenly used in the context of a height-dependent interpolation. Here, not only averages of meteorological parameters are subjected to such an analysis, but properties related to extremes, such as indicators, e.g., of high/low temperature or heavy precipitation. For the empirical assessment a number of stations, preferably from as many different heights above sea level as possible, is required.

The presentation will focus on applications of the heigth-dependency of climate extreme indicators. This approach is particularly feasible when it comes to the investigation of climate impacts on infrastructure such as power lines, railroads or motorways. It is rather improbable that individual stations are in proximity of the infrastructure and therefore the assessment of a height profile of an extreme or an extreme indicator provides users with essential information concerning the vulnerability of the infrastructure.