

Climate Change in Alpine Regions – Regional Characteristics of a Global Phenomenon by the Example of Air Temperature

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For nearly 50 years the Austrian Research Centre for Forests (BFW) has been engaged in research in the Alpine region recording measuring data at extreme sites. Data series of this duration provide already a good insight into the evolution of climate parameters. Extrapolations derived from it are suitable for comparison with results from climate change models or supplement them with regard to their informative value. This is useful because climate change models describe a simplified picture of reality based on the size of the data grid they use.

Analysis of time series of two air temperature measuring stations in different torrent catchment areas indicate that 1) predictions of temperature rise for the Alpine region in Austria will have to be revised upwards, and 2) only looking at the data of seasons (or shorter time periods), reveals the real dramatic effect of climate change.

Considering e.g. the annual average data of air temperature of the years 1969-2016 at the climate station "Fleissner" (altitude 1210m a.s.l; Upper Mölltal, Carinthia) a significant upward trend is visible. Using a linear smoothing function an increase of the average annual air temperature of about 2.2°C within 50 years emerges. The calculated temperature rise thus confirms the general fear of an increase of more than 2.0°C till the middle of the 21st century. Looking at the seasonal change of air temperature, significant positive trends are shown in all four seasons. But the level of the respective temperature increase varies considerably and indicates the highest increase in spring (+3.3°C), and the lowest one in autumn (+1.3°C, extrapolated for a time period of 50 years).

The maximum increase of air temperature at the measuring station "Pumpenhaus" (altitude 980m a.s.l), which is situated in the "Karnische Alpen" in the south of Austria, is even stronger. From a time series of 28 years (with data recording starting in 1989) the maximum rise of temperature was 5.4°C detected for the summer (calculated over a period of 50 years). The predicted overall rise in the annual average temperature within 50 years is +3.9°C, whereas the rise of temperature at the station "Fleissner", located in the "Hohen Tauern", is +2.3°C; both based on determined linear smoothing functions and for the same measuring period (1989-2016).

As the effects of the calculated changes of air temperature on the alpine habitat (the entire ecosystem, natural hazards and tourism) and the characteristics of climate change vary strongly from a geographical point of view (as shown by the two examples of air temperature data), a comprehensive analysis of data series from climatic measurement stations (including precipitation, snow covering, radiation...) in the Alpine region is urgently necessary, to be able to work on targeted climate adaptation strategies for these sensitive areas.