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Small-scale variations of climate change in mountainous forested terrain - a regional study from H.J. Andrews Long Term Ecological Research site in Oregon, USA

Katerina Honzakova (1), Peter Hoffmann (2), Julia Jones (3), Christoph Thomas (1,3)

(1) University of Bayreuth, Micrometeorology, Bayreuth, Germany (christoph.thomas@uni-bayreuth.de), (2) Potsdam Institute for Climate Impact Research, Potsdam, Germany, (3) College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, OR, USA

There has been conflicting evidence as to whether high elevations are experiencing more pronounced climate warming than lower elevations in mountainous regions. In this study we analyze temperature records from H.J. Andrews Long Term Ecological Research, Oregon, USA and several nearby areas, comprising together 28 stations located in Cascade Mountains. The data, starting in 1958, are first checked for quality and homogenized using the Standard Normal Homogeneity Test. As a reference, composite climate time series based on the Global Historic Climate Network is created and together with cross-referencing against station records used to correct breaks and shifts in the data.

In the next step, we investigate temperature patterns of the study site from 1958 to 2016 and compare them for valley and hill stations. In particular, we explore seasonality and inter-annual variability of the records and trends of the last day of frost. Additionally, 'cold' sums (positive and negative) are calculated to obtain a link between temperature and ecosystems' responses (such as budbreaks). So far, valley stations seem to be more prone to climate change than ridge or summit stations, contrary to current thinking. Building on previous knowledge, we attempt to provide physical explanations for the temperature records, focusing on wind patterns and associated phenomena such as cold air drainage and pooling. To aid this we analyze wind speed and direction data available for some of the stations since 1996, including seasonality and inter-annual variability of the observed flows.