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# Are there local-scale effects of altitude, slope and aspect on temporal trends in a spatially high-resolved plant phenological network in the Swiss Alps 1971–2000?

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Shifts in phenology of plants and animals have been widely observed as consequence of climate change impacts and temperature increase. Species-specific data are often assigned to limited and generalized site information on the precise location of the observation. However, as much meta-information as possible on the individual plant under observations is necessary to assess the impacts of changing weather patterns at the local scale that are related to changes in radiation, fog, frost and dominating circulation.

Here we used plant phenological data of the BERNCLIM network that collects data in the Canton of Bern (Switzerland) and adjacent areas covering a total area of 7,000 km2 since 1970. The number of observation sites reached up to 600 observation sites with detailed meta-information of several locations within each site. The precision of coordinates for each location is generally less than one hectare. This information allows to differentiate several terrain-types, based on altitude, slope and aspect. We used original observations and two interpolated data sets based of the blooming of hazel (Corylus avellana L.) for early spring, dandelion (Taraxacum officinale aggr.) for mid spring, and apple trees (Malus domestica Borkh.) for late spring. In addition we used interpolated data by using averaged maximum differences between several locations of a site and an algorithm based on constant spatial patterns in the 1971–1974 period. Phenological maps were created using multiple linear regression models with longitude, latitude, altitude, slope and aspect as independent variables and phenological date of each phase as dependent variable models in a Geographical Information System (GIS).

For this contribution we analysed the impact of local terrain differences on phenological trends of three plant species. Specifically, we addressed the question whether differences in altitude, slope and aspect lead to systematic differences in temporal trends for the 1971–2000 period. Whereas altitude shows generally high correlations with phenology, we aimed at quantifying additional impacts on phenological trends such as microclimate and local adaptation of individual plants. We present results from an ongoing analysis and discuss the impact and additional uncertainties of local parameters on phenological observations and trends. Strongest variations between locations are expected for Corylus and Malus whereas Taraxacum is most strongly influenced by temperature along altitudinal gradients. This information derived from a regional observations network with long-term observations and high precision meta-information can be useful for detailed analyses of large data sets that stored in a number of European databases.