BIOCLIM: High resolution climate indicators for Tirol and Vorarlberg for historical and future periods

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Climate change poses significant challenges to the forestry sector, and effective planning and management require appropriate responses. To accurately model the impact of climate change, it is essential to have high-resolution climate data.

As an intermediary between climate researchers and impact scientists we conducted optimized climatological analyses to generate high-resolution 250m daily spatial gridded data sets of various meteorological variables, including temperature (mean, maximum, minimum), total precipitation, global radiation (on flat surface), vapor pressure, and wind mean speed. To obtain the climatological variables, we used the gridded SPARTACUS and APOLIS datasets provided by GeoSphere Austria, except for wind speed and dew point, for which we created new gridded datasets directly from station data using a multi-stage approach that included the 3D inverse distance method and machine learning (ML) techniques. Based on those variables, we further derived and downscaled climate indicators to a 10m resolution.
Our data cover both historical (1991-2020) and future periods (until 2100), providing a comprehensive understanding of how climate change will impact forests in the long term under three selected scenarios derived from CMIP5-RCMs.

We placed particular emphasis on foehn occurrence, since it has a significant impact on variables like humidity and wind speed and can lead to flora desiccation due to its drying effect. To generate plausible high-resolution wind fields on foehn days, we used a novel Fingerprint approach, where spatial wind pattern on a 333m resolution were created for selected time steps with the model WRF. These fields were combined with a ML approach to replace daily wind fields on foehn days.