



SNOW COVER VARIABILITY IN THE BLACK FOREST REGION AS AN EXAMPLE OF A GERMAN LOW MOUNTAIN RANGE UNDER THE INFLUENCE OF CLIMATE CHANGE

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During the last decades high snow cover variability was observed in the German low mountain ranges. In addition, average snow cover periods have decreased at most localities. This process involves a strong economic impact on skiing resorts of low mountain ranges. Based on data sets from weather stations of the German meteorological service (Deutscher Wetterdienst (DWD)) which cover up to the last 60 years, the temporal development of the mean seasonal snow cover period in the low mountain ranges of Black Forest (south-west), Harz (north), and Bavarian Forest (south-east) of Germany was examined.

Mean wintertime air temperature in the low mountain ranges is increasing more rapidly compared to the annual mean air temperature. Additionally the south west is the warmest region in Germany. Therefore, the snow cover of the Black Forest is much more susceptible to an increase in air temperature than in the other low mountain ranges in Germany. In the Black Forest region air temperatures near the melting point are observed even in January. Snow cover in the Bavarian Forest region with its much more continental climate is less affected by temperature variations but subject to variations in wintertime precipitation. Seasonal snow cover in the Harz region starts about two weeks earlier compared to Bavarian Forest and the Black Forest.

The future snow cover development of Black Forest was examined using Intergovernmental Panel on Climate Change (IPCC) prognosis of future air temperature development and trend analysis within observed time series at low mountain range

weather stations. The IPCC scenarios were adopted specifically with respect to region, season and altitude and afterwards compared to the observed trend. A transfer function describes the relation between seasonal air temperature change and snow cover duration. A mean reduction of snow cover duration until 2025 for each mountain range is approximated.

For instance, the period of a snow cover with a minimum height of 10 cm is likely to be shortened by 20 days per winter season until 2025 in the Black Forest. That is to say snow cover duration in the summit region will be shortened by one third in comparison to the snow cover duration in the 1990s. Regions below 800 m altitude a.s.l. will no longer regularly receive a snow cover lasting for at least a fortnight during the winter season.

The analysis was extended to allow for the possibilities of artificial snowing within skiing resorts. Based on air temperature and air humidity data the mean seasonal number of days suitable for artificial snowing was calculated depending on region and altitude. The conditions for operating artificial snow production units are much better within more continental toned climates in the east of Germany than in the southern and western parts of the country.

Together with a digital elevation model (DEM) of Germany the data within a Geographic Information System (GIS) serves to identify key regions of possible investments into winter sport facilities.