



Long term spatio-temporal variability and trend of snow height, Sonnblick region, Austrian Alps

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High quality measured time series of snow cover characteristics (height, density, temperature, snow crystal characteristics etc.) are essential for calibration and validation of snow cover models (snow melt models). Moreover multi-years series of such measurements can be used for investigation of effects of climate change on snow cover. Whereas several snow cover measurements are available from lower elevation test sites high alpine data series are sparse though this region causes highest uncertainty in modelling results. This uncertainty originates both from the importance of the wind as well as from the influence of avalanche activity on snow accumulation and snow redistribution.

The Sonnblick region (Hohe Tauern, Austrian Alps) presents a unique example of long term measurements of snow cover characteristics covering both sides of the Alpine crest. Measurement points both south as well as north of the Alpine crest covers an elevation range from 2500masl to 3100masl (which represents the level of highest peaks in this region). Snow-height measurements (25 stakes with monthly reading) date back to 1927 and detailed measurements of snow cover characteristics (height for about 200 measurement points, density, temperature, snow crystal characteristics for up to 25 sites) are available from measurements once a year since the beginning of the 1980ies. These measurements are part of a detailed monitoring program of mass balance of 3 glaciers in the Sonnblick region. The nearby Sonnblick Observatory (3106m) enables the investigation of snow cover changes in the frame of detailed meteorological measurements.

The snow height measurements show a distinct influence of the Alpine crest on snow height distribution. At lower elevation regions snow height is remarkably higher at

northern side of the Alpine crest compared to the southern side. However at highest elevation level precipitation events originates from the same air masses (without importance of orographic uplifting effects) and therefore amount of snow accumulation is equalized. This finding was proved by stable isotope measurements of snow cover. On long term scale trends of maximum snow height (around 1. May) are parallel both north and south of the Alpine crest as well as at different elevations. Highest values were measured in the 1950ies and a slight increase was observed in the 1990ies. In order to investigate the spatial representativity of snow stake measurements these single point measurements with long term readings were compared with a spatial high density snow depth probing with about 100m inter-point distance.