Monitoring of snow in small alpine catchment using digital camera

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Monitoring of snow accumulation and melt is appealing as it provides detailed insight into the governing hydrological processes and valuable up-to-date information for water resources managers. Snow cover characteristics are typically measured at climate stations or during spatially- and temporarily-irregular snow field campaigns. In the high alpine regions, manual snow depth measurements are often very difficult, if even possible. An alternative to sparse ground observations is the use of remote sensing techniques. These include global satellite monitoring, radar based observations, laser scanning altimetry and, alternatively, digital camera images.

The objective of this study is to present the potential of using a digital camera for remote snow cover monitoring at the small catchment scale. The presentation will show results of snow monitoring at Edelbodenalm site located in Hochschwab part of the Austrian Alps. The images were taken using an off-the-shelf 3 Mega-Pixel (2048 x 1536) Canon A70 camera built in a special air-conditioned compartment and controlled by an industrial PC located in the same case. After an off-site camera calibration, hourly images of the domain were taken in the period November, 2004 - December, 2006.

The camera applications shown in this study include automatic snow depth measurements, snow settling and interception assessment and validation of a distributed energy based snow model for the domain located in the perspective of camera view. The results indicate that the main camera advantages over alternative remote sensing methods are usually minimal effects of clouds and high temporal and spatial resolution of snow cover characteristics.