

## Potential and limitations of webcam images for snow cover monitoring in the Swiss Alps

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In Switzerland, several thousands of outdoor webcams are currently connected to the Internet. They deliver freely available images that can be used to analyze snow cover variability on a high spatio-temporal resolution. To make use of this big data source, we have implemented a webcam-based snow cover mapping procedure, which allows to almost automatically derive snow cover maps from such webcam images. As there is mostly no information about the webcams and its parameters available, our registration approach automatically resolves these parameters (camera orientation, principal point, field of view) by using an estimate of the webcams position, the mountain silhouette, and a high-resolution digital elevation model (DEM). Combined with an automatic snow classification and an image alignment using SIFT features, our procedure can be applied to arbitrary images to generate snow cover maps with a minimum of effort. Resulting snow cover maps have the same resolution as the digital elevation model and indicate whether each grid cell is snow-covered, snow-free, or hidden from webcams' positions. Up to now, we processed images of about 290 webcams from our archive, and evaluated images of 20 webcams using manually selected ground control points (GCPs) to evaluate the mapping accuracy of our procedure. We present methodological limitations and ongoing improvements, show some applications of our snow cover maps, and demonstrate that webcams not only offer a great opportunity to complement satellite-derived snow retrieval under cloudy conditions, but also serve as a reference for improved validation of satellite-based approaches.