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Using web content for informing water management in snow-dominated catchments

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Abstract: Snow accumulation and melting are fundamental components of the hydrologic cycle in many water systems across the world. In such contexts, improving snow monitoring can be extremely valuable in a variety of operational contexts, such as avalanche protection, medium to long-term streamflow forecast, and drought risk management. Despite recent advances in environmental monitoring systems, continuous snow monitoring systems able to collect data at high spatial and temporal resolution are not well established yet. The unprecedented availability of user generated data on the Web is opening new opportunities for enhancing real-time monitoring and modeling of environmental systems based on data that are public, low-cost, and spatio-temporally dense. In this work, we contribute a novel crowdsourcing procedure for extracting snow-related information from public web images, either produced by users or generated by touristic webcams. A fully automated process fetches mountain images from multiple sources, identifies the peaks present therein, and estimates virtual snow indexes representing a proxy of the snow covered area. The value of the obtained virtual snow indexes is estimated in a real world water management problem, the regulation of Lake Como, where we used these indexes for informing the daily operation of the lake's dam. Numerical results show that such information is effective in extending the anticipation capacity of the lake operations, ultimately improving the system performance.

Keywords: User generated content, crowdsourcing, water resources management