Cold Region Hydrology in a Changing Climate (Proceedings of symposium H02 held during IUGG2011 in Melbourne, Australia, July 2011) (IAHS Publ. 346, 2011). 103-108

Monte Carlo experiments for uncertainty investigation of glacier melt discharge predictions through surface energy balance analysis

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Abstract The spatial representativeness of point records is a concern in glacier discharge predictions. A Monte Carlo-based global sensitivity approach is used to investigate the predictive uncertainty in the net radiation (*Rn*) as the major component driving glacier melt in the Bolivian Andes. The *Rn* is inferred through the Surface and Energy Balance Algorithm, calibrated with point dry-season records monitored on a glacier's ablation area. High uncertainties are expected in the vicinity of the monitoring station (surface albedo (α) between 0.81 and 0.79, specific melt discharge (SMD) between 72 and 88 L s^{-1} km^{-2}); smaller uncertainties are expected on the glacier boundaries (α between 0.10 and 0.08, SMD between 128 and 143 L s^{-1} km^{-2}). Thus, with the incoming long wave radiation ($R_L\downarrow$) as the most sensitive model parameter, the spatial variability in α determines the spatial variability in the SMD predictive uncertainties.

Key words tropical Andes; sensitivity analysis; remote sensing