Submitted Abstract

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First Author First Name Last Name	 Chetan (1) Singh
Submitting Author First Name Last Name	 Chetan Singh
Correspondence	chetansingh10.11dawn@gmail.com
Co-Authors **>> E-Mails will be not listed**	Mandal, Arindan (1); Soheb, Mohd (1,2); Sharma, Parmanand (3)
Organisations	1: Jawaharlal Nehru University, India 2: Heidelberg University 3: National Centre for Polar and Ocean Research,India
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Abstract

The study presents point-scale wintertime surface energy balance (SEB) of the snow surface in the cold arid environment at 5114 m a.s.l. in the Lato catchment in the Ladakh region of India from October 2018 to March 2021. The study includes those days of winter months (October to March) when albedo was greater than 40% for computation of snow SEB to understand the processes and drivers of SEB and sublimation of snow. We also investigate the control of cloud cover on SEB components and sublimation. The bulk Aerodynamic method including stability corrections is employed to calculate turbulent heat fluxes. The relative contribution of turbulent heat fluxes and net radiation to SEB are 83% and 17%, respectively, indicating turbulent heat flux, particularly Latent heat (67%) governing the winter SEB of the snow surface. Cloud cover controls SEB on overcast days by reducing shortwave incoming radiation by up to 70% and consequently sublimation rate by 61%. The computed winter sublimation rate is 2.23 mm we d-1 which is relatively greater than that of western and central Himalayan glaciers/snow surface, located at similar altitude, highlighting dry air favoring higher sublimation in the cold arid regime of Ladakh. We also observe that mid-latitude western disturbances induced winter precipitation impede sublimation rate from 2.46 to 1.74 mm we d-1 through the influx of high moisture in the region.