

Elevation-dependence of summer climate over the south slope of Mt. Everest, central Himalaya

Kun Yang (1), Franco Salerno (2), Lin Ouyang (1), Nicolas Guyennon (3), and Gianni Tartari (2)

(1) Chinese Academy of Sciences, Inst of Tibetan Plateau Research, Beijing, China (yangk@itpcas.ac.cn), (2) National Research Council, Water Research Institute, Brugherio (IRSA-CNR), Italy, (3) National Research Council, Water Research Institute, Roma (IRSA-CNR), Italy

Exploring the climate elevation-dependence is crucial for understanding hydro-meteorological processes in high mountains as in the Himalayan Range. Using two-year data at six stations deployed from 2660 to 7986 m a.s.l. along the south slope of Mt. Everest, distinct differences in summer climate between upper-high-elevations (> 4500 m a.s.l. or UHE) and lower-high-elevations (<4500 m a.s.l. or LHE) are detailed for the first time. During the summer, the LHE daytime surface wind is generally upslope, accelerates along the slope, and thus air divergence occurs, whereas the UHE daytime upslope wind slows down, even becomes downwards at 7986 m a.s.l., and thus air convergence occurs. The air divergence and convergence along the slope is consistent with the observed diurnal cycle of precipitation, which peaks at night in the LHE, but in the daytime in the UHE. During the summer, humid environment drastically weakens solar radiation and enhances downward longwave radiation; clouds associated with precipitation daytime peak further attenuate solar radiation in the UHE. Because of the weak solar radiation and stable downward longwave radiation, the diurnal range of air temperature is not so dependent on elevation. The lapse rate of surface air temperature has a typical diurnal variation over the UHE, with larger values in the daytime and smaller values at night, but such a regular diurnal cycle is not found over the LHE. Relative humidity shows much stronger seasonal variations in the UHE than in the LHE, but its elevation-dependence is very weak in the summer as the humidity is close to saturation at all stations except for the highest station that has low relative humidity. Because of these complex elevation-dependences of the individual variables, caution must be exercised in estimating UHE climate from observed data at lower elevations in the mountainous region.