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Energy exchange of an alpine grassland on the northeastern Qinghai-Tibetan Plateau

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The seasonal variability in the surface energy exchange of an alpine grassland on the northeastern Qinghai-Tibetan Plateau was investigated using eddy covariance measurements. Based on the change of air temperature and the seasonal distribution of precipitation, a winter season and wet season were identified, which were separated by transitional periods. For each period, the surface energy exchange exhibited distinct patterns.

Daily mean net radiation (R_n) was almost always positive throughout the year. Sensible heat flux (H) was almost always greater than latent heat flux (LE) during the winter season, and LE was always greater than H during the wet season. Ground heat flux (G_0) was relatively low throughout the year. The annual mean net radiation was about 39% of the annual mean solar radiation (R_s). R_n was relatively low during the winter season (21% of R_s) compared to the wet season (55% of R_s), which can be explained by the difference in surface albedo and moisture condition between the two seasons. H and LE had different roles during different periods of the year. Annually, the main consumer of net radiation was LE. During the winter season, H was dominant because of the frozen soil condition and lack of precipitation. During the wet season LE was dominant due to increased temperature and sufficient rainfall coupling with vegetation development. LE was strongly controlled by R_n from June to August though surface conductance (g_c) and soil water content (θ_v) were high. During the transitional periods, H and LE were nearly equally partitioned in the energy balance. The results also suggested that the freeze-thaw condition of soil and the seasonal distribution of precipitation had important impacts on the energy exchange in this alpine grassland.