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Biophysical Regulation of Carbon Fluxes over an Alpine Meadow Ecosystem in the Eastern Tibetan Plateau

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We used the eddy covariance method to measure the CO_2 exchange between the atmosphere and an alpine meadow ecosystem in the eastern Tibetan Plateau, China in 2010. The photosynthesis was depressed under low air temperature (T_a), high vapor pressure deficit (VPD) and medium soil water content (SWC) conditions. Temperature was the most dominant factor controlling ecosystem photosynthesis in this alpine meadow. Regardless of photosynthetically active radiation (PAR), the relationship between net ecosystem CO_2 exchange (NEE) and T_a (VPD) showed positive correlation when T_a (VPD) lower than optimal value 16.5 ° (0.55 kPa), whereas negative correlation when T_a (VPD) higher than this value. The responses of NEE and ecosystem respiration (R_{eco}) to SWC can be described as a quadratic polynomial when SWC lower than the threshold value 32.5%, however, both NEE and R_{eco} were increased linearly when SWC higher than this value. The optimal SWC for maximum NEE and R_{eco} was 24.6 % when SWC lower than 32.5%. The apparent temperature sensitivity of ecosystem respiration (Q_{10}) declined with the phenology progressed during the growing season, and decreased with the increase in soil temperature (T_s) during the non-growing. Peak daily sums of NEE, gross primary production (GPP), and R_{eco} were -5.27, 13.33, and 10.24 g C m^{-2} d^{-1}, respectively. Integrated NEE, GPP, and R_{eco} over measured year were -156.4, 1164.3 and 1007.9 g C m^{-2}, respectively. The Zoige alpine meadow was a medium carbon sink in grassland ecosystems.