



Evaluation and Comparison of Vapor Pressure Deficit data derived from commonly used meteorological data sets over the terrestrial biosphere: CRU, ECMWF, and NCEP/NCAR

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Vapor Pressure Deficit (VPD), one of the most important variables in photosynthesis models of the terrestrial biosphere, regulates carbon, water, and energy exchanges between plants and the atmosphere. Unfortunately, this quantity is not measurable directly, but can only be calculated using two other variables: saturation vapor pressure and actual vapor pressure—which often also are derived from other measured meteorological terms. This research evaluates VPD data derived from three climatic data sets: Climatic Research Unit (CRU), European Center for Medium-range Weather Forecast (ECMWF), and National Centers for Environmental Predictions joint by National Center for Atmospheric Research (NCEP/NCAR); and finds that among these three data sets, VPD is quite different, with the magnitudes from CRU the highest, and from NCEP/NCAR the lowest. In addition, the inter-annual variations and trends of these data also deviate from each other. The research also explores possible causes for these discrepancies. This research highlights the need of caution when using VPD in the terrestrial biosphere models, especially the models in which the dynamics of the terrestrial biosphere processes are very sensitive to variations of VPD.