A Global, Dynamic Vegetation Roughness Length Time Series for Improved Meteorological and Climate Modeling of Land-Atmosphere Exchanges

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A global, 1 km database of seasonally varying vegetation aerodynamic roughness for momentum is being developed for all terrestrial areas by combining a physical model of surface drag partition with MODIS vegetation data products (Jasinski et al, 2005; Borak et al, 2005; Borak et al, 2010). The procedure, based on Raupach's (1994) roughness sublayer formulation, yields a unique vegetation roughness length (*z*₀) and zero-plane displacement height (*d*₀), on a pixel-by-pixel basis, on the basis of land cover type, canopy height, and time varying canopy area index. Specific drag parameters have been developed for each MODIS land cover type. Time series roughness fields are being computed for each MODIS 8-day compositing period for the 10 complete years of data available for the MODIS period of record (2001-1010). The new dynamic satellite-based roughness fields, when employed within large-scale hydrologic, mesoscale and climate models, are expected to improve representation of surface fluxes and boundary layer dynamics, compared to models that utilize traditional climatological roughnesses from look-up tables. The roughness formulation is validated using published roughness data from past field experiments.

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