

5B.4 Using a modified Fecan soil moisture calculation to predict dust emissions over semi-arid and arid regions

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Improvements in the Air Force Weather Agency-modified GODdard Chemistry Aerosol Radiation and Transport (GOCART) module in the Weather and Research Forecast coupled with Chemistry (WRF-CHEM) model were developed and tested during Fall 2009 and Spring 2010 periods in southwest Asia. The dry limit in the Fecan et al. (1999) method that is used in GOCART was modified to be equated with the hygroscopic coefficient of a soil. The hygroscopic coefficient, assumed to occur at a matric potential of -310 kPa, was chosen as the new dry limit as it equates to a soil tension too great for capillary water to exist. This implies that the threshold friction velocity (u_{ts}) needed to loft a particular soil decreases in a curvilinear fashion below the new dry limit for the soil, which can be directly related to a volumetric water content via the matric potential-water content relationship outlined in Clapp and Hornberger (1978). We further show that the new dry limit can still be predicted by the fraction of clay content in the soil, as outlined in the original Fecan method. Thus, a direct comparison between the original and modified Fecan methods of calculating a dry limit can be made. At an equivalent water content, the new dry limit generally increases the u_{ts} needed to loft soils with higher fractions of clay and generally decreases the u_{ts} needed to loft soils with higher fractions of sand. Results from tests over southwest Asia in the fall 2009 and the spring of 2010 using the new dry limit are presented here.