ROOT ZONE SOIL MOISTURE: ASSIMILATION OF SMMR OBSERVATIONS

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Knowledge of temporal and spatial variation in root zone soil moisture content is vital for a wide range of environmental and socio-economic activities. However, such information is not currently available, due to an inability to monitor with ground-based point measurement techniques at an appropriate spatial resolution, and the uncertainty associated with land surface model predictions. Advances in remote sensing instruments and algorithms have made possible monitoring of spatial variation in near-surface soil moisture content for areas of low to moderate vegetation, but these measurements are limited to the top few centimetres at most. While soil moisture measurements for such a thin near-surface layer are not very useful on their own, we use this near-surface data to constrain land surface model predictions through the process of data assimilation, yielding improved estimates of soil moisture not only in the near-surface layer, but also at depth. We assimilate C-band passive microwave remote sensing data from the Scanning Muliti-frequency Microwave Radiometer (SMMR) for the period 1979 to 1987. We are limited to this time period as there has been no appropriate space-borne passive microwave sensor from then until March 2002, when the Advanced Microwave Scanning Radiometer for the Earth observing system (AMSR-E) was launched. Moreover, SMMR has the same frequencies as AMSR-E making it an ideal developmental test bed for when AMSR-E data become available. The disadvantage of the SMMR time frame is the lack of adequate soil moisture validation data, meaning that it is difficult to assess the improvement of skill in predicting root zone soil moisture content when near-surface observations are assimilated. We assess the improvement in skill by comparing with patterns in Normalised Difference Vegetation Index (NDVI) data, runoff data, and the limited soil moisture profile data available.