Are we improving weather forecasts through better initialisation of the land surface state?

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Abstract: The last ten years have seen some significant progress in land surface modelling and data assimilation. There is now a much better appreciation amongst land surface modellers of the nature of model soil moisture and the implications this has for the bias correction of satellite derived surface soil moisture for data assimilation, verification of model soil moisture and the inter-comparison and inter-changeability of model soil moisture.

At the same time, a number of significant satellite systems have been launched to globally monitor surface soil wetness from space. The Advanced Scatterometer (ASCAT) instrument on both the Metop-A (launched 2006) and Metop-B satellites (launched 2012) provides the first remotely sensed operational surface soil wetness product. A third ASCAT instrument will be launched on the Metop-C satellite, thus maintaining the service until at least 2020. The Soil Moisture Ocean Salinity (SMOS, launched 2010) is the first dedicated satellite soil moisture monitoring mission. While the Soil Moisture Active Passive (SMAP) is another dedicated satellite soil moisture mission due to be launched in 2014.

To take advantage of the newly available remotely sensed data, many numerical weather prediction centres have developed new flexible Kalman Filter based land surface data assimilation (DA) systems capable of assimilating a wide variety of remotely sensed measurements such as surface soil moisture, land surface temperature and vegetation properties as well as the traditionally used screen level temperature and humidity observations. The new land DA systems can make more optimal use of the observations by taking into account the expected error variance of the observations and propagate information from the surface measurements into the deeper soil layers.

This talk describes the impact of recent advances in land DA on weather forecasting as well as opportunities to improve land DA systems and land surface models together with a discussion of the utility of land DA for the monitoring and prediction of natural hazards such as bushfires, droughts, heatwaves and floods.