

Recent Advances in Land DA and Modelling at the Bureau

By Imtiaz Dharssi

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Recent Advances

1. Development of a new flexible Land DA scheme for ACCESS NWP
2. New Urban Parameters and Tree Heights for ACCESS NWP
 1. http://www.cawcr.gov.au/staff/idharss/Dharssi_urban.ppt

New Land DA scheme

- Built Around the JULES LSM
- Can Assimilate many observation types
 - 2m temperature and humidity
 - Satellite derived surface soil wetness
 - Satellite derived land surface temperature
 - Satellite derived vegetation indices (e.g. NDVI, LAI)

New Land DA scheme

- Atmospheric driving data for JULES is from ACCESS NWP model at same spatial and temporal resolution (25km, 10min)
- Uses many JULES runs with perturbed initial conditions to derive the observation operator
 - Example; need 10 JULES runs to analyse soil moisture and soil temperature on four soil layers plus skin temperature
 - Computing costs aren't an issue. The perturbed JULES simulations run concurrently with the atmosphere DA which is much more expensive.

New Land DA scheme

- The new land DA scheme is operational at the UK Met Office
- The new land DA scheme is running in research mode at the Bureau
 - Assimilates 2m T, q and ASCAT soil wetness
- We should be able to use the new land DA scheme with CABLE once CABLE is in the JULES framework
 - CABLE uses same I/O interface as JULES

New Urban Parameters

- ACCESS NWP uses the MOSES2/JULES LSM
 - Has an urban tile
 - Uses a simple Urban Canopy model
 - Three parameters; heat capacity, albedo, roughness length
 - Parameters values are same everywhere
 - All cities/towns use exactly the same parameter values

New Urban Parameters

- We have reduced the urban heat capacity, albedo and roughness length in ACCESS NWP
- Testing in the ACCESS City models shows a significant improvement to 2m temperature forecasts
- This change went operational in Winter 2014

New Tree Heights

- ACCESS NWP assumes that trees in Australia have a height of 28 meters
- We have used a global satellite derived dataset of tree heights
- Testing in ACCESS city models shows an overall marked improvement to forecasts of 2m temperature and wind speed forecasts
 - Some areas show worse wind speed forecasts which may be due to deficiencies with the calculation of the roughness length ($Z=H_{\text{tree}}/20$)
- This change went operational in Winter 2014

Future Work

1. Put CABLE into the JULES framework
(Aspendale/UKMO)
2. Test CABLE in JULES with GSWP2 driving data (Huqiang)
3. Test new land DA scheme with CABLE (Imtiaz/Huqiang)
4. Implement urban scheme in CABLE (Aspendale)
5. Implement lake scheme in CABLE (Aspendale)
6. Implement and test new satellite derived tree heights
in CABLE (Imtiaz/Huqiang/Aspendale)
7. Test CABLE in ACCESS NWP
(Huqiang/Aspendale/Imtiaz)