Soil Moisture

Questions

1. Spatial, temporal and accuracy requirements for satellite missions
2. Development and validation of passive microwave algorithms for AMSR-E/SMOS/Hydros – scaling, multiangle, etc
3. Downscaling of low resolution passive microwave soil moisture measurements using high resolution visible/thermal data and/or radar (ie Hydros)
4. Retrieval and validation of derived root zone soil moisture from the assimilation of near-surface measurements

Ground Requirements

1. Long-term monitoring of soil moisture profiles and associated meteorological data for modelling and evaluation of root zone soil moisture
2. Extensive ground-based measurement of near-surface soil moisture and soil temperature across individual farms at scales of 2.5m to 150m spacing during airborne monitoring campaigns for aircraft validation and scaling, algorithm development, downscaling and mission requirements
3. Continuous near-surface soil moisture, soil temperature, and thermal infrared logging at focus farms for relating air/ground measurements

Air Requirements

1. Fly with passive microwave, thermal and NDVI scanner; would also like lidar scan and digital photography (once)
2. Air measurements coinciding with ground measurements, as early in the morning as possible as – need to check for dew effect
    a. soil and veg temperatures are more closely aligned
    b. more uniform soil temperature profile
    c. Hydros/SMOS have 6am/pm overpass; AMSR-E has 10am/pm overpass
3. Fly at a range of altitudes to achieve a range of ground resolutions to provide data for scaling, root-zone, algorithm development/validation and mission requirements
    a. 50m at 500ft (farms) to 1km at 10,000ft (regions) for microwave
    b. 1m at 500ft to 20m at 10,000ft for thermal & NDVI
4. Fly farms with instrument in multiangle configuration to provide data for SMOS algorithm development
5. Range of soil, landuse, vegetation etc (summer/winter crops, fallow, grazing)

Irrigation and Salinity

Questions

1. Assessment of allocation policy changes – crop mapping
2. Water balance modelling at farm and area levels – estimating Ksat
3. Soil salinity mapping
4. Estimation of recharge discharge areas to predict impacts of irrigation
5. Identification of channel seepage

Ground Requirements

1. Crop data
2. Soils data, especially Ksat
3. Surface soil salinity
4. Groundwater, ET and soil moisture monitoring
5. Identification of channel seepage areas

Air Requirements

1. Passive microwave, TIR, LIDAR, tri-spectral and hyperspectral
2. Focussed on an irrigation district such as Colleambally
3. Flying of individual irrigation bays
4. Very low flying of irrigation supply channels

Runoff

Questions

1. Identification of source areas in semi arid catchments
2. Channel connectedness

Ground Requirements

1. Soil properties – macropores and surface sealing

Air Requirements

1. Passive microwave for soil moisture
2. LIDAR for accurate elevation information
3. Opportune mapping of inundation/flow paths with NIR and/or radar
4. Digital photography

Evapotranspiration

Questions

1. Surface conductance/soil moisture relationship
2. Validation of simple linear surface conductance model
3. Remote sensing of evapotranspiration
4. Combining tower and aircraft data

Ground Requirements

1. Surface meteorology and fluxes (CO2 and water)
2. Calibration data (soil moisture, LAI, NDVI, LST, albedo)
3. ABL profiles, met. forcing, physiological parameters
4. Vegetation description
5. Antecedent data (rainfall, soil moisture, fluxes….)

Air Requirements

1. Surface conditions (diurnally invariant) - soil moisture, LST, NDVI, LAI, albedo, *gsmax* (derived)
2. Surface fluxes (*x*, *z* and *t*, but not continuous)
3. Concentration fields (*x*, *z* and *t*, but not continuous)

Soil Carbon

Questions

1. What's driving catchment soil carbon dynamics?
    a. Textural properties?
    b. Soil moisture, soil temperature?
    c. Vegetation?
    d. Hillslope/catchment hydrology/geomorphology?
    e. What scale?

Ground Requirements

1. Weather, soil moisture, temperature, stream gauges
2. Dissolved organic carbon, ground based vegetation and soil carbon quantification at each of the field sites at a range of scales
3. Soil texture, erosion, sediment loads

Air Requirements

1. LIDAR, TIR, PLMR, trispectral scanner

Forests

Questions

1. Forest water use
2. Productivity prediction – catchment-scale soil water holding capacity
3. The condition of crowns that are severely affected by agents that reduce crown visibility in images

Ground Requirements

1. Canopy transpiration rate – sap flow
2. soil water holding capacity
3. Radiometric targets

Air Requirements

1. High resolution thermal imagery – midday
2. Moderate resolution radar
3. LIDAR and hyperspectral

Bushfire

Questions

1. Seasonal drying and curing of grassland using
    a. Satellite data – passive microwave and optical
    b. Pasture growth models

Ground Requirements

1. Fuel moisture content
2. Soil moisture
3. Range of topography and vegetation conditions throughout entire seasons
4. VNIR/TIR multiangular

Air Requirements

1. PLMR, TIR, tri-spectral scanner
2. VNIR/TIR multiangular

Water Quality

Questions

1. Erosion – gully, bank and hillslope
2. Role of rangeland, forests, riparian veg, flood plains, estuaries

Ground Requirements

1. Water sediment and nutrients

Air Requirements

1. LIDAR (multi-temporal), tri-spectral scanner, radar, digital photos

Ground Data

Soil moisture
Soil temperature
Soil carbon
Flux
- Water
- Energy
- Carbon

Precipitation
Micrometeorology
NDVI – Neil/Simon
LST
LAI
Channel seepage
Cropping pattern & veg type
Sap flow
Atmospheric boundary layer
Soil salinity/EM38
Standing biomass
Soil properties
- Texture
- Surface sealing
- Macropores
- Ksat

Veg moisture
Veg structure
VNIR spectrometer – Ian/Susan ?
Runoff
Water sampling
- Nutrients
- Sediment

Erosion
Ground rainfall radar – Alan (CBR/WGA)
Forecasting support – BoM or website
PIF – Neil
Ground laser scan (Echidna) – Neil
Water temperature

Notes

Already plan to do
Potentially do or doing in part
No current plans or resources

Airborne Data

Microwave radiometer
TIR
Trispectral
Albedo
Photos
LIDAR (differencing)
Flux
- Water
- Energy
- Carbon

Hyperspectral
Radar
VNIR – Ian
Turbidity

Flying Requests

Early morning (dew), mid morning, midday (500ft), repeat morning, high to low altitude to avoid cloud/retrieve ET
Irrigation channels
Irrigation bays during irrigation
Multiangular
Opportunistic flying of flooded rivers

How much trispectral scan data?
Digital photography again at end?
Repeated low-res digital photography
Mix of high/low res with MODIS o/pass

Tumut – forests & Tumbarumba -- fluxes

Satellite

AMSR-E
MODIS
AVHRR
Landsat
ASTER
GOES