Algorithm Requirements for Field Campaigns

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Algorithm Requirements for Field Campaigns – L1

L1B_TB [E. Kim, P. Mohammed]

1. Fly OSU, UMich & GSFC RFI-detecting backends on future SMAPVEX flights
   -- continue RFI surveys of environment through pre-launch period
2. Repeat three SMAPVEX08-RFI flights: VA, PA, NY (Long Island Sound most important)
   -- repeat exact RFI flights to look at time evolution of RFI environment
3. Overpass of Delaware Bay NOAA buoy with low surface wind speeds on multiple days
   -- could be used to test APC (antenna pattern correction) over ocean
4. Airborne measurement of $T_B$ spatial scaling in Dome-C vicinity
   -- for scaling up from Dome-C tower to 400-800 m box around Dome-C
5. Continue tower-mounted $T_B$ measurements at Dome-C (ESA has stopped theirs)
   -- #4 & #5 both useful for calibration of L1B_TB (both point and area $T_B$)
   -- intercalibration of SMAP with SMOS & Aquarius

L1C_S0 [R. West]

-- Need more polarimetric L-band radar data over Amazon target areas (esp. VV, HV)
   -- currently checking existing satellite radar data
   -- used as reference target for removing long-term trends & biases
Algorithm Requirements for Field Campaigns – L2

• L2_SM_P [P. O’Neill, E. Njoku, T. Jackson, S. Chan]
  -- Needed for cal/val:
    -- measurements of 0-5 cm soil moisture, effective temperature, VWC
    -- measurements applicable to 36-km SMAP grid
    -- sites covering a variety of land covers & crops
    -- data acquired throughout the year to assess seasonality of algorithm parameterizations
  -- Priorities for Cal / Val pre-launch are developing good vegetation parameterizations for different land cover classes, including their seasonal & polarization variations

• L2_SM_A [M. Moghaddam, S. Kim]
  -- Needed for cal/val:
    -- soil moisture and roughness varying over expected ranges
    -- many classes of vegetation cover
    -- measurements of vegetation geometry and fractional cover
    -- dynamic vegetation to test time series algorithms
    -- long time series radar data of sufficient accuracy (better than 0.5 dB)
Algorithm Requirements for Field Campaigns – L2/3

- **L2_SM_A/P** [D. Entekhabi, N. Das]
  - Needed for cal/val:
    - new PALS data sets (in conical scan mode) over diverse landscapes and land covers
    - long time series active/passive data (at least one month)
    - large dynamic range of soil moisture conditions

- **L3_F/T_A** [K. McDonald, S. Dunbar]
  - Needed for cal/val:
    - focused campaigns using available a/c (UAVSAR) and satellite L-band radar data spanning F/T transitions over regional gradients (climate, land cover, terrain)
    - initialization of algorithm parameters (e.g. F/T reference states) over L3_F/T domain
    - test site with distributed measurements to capture sub-grid scale temperature variability and continuous measurements to characterize diurnal and daily variability
    - coincident measurements of surface meteorology & fluxes (water, CO₂)
Algorithm Requirements for Field Campaigns – L4

• L4_SM [R. Reichle]
  -- Needed for cal/val:
    -- 9 km sites w/ distributed measurements of both surface (0-5 cm) & profile (0-100 cm) soil moisture
    -- as many climate/vegetation/terrain combinations as possible
    -- need multi-year time series to obtain robust climatologies

• L4_C [J. Kimball]
  -- Needed for cal/val:
    -- will use subset (~ 40 towers) of FLUXNET tower network in pre-launch algorithm development activities along with MERRA and MODIS inputs
    -- remaining tower network reserved for post-launch validation
    -- will collaborate with AirMOSS efforts on carbon modeling & a/c campaigns in regional windows around 6-8 Ameriflux tower sites
Algorithm Requirements in Common

- F/T requirements unlikely to be met by soil moisture campaigns which avoid frozen soil conditions
  -- separate campaigns for F/T and SM       [F/T campaign on agenda Wed AM]

- Soil moisture campaigns should strive for:
  -- long time series of active / passive microwave data
    -- to collect full dynamic range of soil moisture conditions
    -- to provide changing biomass conditions
    -- to assess seasonality of parameterizations
  -- new vegetation types / diverse landscapes
  -- test sites scalable to SMAP grid cells
    -- sites with sufficient number of ground measurement locations to provide good average at SMAP spatial scales
  -- availability of needed ancillary data (measurements of temperature, vegetation (type, water content, fractional cover, & geometry), surface roughness, etc.)
  -- should fly RFI backends on any cal/val flight
Ground samples of soil and biomass should include:

-- To validate the forward model:
  - Soil moisture & soil texture
  - Surface roughness profiles 5-10 at pixel scale and description of row pattern if it exists
  - Density of vegetation (e.g., # trunks or stalks)
  - Leaf geometry (shape and sizes) and water content (5-10)
  - Stalk or woody part geometry (length and radius) (5-10)
  - Leaf and Stalk orientation distribution characteristics
  - Ratio of stalks to leaves
  - Dielectric properties of vegetation
  - Fraction of vegetation cover in a given pixel

-- For validation of the retrieval:
  - Soil moisture & soil texture
  - Surface roughness
  - Biomass level
  - Vegetation class
  - Fraction of vegetation cover in a given pixel