Jet Propulsion Laboratory
California Institute of Technology

Science of 10-km Resolution L-band Radiometry Workshop

Meeting Objectives

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Bottom Line Up Front

1. The workshop is not about any mission, it is about science

2. The main target is the upcoming NASA Decadal Survey

3. Deliverable: Workshop summary report with science traceability matrices (everybody invited to contribute)

Why 10 km?

- The current resolution is about 40 km
- We know there are science cases and applications that require much finer resolution
- However, we know that, for example, 100 m resolution with L-band from space is not feasible in the next generation
- What would be feasible next step that would produce significant added science return?
- 10 km has 16x spatial information compared to 40 km
- Does 10 km scale reveal geophysical processes and other benefits not achieved with 40 km?

Objective of the Workshop

- Highlight the science achievable with 10-km daily L-band radiometry
  - …to raise awareness of the importance of the measurement
  - …to develop Science Traceability Matrices for different cases to serve as the basis for any future mission design
  - …to be included in the next decadal survey

- The workshop is more about shaping the future NASA priorities rather than trying to serve the current ones

What We Are Covering

- The invited talks were asked to answer the following questions:
  - Why is this observable important in Earth System?
  - Is there benefit obtaining this observable at 10 km compared to 40 km?
  - How is this observable retrieved from L-band brightness temperature?
  - Can simultaneous higher frequency brightness temperature help?
- Oceanography, Cryosphere, Hydrology, Atmosphere, and Ecology
- This information will be used to build science cases and populate science traceability matrices for different cases and disciplines

Agenda, Day 1

Setting the Stage (Chair: Andreas Colliander)

8:00	Registration	
8:30	Welcome and Introductions	Andreas Colliander
8:50	Meeting Objectives	Andreas Colliander
9:15	Current State of L-band Radiometry	Dara Entekhabi
9:35	Outlook of L-band Radiometry	Andreas Colliander
9:50	ESA User Consultation Study on the Need of L-band Radiometry	Matthias Drusch (remote)
10:10	***Break***	
10:25	Feasibility of 10-km Resolution L-band radiometry	Andreas Colliander
10:45	Discussion	

Cryosphere: Sea Ice (Chair: Ted Maksym)

11:00	On Sea Ice and Its Importance in the Climate System and Processes Observable with 10 km L-band Radiometry	Ted Maksym
11:30	Sea Ice Thickness Retrieval	Lars Kaleschke (remote)
11:45	***Lunch***	

Agenda, Day 1 (cont'd)

Cryosphere: Ice Sheets (Chair: Joel Harper)

12:45	Overview of Science Problem, Value of Liquid Water Retrieval, and Treatment of Spatial Scales	Joel Harper
13:25	Ice Sheet LWC Retrieval (L-band and multi-freq.)	Andreas Colliander
13:40	Firn Aquifer Detection and Monitoring (L-band)	Julie Miller
13:55	Ice Sheet Temperature Retrieval	Giovanni Macelloni (remote)

Cryosphere: Land Surface and Freeze/Thaw (Chair: Alexandre Roy)

14:10	Importance of Vegetation Growth Processes and Methane Release to Earth System and Linkage of F/T Spatial Scales to the Processes	Alexandre Roy
14:50	***Break***	
15:05	Retrieval of F/T with L-band Radiometry	Xiaolan Xu
15:25	Enhancement with C- to Ka-band Radiometry	John Kimball

Atmosphere: Convective Initiation (Chair: Steven Quiring)

15:40	Significance of Convective Processes in INCUS	Kristen Rasmussen
16:00	Soil Moisture-Precipitation Interactions in the Central United States	Trent Ford
16:20	Investigating Spatial Relationships Between Soil Moisture and Tornado Events using SMAP	Jana Houser
17:00	***Adjourn Day 1***	

Agenda, Day 2

Oceanography (Chair: Severine Fournier/Tony Lee)

8:00	*Preparation for day 2*	
8:30	Operational Implications of Higher Resolution Sea Surface Salinity (NOAA)	Eric Bayler (remote)
8:45	Sea Surface Salinity and Open Ocean Processes	Fred Bingham
9:00	Sea Surface Salinity and Coastal Processes	Doug Vandemark
9:15	Sea Surface Salinity and Polar Processes	Julian Schanze
9:30	Air/Sea Fluxes and Impact of Sea Surface Salinity at Small Scales	Lisan Yu
9:45	SSS Retrieval with 1.4 GHz and Wide-Band Measurements	Sidharth Misra
10:00	SSS Enhancement with C- to Ka-band Radiometer Measurements	Alex Akins
10:15	***Break***	

Hydrology: Water and Energy Cycle (Chair: Dara Entekhabi/Wade Crow)

10:45	Soil Moisture and Land-Atmosphere Coupling with Higher Resolution Soil Moisture	Josh Roundy
11:00	Soil Moisture Heterogeneity and Triggering of Atmospheric Convection	Paul Dirmeyer (remote)
11:15	Global Estimates of L-band Vegetation Optical Depth and Soil Permittivity over Snow-covered Boreal Forests and Permafrost using SMAP Satellite	Ardeshir Ebtehaj

Agenda, Day 2 (cont'd)

Hydrology: Land Surface Models (Chair: Wade Crow)

11:30	Issues and Challenges in Soil Moisture Data Assimilation	Sujay Kumar (remote)
11:45	NWP/Hydrologic Forecasting Implications	Stephane Belair (remote)
12:00	Issues In Soil Moisture Assimilation with LSM	Wade Crow
12:15	**Lunch**	

Hydrology: Soil Moisture Applications and Retrieval (Chair: Thomas Holmes)

13:30	Surface Soil Moisture and Plant Water Uptake	Andrew Feldman (remote)
13:45	SM Retrieval with L-band Radiometry	Rajat Bindlish
14:00	Multichannel PMW for soil moisture and Evapotranspiration	Thomas Holmes

Breakouts (Chair: Andreas Colliander)

14:15	Organize to Breakouts	
14:30	**BREAKOUT 1 (including break)**	
16:30	Breakout Summaries	
17:15	***Adjourn Day 2***	

Agenda, Day 3

Ecology (Chair: John Kimball)

8:00	*Preparation for day 3*	
8:30	Importance of Biomass and Plant Hydrology to Earth System	Paul Siqueira
9:00	L-band VOD biomass Applications	Maria Piles (remote)
9:15	VOD Applications for Plant Hydrology	Alex Konings
9:30	Review of Measuring VOD Dynamics with L through X-band Radiometry	JP Wigneron (remote)
9:45	VOD Linkage to Biomass and Vegetation Water Content over Croplands	Brian Hornbuckle

Breakouts (Chair: Andreas Colliander)

10:00	**BREAKOUT 2 (including brake)**	
11:15	Breakout Summaries and Inputs to Science Traceability Matrices	
12:00	Closing and Future Activities	
12:30	***Adjourn Day 3***	

STM

Science Motivation	Science Goal	Science Objectives	Scientific Measurement Requirements		Instrument		Mission Requirements (Top Level)
			Physical Parameters	Observables	Requirements	Projected Performance	
1. …	**G1**. … METHOD – General: … METHOD – Specific: …	**O1.** …	**PP1.** … **PP2.** …	**Obs1.** … **Obs2.** …	**R1.** … **R2:** … **R3.** … **R4.** … **R5.** …		MR1. … MR2. … MR3. … MR4. …
2. …	**G2.** … METHOD – General: … METHOD – Specific: …	**O2.** … **O3.** …	**PP3.** … **PP4.** …				

We start here and fill up to the right