Global L-band Observatory for Water Cycle Studies (GLOWS):

L-band Active/Passive Ocean Observations

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This poster is presented as a grief sequence of slides describing the GLOWS mission

L-band Active (Radar) / Passive (Radiometer) Measurements

- SMOS, Aquarius and SMAP have demonstrated the ability to estimate soil moisture, ice, ocean salinity, and ocean winds from space at L-band
  - Radar observations particularly useful for ocean vector wind measurement
    - Higher winds speeds, no rain contamination
  - SMAP had active and passive sensors, but radar failed shortly after launch
  - Low frequency missions expensive due to need for a large parabolic antenna
- No current plans for a future U.S. L-band (1.4 GHz) mission
  - ESA plans low resolution L-band *passive only* mission (CIMR)
- GLOWS addresses the need for new low frequency active/passive L-band mission
  - Follow-on/data continuity for SMAP; augment CIMR

MMA Design

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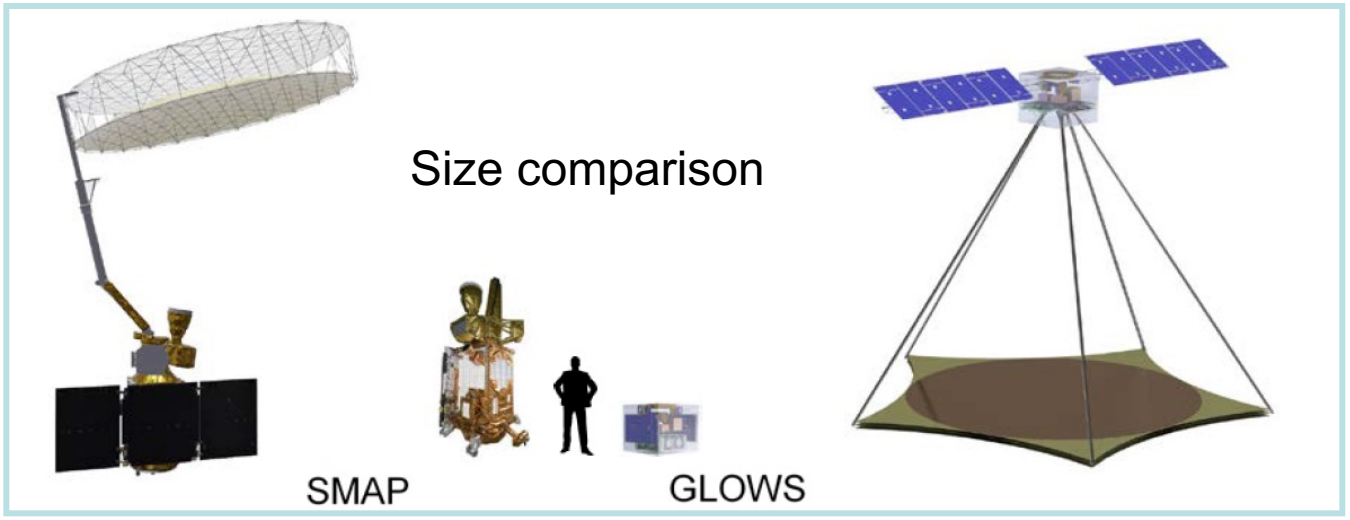
NovaWurks

Global L-band Active/Passive Observatory for Water Cycle Studies (GLOWS)

- Similar to SMAP in resolution, coverage, accuracy
  - Lower cost due lens antenna and smaller spacecraft
- Collect array of measurements over a wide swath
  - Radar: normalized radar cross-section (sigma0)
    - Transmit pulse, measure echo power
    - Convert power to sigma0 using the *radar equation*
  - Radiometer: emitted microwave power (brightness temperature, TB)
    - Integrate receive-only power over dwell time
    - Convert to TB
  - Slightly different frequencies to enable simultaneous active and passive observations

Global L-band Active/Passive Observatory for Water Cycle Studies (GLOWS)

- Will employ a deployable L-band 6m membrane transmitarray meta material lens antenna
  - Thin, light-weight, flat, deployable
- Advantages
  - Easier to deploy and rotate
  - Smaller spacecraft



GLOWS Science
(Active & Passive L-band Measurements)

Soil Moisture

- High-resolution and frequent-revisit
- Understand processes that link the terrestrial water, energy and carbon cycles
- Estimate global water and energy fluxes at the land surface
- Enhance weather, flood and drought prediction

Ocean Surface Salinity

- Ocean circulation governed by salinity + temperature
- Global water cycle: Salinity reflects balance between precipitation and evaporation
- Freshening due to ice melt in Arctic
- Balance between Atlantic and Pacific
- Changes in coastal salinity due to increased run off

Ocean Surface Winds

- Effective in intense tropical cyclones
- L-band not affected by rain or clouds
- L-band does not saturate with wind speed

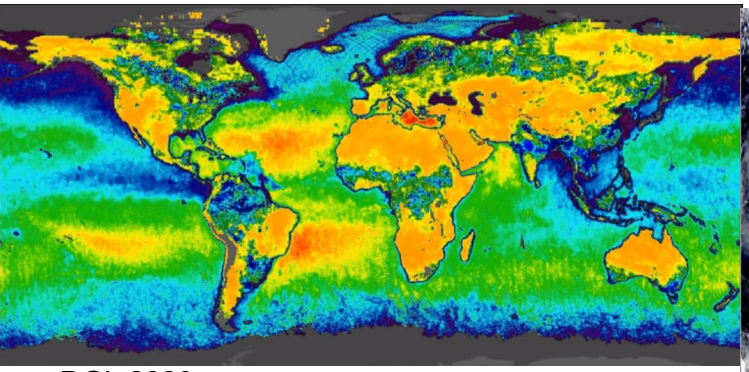
Vegetation Biomass

- Radar observations provide all-weather vegetation biomass
- Microwaves observations saturate at higher biomass
- Food security and agriculture
- Quantify net carbon flux in boreal landscapes

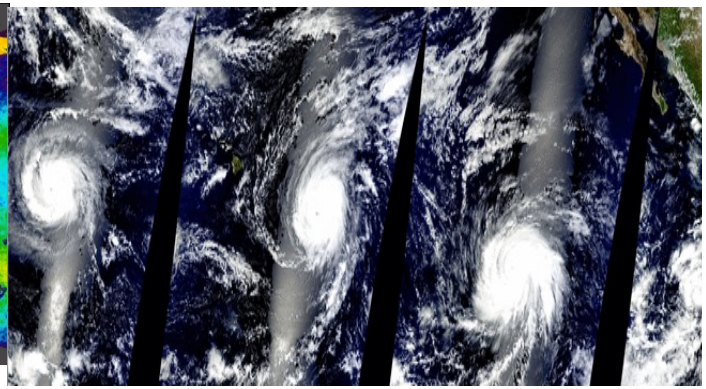
Thin Sea Ice

- Sea ice thickness up to 0.5 m
- Complementary observations to altimeter - thin sea ice
- Summer melt of sea ice and ice sheets can cause fresh water lenses

Soil Moisture and SSS from SMAP



Ocean Winds using L-band



Sea Ice