High Resolution L-band Wind Speeds from the Global L-band Observatory for Water Studies (GLOWS)

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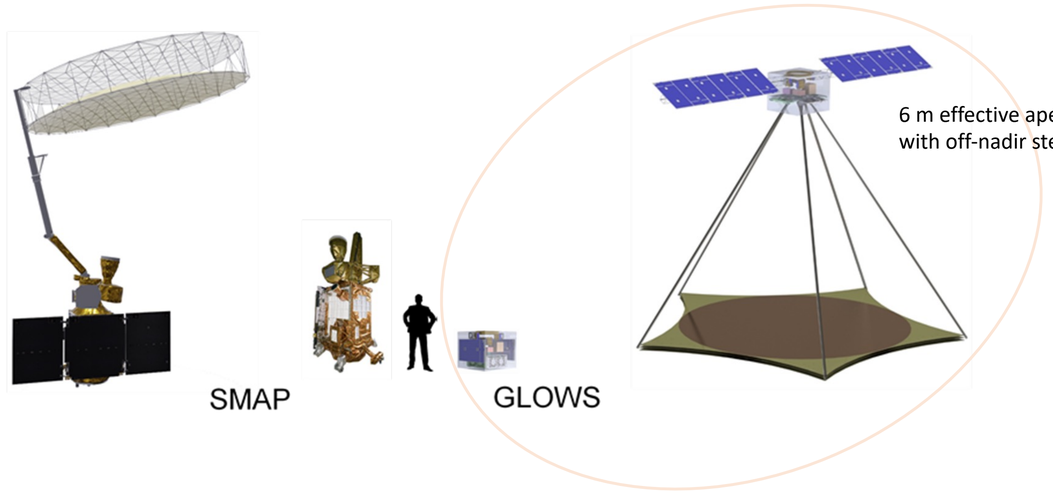
Virtual Poster

Comparing GLOWS and SMAP

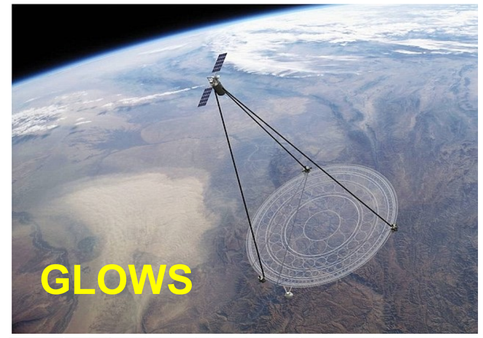


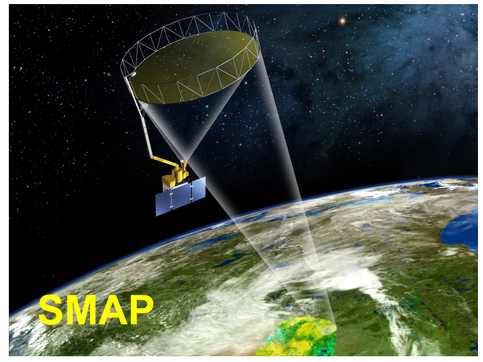
GLOWS Mission Objectives

- **Soil Moisture Active Passive (SMAP) data continuity**
  - L-band polarimetric radiometer *and* radar
  - SMAP-level accuracy to continue data (same resolution/swath/accuracy)
  - Radar provides <5 km resolution wind speed retrieval
- Lost cost mission achieved by
  - Small size: stow within a rideshare volume
  - Use meta-material lens as a refractor
  - Use multi-element patch array feed
  - Update radiometer to reduce volume and improve performance
  - Leverage SOA commercial radar technologies
- Funded by NASA IIP

GLOWS Design

- GLOWS similar to SMAP:
- Four **radiometer** channels
  - H, V, 3rd and 4th Stokes @ 1.41 GHz
  - ~15 ms integration interval with 24/80 MHz BW
  - ~40 km resolution
  - 1000 km wide swath
  - **6 m membrane lens antenna vs reflector**
- Quad Pol rotating **SAR**
  - HH, VV, HV/VH @ H 1.26, V 1.29 GHz
  - PRF=2.8 kHz, Tp=15 us w/1 MHz BW chirp
  - Peak Xmit power 500 W
  - 250 m SAR resolution averaged to 1 & 5 km
  - 1200 km wide swath
- Orbit
  - 685 km, 8-day repeat orbit



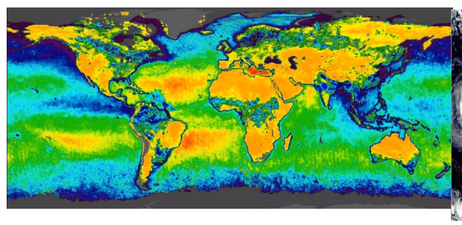


SMAP Science Continuity

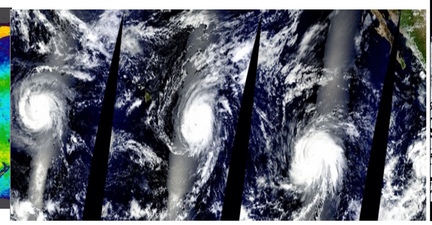
Soil Moisture	Ocean Surface Salinity	Ocean Surface Winds	Vegetation Biomass
• High-resolution and frequent-revisit • Understand processes that link the terrestrial water, energy and carbon cycles • Estimate global water and energy fluxes at the land surface • Enhance weather, flood and drought prediction	• Ocean 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	• L-band not affected by rain or clouds • L-band does not saturate with wind speed • Effective in intense tropical cyclones *(Unfortunately, SMAP radar failed shortly after launch)*	• 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 freshwater lenses

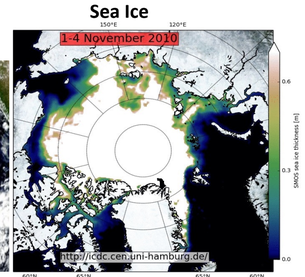
Soil Moisture and SSS from SMAP



Ocean Winds using L-band



Sea Ice



GLOWS Instrument Development Status

- Lens RF Design
  - Membrane L-band waveguide transmissivity testing
  - Lens design and model validation
  - – 2 m x 4 m full scale antenna slice
- Feed Design
  - 12 element test completed, studying 16 element
  - 1/6 scale testing complete
- Lens Structural Design
  - 6 m prototype deployment demonstration successful
  - 6 m positional deployment stability test complete
  - Satellite packaging study completed – Systems fits in EPSA Grande envelope
  - Completed buckling test of slit tube struts to validate FEA subassembly model
- SMAP Diplexer Upgrade