

Science of 10-km Resolution L-band Radiometry Workshop

Outlook of L-band Radiometry

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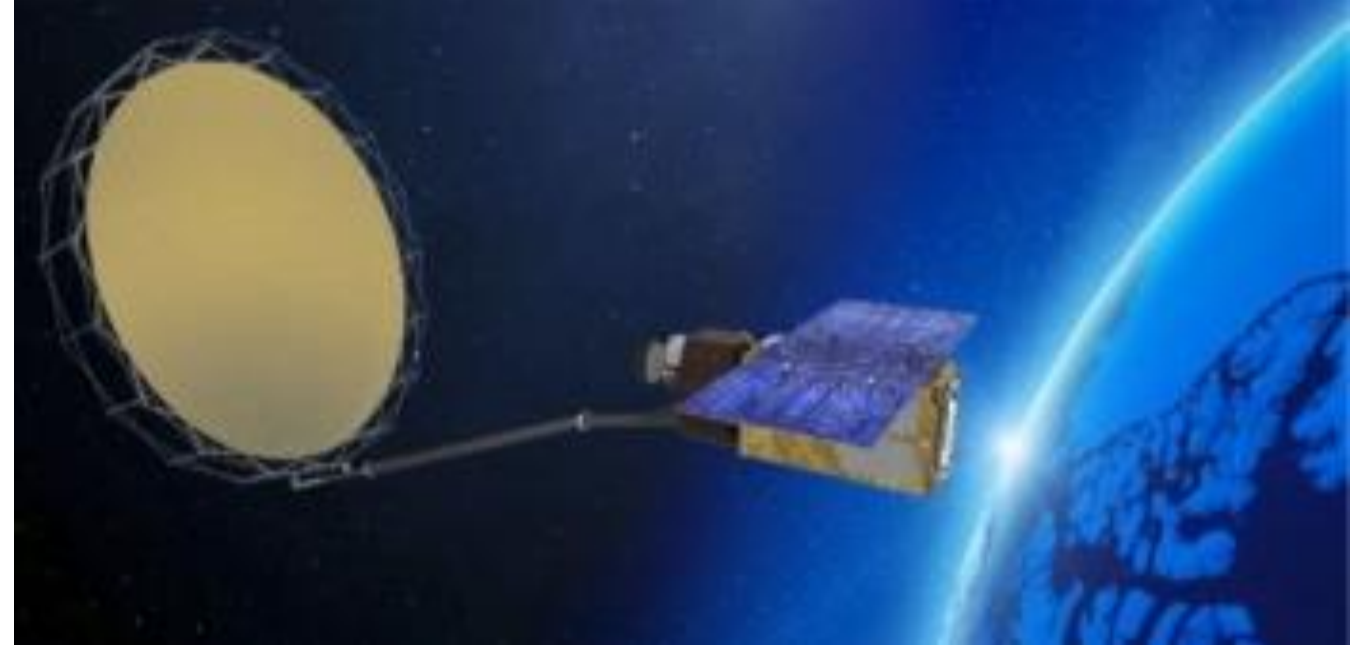
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Path Forward for New L-band Radiometry Science

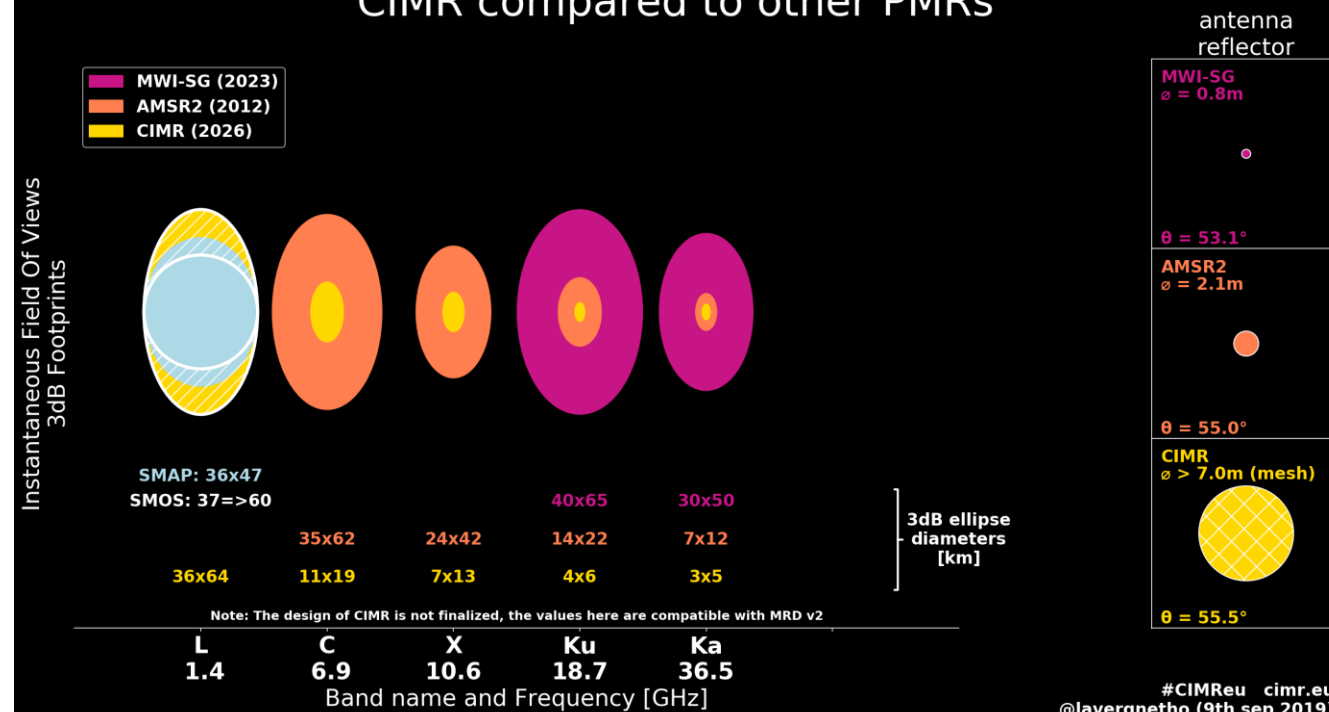
- Utility of spaceborne L-band passive observations has been demonstrated
- However, SMAP and SMOS still flying and CIMR in the pipeline creates a strong program of record (PoR) and inflates the urgency for next generation L-band missions
- Wait, what is CIMR..?

CIMR

- Copernicus Imaging Microwave Radiometer
 - One of the Copernicus Sentinel Expansion missions
 - Copernicus Sentinel program is funded by EU
 - To be launched around 2028
- Microwave radiometer at 1.4 to 36.5 GHz
 - 8-m conically scanning reflector
 - ~55° incidence angle
- Continuity at least 15 years after launch with a minimum of two satellites
- CIMR will provide simultaneous measurements for all frequencies with improvement in spatial resolution for 6.9 to 36.5 GHz, but with L-band resolution (60 km) less than SMAP/SMOS
 - For some major applications, resolution degradation and 55 ° incidence angle pose problems
 - Multi-frequency aspect is very beneficial

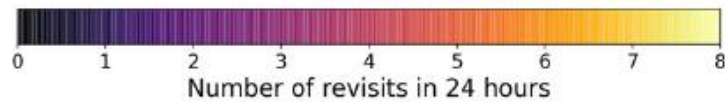
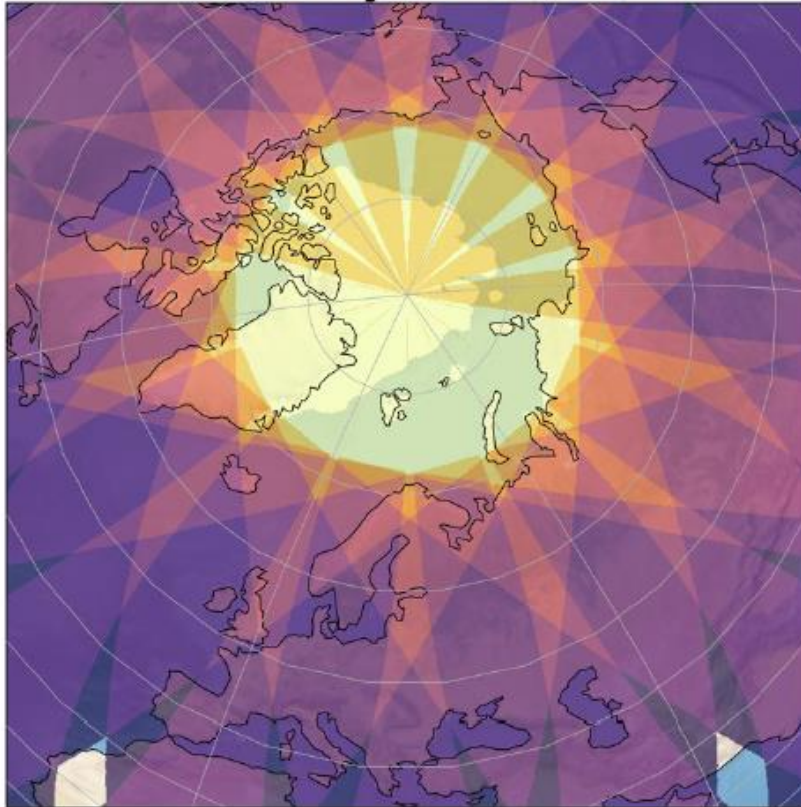


CIMR compared to other PMRs

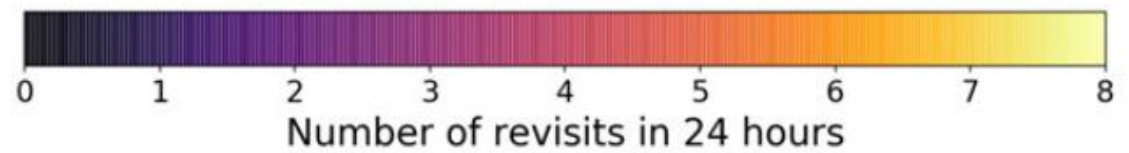
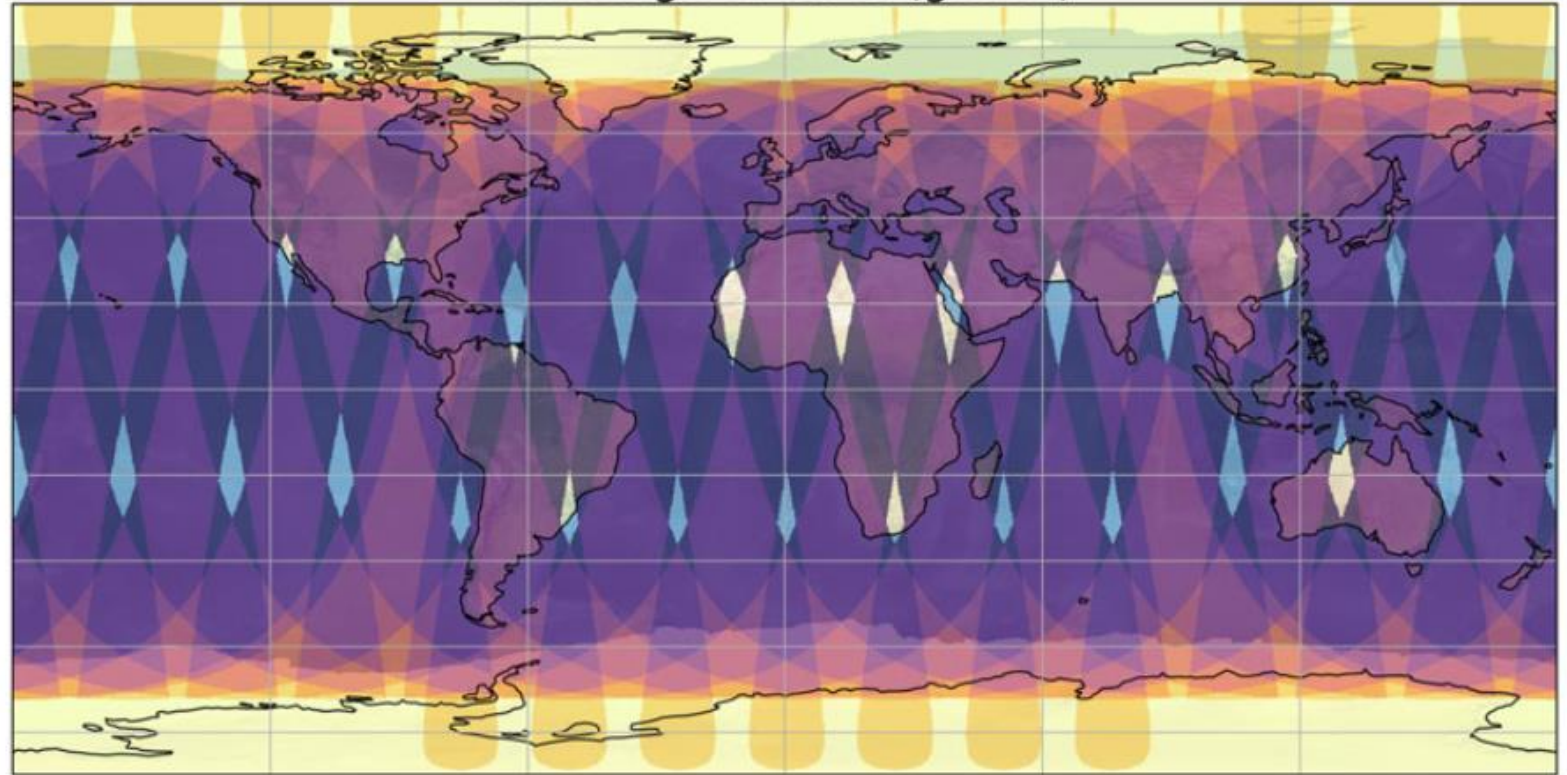


CIMR Coverage

Polar coverage of CIMR (Arctic)



Coverage of CIMR (global)



Daily revisit on equator, more at higher latitudes

Path Forward for New L-band Radiometry Science

- Two different pathways that require different strategies
 - Continuity of current measurements
 - There is a need to continue the 40° L-band observations at 40 km (at least) resolution for many applications
 - The nuances of resolution and incidence angle differences between CIMR and SMAP/SMOS and their impact on specific applications are hard to convey effectively
 - Improvement of current measurements
 - Lack of capability by the current instruments for some high-impact applications
 - Resolution
 - Revisit
 - Bandwidth

Earth Science Decadal Survey

- Earth Science Decadal Surveys dictate what science and which observables will be targeted by NASA over the following decade
 - Important part of the evaluation is the program of record that accounts all available data
- Last one released end of 2017, the next one expected end of 2027
 - In 2007, SMAP was top tier recommendation
 - In 2017, soil moisture was “Not Allocated to a Flight Program Element”
- Relevant Decadal Survey mission types
 - Designated missions – Big missions
 - Earth System Explorers – Intermediate size
 - Earth Venture Continuity – relatively small cost cap (GLOWS)
 - (Earth Venture Mission – likely too small cost cap, at least as stand alone)
- Having a relevant science case highly rated by Decadal Survey is needed to be successful with these mission types

Earth Science Decadal Survey

- Working groups for answering 2027 Decadal Survey RFI's are being formed
 - Now is the time to start influencing those working groups and make other preparations
- Evolution of Decadal Surveys
 - 2007 DS focused on prioritizing missions
 - 2017 DS focused on prioritizing observables
 - 2027 DS may focus on prioritizing science themes (or equivalent)
- Target science impact
 - Need to highlight how 10-km L-band radiometry can contribute to different disciplines (Oceanography, Cryosphere, Hydrology, Atmosphere, Ecology) and their high-priority science cases
 - Development of observational approaches needs to go hand in hand with the science cases (science cases discussed here, observational approaches not)

Opportunities for Collaborating with ESA?

- ESA Earth Explorer 12 Call
 - ESA Earth Explorer 12 proposals were submitted in September
 - Two groups are preparing proposals on L-band radiometry using interferometry/beam forming and one on P-L-band spectrometry
 - More than one will be selected, after which there is more down-selection
 - For this workshop, these efforts do not have direct relationship
- ESA Missions of Opportunity
 - Avenue for joint missions
 - End of 2020's
 - Practically would require good positioning in the next Decadal Survey on the NASA side
- So, whether NASA alone or NASA-ESA cooperation, high priority in the next Decadal Survey is the key

Summary

- Complex environment for advancing L-band measurements
- Whatever happens we need strong science cases and that's why we are focusing on it here