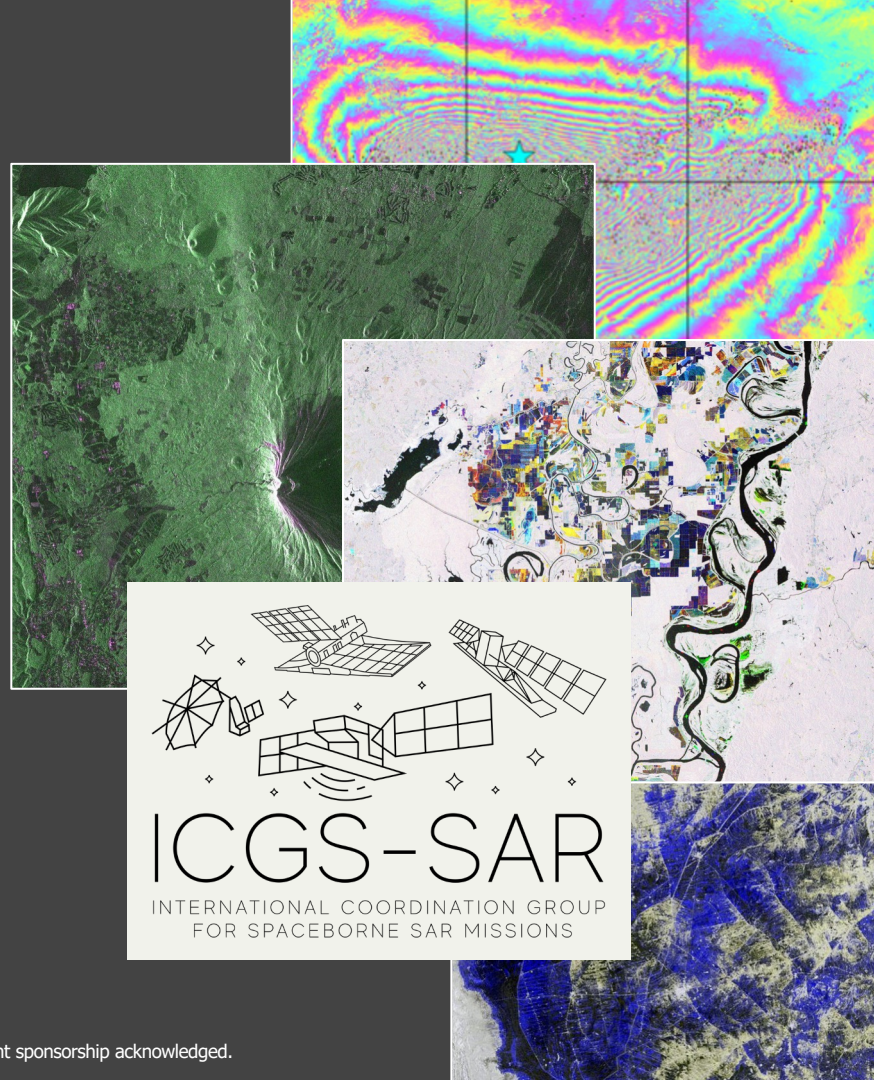
Working Group 2 Breakout Summary



WG2 participants

3rd International SAR Workshop
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Summary of WG2 Breakout Session

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- Discussed strengths and weaknesses of the JPL performance tool
- Discussed the capabilities and future plans for the CSA mission planning tool
- Agreed that the JPL performance tool provides value in constellation optimization
- Agreed that the CSA tool provides value in mission planning
- Discussed possible extensions and enhancements for both tools
- Discussed constellation configurations for upcoming missions to explore optimization trade space (preliminary)
- Discussed the relationship of this work to the Thematic Areas observation requirements and brave mission capabilities

Potential Extensions and Enhancements

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- Additional constellation components
  - (Currently incorporating SAOCOM plan – need EEZ from Luigi Dini)
  - Use ALOS-4 instead of ALOS-2 proxy plans and instrument performance YES (JAXA can provide Observation Plan and Radar Instrument Mode Characteristics in March 2025 TBC)
  - ASI L-band constellations (Ask ASI, perhaps premature)
  - C-band and X-band constellations
    - Actual S-1 mission plan in convenient format for 1 year
    - TerraSAR-FOX to be added later
- Alternate algorithms for deformation and biomass – implies different error models
  - Thuy Le Toan biomass error model? Irrigated rice?
  - Harmony
    - Deformation error model
    - Differential DEM performance in non-zero baseline mode
  - Sentinel-1 (Bjorn to provide pub)
    - Deformation (phase uncertainty) model
    - Rice paddy (needs updating!)
    - Soil moisture (needs updating!)
- Additional science performance metrics – any new models must be validated
  - (see later slide)
  - Soil moisture? Snow Water Equivalent? Crop Yield? Etc.
- Coordinating future mission plans to optimize performance
  - S-1 & NISAR

Additional Capabilities recommendations

- Flood mapping (surface water extent)
- Disturbance/Crop area
- Faraday rotation error model (need magnetic field)
- C-band polarimetric backscatter-to-biomass error model
- Add layover/shadow mask for visibility estimation

TA1/2 Recommended Future Mission Enhancements for WG2 to Prioritize

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- Full pol L-band, 3-4 days of repeat cycle, 5-10 m spatial resolution (Soil Moisture)
- Companion satellites (Soil Moisture)
- Multi-frequency, including P-band (Biomass)
- Full-pol Polarizations capabilities , 10-25 m resolution (Wetlands)
- Multi-frequency, full pol, compact pol capabilities, X-band wide-area mapping missions, 3-day repeat (Agriculture)
- Near-simultaneous L/C, HH+VV in summer, low noise floor (Sea ice)
- Daily to subdaily (2-6 hours), diverse look angles, on fast moving coasts (ice sheets)
- More direct tasking for disasters, low latency products, including prioritized InSAR NewSpace capabilities, background missions for all sensors,including NewSpace, coordinated disaster response system (Hazards)

TA1/2 Recommended Future Mission Enhancements for WG2 to Prioritize

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- Temporal sampling (1-day), LOS diversity, 3-D reconstruction, Multiwavelength, continuous monitoring, 2 companion satellites for tropospheric correction (solid earth)
- Multifrequency, multipolarization, InSAR compatible, short repeat (permafrost)
- HRWS-capable/multi-along-track-aperture system, multipolarimetric systems that can be configured for high SNR, directional diversity using companion satellites or squintmode ATI, 1-30 km (ocean-science)

WG2 Recommendations

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- Adopt the NASA/JPL Performance Tool for ISCG constellation science and applications performance studies
- Adopt the CSA Mission Planning Tool for ISCG coverage studies
- Establish a model validation framework to create confidence among agencies that constellation performance is properly/sufficiently estimated as input to decision-making on international coordination
  - Cross-validate among agency planning tools
  - Develop data sets and ground truth to estimate performance from observations and compare to model predictions
- Extend the NASA/JPL Performance Tool to include additional geophysical parameters to be optimized and associated error models
- Ensure that the optimization effort is tied to the Thematic Area observation requirements

WG2 Next Steps

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- Assemble TA requirements to determine metrics scope
- Parse/prioritize TA recommendations for future mission capabilities to see what new work would need to be done to the performance tool
- Develop model validation framework and workplan
- Implement prioritized enhancements and extensions

- Develop a timeline of above activities for the coming year