

SWOT
Ka-band
Scattering
Phenomenology

Lake Winds,
Vegetation
and Surface
Moisture

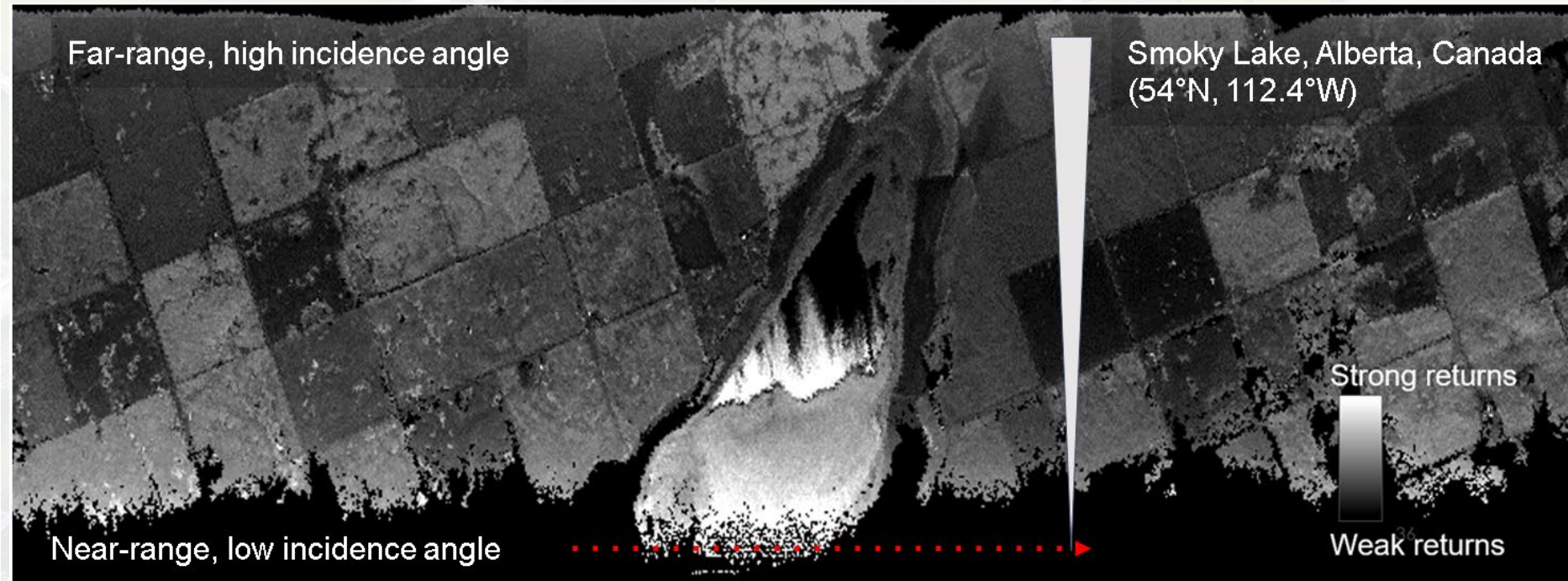


Jessica Fayne

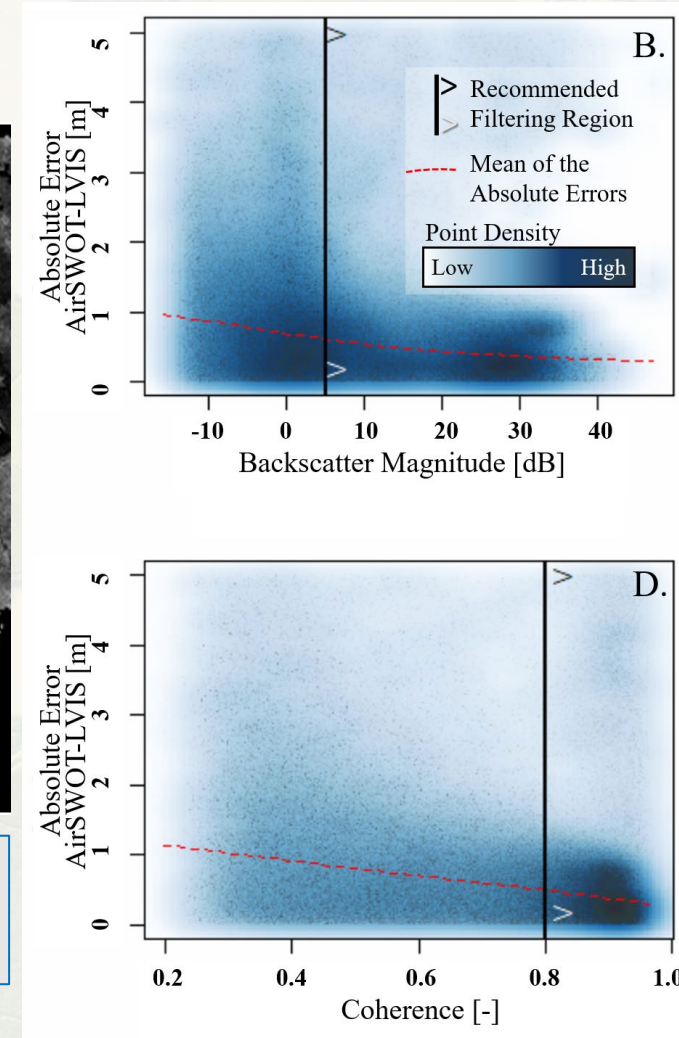
Site suggestions from Clara Chew and Luciana Fenoglio
Waveform analysis by Duncan Jurayj

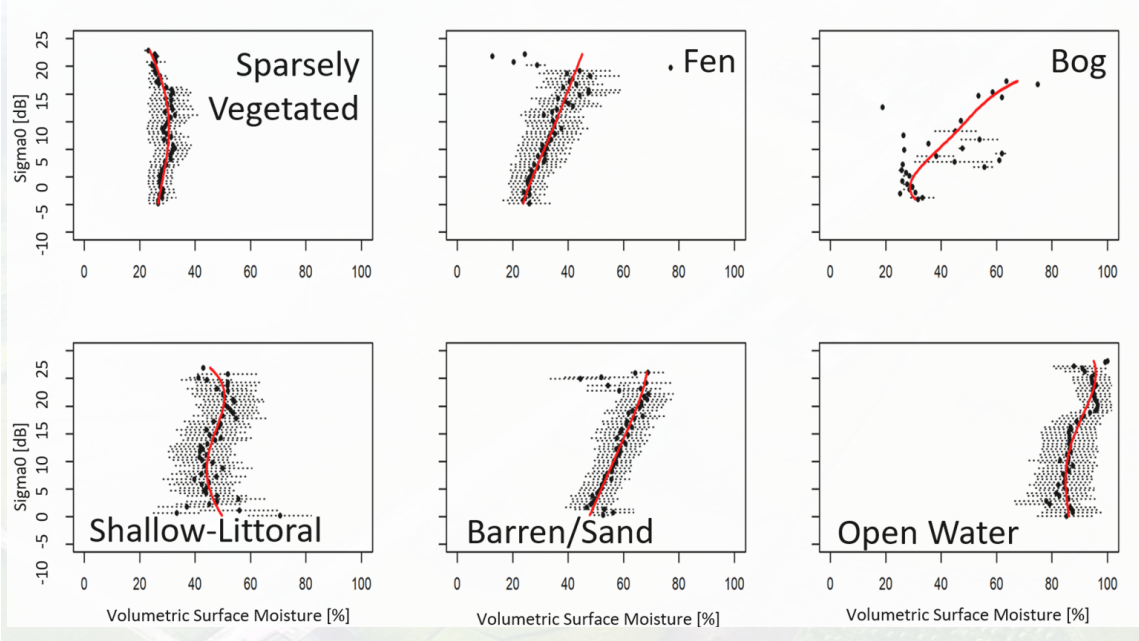
SWOT and AirSWOT SAR backscatter (σ_0) observations can be used to help:

- 1) Quantify uncertainties in SWOT water surface elevations and water surface extents
- 2) Produce new and dynamic wind, moisture, and vegetation products for lakes and wetlands



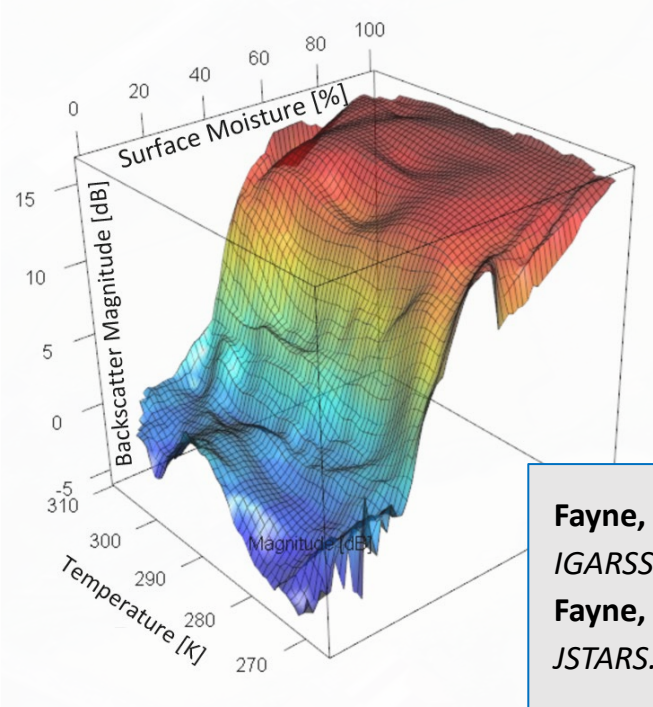
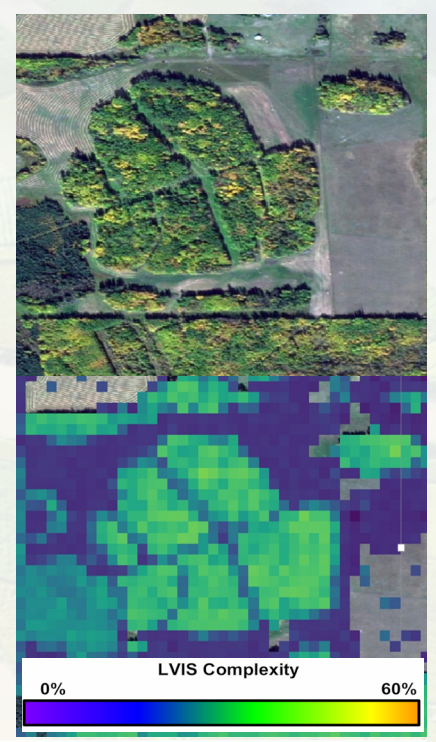
^^ Fayne, & Smith 2023. *MDPI RS*.
Fayne, JV et al. 2020. *ERL*. >>





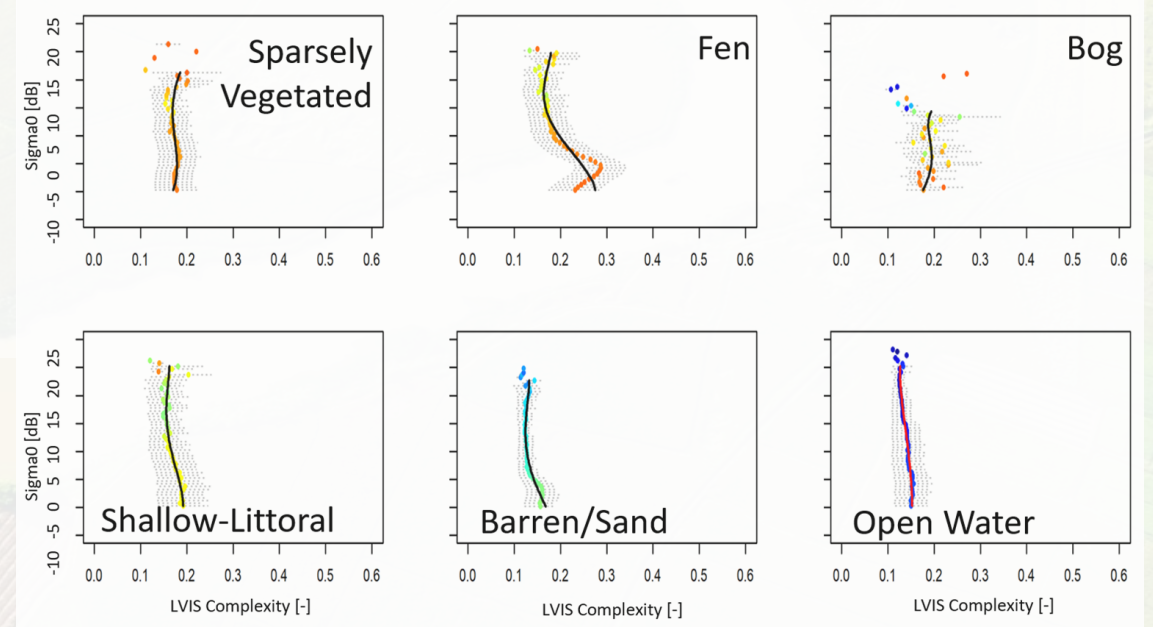
SWOT raster and pixel cloud products contain backscatter information that can be used to estimate surface moisture and vegetation structure.

Polynomial equations have been defined to describe the relationships between backscatter and moisture, and backscatter and vegetation structure.

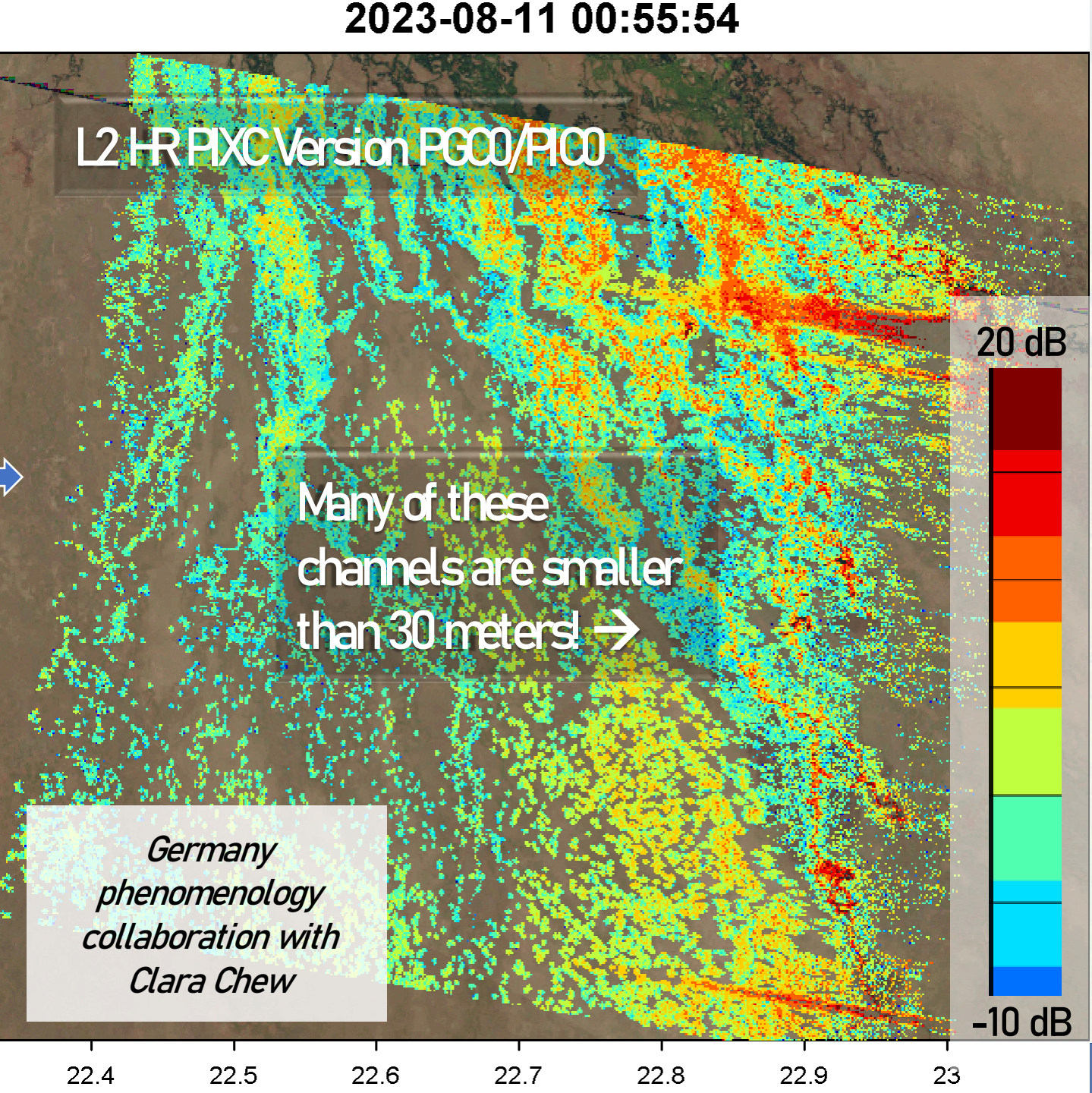
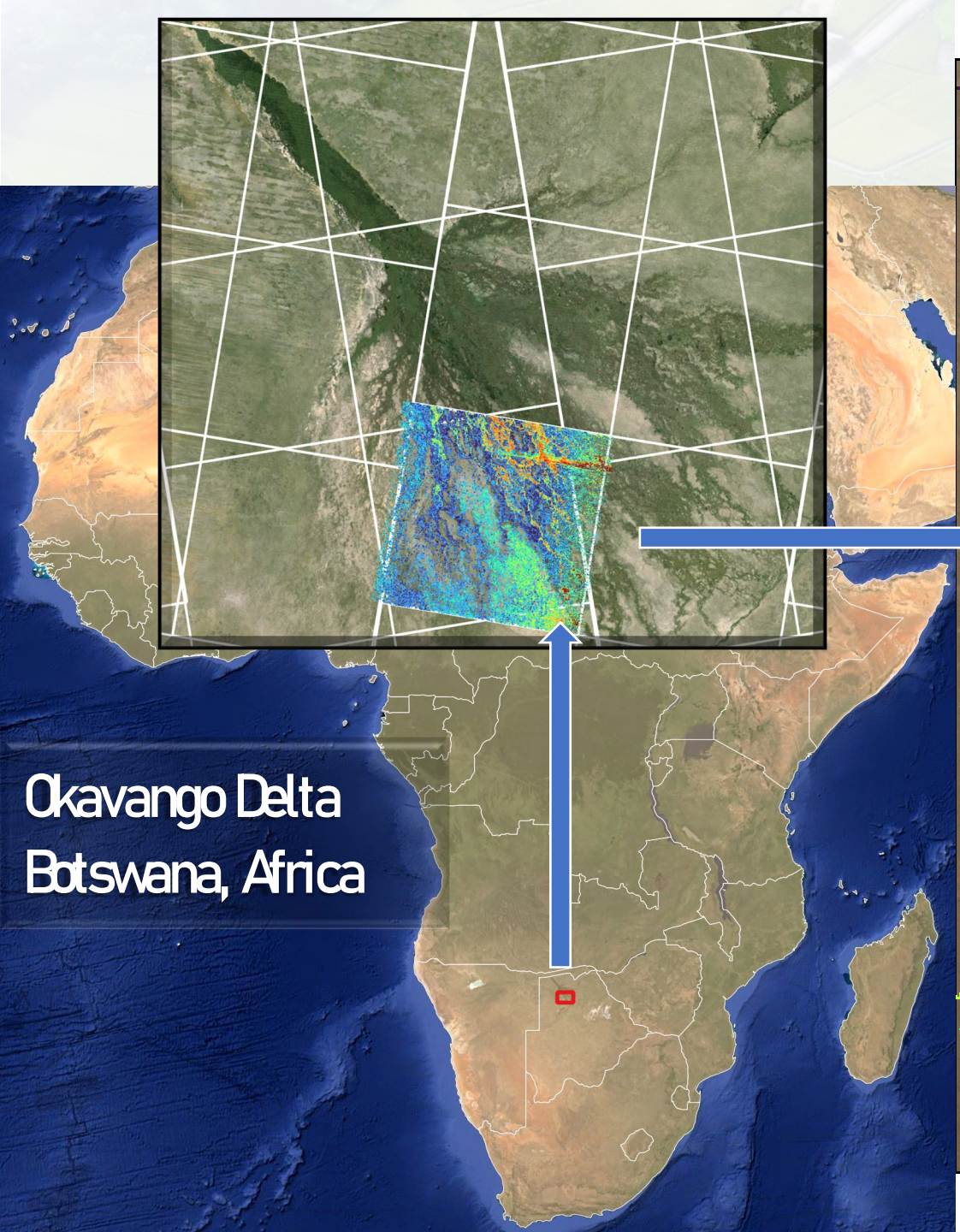


Skin-surface moisture (*SMOPS + added water bodies*) is correlated with AirSWOT Ka-band backscatter. Trends depend on plant functional type and foliage density (*LVIS LiDAR*).

Fayne, JV et al. 2021. *IEEE IGARSS Proceedings*. <<
 Fayne, JV et al. 2023. *IEEE JSTARS*. >>



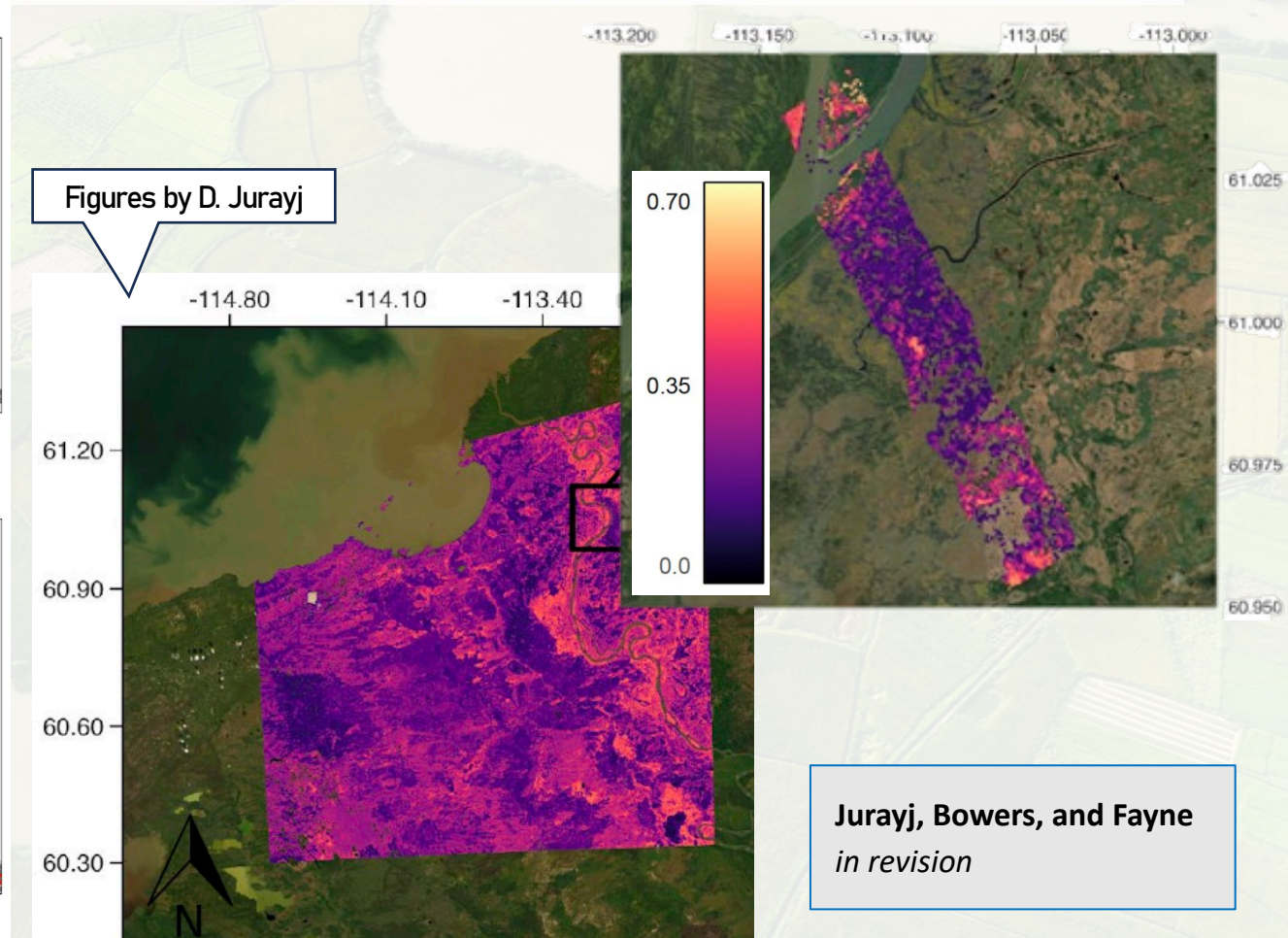
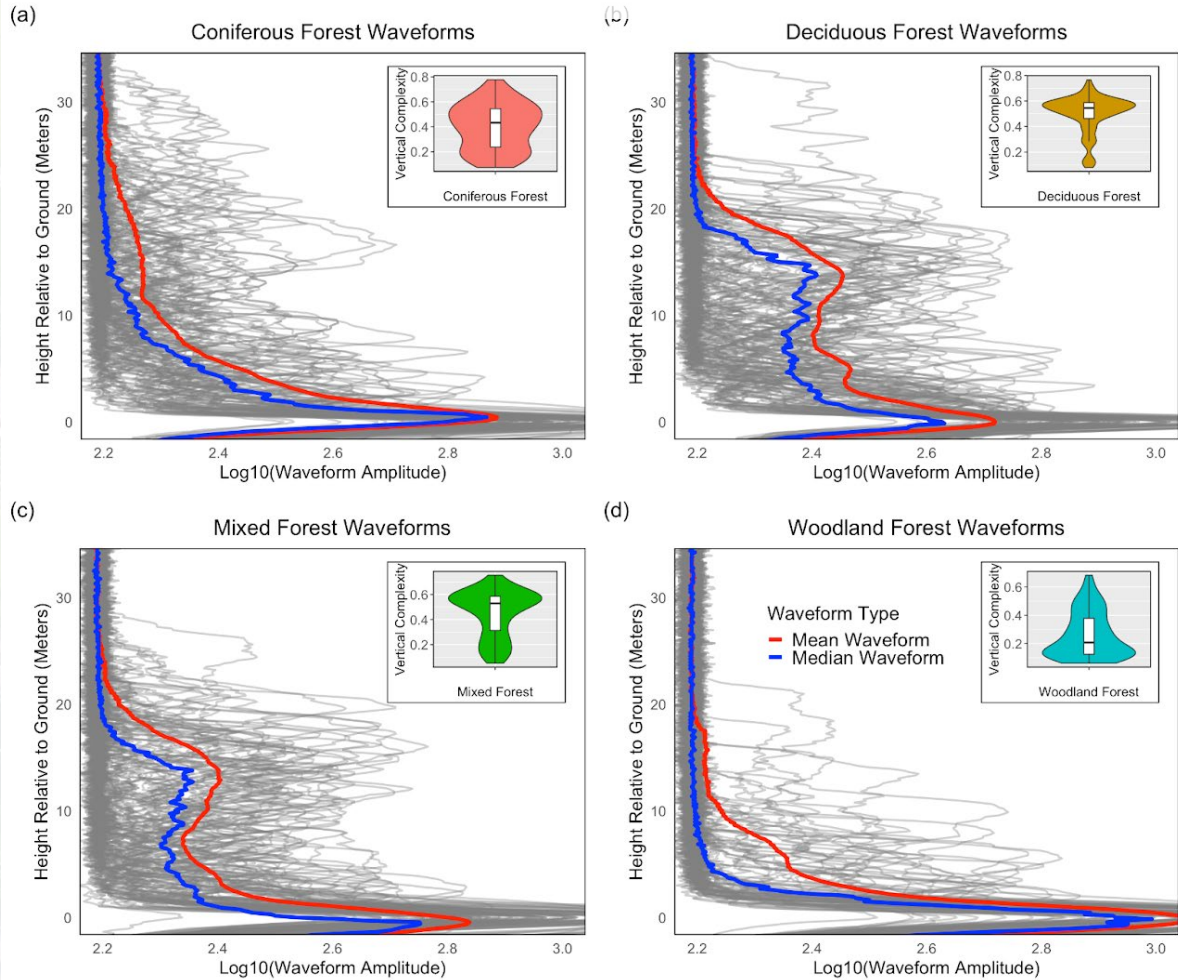
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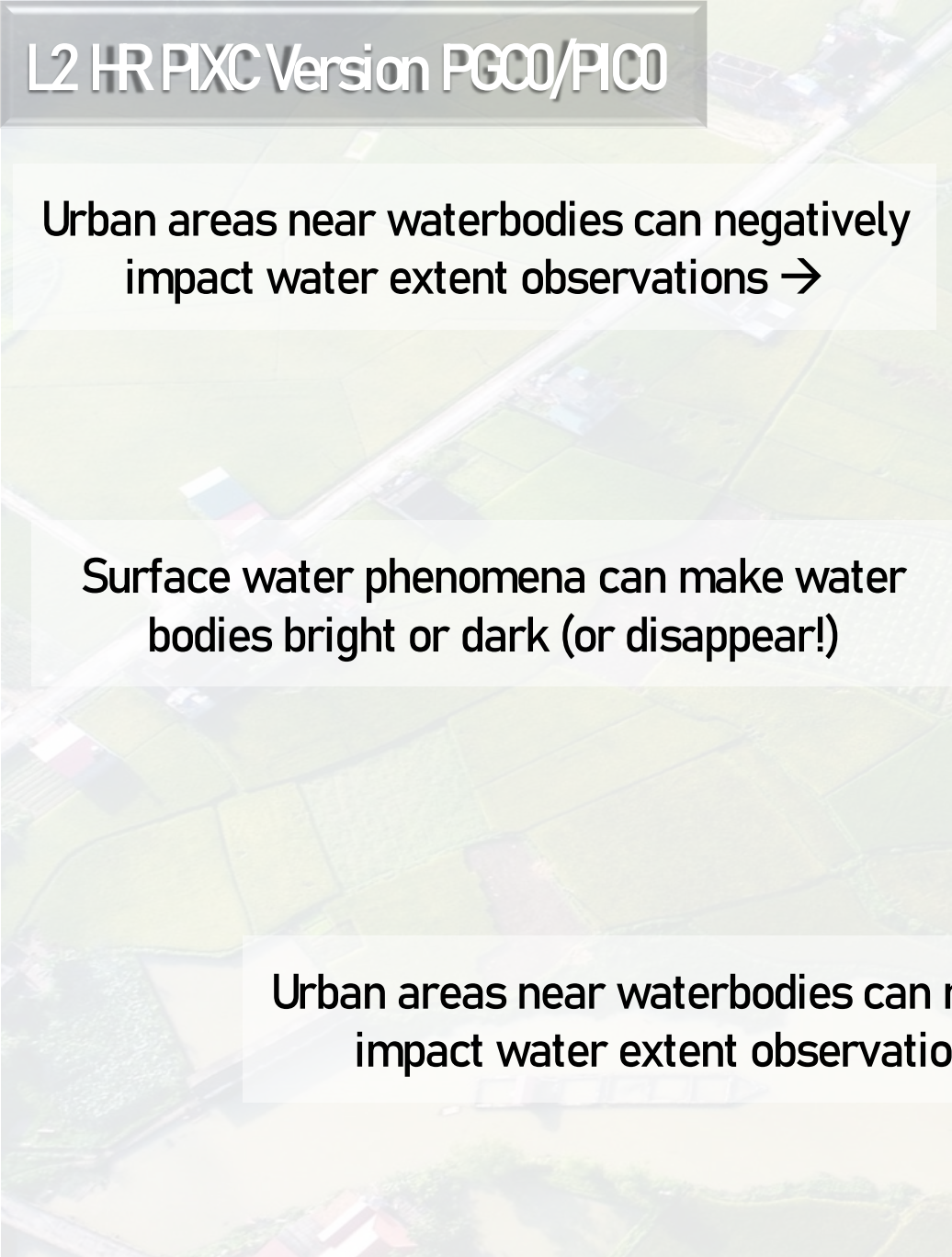


Research on AirSWOT vegetation structure relied on near-coincident airborne LIDAR from LVIS.

LiDAR complexity data at the resolution necessary to quantify small branches and leaves is not globally available.

We are currently working to produce global vegetation complexity maps. This is critical for SWOT retrievals of vegetation and ground moisture characteristics and additionally useful for ecology, agriculture, and agronomy studies.



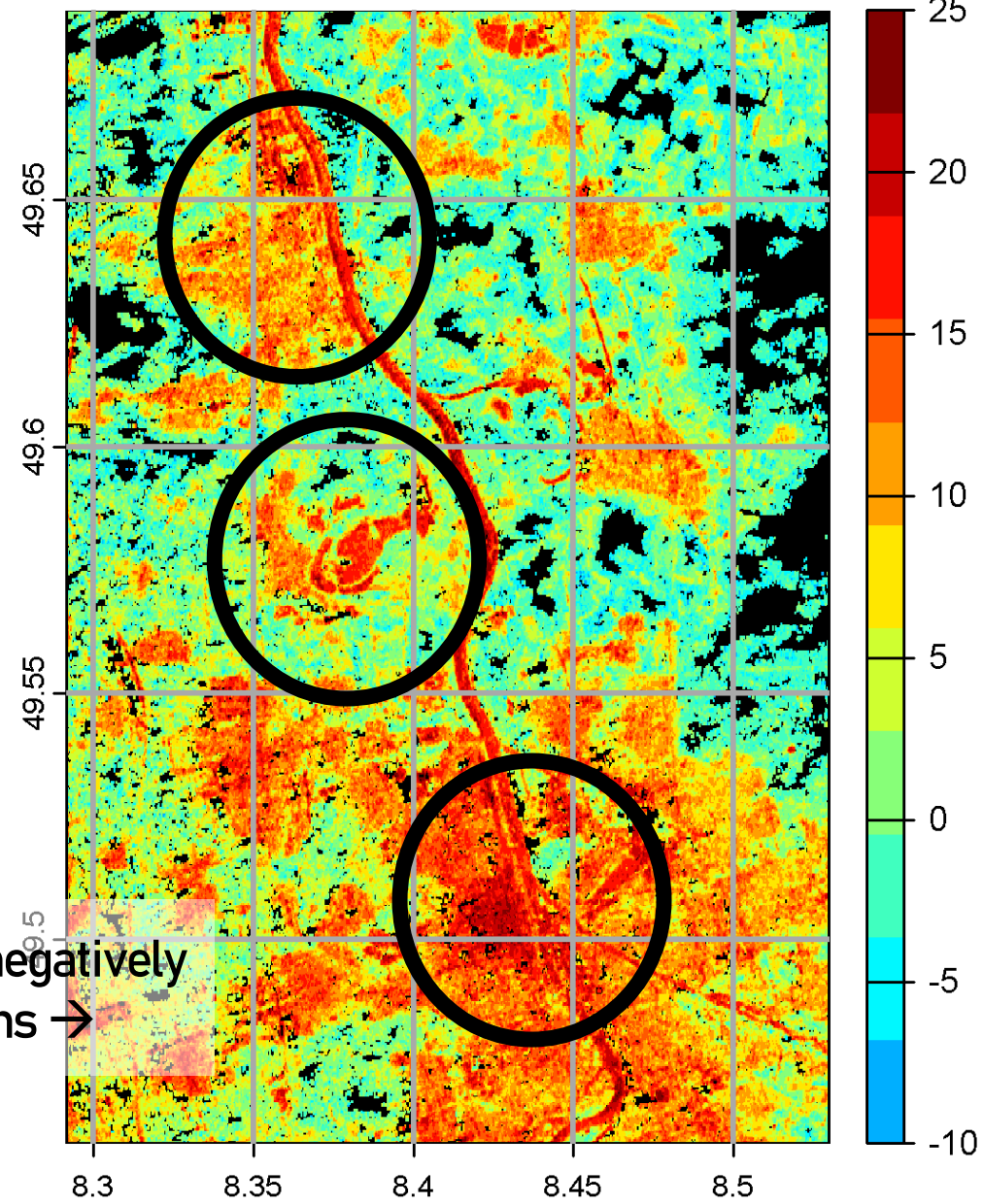


Urban areas near waterbodies can negatively impact water extent observations →

Surface water phenomena can make water bodies bright or dark (or disappear!)

Urban areas near waterbodies can negatively impact water extent observations →

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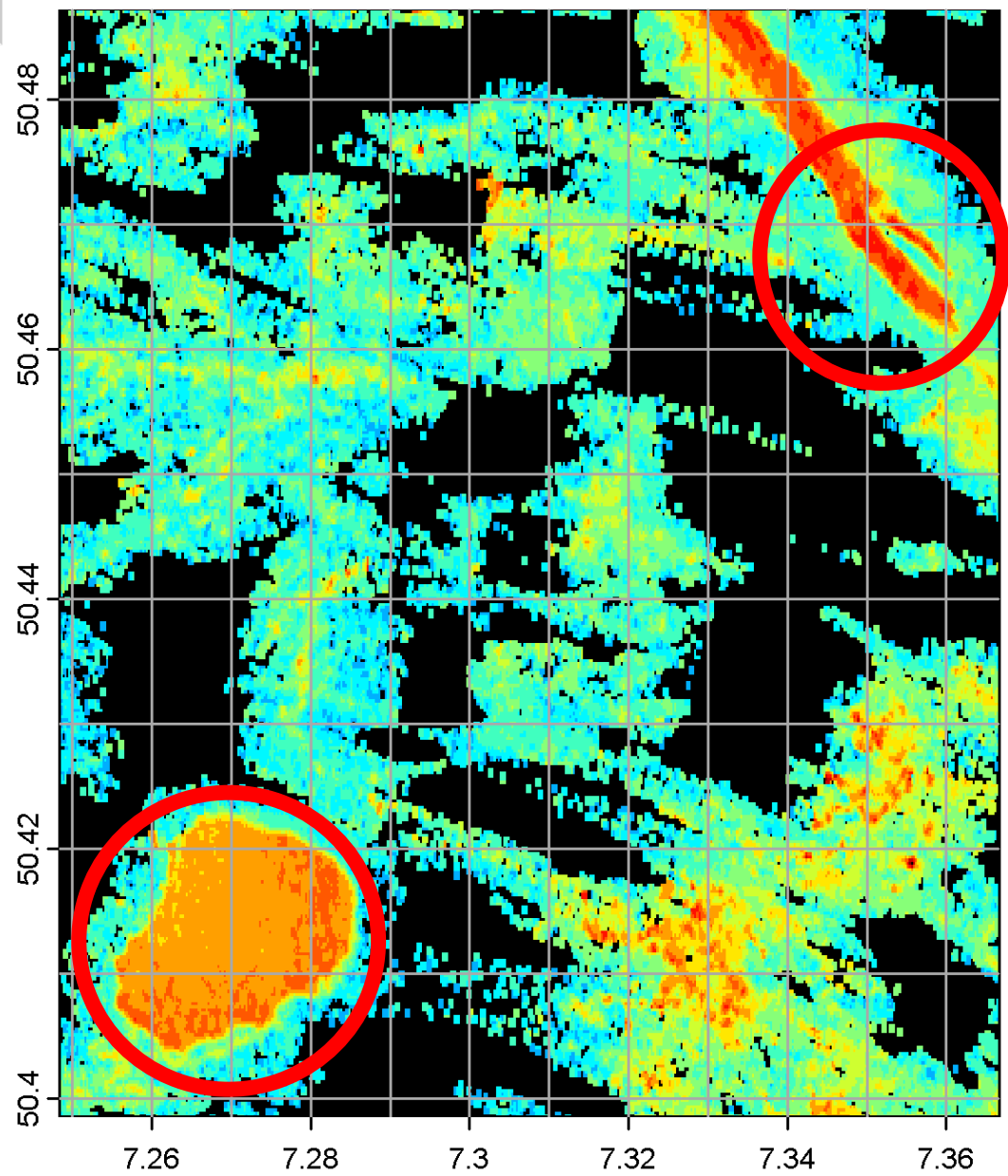
Worms, Germany

*Germany
phenomenology
collaboration with
Luciana Fenoglio*

The Laacher See (~1.5km wide) disappears completely in the May 20th observation!

Wind streaking is evident in some observations, but not consistently.

Check out two posters on wind retrievals over lakes!
Katie McQuillan
Jessica Fayne



Koblenz, Germany

← Surface water phenomena can make water bodies bright or dark (or disappear!)

Germany phenomenology collaboration with Luciana Fenoglio

Vegetation Water and Surface Water Studies from SWOT

- ❖ The Ka-band is sensitive to very fine and surficial spatial and structural details.
- ❖ Ka-band does not penetrate canopies, but the high-resolution observations work well to see through sparse canopies and short grasses.
- ❖ The Ka-band frequency and 25m spatial resolution are ideal for studying surface moisture in croplands and wetlands to where water bodies are not present or are obscured by vegetation.
 - ❖ Work is ongoing to develop reference datasets for more global studies of vegetation structure and surface moisture.
 - ❖ Important datasets/algorithms to consider:
 - Vegetation Complexity (Jurayj et al in review)
 - Multi-Resolution Index of Valley Bottom Flatness (Gallant & Dowling 2003)
 - Plant Health Indicators-- ECOSTRESS/(TRISHNA coming soon)
 - NISAR/SMAP Soil Moisture