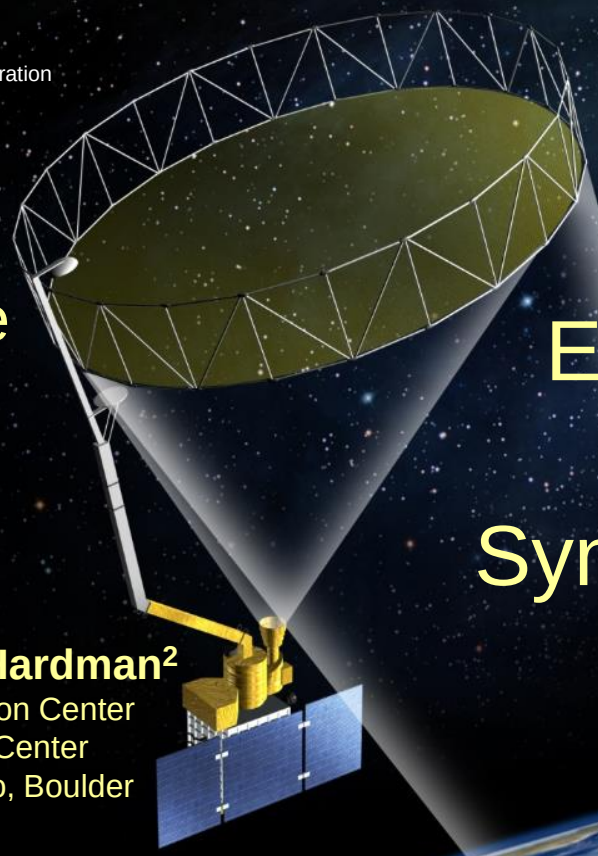
National Aeronautics and Space Administration



Soil Moisture Active Passive Mission

SMAP

SMAP Radar Enhanced-Resolution Scatterometer and Synthetic Aperture Radar Image Products

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SMAP Radar Project Objectives

- **(1) Convert the SMAP Radar products from swath-based grids to Earth-based grids, then archive and distribute the product to the community via the NASA NSIDC DAAC.**

- **Input Data:**
- SMAP L1B Radar Half-Orbit Time-Ordered Low-Resolution Backscatter Data, Version 1
- https://nsidc.org/data/SPL1BS0/versions/1

- SMAP L1C Radar Half-Orbit High-Resolution Backscatter Data on 1 km Swath Grid, Version 1
- https://nsidc.org/data/SPL1CS0/versions/1

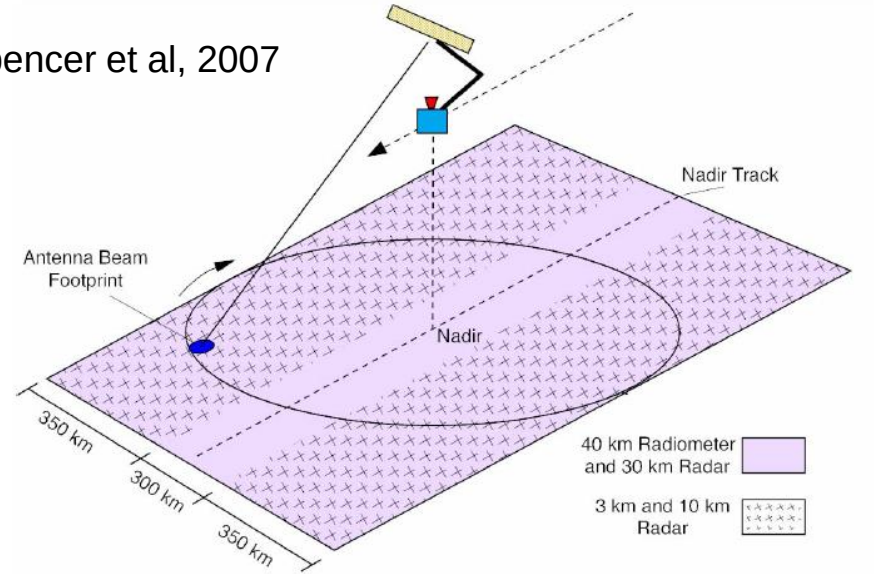
- **Output Data Format:**
- SMAP Radiometer Twice-Daily rSIR-Enhanced EASE-Grid 2.0 Brightness Temperatures, Version 1
- https://nsidc.org/data/NSIDC-0738/versions/1

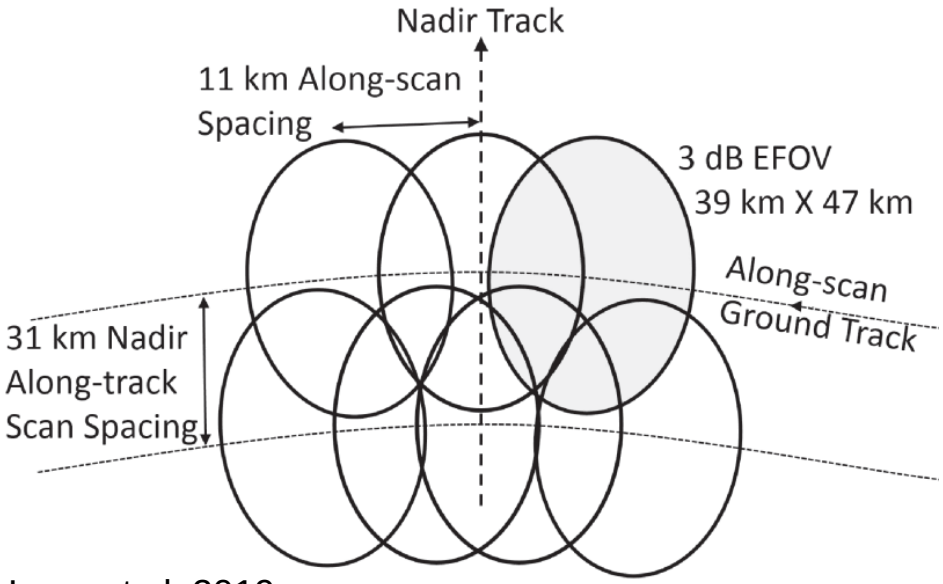
- **(2) Use the SMAP radar data together with the SMAP enhanced resolution radiometer data to explore combined active-passive mapping approaches over the polar ice sheets and ice shelves.**

- **Subsurface Meltwater (i.e., firn aquifers)**

The SMAP L-band Radar

Spencer et al, 2007





Long et al, 2019

- **Hybrid Scatterometer + SAR**
- **Operated at 1.26 GHz and collected radar backscatter**
- **13 April – 7 July 2015 (failed)**

- **Scatterometer-mode:**
- **HH, VV, HV, VH**
- **40° constant incidence angle**
- **Resolution ~30 km**

- **Global converge ~ 3 days**
- **Polar coverage ~1 day**

- **SAR-mode (ground processed):**
- **HH, VV, HV**
- **40° constant incidence angle**
- **Resolution ~1-3 km**
- **Land surfaces, excludes Antarctica**

Image Reconstruction

- **Scatterometer images are processed using the Scatterometer Image Reconstruction Algorithm (SIR)**

- **The SAR are processed using a 'Drop in the Bucket' gridding algorithm**

- **Scatterometer and SAR Images a Twice-Daily**
- **Ease-Grid 2.0 Polar Azimuthal Equal-Area Projection**
- **8am-4pm local time of day**

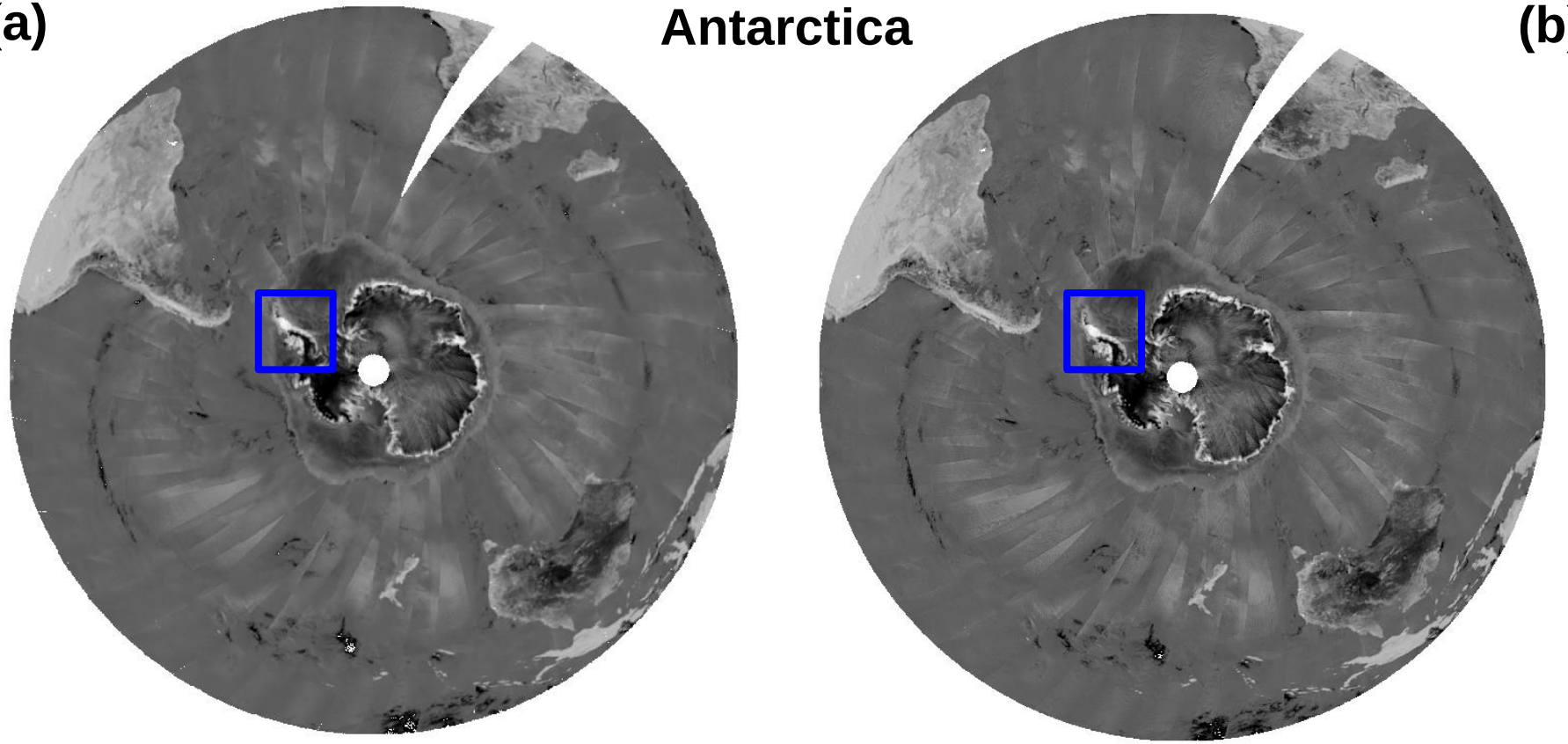
- **Ease-Grid 2.0 Global Cylindrical Equal-Area Projection**
- **Descending (6 am) and ascending (6pm) satellite passes**

- ***Scatterometer Images:***
- ***9 km, 6.25 km grids, 1-day, 3-day images, HH, VV, HV, VH***

- ***SAR Images:***
- ***3 km grids, 1-day and 3-day images, HH, VV, HV***

SMAP L-band Scatterometer Images
Ease-Grid 2.0 SH Azimuthal Equal-Area Projection

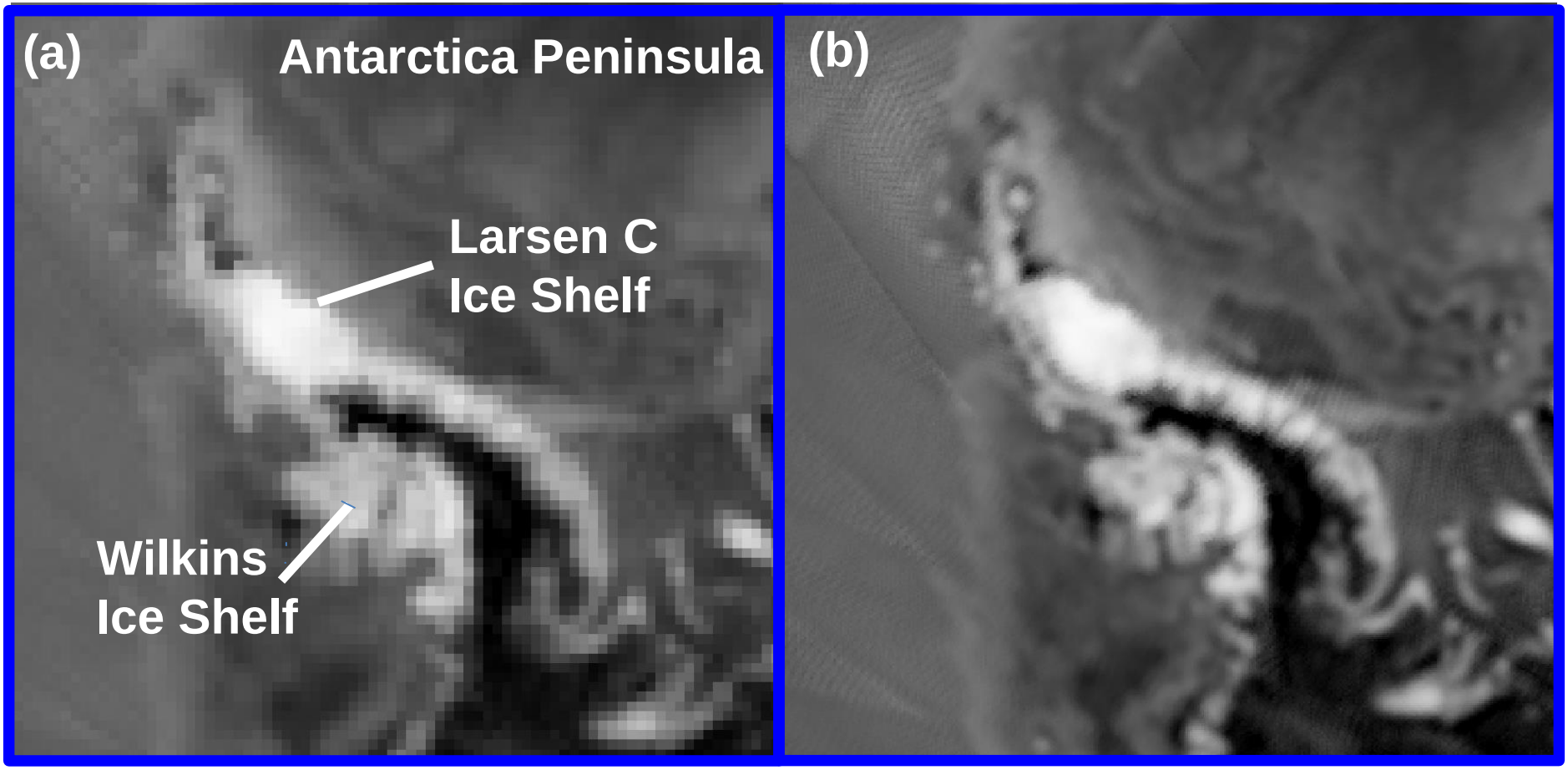
(a) Antarctica (b)



0 dB Radar Backscatter -25 dB

1-3 June 2015 HV M 25km GRD 1-3 June 2015 HV M 6.25km SIR

SMAP L-band Scatterometer Images
Ease-Grid 2.0 SH Azimuthal Equal-Area Projection

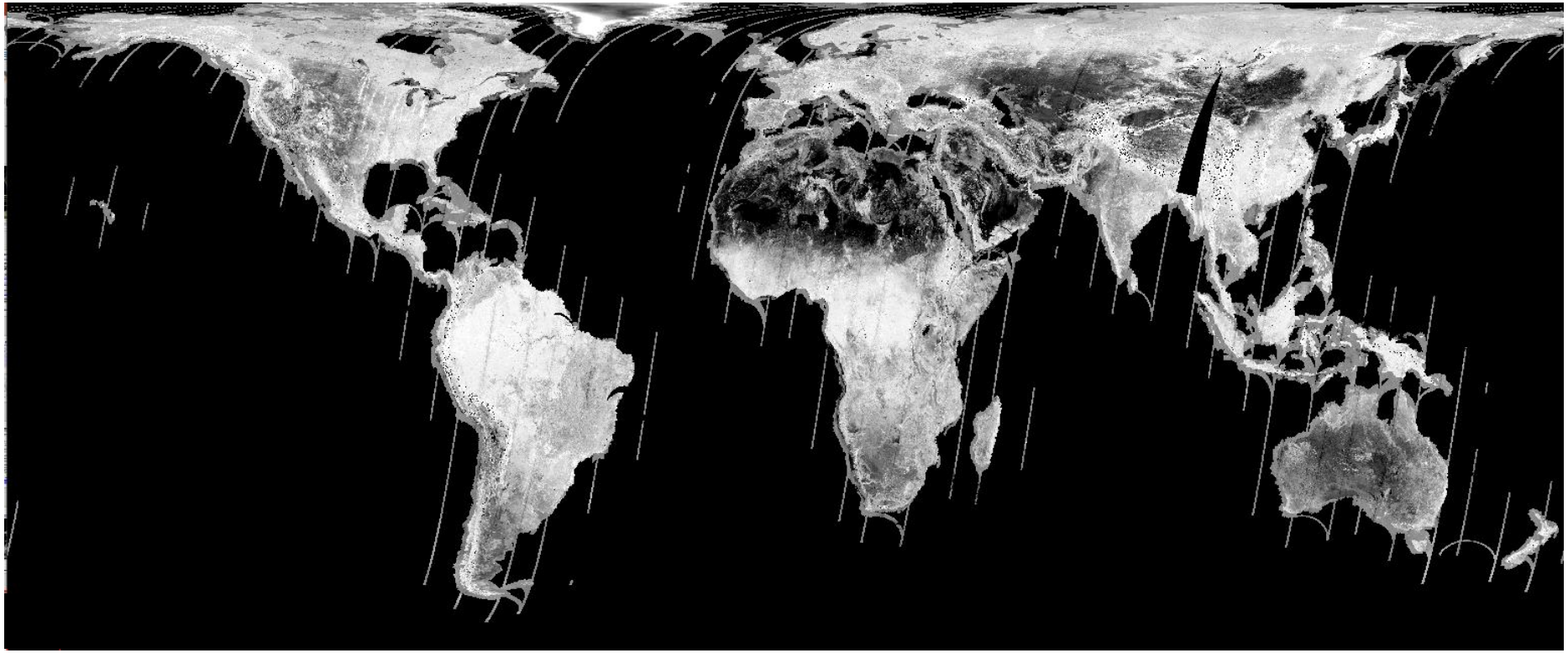


0 dB — Radar Backscatter — -25 dB

1-3 June 2015 HV M 25km GRD

1-3 June 2015 HV M 6.25km SIR

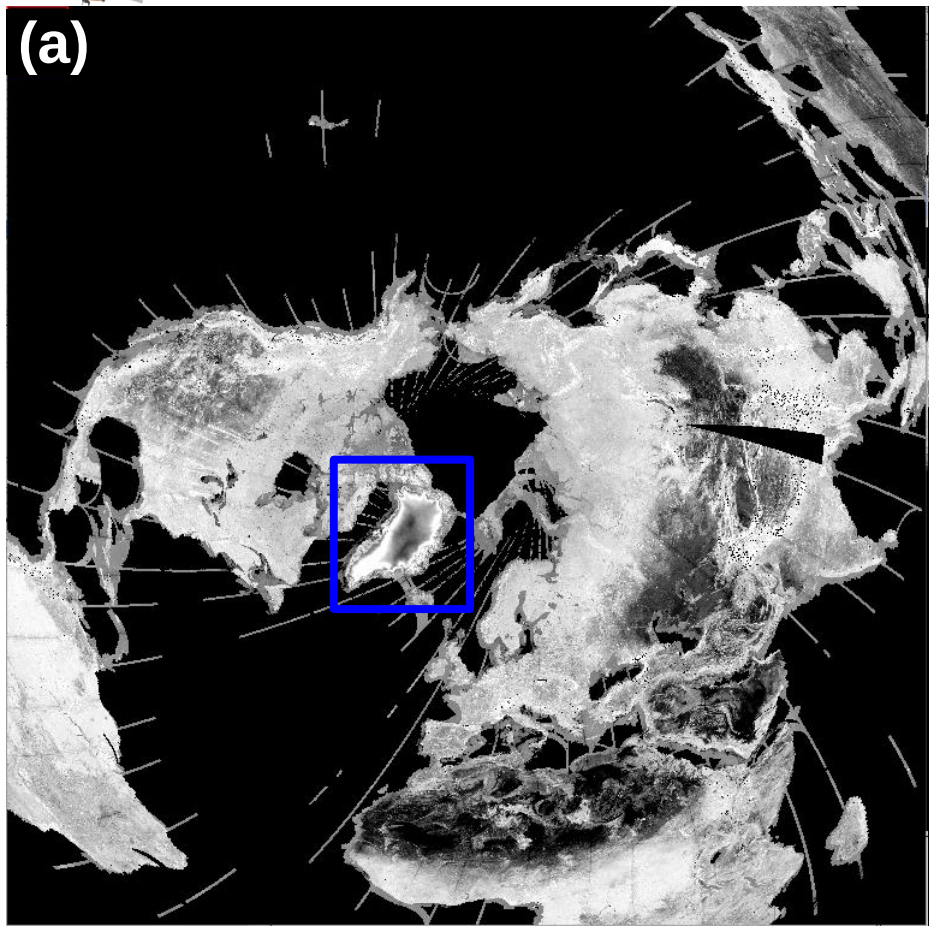
SMAP L-band SAR Images
Ease-Grid 2.0 Global Cylindrical Equal-Area Projection

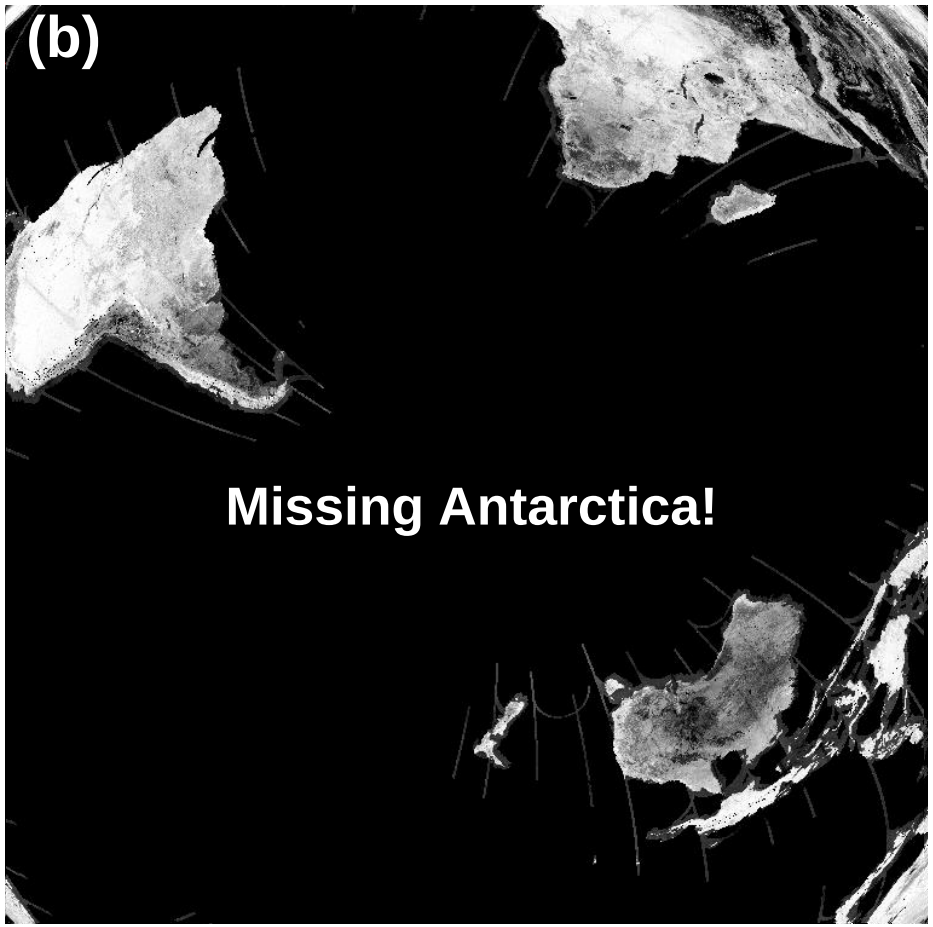


0 dB — Radar Backscatter — -25 dB

4-6 July 2015 VV M 3km GRD

SMAP L-band Scatterometer Images
Ease-Grid 2.0 Polar Azimuthal Equal-Area Projection



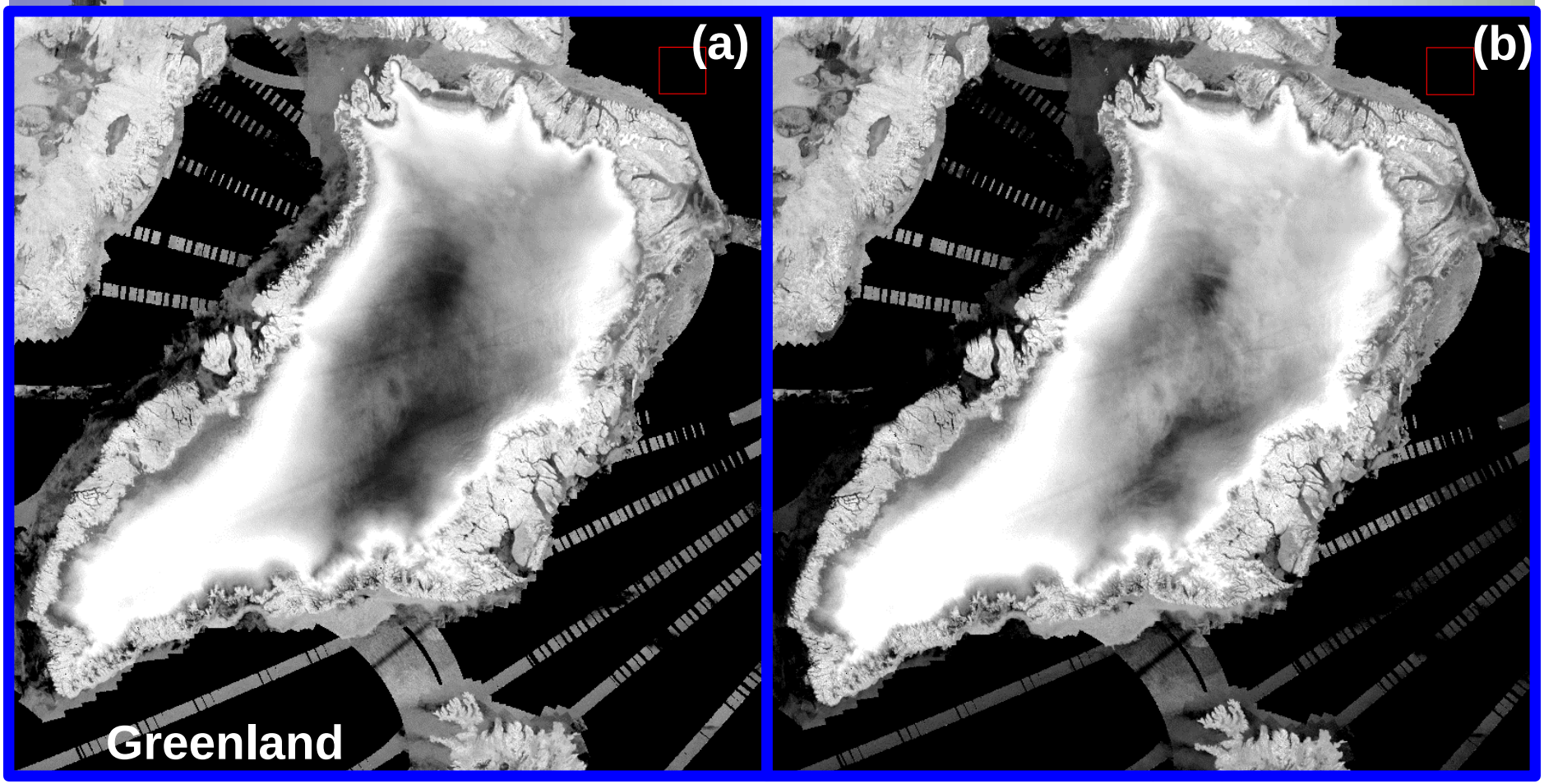


0 dB — Radar Backscatter — -25 dB

4-6 July 2015 VV M 3km GRD

4-6 July 2015 HH M 3km GRD

SMAP L-band SAR Images
Ease-Grid 2.0 NH Azimuthal Equal-Area Projection



0 dB — Radar Backscatter — -25 dB

4 July 2015 HH M 3km SIR

4 July 2015 VV M 3km SIR

Questions? or interested in the SMAP radar data?

Contact: jzmiller.research@gmail.com