AMSR-E Sea Ice Parameters and Validation Studies

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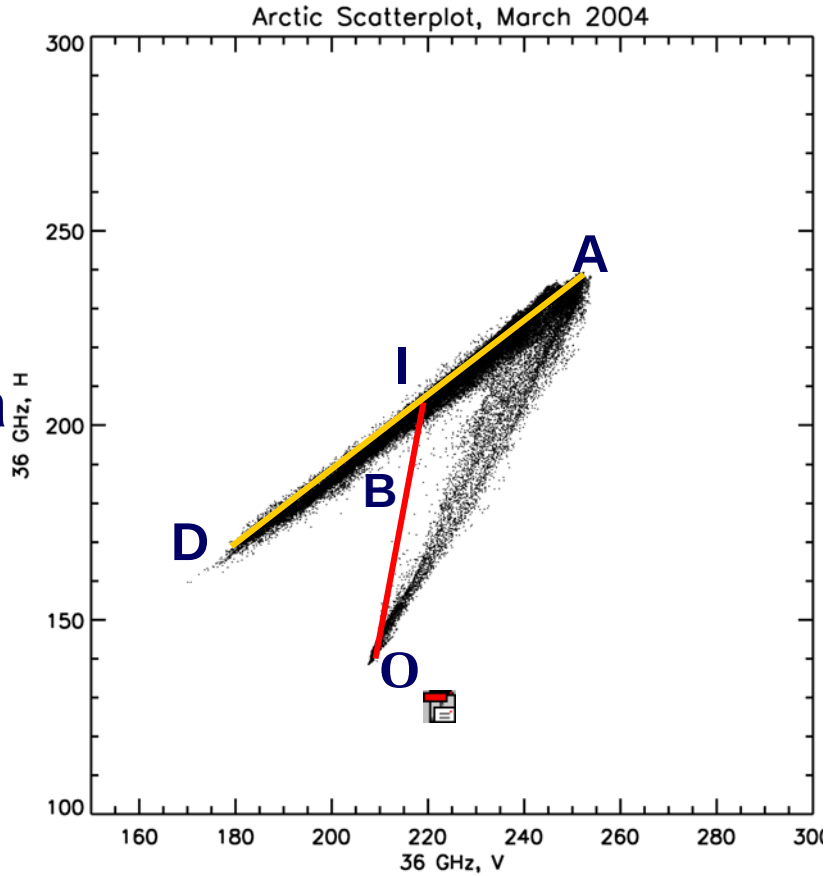
Ice Parameters Vs Science Objectives

- AMSR-E provides opportunity to generate ice data that match better with scientific needs
- With much higher resolution and wider spectral range, sensor provides ice information not available with previous systems
- Science needs may not necessarily match operational needs
- Ice parameters need to be better defined. Primary needs are ice and surface types
- A more complete set of ice measurement is desired

The HV36 Bootstrap Algorithm Set:

Highly compact cluster with sigma about 1.5K and slope about 0.99. This implies good accuracy and accounts for variability in T_S.

$\delta T_{Bp} = \varepsilon \, \delta T_{Sp}$

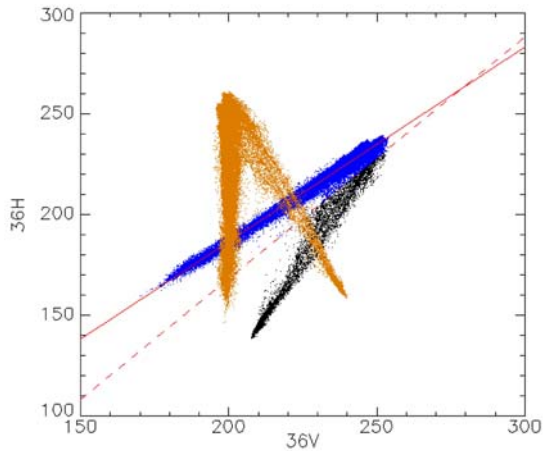


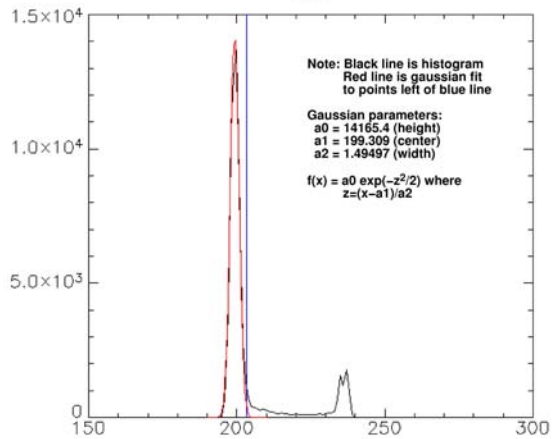
$T_B = C_I T_I + C_O T_O$

$C_I = (T_B - T_O)/(T_I - T_O)$

$= OB/OI$

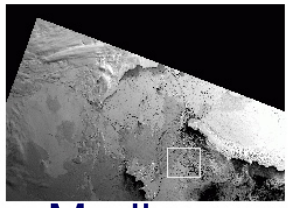
$\partial C_I = f(\partial T_B, \partial T_I, \partial T_O)$

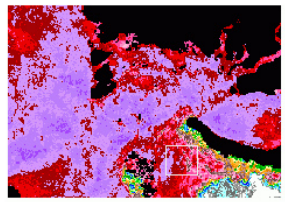


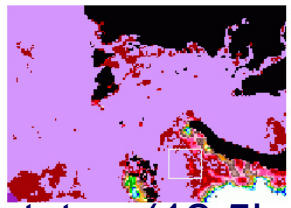


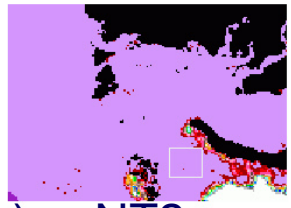
The statistical error depends on the standard deviation from the line AD which has been evaluated to be around 1.5 K. This means an error in ice concentration of about 2%.

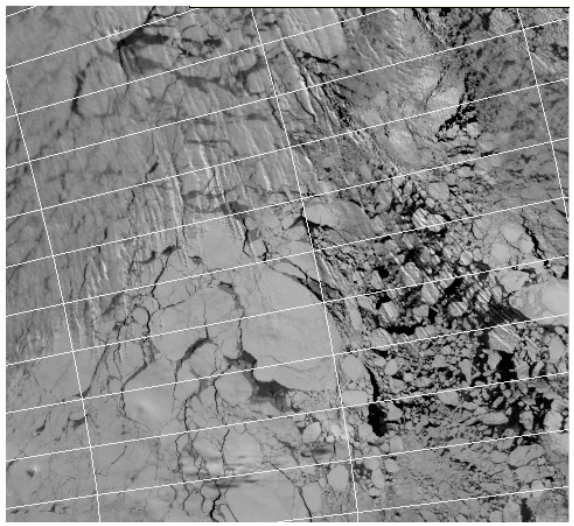
Divergence in the vicinity of Novaya Zemlya Island in April 15, 2004

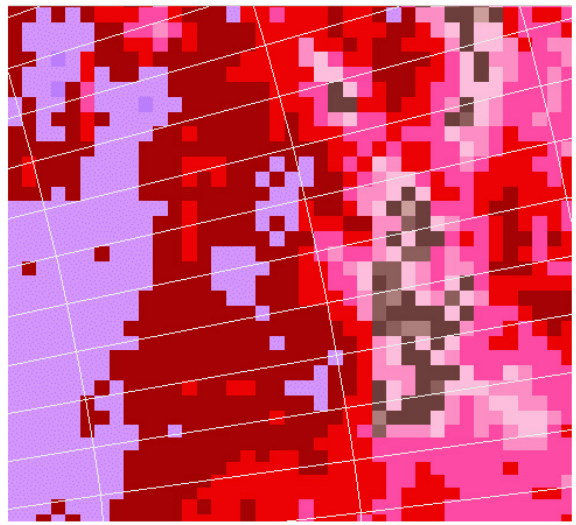

Modis

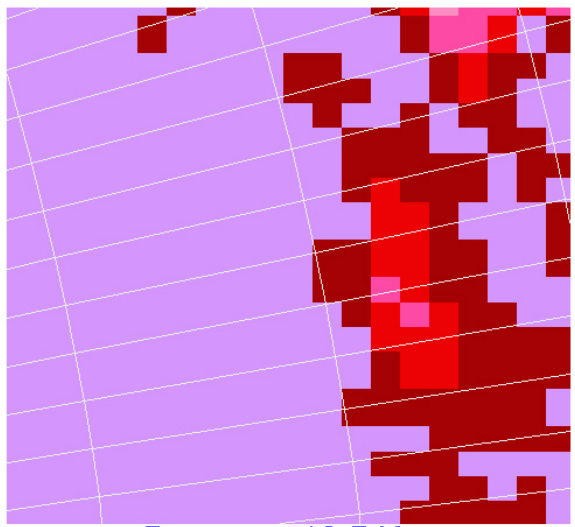

89Algo

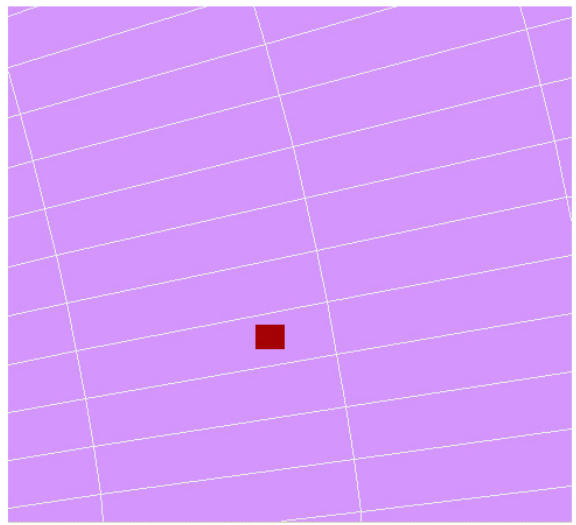

Bootstrap(12.5km)


NT2

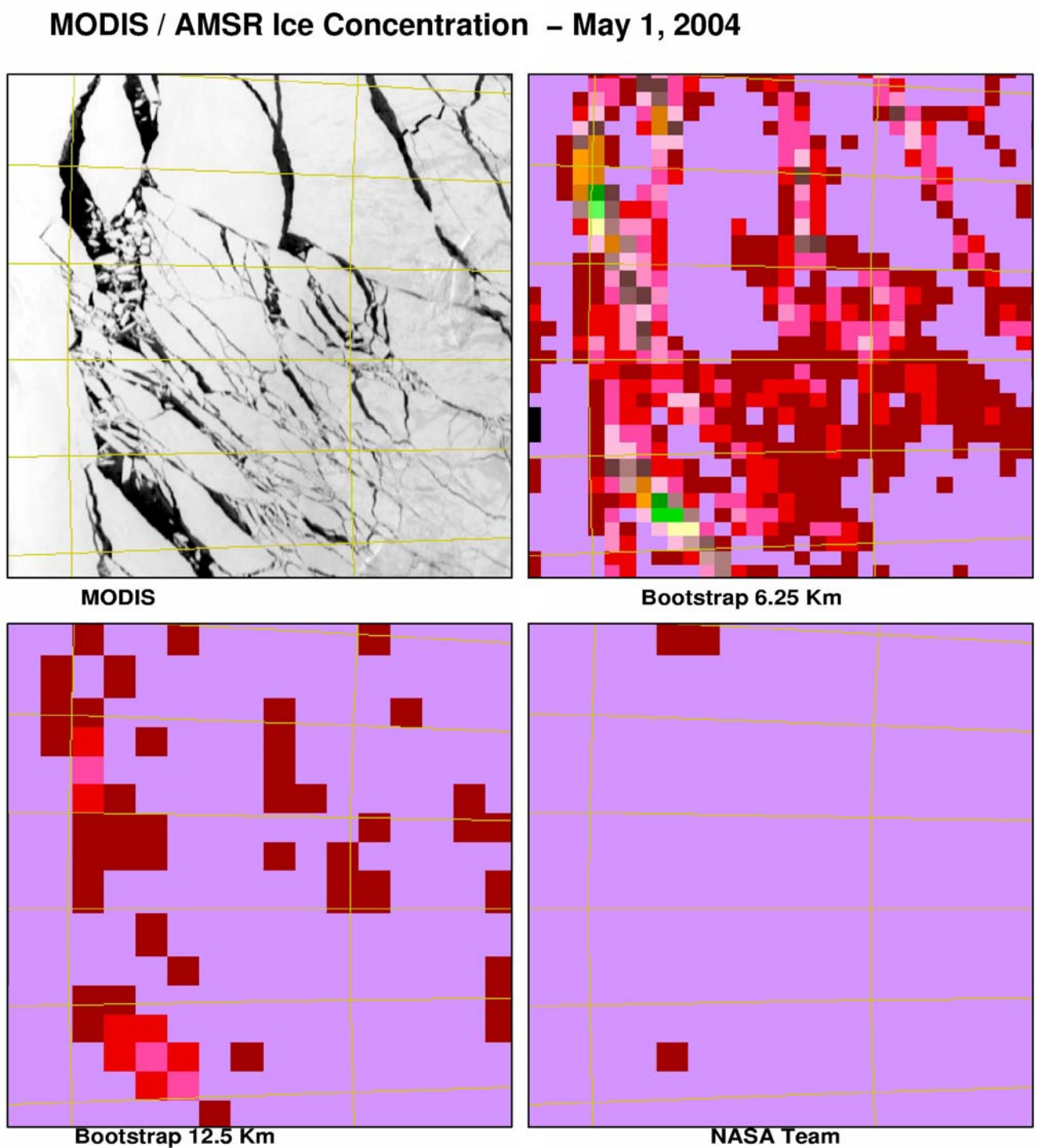

MODIS


Bootstrap 6.25 Km


Bootstrap 12.5 Km

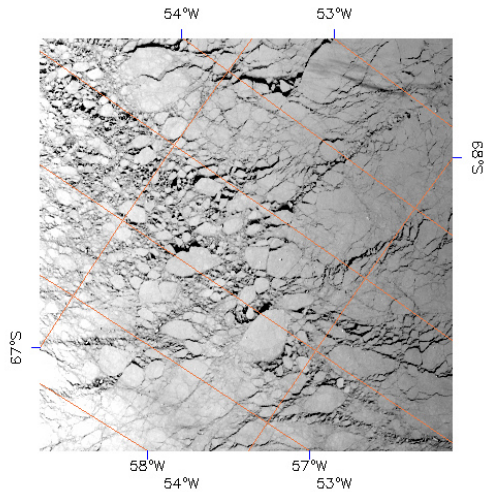

Nasa Team

Large leads in Alaska

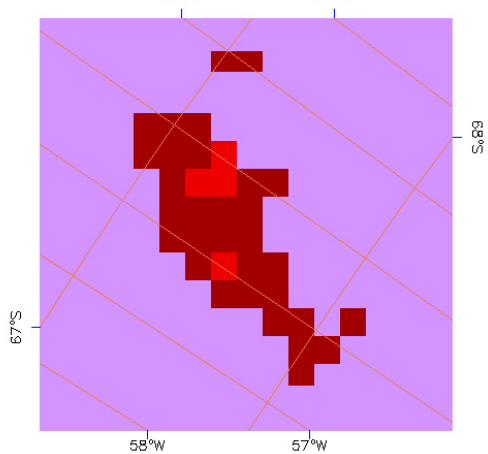


Algorithm Comparison in the Weddell Sea on 3 Sept 2004

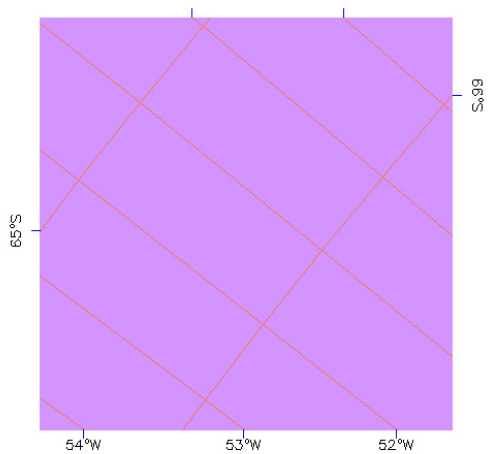
The Antarctic sea ice cover is constantly moving and is affected by temperature change, wind, waves, and tides. Location of divergence areas may be important to identify.



MODIS



AMSR Bootstrap
Ice Concentration



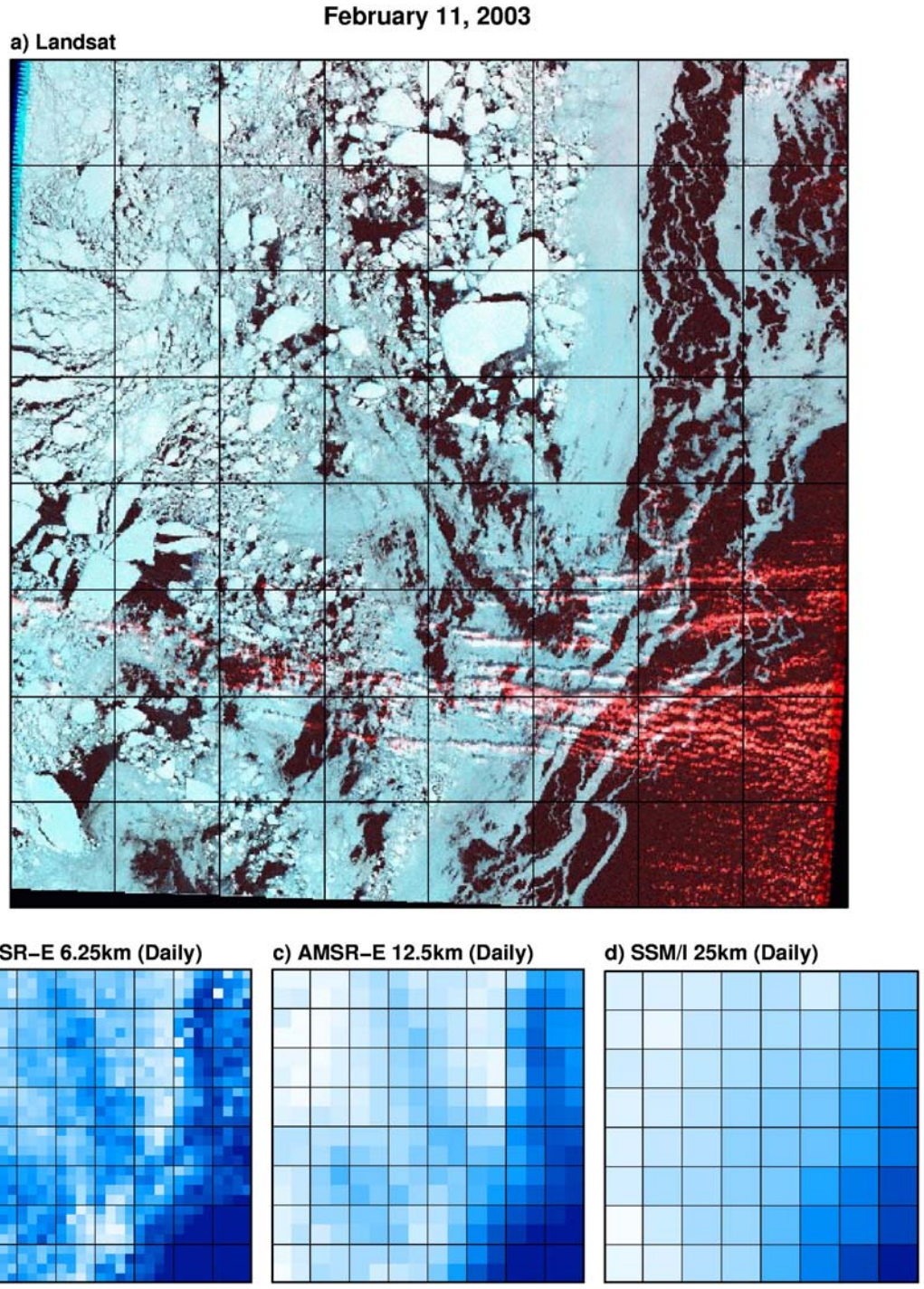
NASA Team
Ice concentration

AASI/Okhotsk Sea Ice Missions

- Principal Investigator: Josefino Comiso
- Overall coordinator: Elena Lobl
- Co-investigators: Fumihiko Nishio, Koni Steffen
- PSR Scientists: Al Gasiewski, Marian Klein, Boba Stankov
- ATM Scientists: Bob Swift, Bill Krabill, John Sonntag
- D2P Scientists: Keith Raney, Carl Luschen, Dick Chapman
- THOR Scientist: Bob Cahalan
- GSFC Support: Rob Gersten, Raj Poudyal
- NSIDC/MSFC Support: Real time data providers

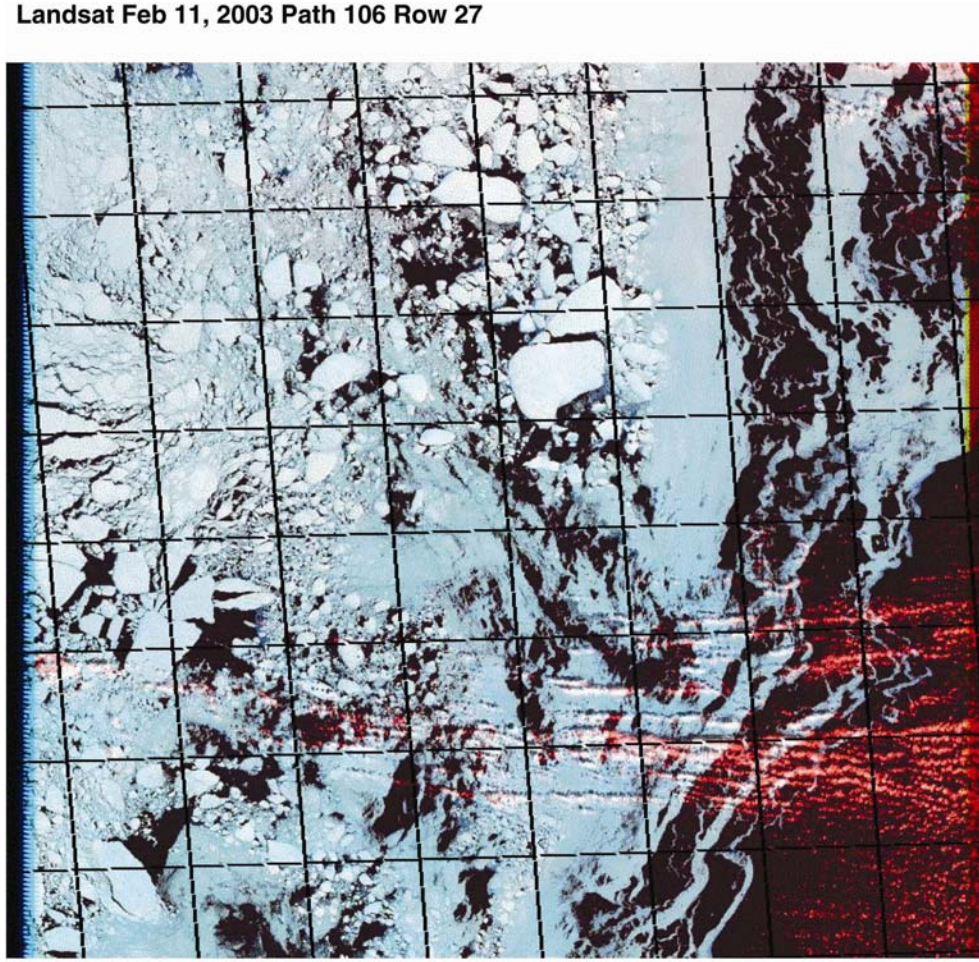
High Resolution AMSR vs Landsat

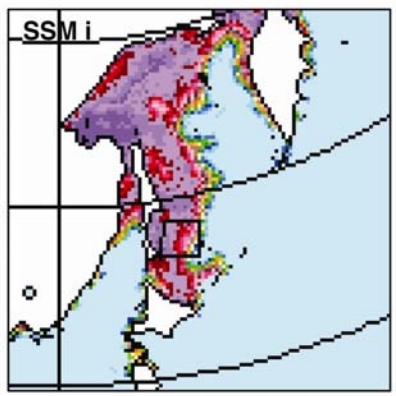
- AMSR-E data at 6.25 km resolution captures many of the spatial features from a high resolution visible channel
- The 12.5 km data show some details but the 25 km data smear out much of the features.

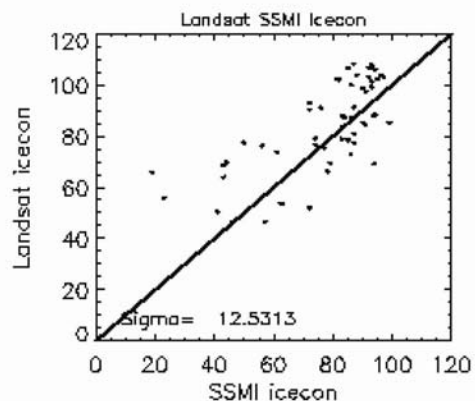


Landsat image of the Sea of Okhotsk

- Landsat scenes provide the means to study large areas at a high resolution.
- On February 11, the ice cover in the southern area was very active with a large fraction being covered by shuga, pancakes, nilas and grease ice.
- Mismatch in IC mainly due to the few hours difference in observational time and the presence of thin ice.







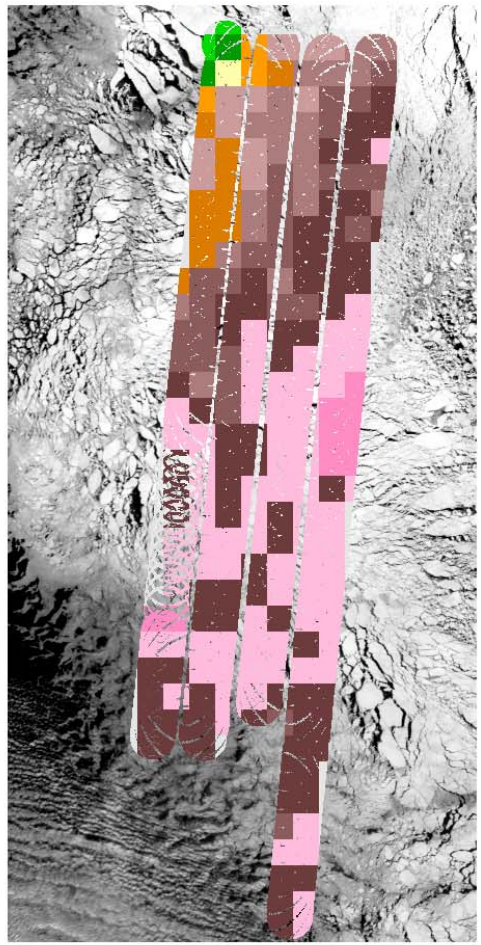
37 GHz (H) and MODIS in Okhotsk Sea

February 9, 2003

AMSR + PSR

AMSR

PSR+MODIS

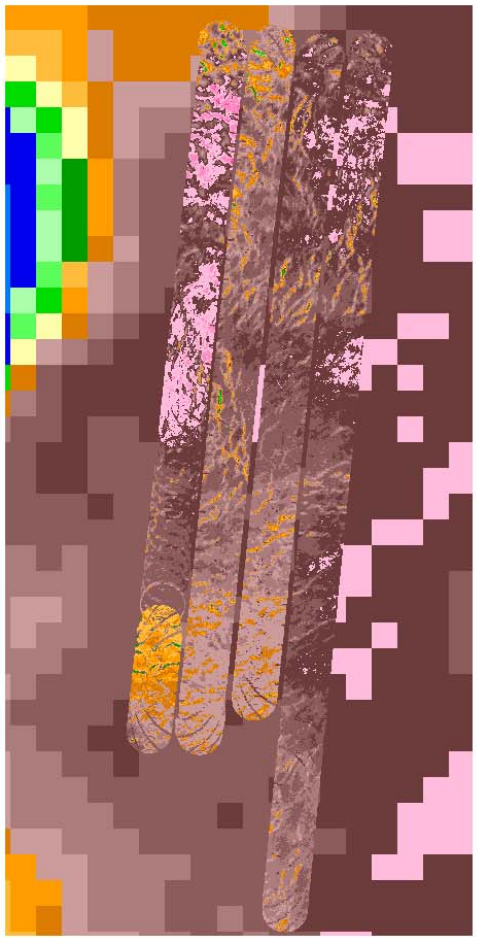


MODIS

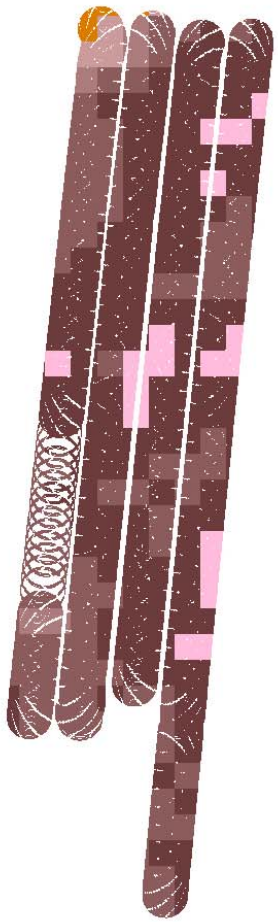
89 GHz (H) AMSR and MODIS the Okhotsk Sea

February 9, 2003

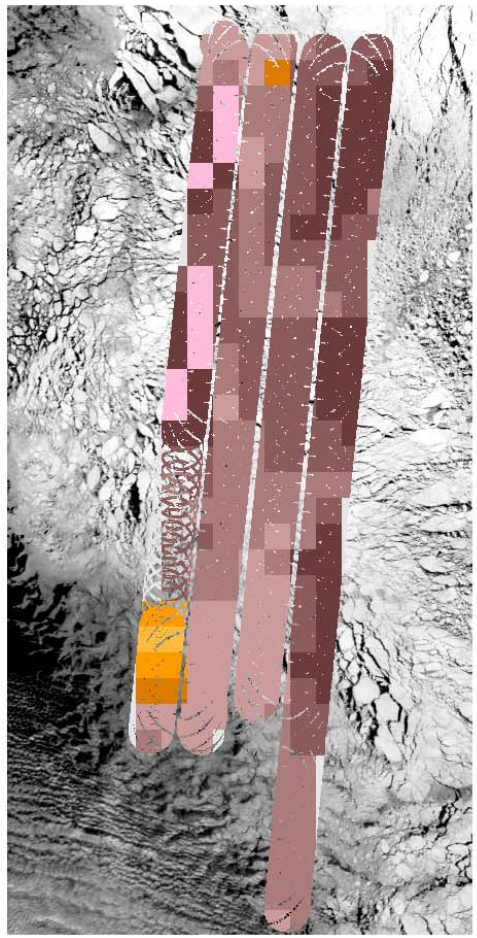
AMSR+PSR



AMSR

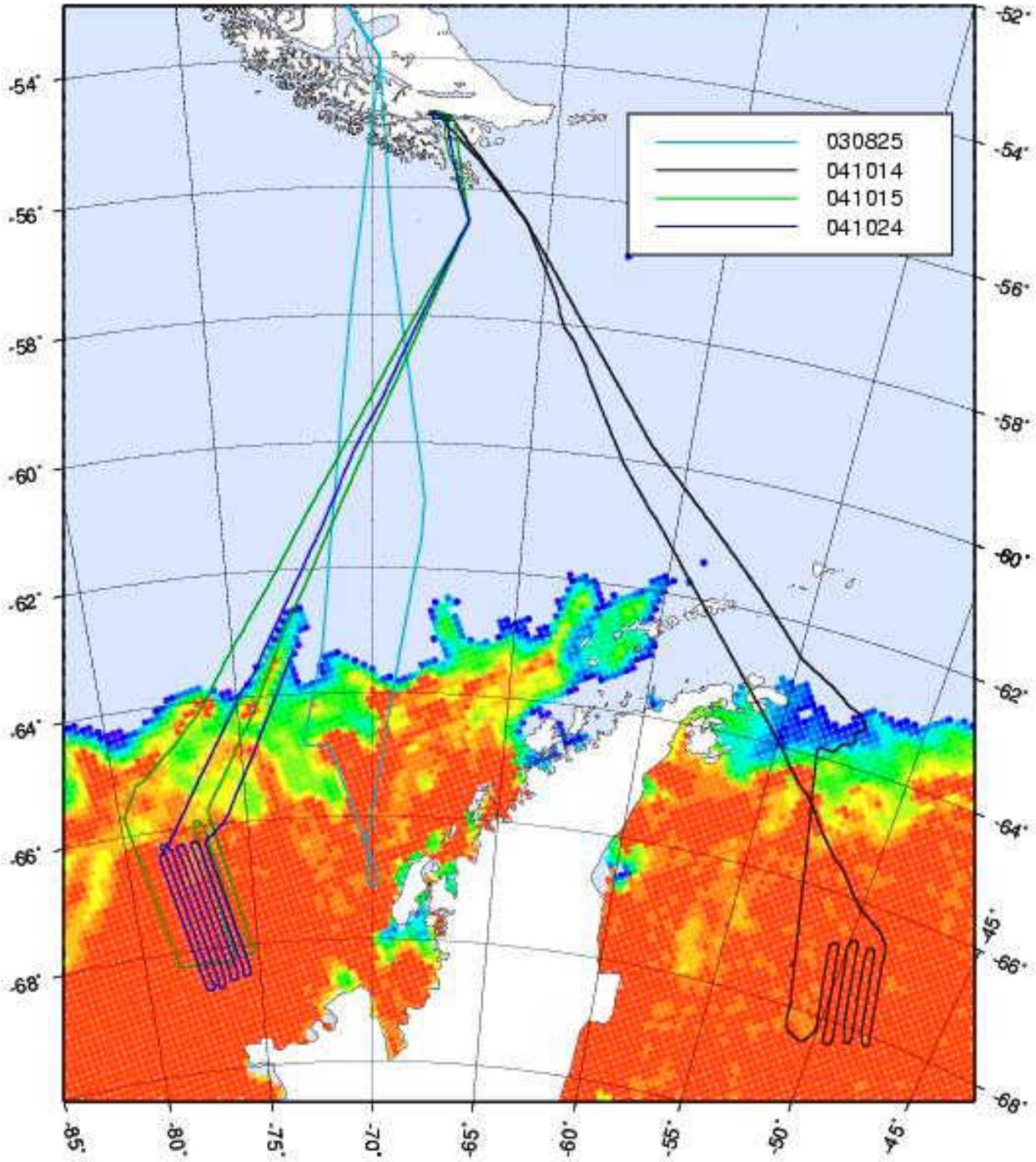


MODIS+PSR

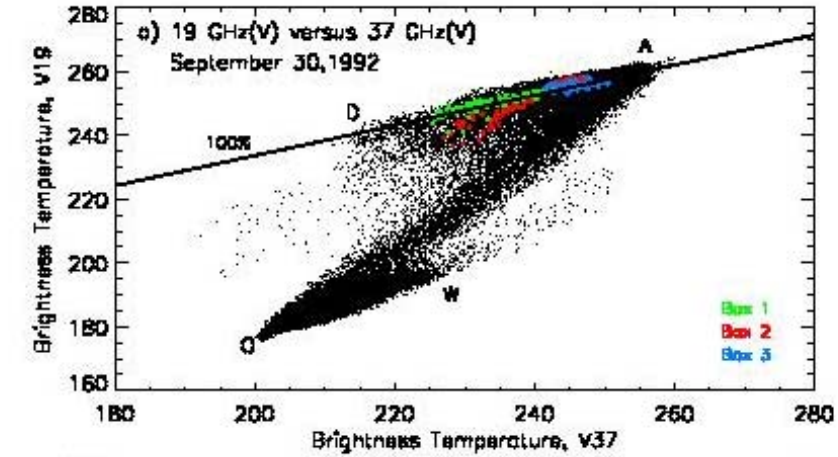


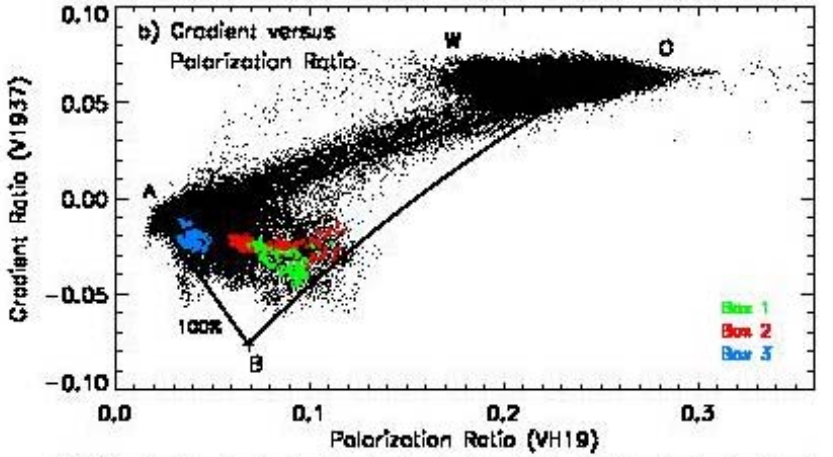
MODIS

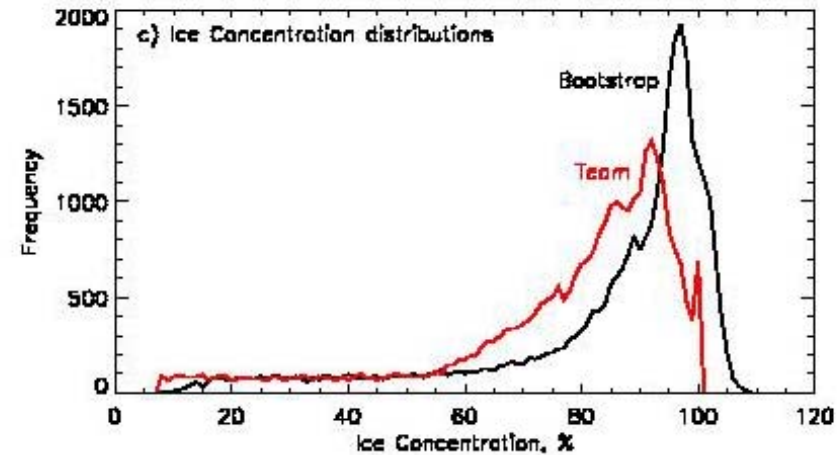
Summary of actual AASI Flight Tracks 2003 and 2004

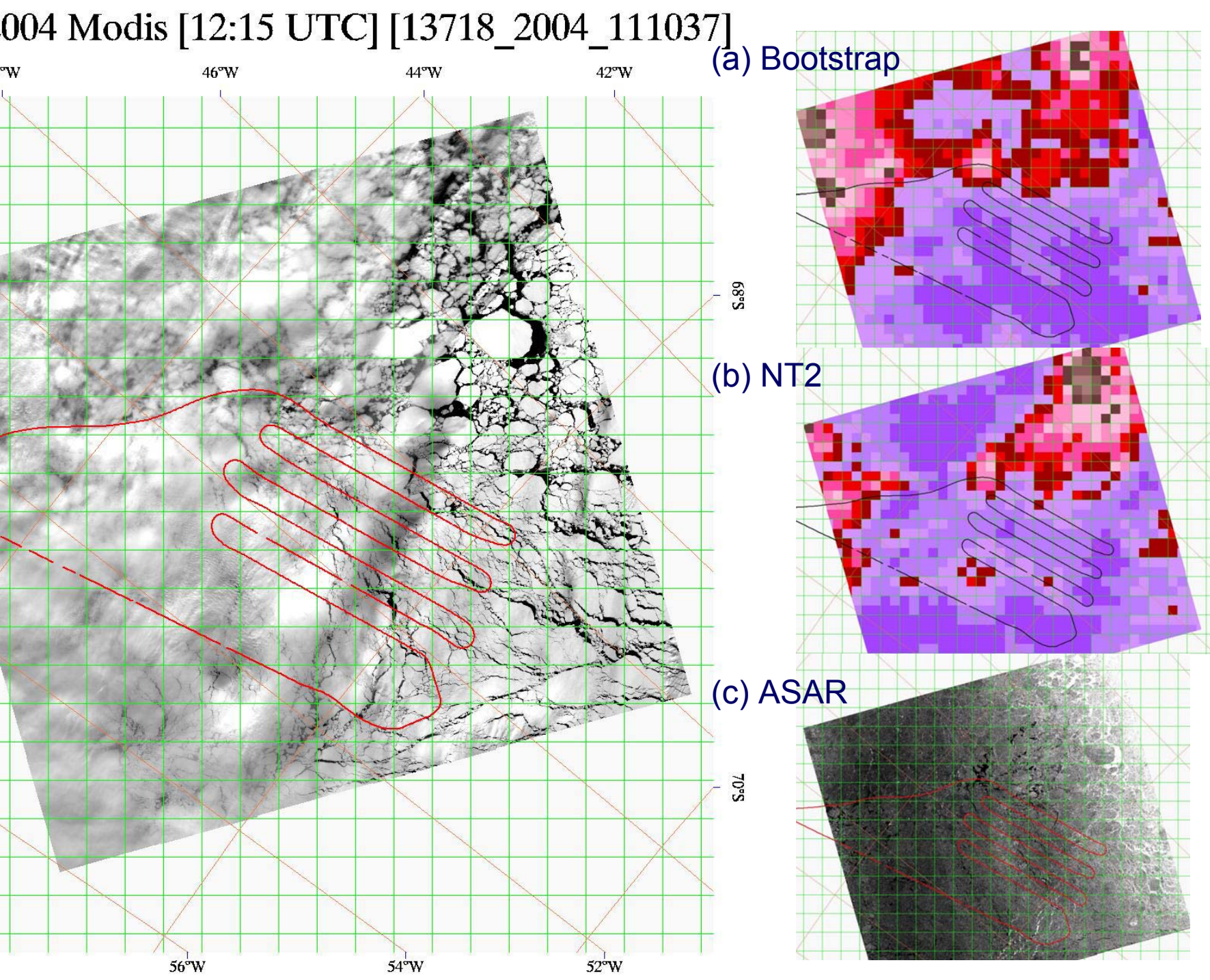


Cluster Plots illustrating the basic differences between NT1 and Bootstrap results

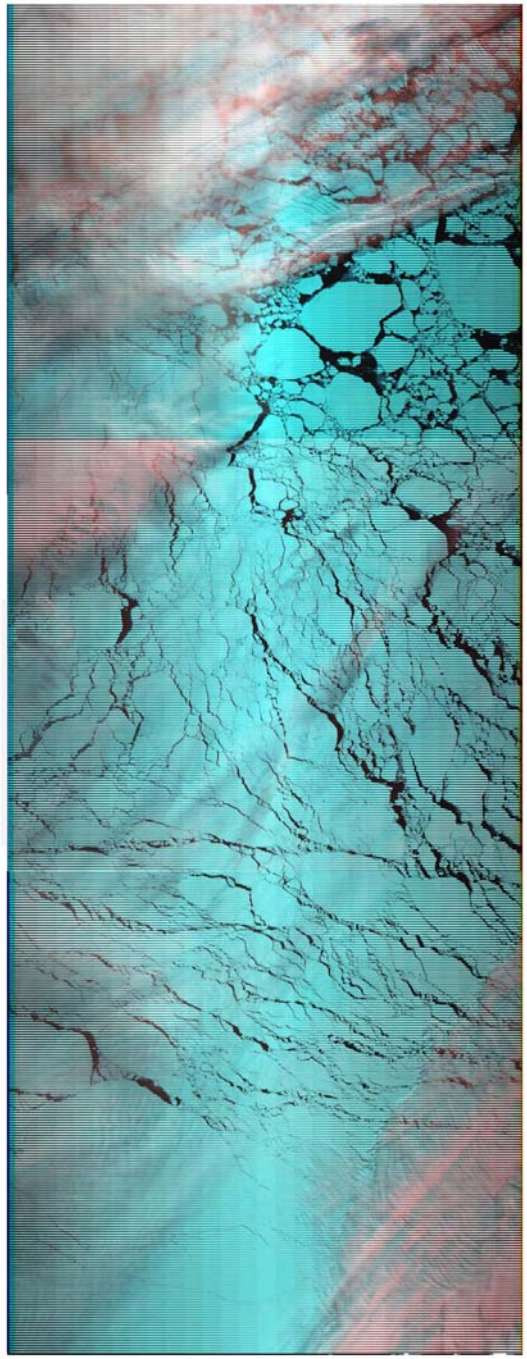


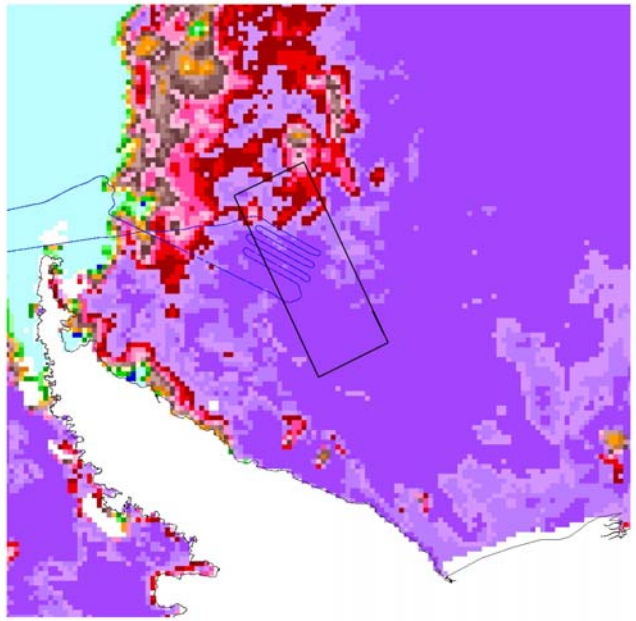




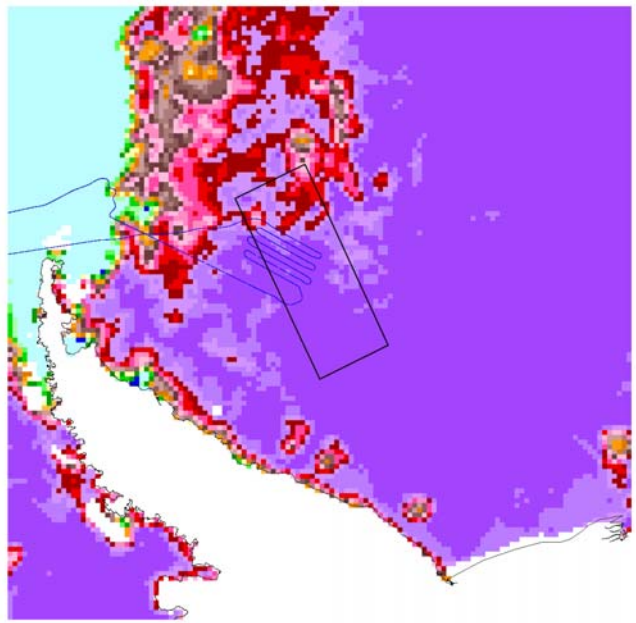

004 Modis [12:15 UTC] [13718_2004_111037]
°W
46°W
44°W
42°W
68°S
70°S
56°W
54°W
52°W
(a) Bootstrap
(b) NT2
(c) ASAR

Weddell Sea on 14 October 2004 using AMSR-E and MODIS





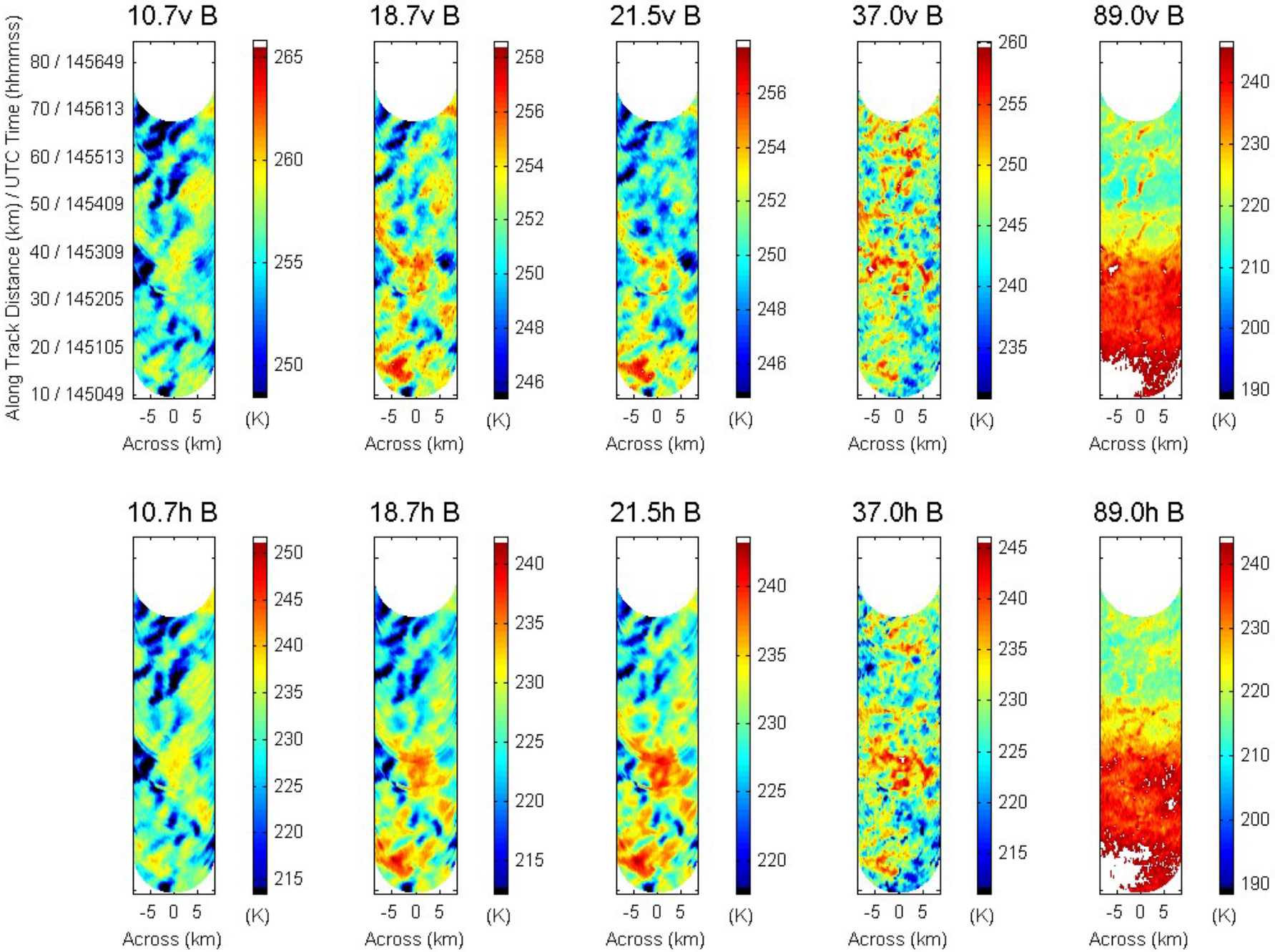
3Ch Bootstrap Icecon



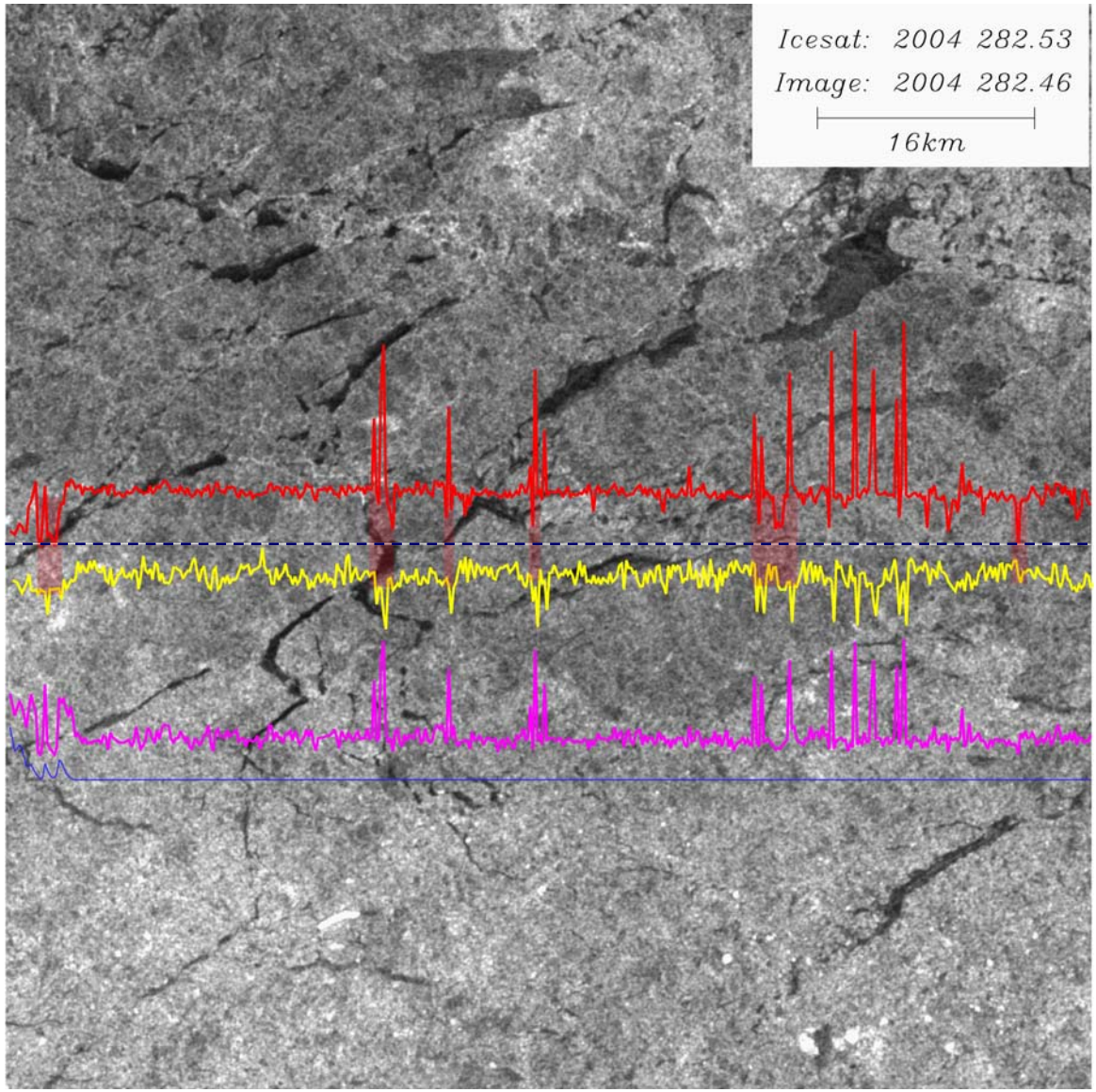
2ch Bootstaap Icecon

⟵ Landsat

Sample PSR-A images on 14 October 2004



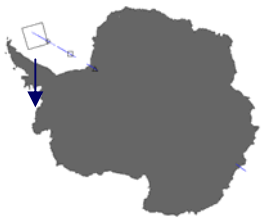
Track



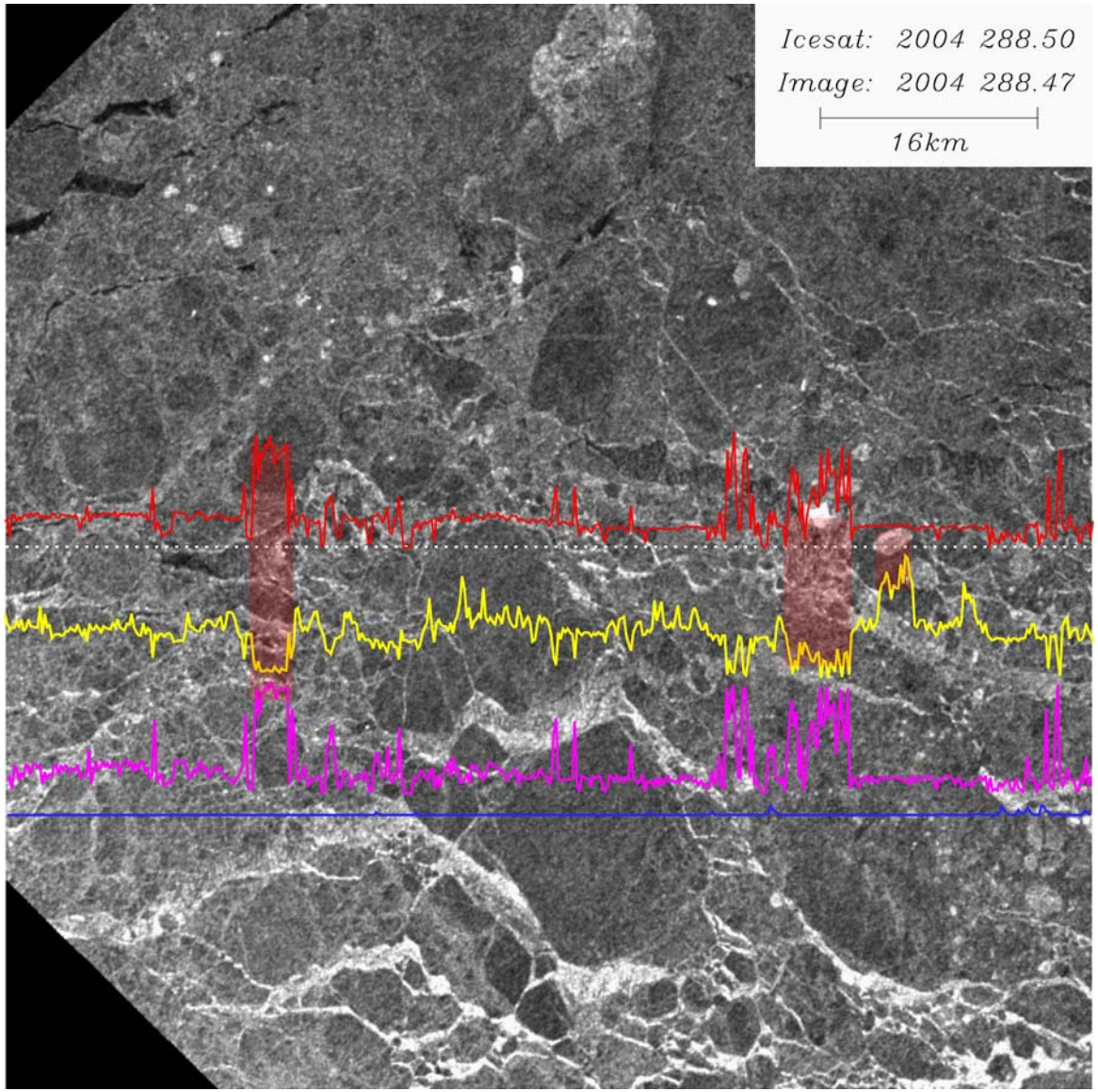
Reflectivity

Elevation

Gain



Track

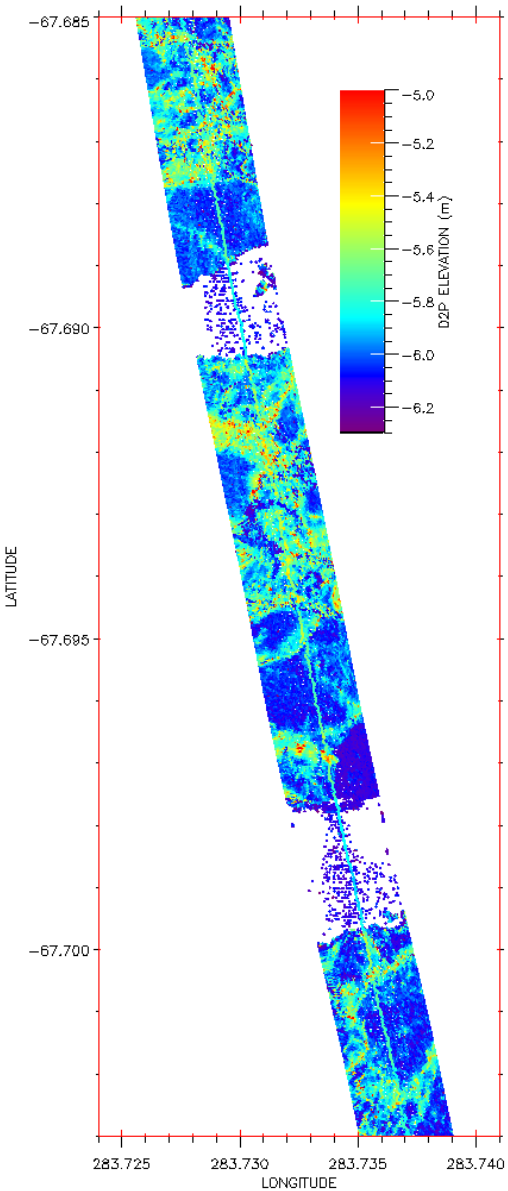


Reflectivity

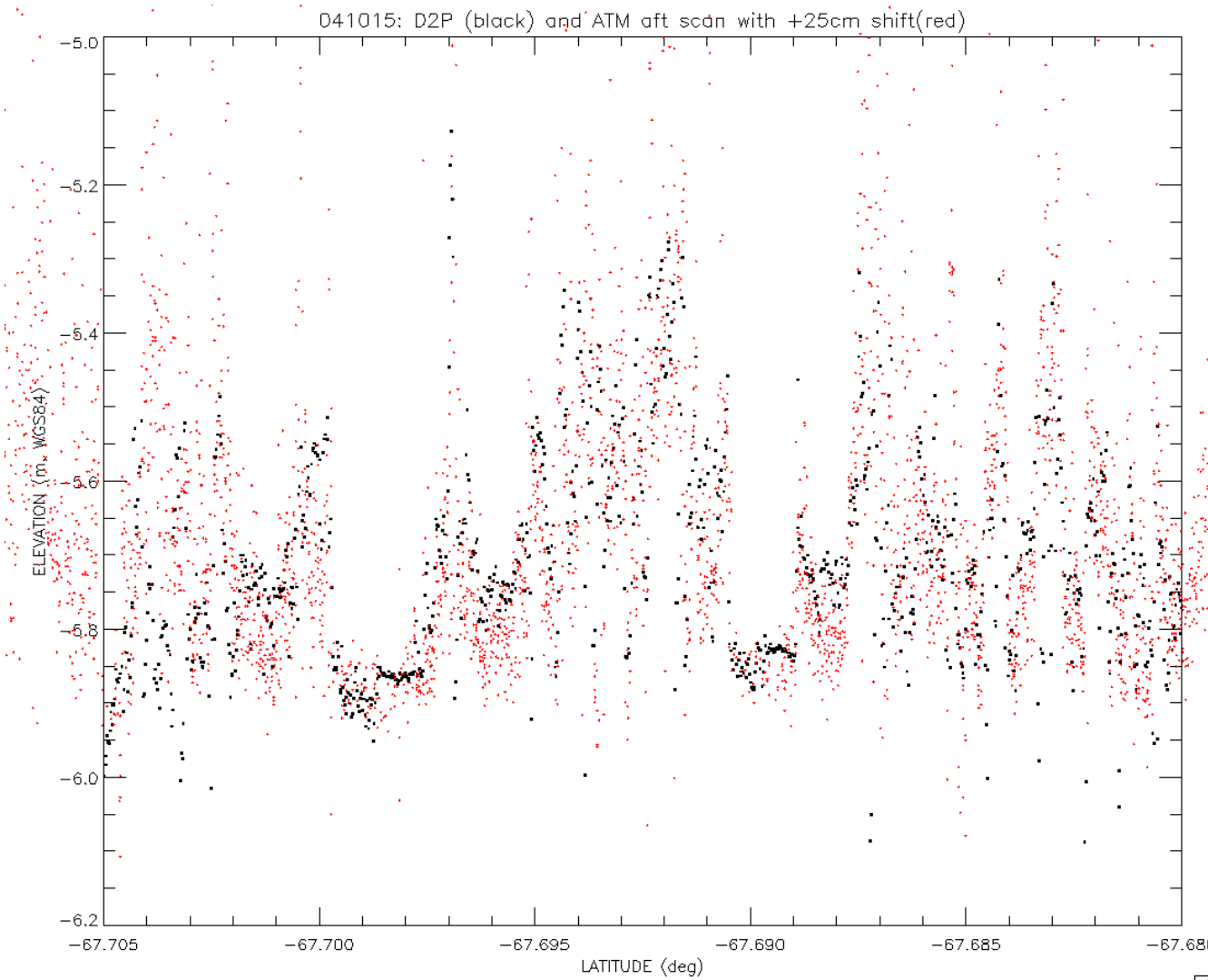
Elevation

Gain

ATM Topography Image Data

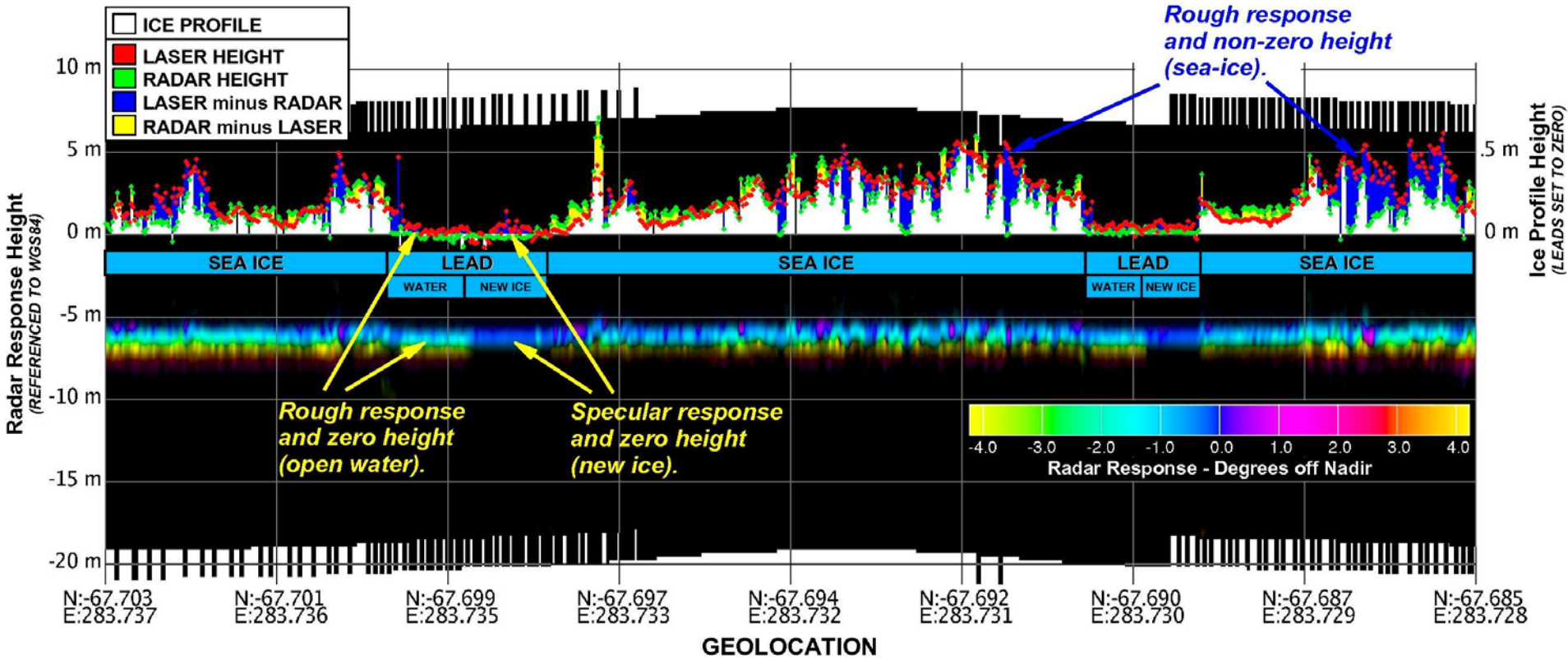


ATM versus D2P Data



D2P and ATM comparisons

Carl Luschen and Bob Swift

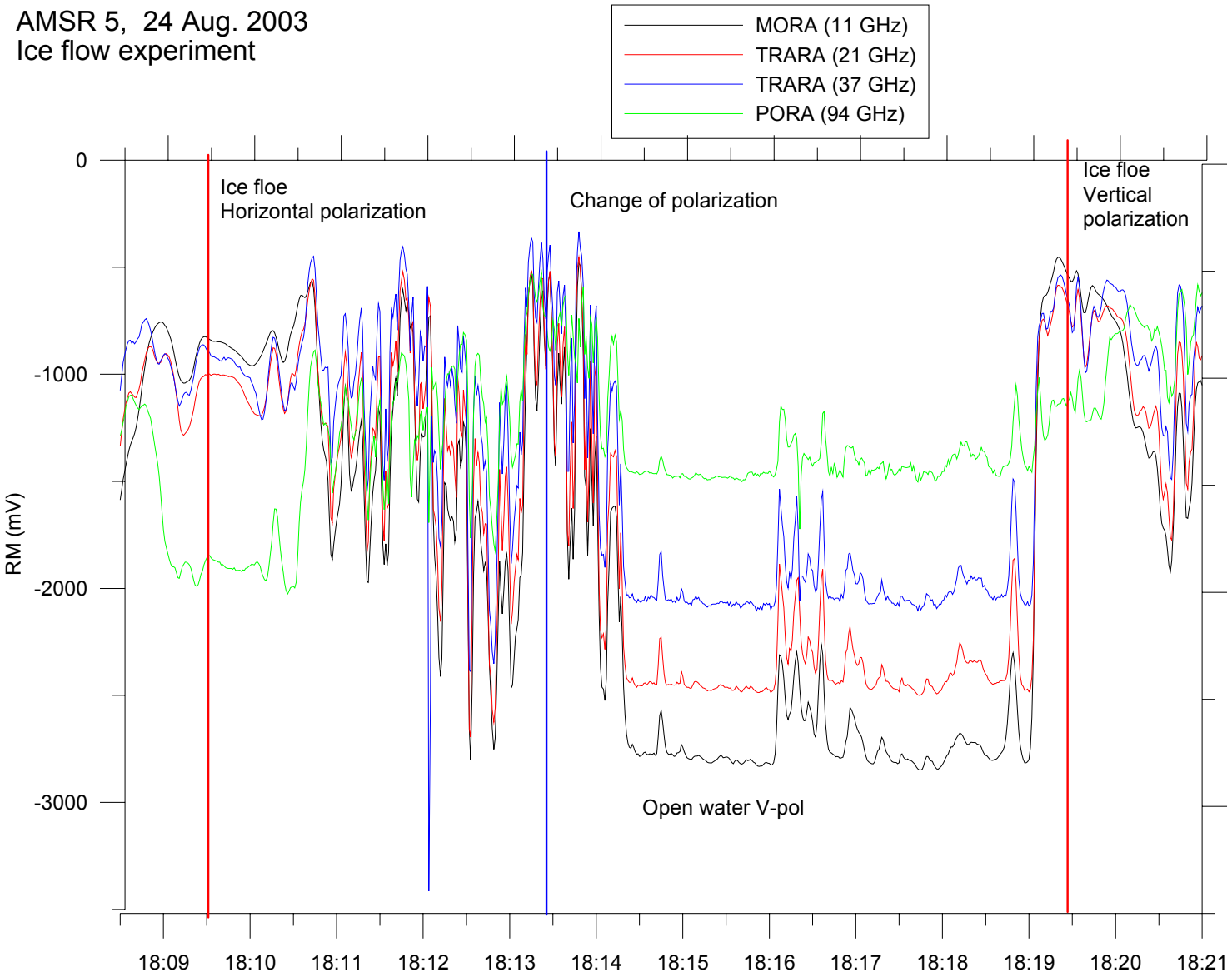


Ship Measurements

photos by Koni Steffen

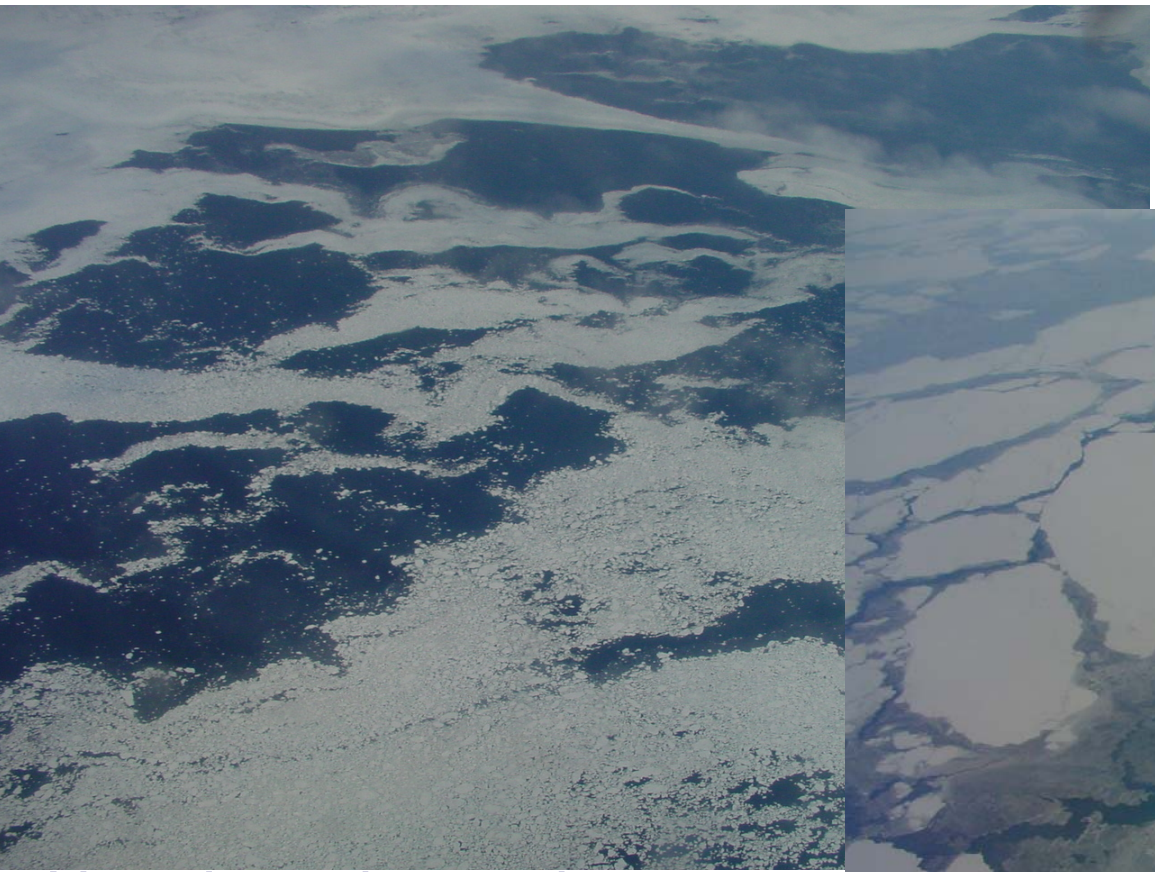
PM measurements from RV Gould

courtesy of Koni Steffen



Sea ice cover in the Bellingshausen Sea on 25 August 2003

Photos from P3 by F. Nishio

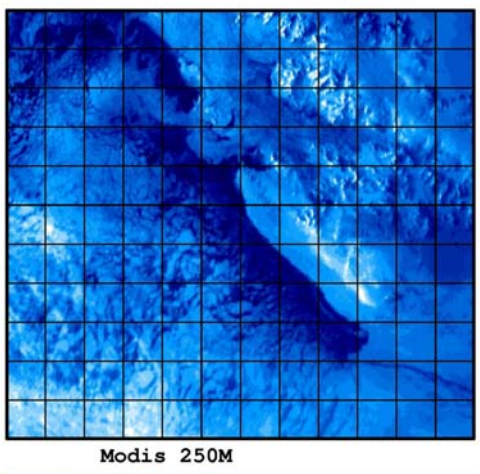


Near ice edge region

Within the ice pack

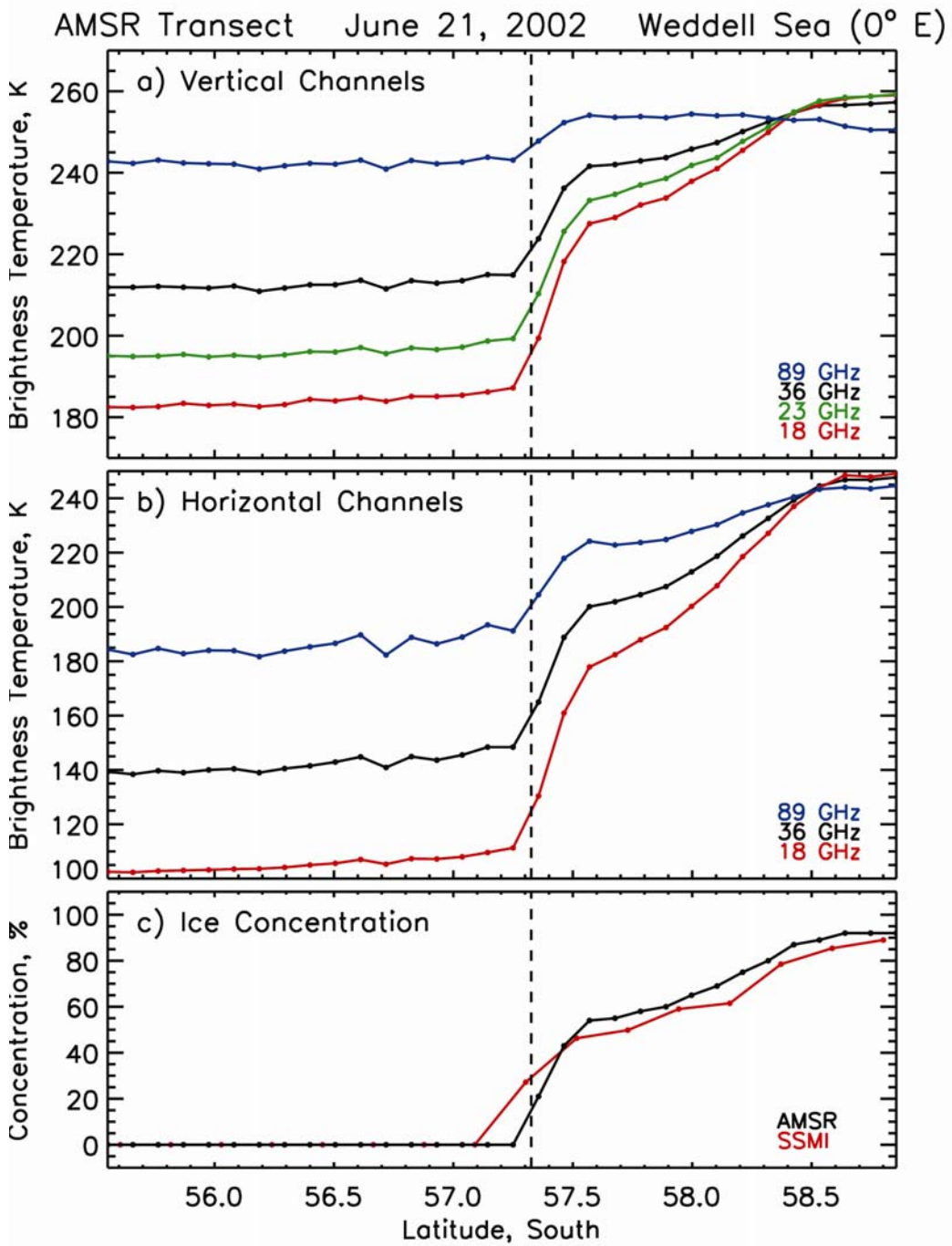
Envisat ASAR

during
AASI Campaign
in August 2003



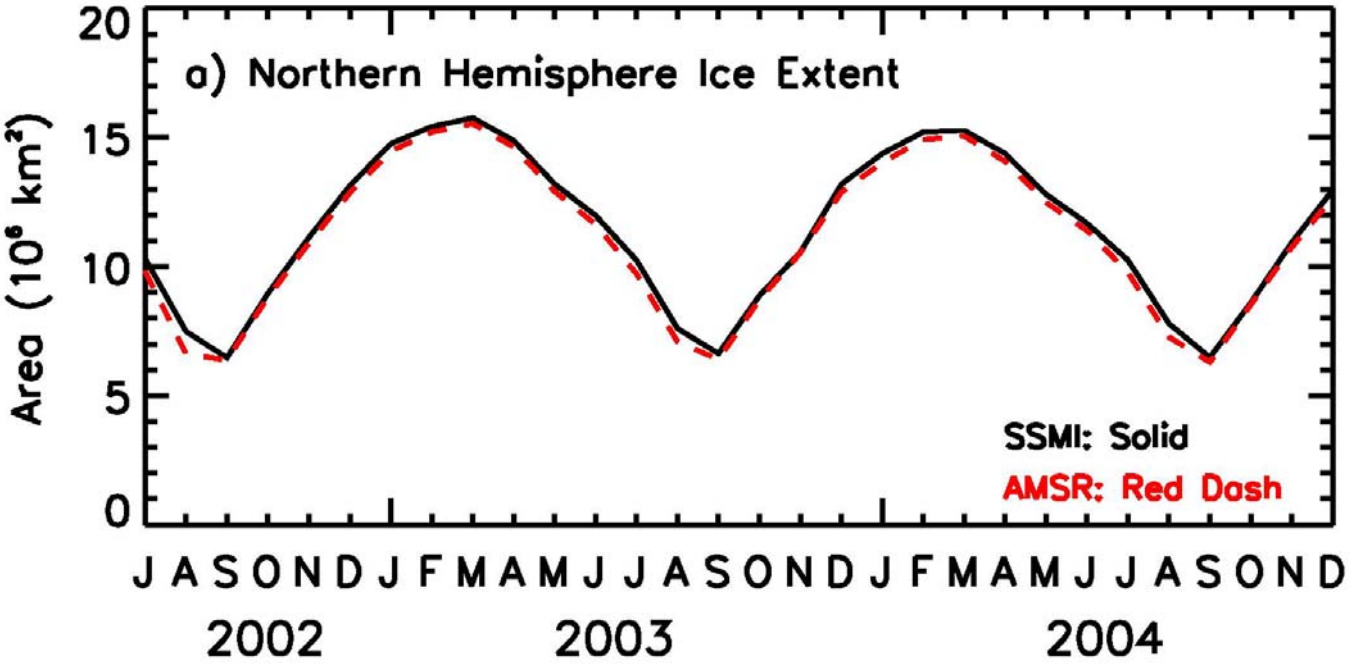
AMSR Ice edge
12.5 km resolution

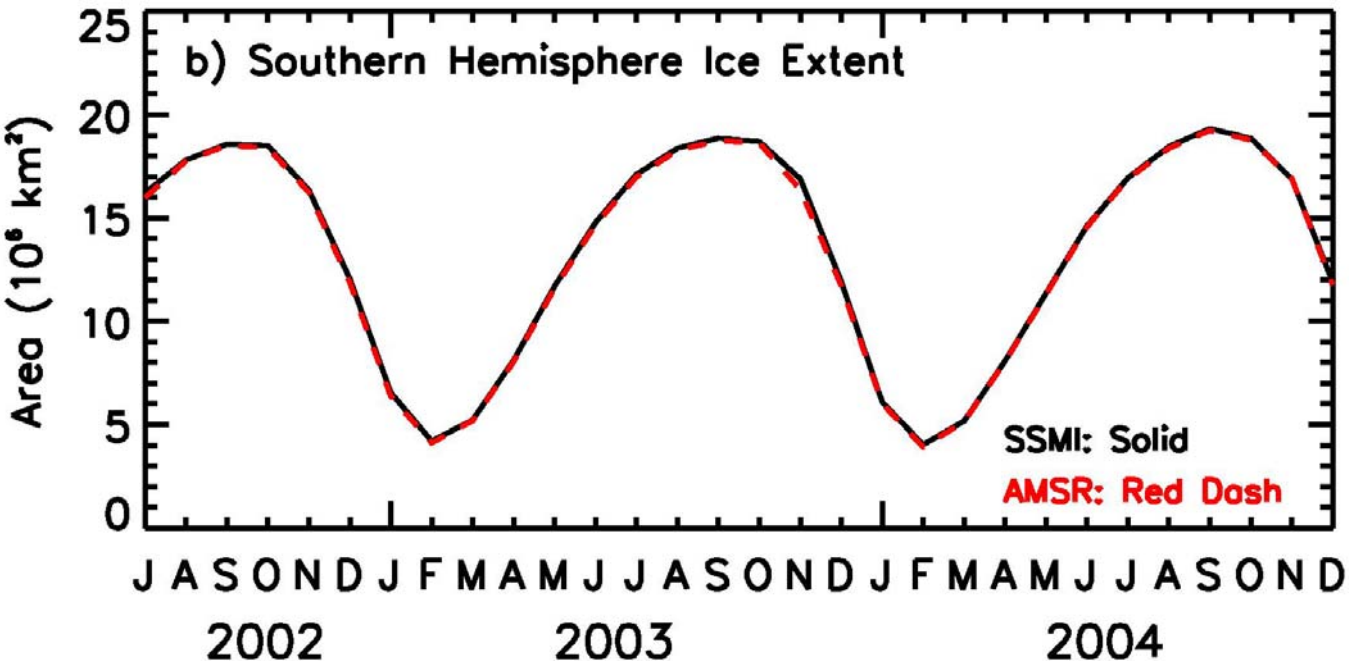
- High resolution data provide a better definition of the ice edge.
- With AMSR data, all channels provide consistent ice edge information.
- Some discrepancies between AMSR and SSM/I IC ice edge location is observed.



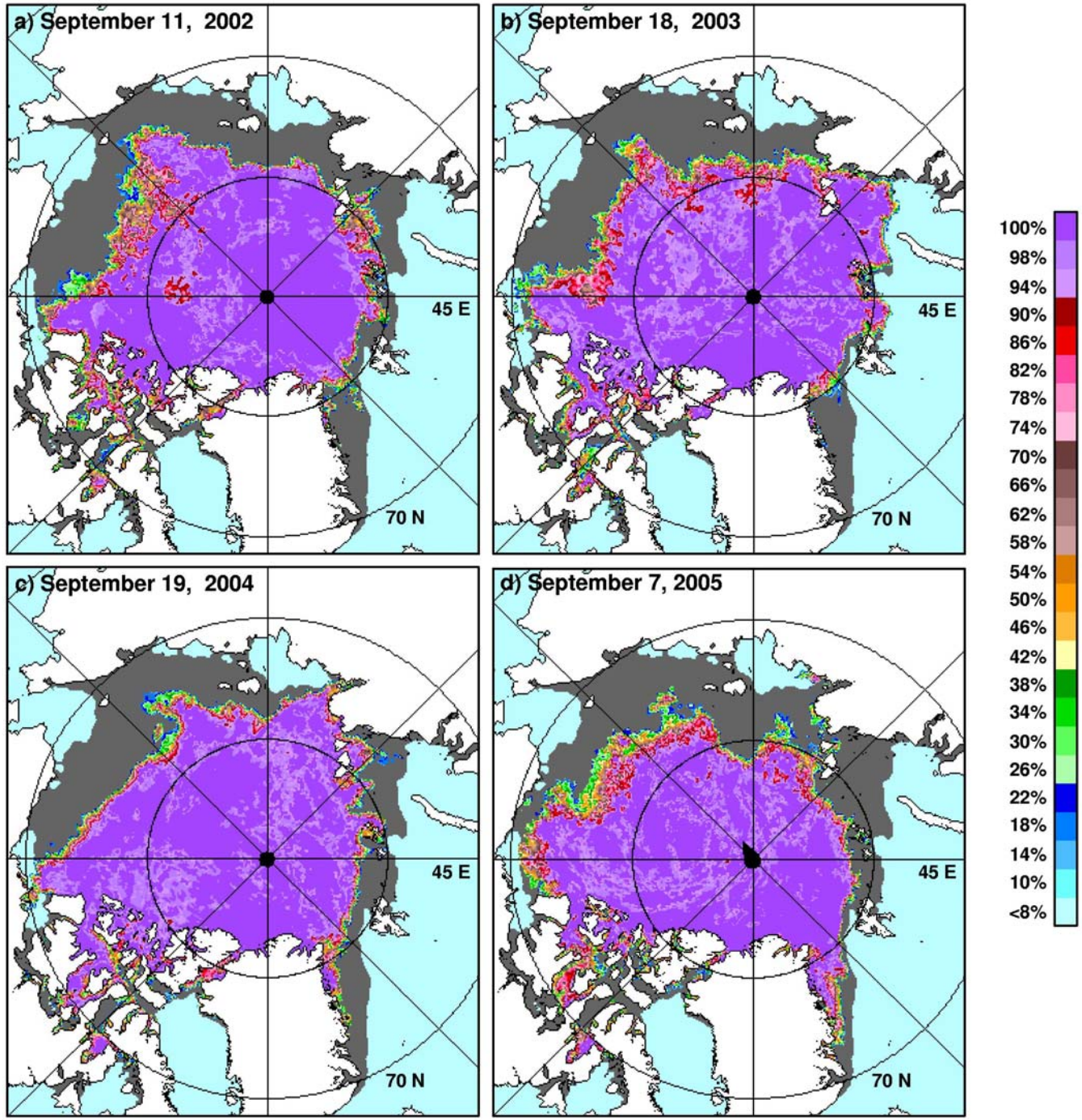
Extent comparisons

- A small bias is apparent with AMSR showing less extent than SSMI
- Bias is smaller in the SH than in the NH



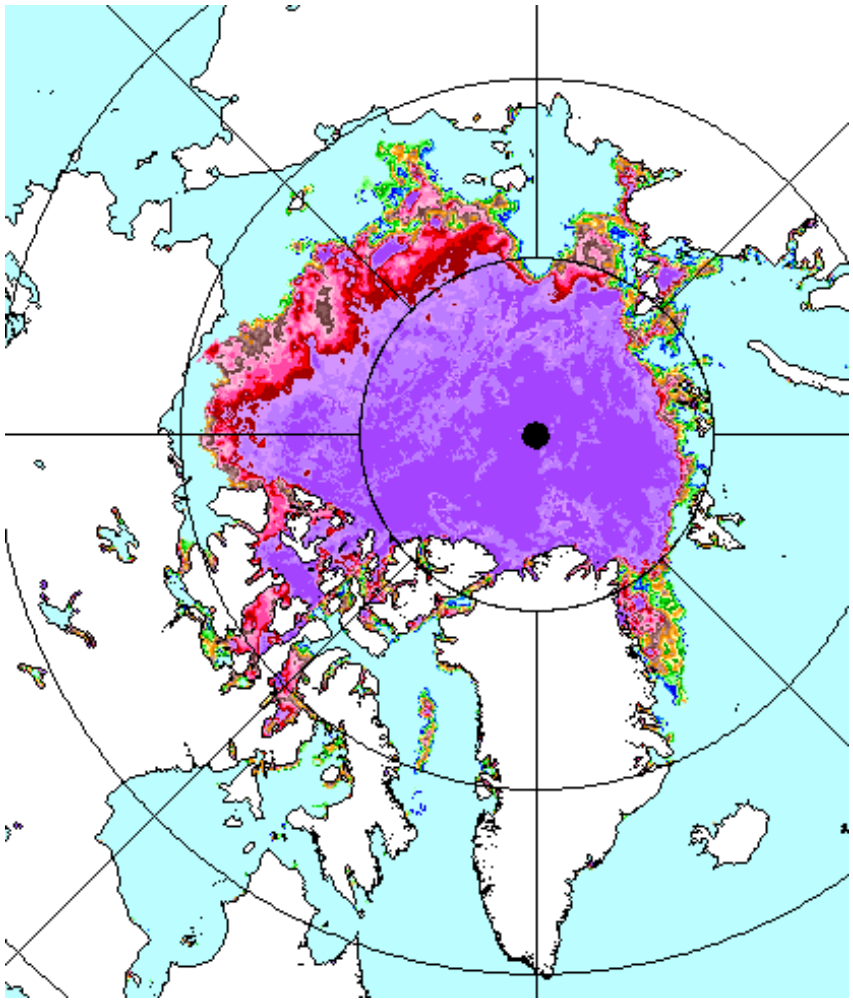


The perennial ice cover using joint AMSR and SSMI data

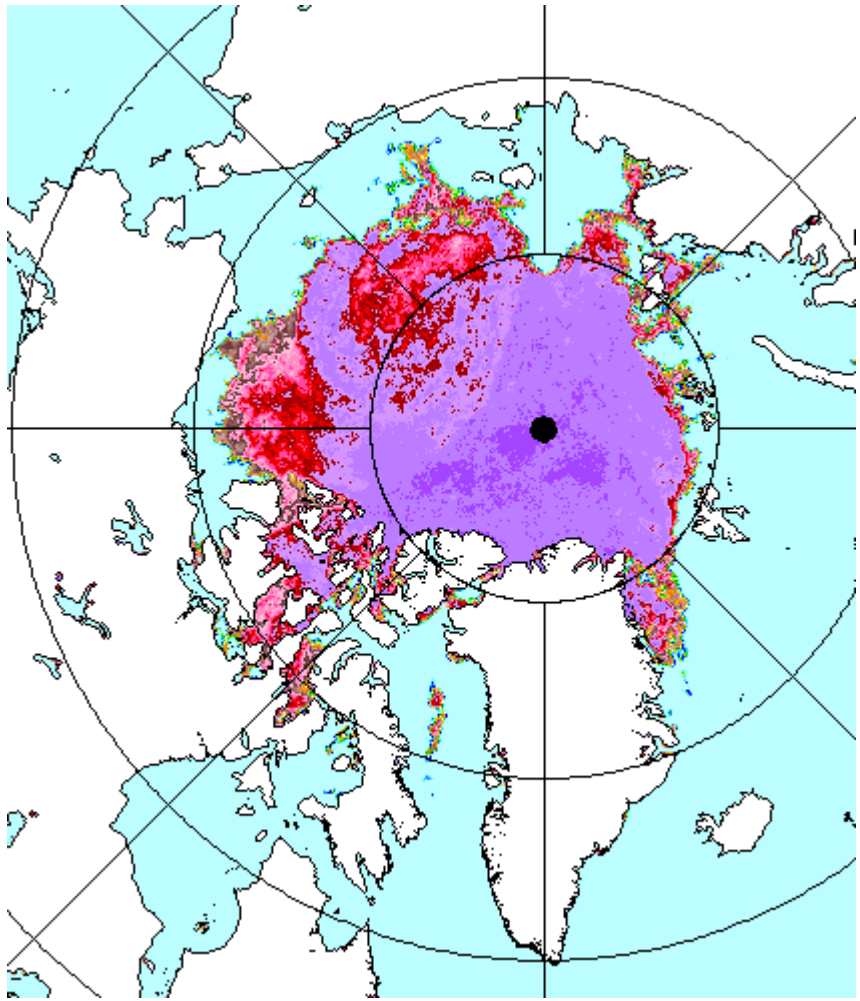


Perennial Ice 09 September

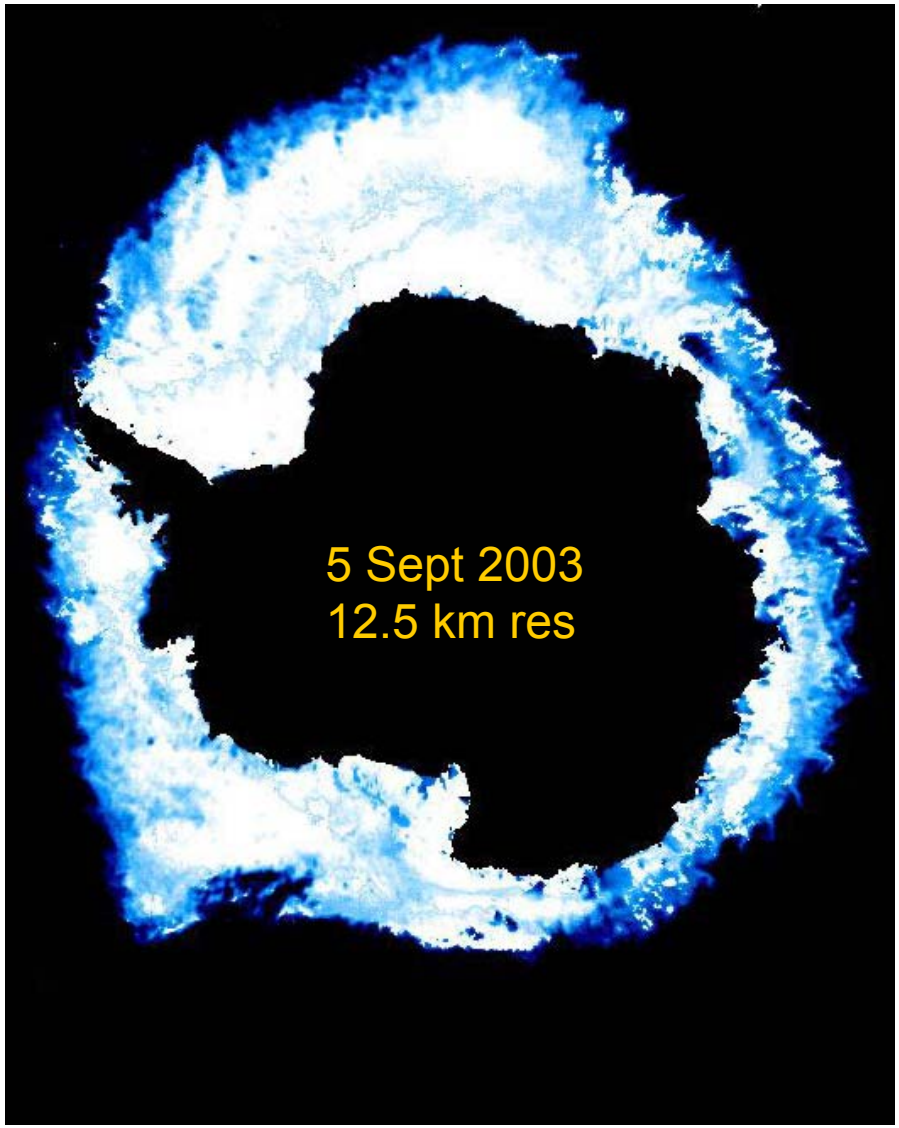
Bootstrap

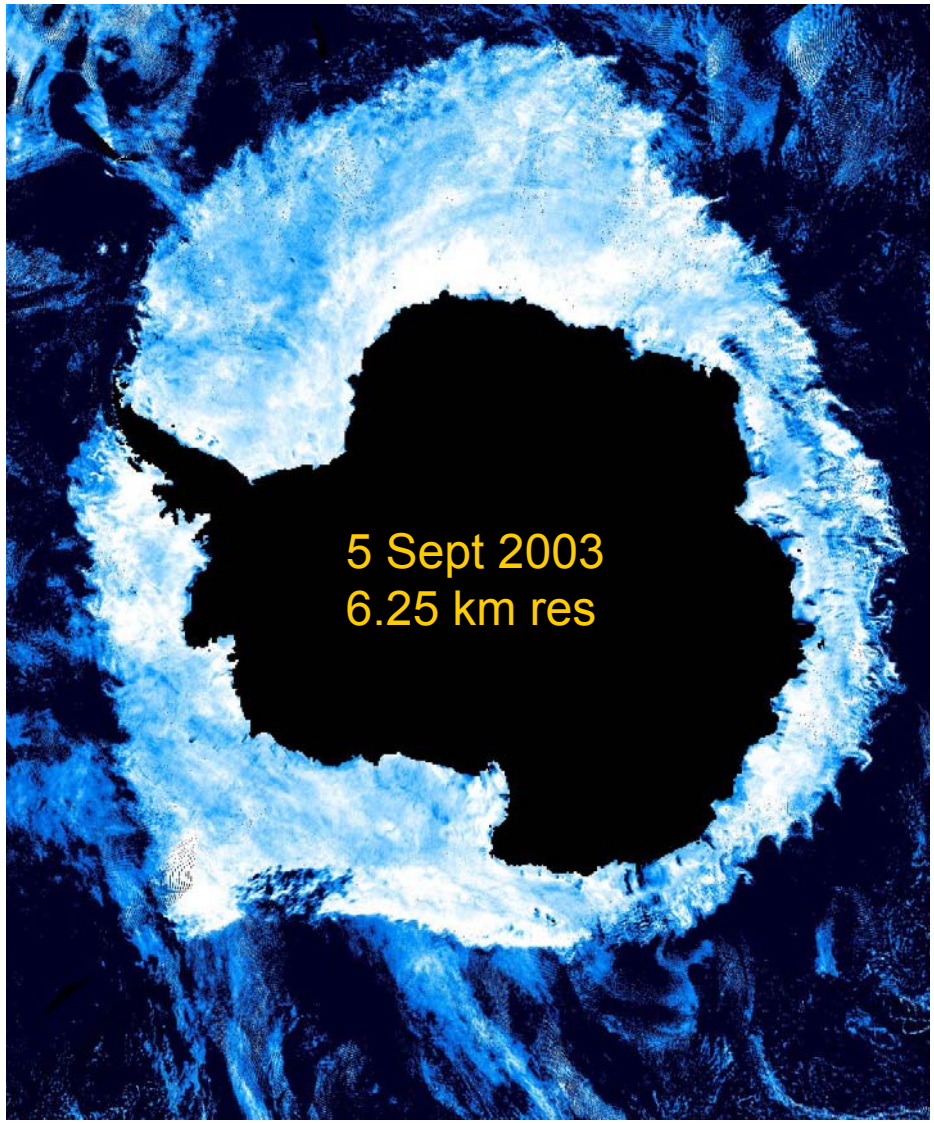


NT2

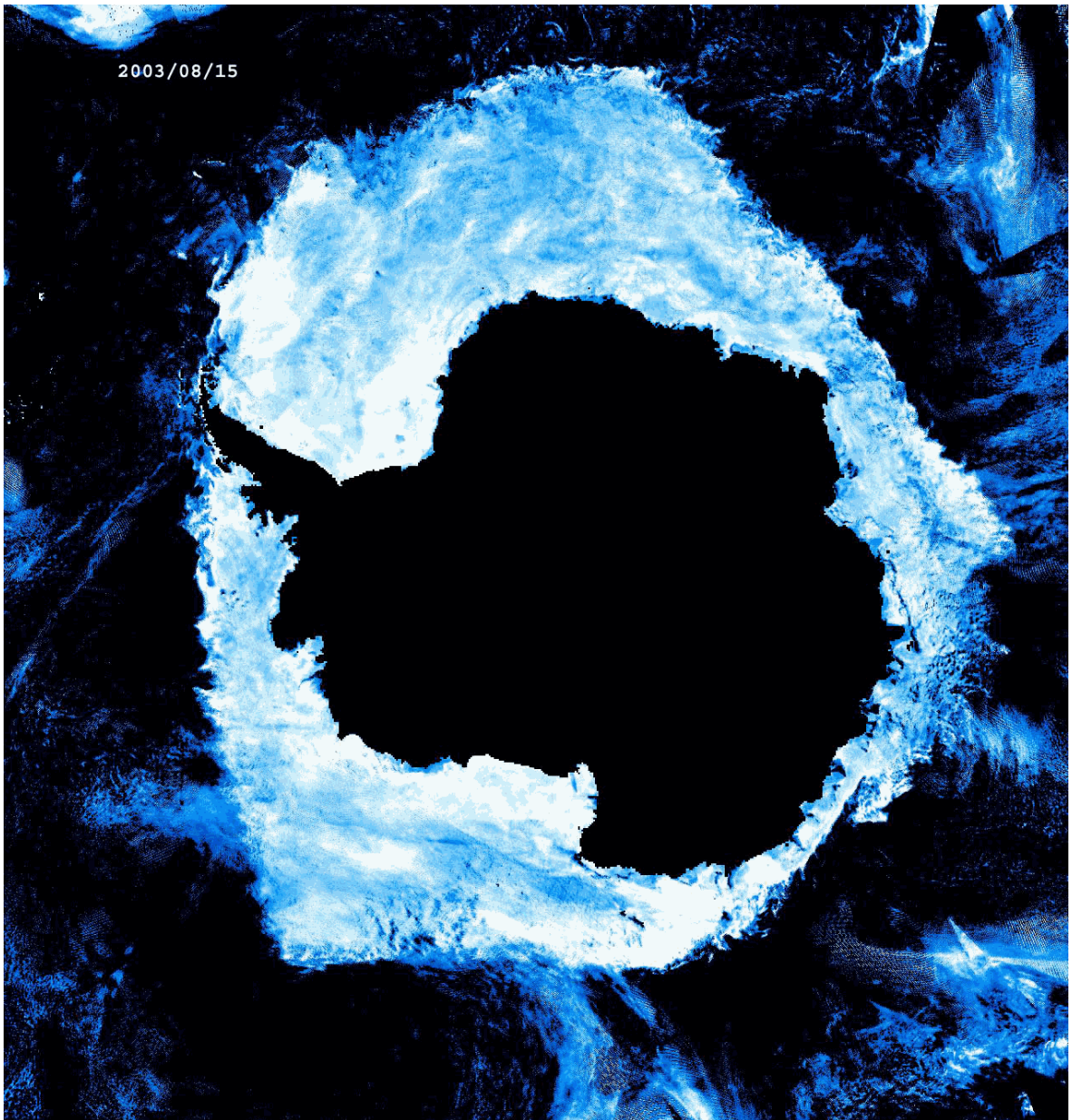


AMSR IC: 12.5 km vs 6.25 km





Antarctic sea ice from 89GHz data



Summary and Conclusions

- The AMSR data has lots of potential, especially for polar process studies
- Higher resolution, especially at high frequencies, provides spatial details that are comparable to visible and SAR data
- Flexibility in the choice of channels provides opportunity for different applications. It should be stressed that different frequencies and polarizations have different sensitivities to different surface and atmospheric conditions.
- The AASI Mission suffered aircraft hardware problems two years in a row. However, some unique data sets were collected that is expected to provide new insights into the physical and radiative characteristics of different ice types and surfaces.

End of Presentation