Sea Ice retrieval

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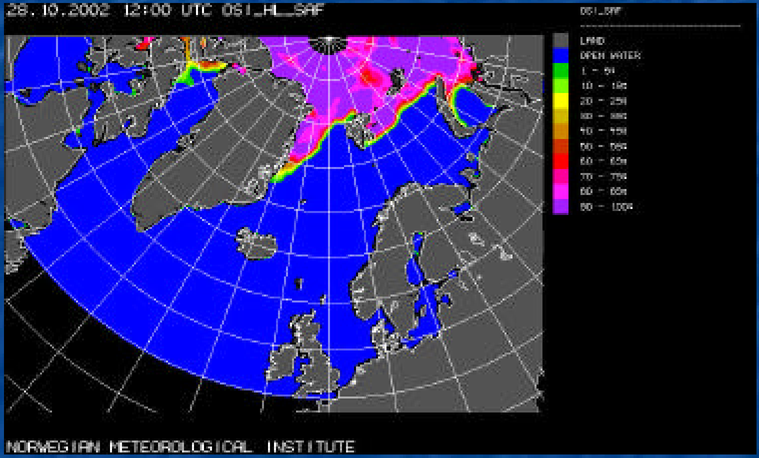
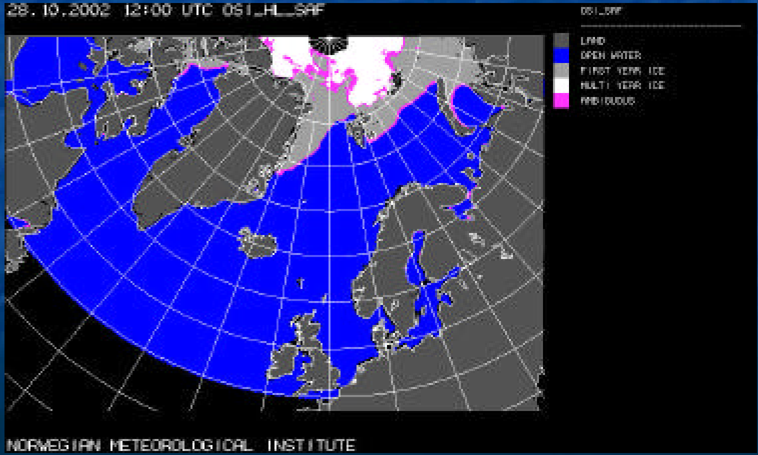
About Sea Ice in IOMASA

- Sea Ice component outline
  - SAF HL Center (DMI, met.no)
  - Tight connection to WP 3 (emissivity)

About Sea Ice in IOMASA

- State of the art
  - Operational algorithms
    - NASA, Bootstrap (Weather Filtered, Static Tiepoints)
    - SAF products (Weather Corrected, Monthly tiepoints)
  - Advances at 85 GHz
    - ASI (Kaleschke)
    - Sealion (Kern)
  - Poorly known ice/snow contributions affect concentration retrieval
  - Ice type from SSM/I is unreliable
  - Little reference data over sea ice
    - Difficult to assess performance





Goals for IOMASA Sea Ice

Overall Goal:

- Improve description and quantification of leads and polynias in daily hemispheric analyses.
- Benefits are expected also in the low concentration ranges/ice edge area due to improved description of ice properties (e.g. thin ice).

- Better accounting for sea ice/snow properties.
- Improved use of multiple sensors for concentration retrieval.
- Improved use of and better atmospheric fields over consolidated sea ice.
- Improved use of high resolution information/channels.
- Extensive validation/testing

Consortium expertise

- Sea Ice (Navigational and hemispheric)
  - SAR
  - Scatterometer
  - Passive microwave

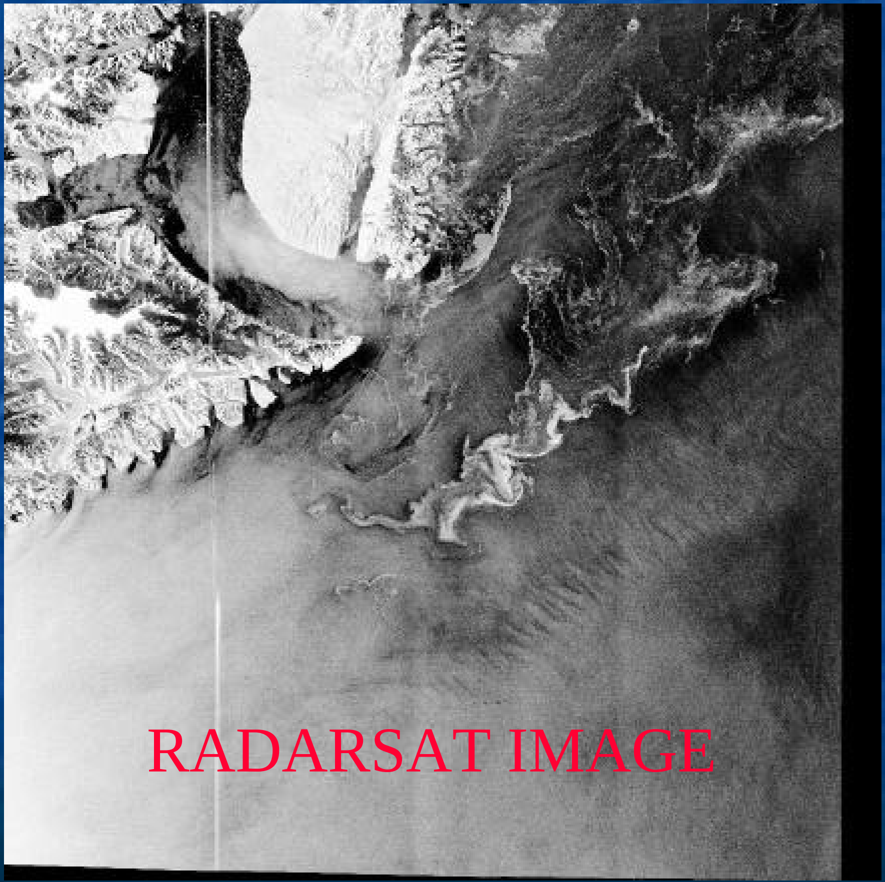
Sea Ice Expertise

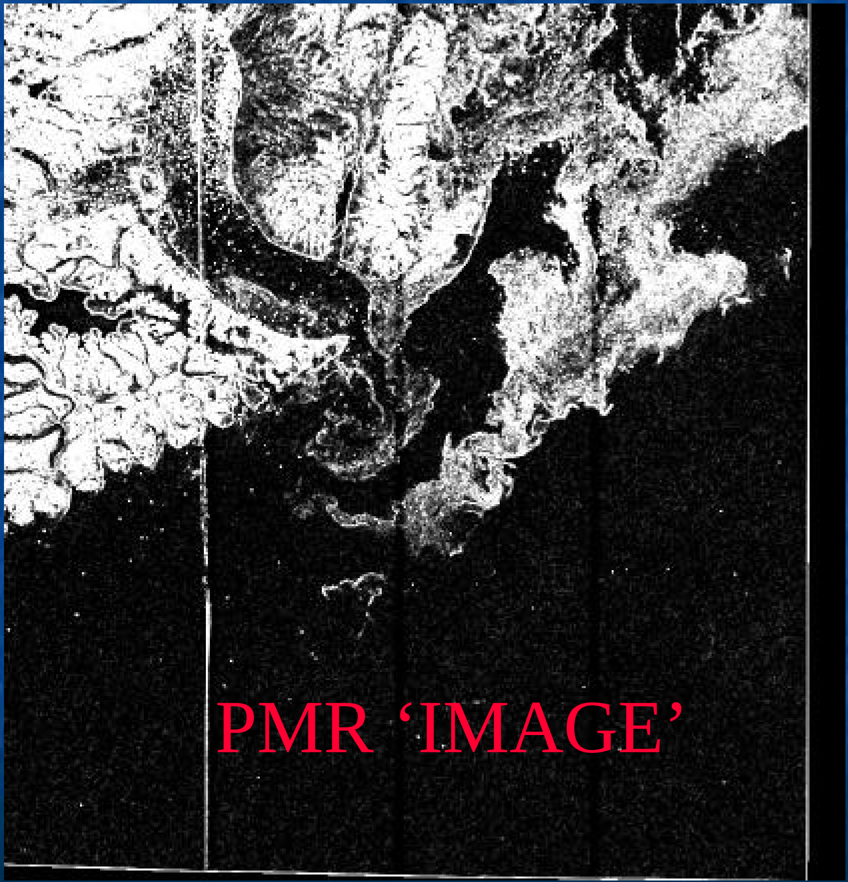
- Operational sea ice charting of the North Atlantic.
  - Extensive experience in use of SAR and other satellite data at met.no
  - Since 1998 ~2500 RADARSAT images processed operationally at DMI.
  - Contract on 500+ SAR images per year.

Sea Ice Expertise

- Extensive experience in SAR research
  - First RADARSAT images analysed in 1996.
  - Feature extraction tools.
  - Automated classification.

Example Scoresby Sound

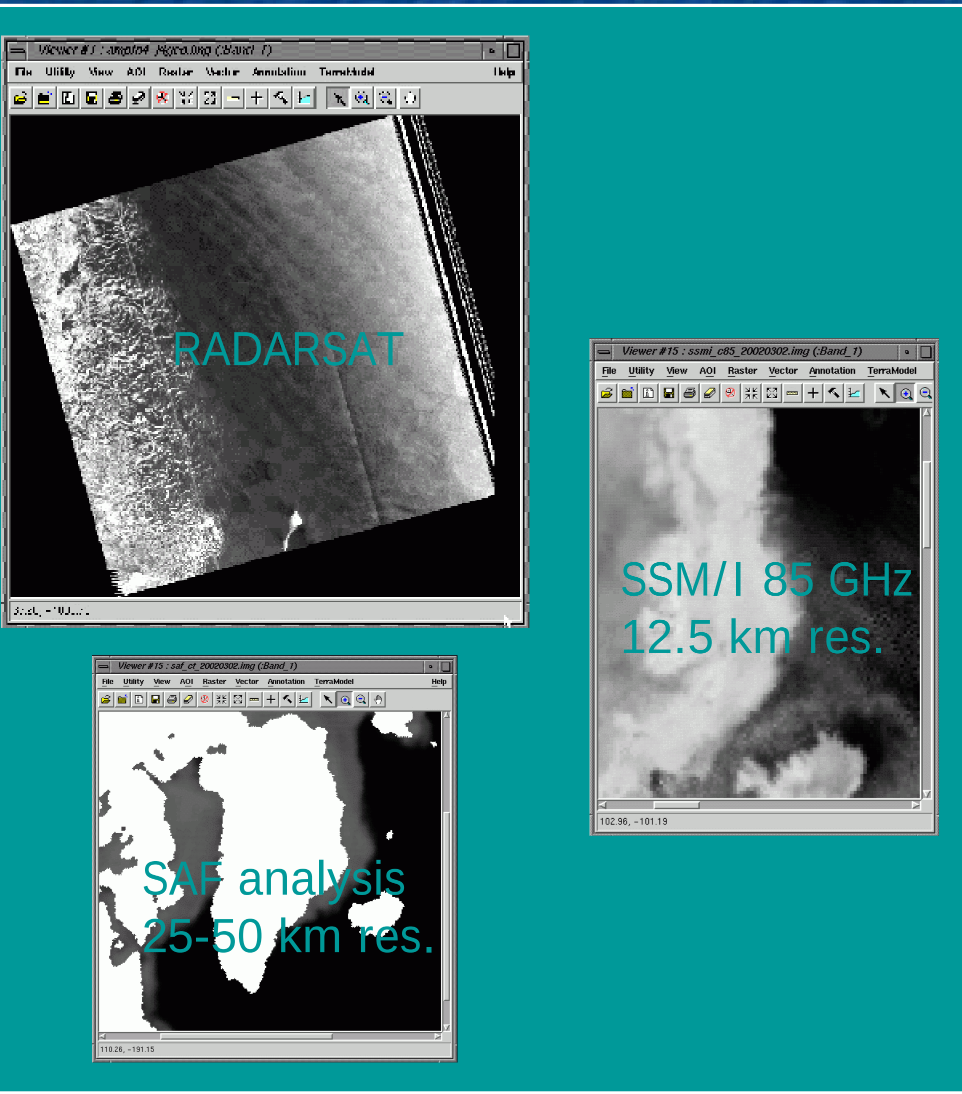


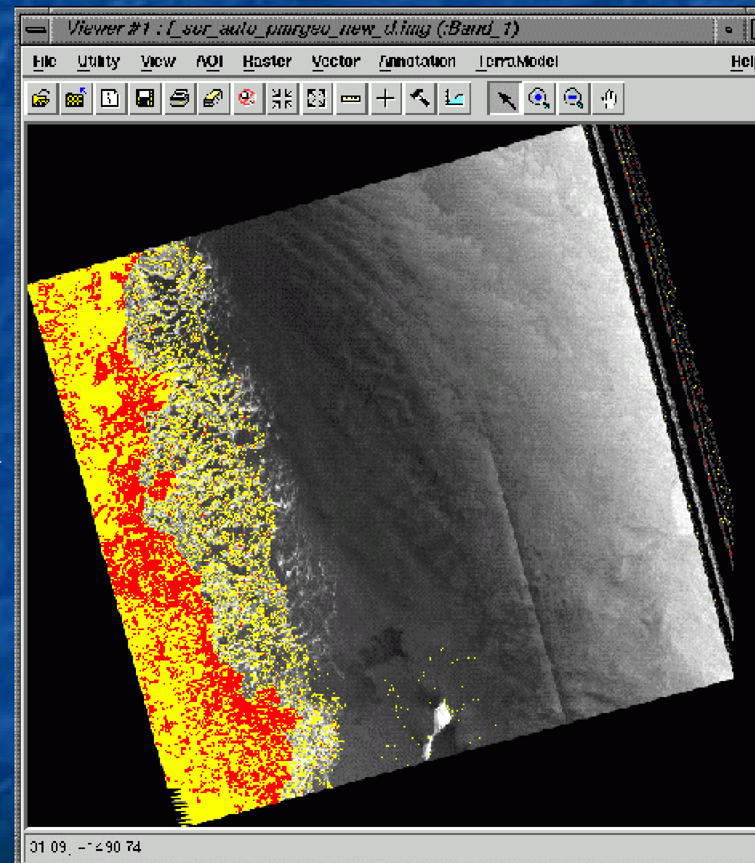


Sea Ice Expertise

- Extensive experience in SAR research
  - First RADARSAT images analysed in 1996.
  - Feature extraction tools.
  - Automated classification.

Fuzzy logic classification



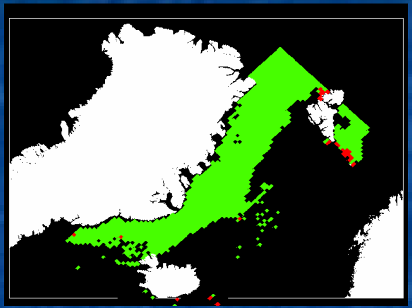


Scatterometry

- Seawinds
  - Thin ice detection scheme
  - Backscatter modelling

Thin ice detection

Ratio of SSM/I PR and Seawinds PR



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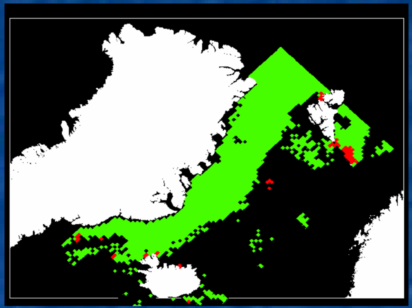

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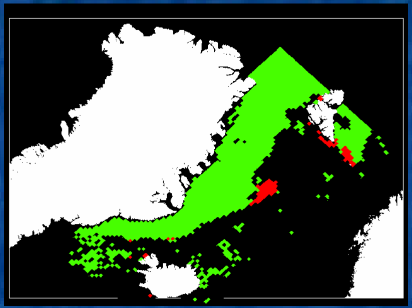

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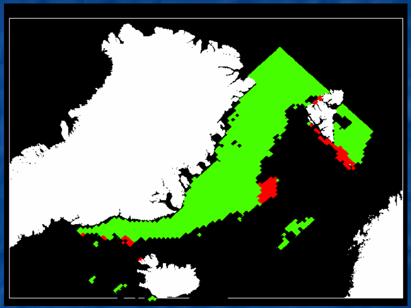

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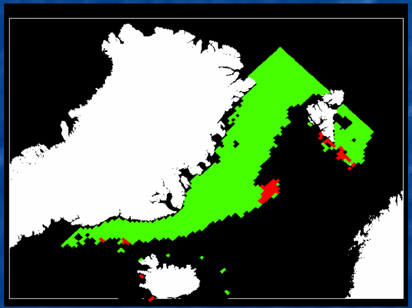

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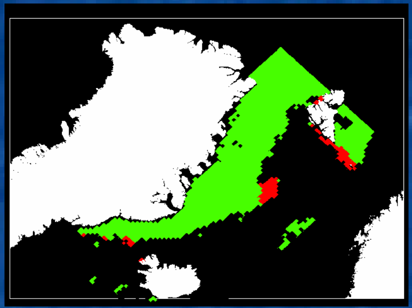

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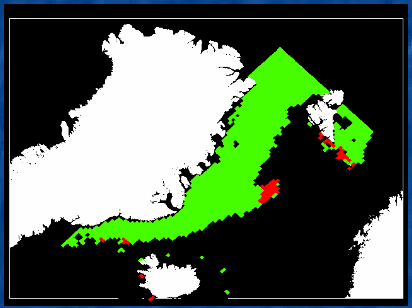

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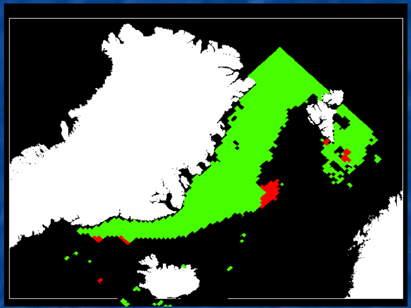

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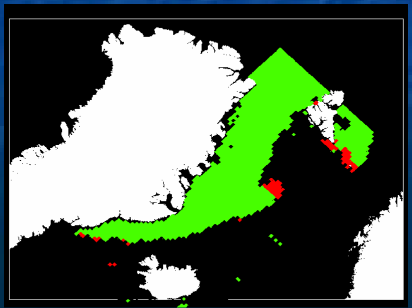

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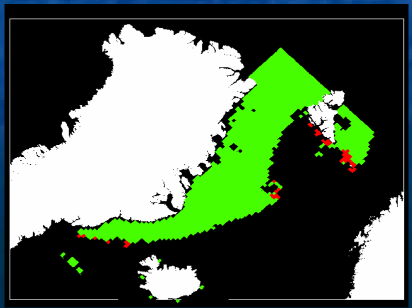

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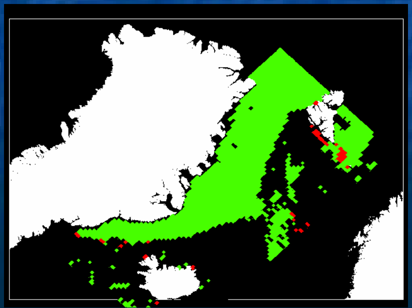

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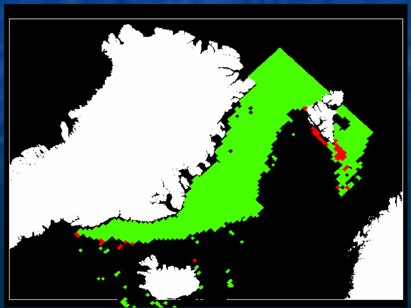


March 21st, 2001

Scatterometry

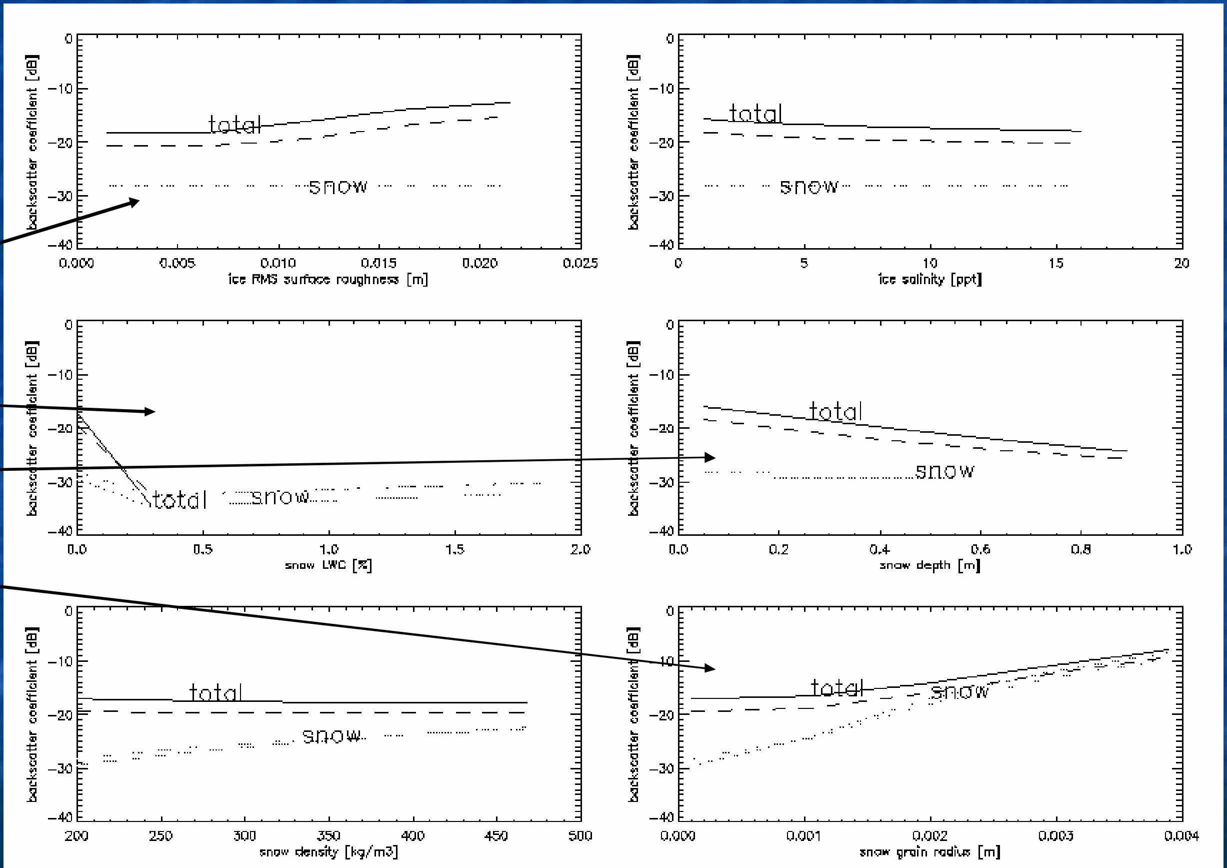
- Seawinds
  - Thin ice detection scheme
  - Backscatter modelling

Backscatter sensitivities

Typical FY ice sensitivities

Largest sensitivities:

- Roughness
- Snow LWC
- Snow depth
- Snow grain

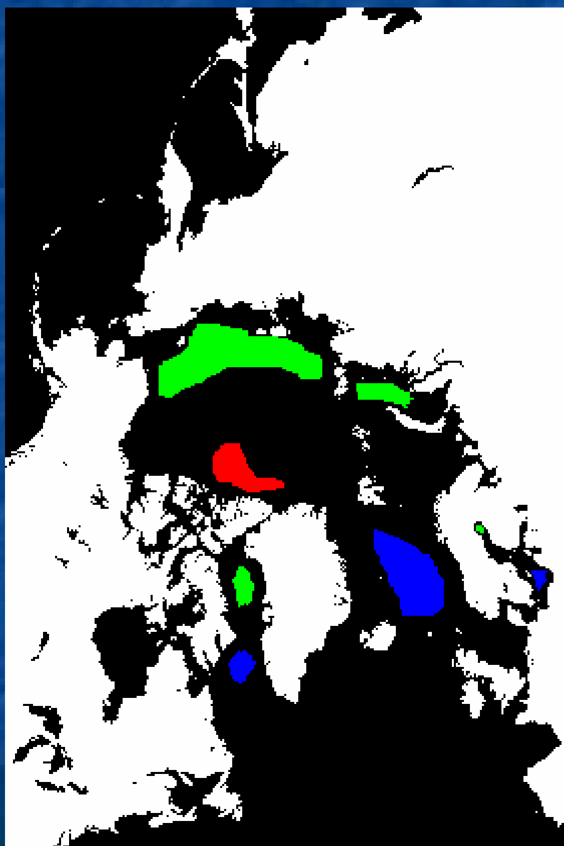


Passive Microwave

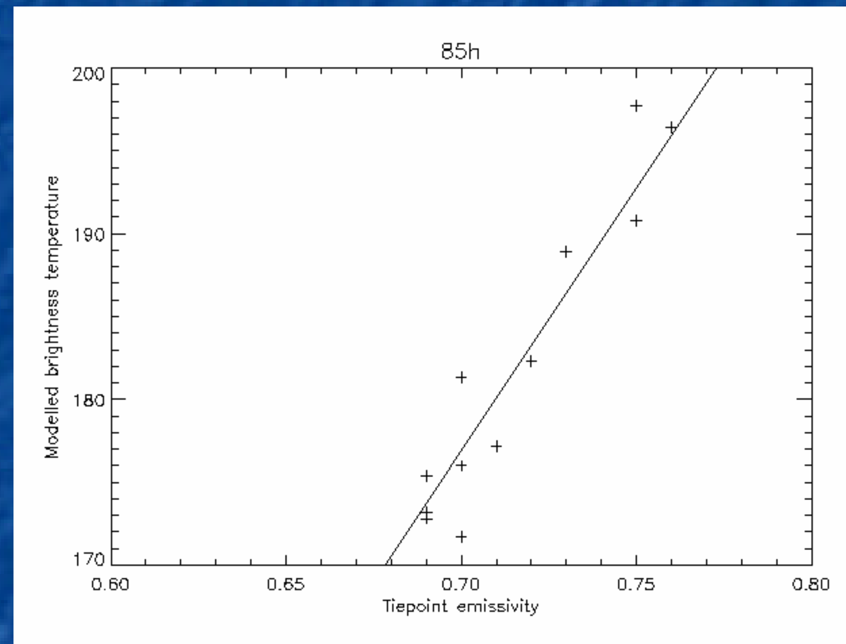
- Passive Microwave
  - Tiepoints
  - Atmospheric correction
  - Algorithm sensitivity
  - Sea ice emissivity modelling

Tiepoints

Extraction areas,
based on satellite observations



Include average atm. state



Tiepoints	SAF tiepoints		Original tiepoints	
	Mean (%)	Stdev (%)	Mean (%)	Stdev (%)
Open water	9.3	5.7	15.0	5.1
Ice	99.4	7.2	92.7	6.6

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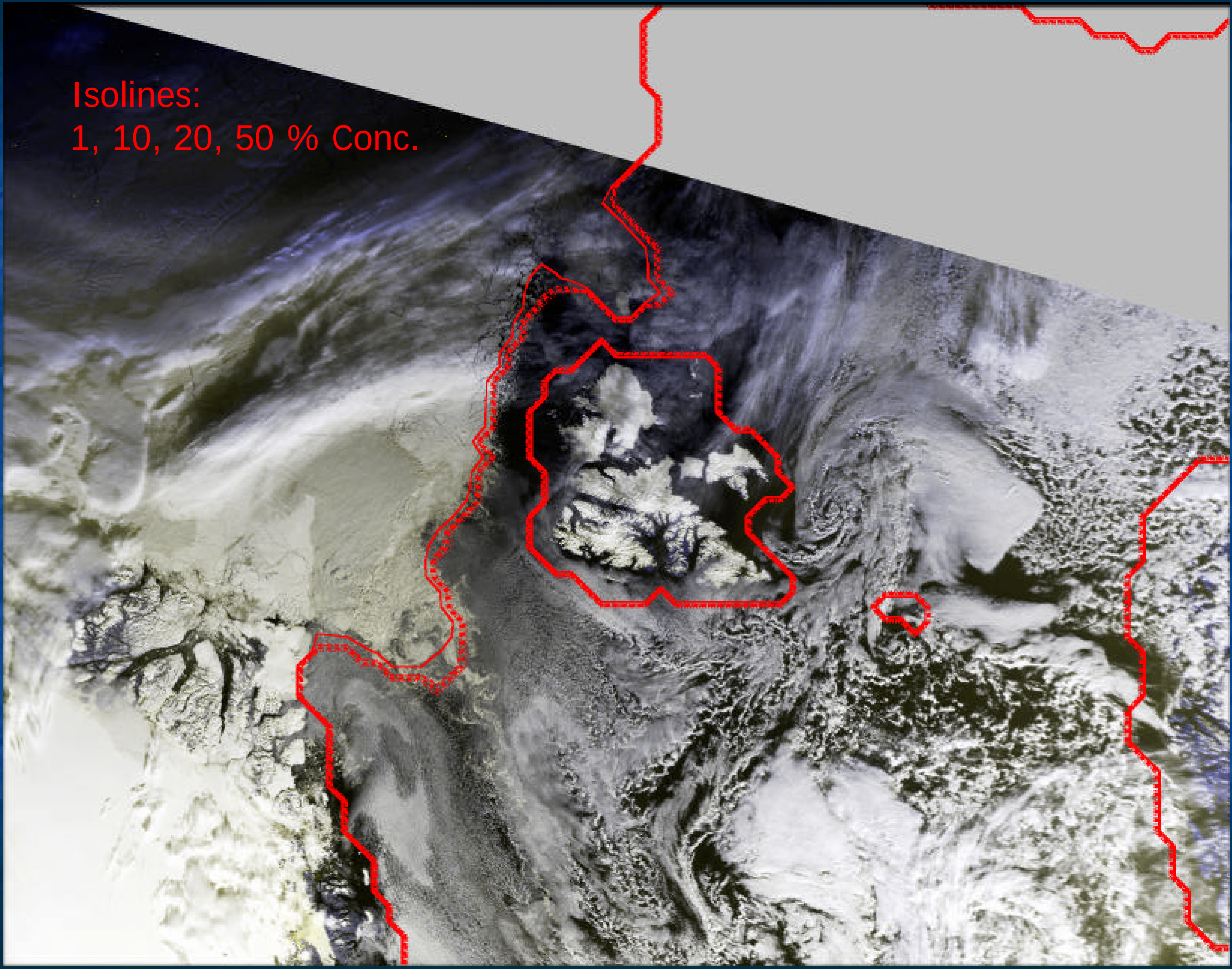
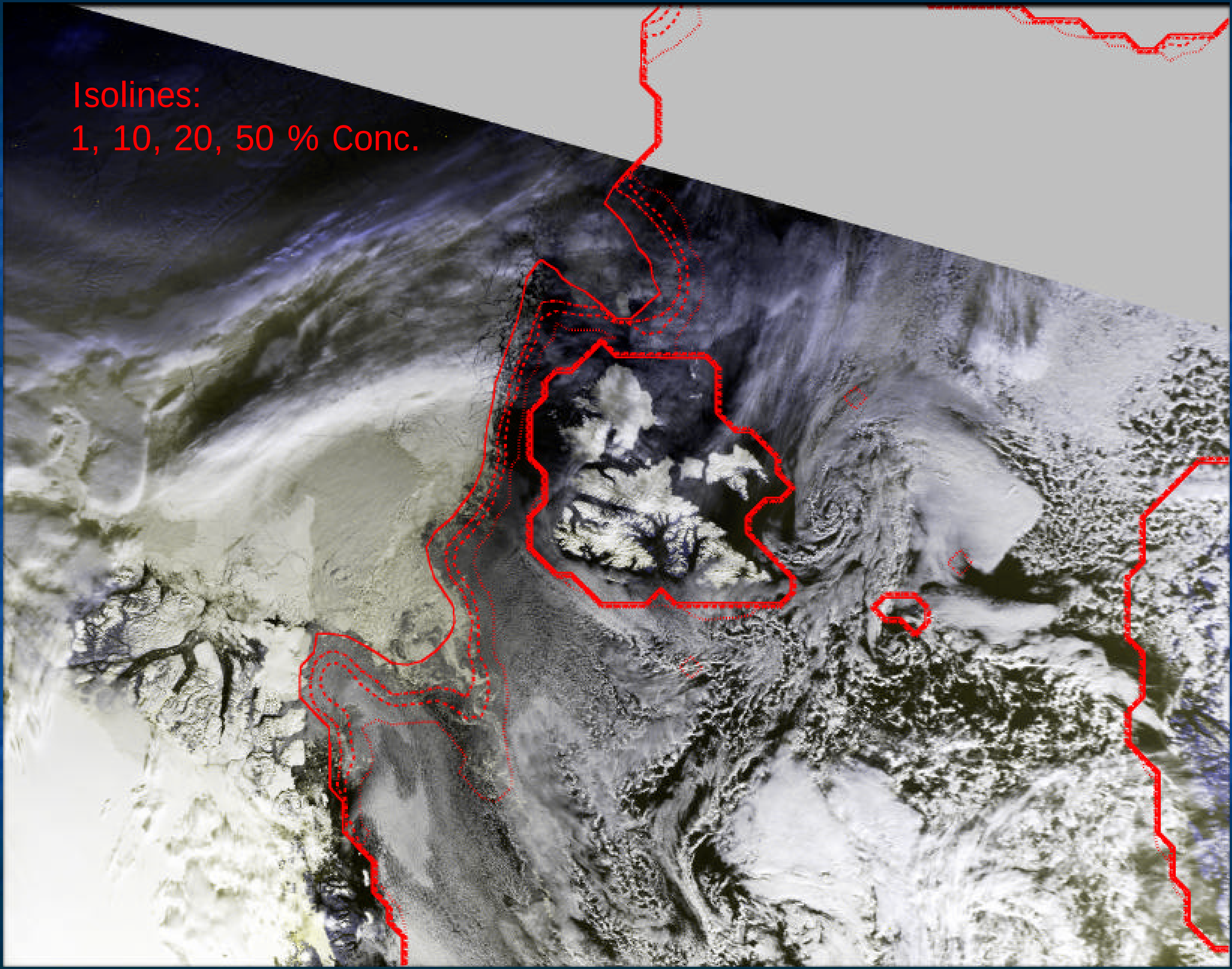
NASA weather filter



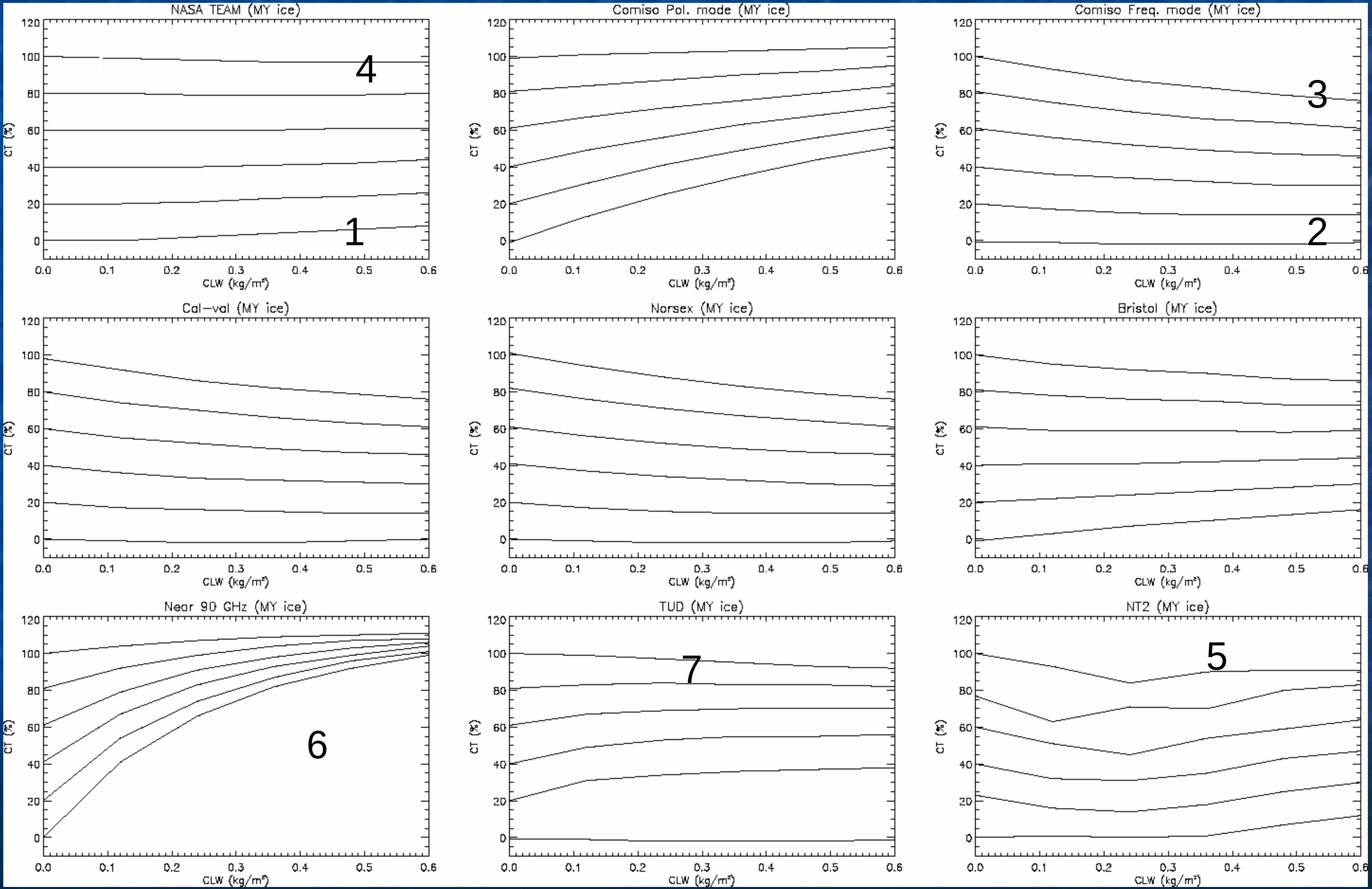
Atmospherically corrected data



Passive Microwave

- Passive Microwave
  - Tiepoints
  - Atmospheric correction
  - Algorithm sensitivity

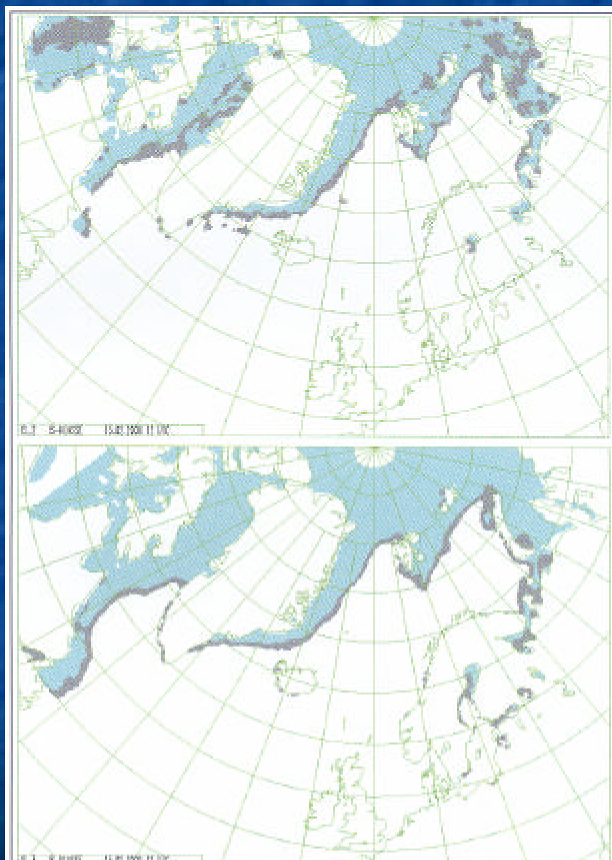
Sensitivity (cloud water)



Multisensor products

- Multisensor product generation
  - Bayesian multisensor approach

Bayesian multisensor analysis



Conclusions/plans

- Improve the surface type description
  - Combine Scatterometer and Radiometer
- Incorporate surface type in Ice Conc. retrieval
  - Requires more detailed knowledge of surface radiative characteristics (tiepoints)
- Increase resolution where possible
  - E.g. by detecting cases where 85 GHz is too noisy
- Compare with independent data
  - Classified SAR (***Supervised*** Neural net/Fuzzy logic)
  - Radarsat Geophysical Processor System ice dynamics
- Assess new possibilities with AMSR and Coriolis if possible