OSI SAF
Ocean and Sea Ice

EUMETSAT
Monitoring weather and climate from space
Surveiller le temps et le climat depuis l'espace

OSI SAF Sea Ice products

Lars-Anders Brevik, Gorm Dybkjær, Steinar Eastwood, Øystein Godøy, Mari Anne Killie, Thomas Lavergne, Rasmus Tonboe, Signe Aaboe

Norwegian Meteorological Institute

Norwegian Meteorological Institute
Danish Meteorological Institute

Course on Practical use of EUMETSAT data
10-12. Feb 2014

OSI SAF
Ocean and Sea Ice

Outline

- EUMETSAT OSI SAF
- What does the sea ice look like?
- Current OSI SAF Sea Ice products
- Validation and monitoring
- Examples of use
-

OSI SAF
Ocean and Sea Ice

OSI SAF Sea Ice products

- EUMETSAT OSI SAF
- What does the sea ice look like?
- Current Sea Ice products
- Validation and monitoring
- Examples of use
-

OSI SAF
Ocean and Sea Ice

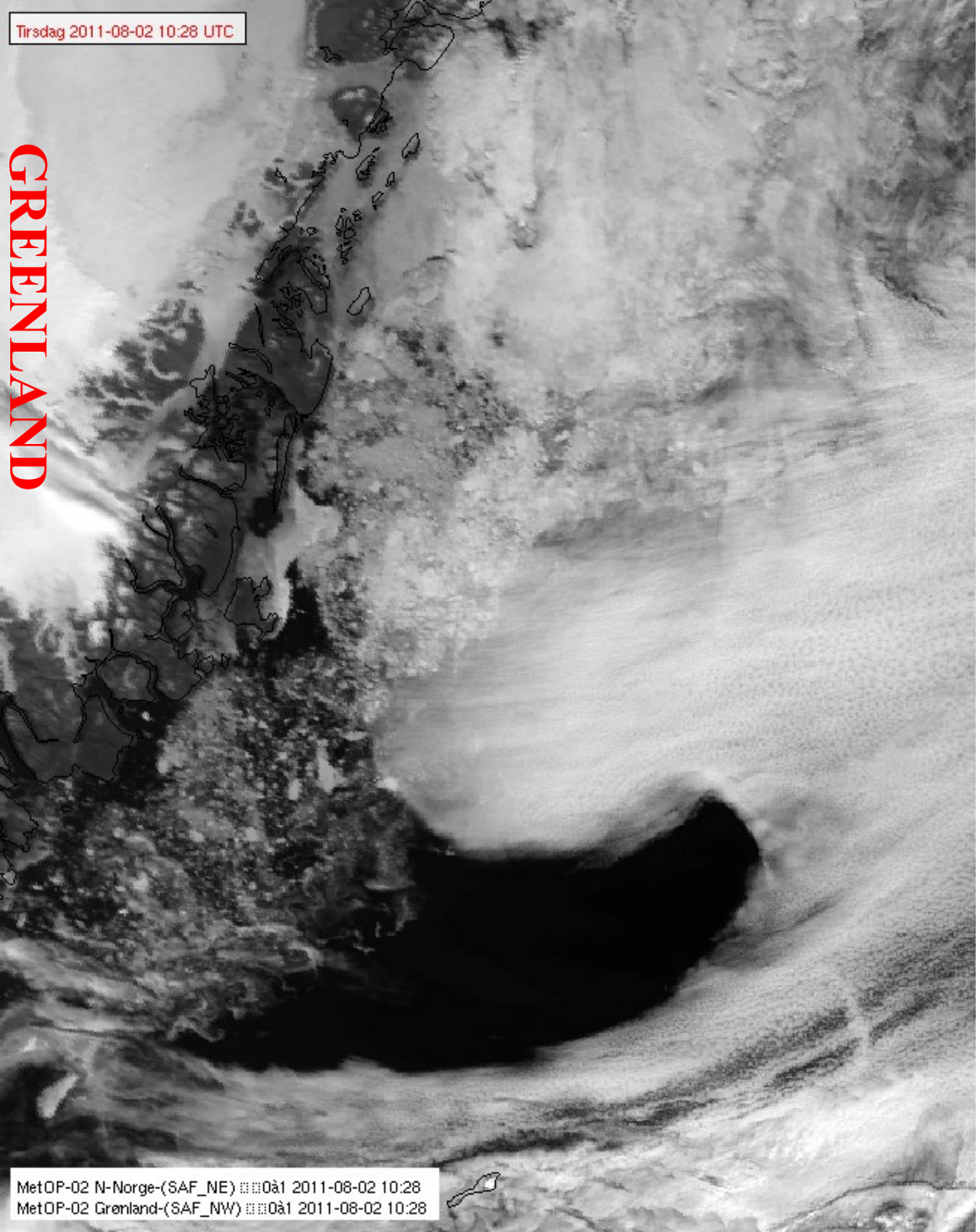
EUMETSAT OSI SAF

- OSI SAF = Ocean and Sea Ice Satellite Application Facility
- Part of EUMETSAT distributed processing of satellite data
- Products over oceans:
  - Sea Ice, SST, wind, radiative fluxes
- Cooperation between Meteo-France, MET Norway, DMI, KNMI and Ifremer

OSI SAF
Ocean and Sea Ice

OSI SAF Sea Ice products

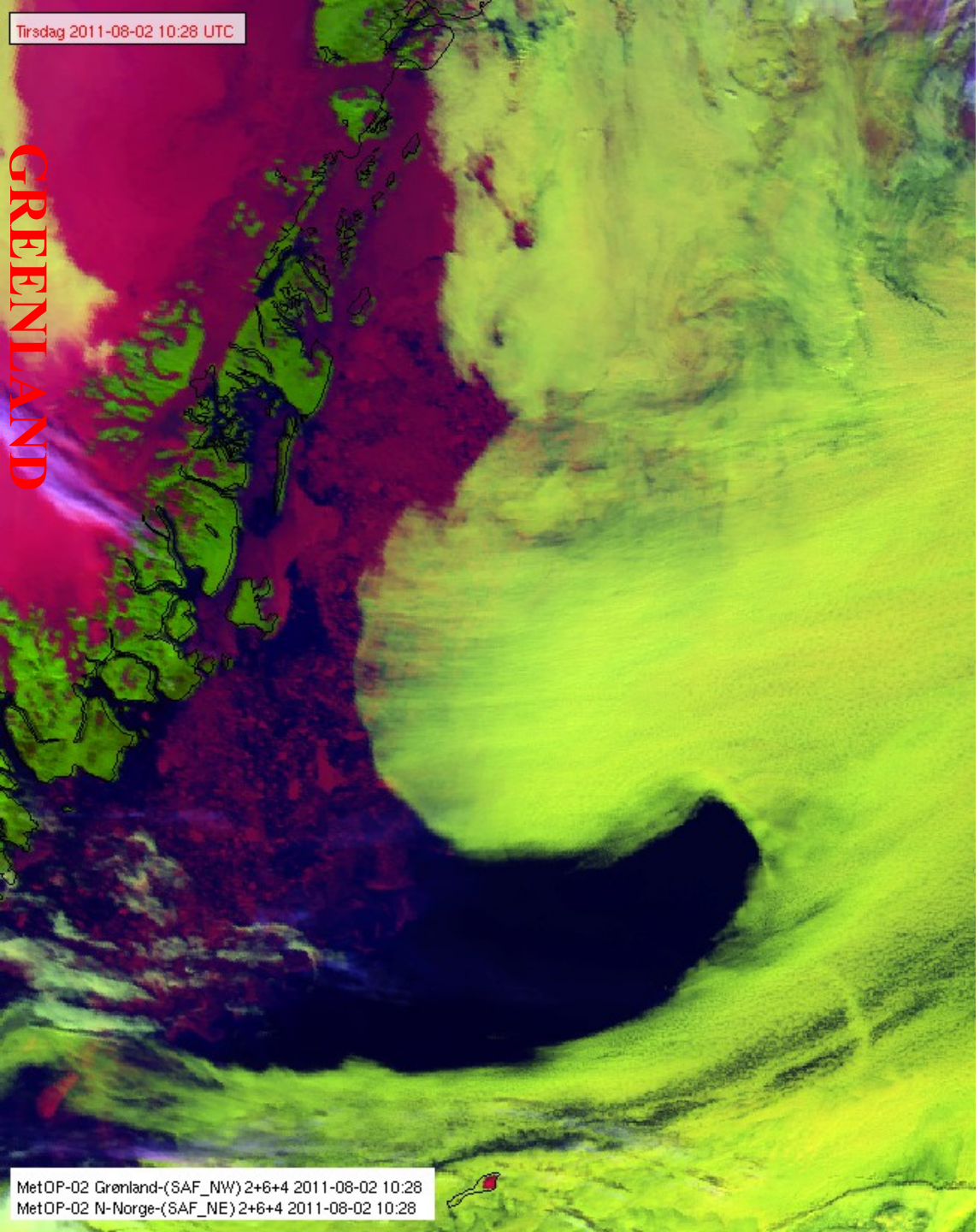
- EUMETSAT OSI SAF
- What does the sea ice look like?
- Current Sea Ice products
- Validation and monitoring
- Examples of use
-



What does the ice look like?

- Single visible channel
- Easy to see the clear water
- But what is ice and what is cloud?
- Ice has the same reflectance as clouds in the visible channel

Can you try to identify where is clear water, sea ice and clouds?



What does the ice look like?

- Single visible channel
- Easy to see the clear water
- But what is ice and what is cloud?
- Ice has the same reflectance as clouds in the visible channel
- Combining more channels, including near infra red, gives us a change to also separate ice and clouds

OSI SAF
Ocean and Sea Ice

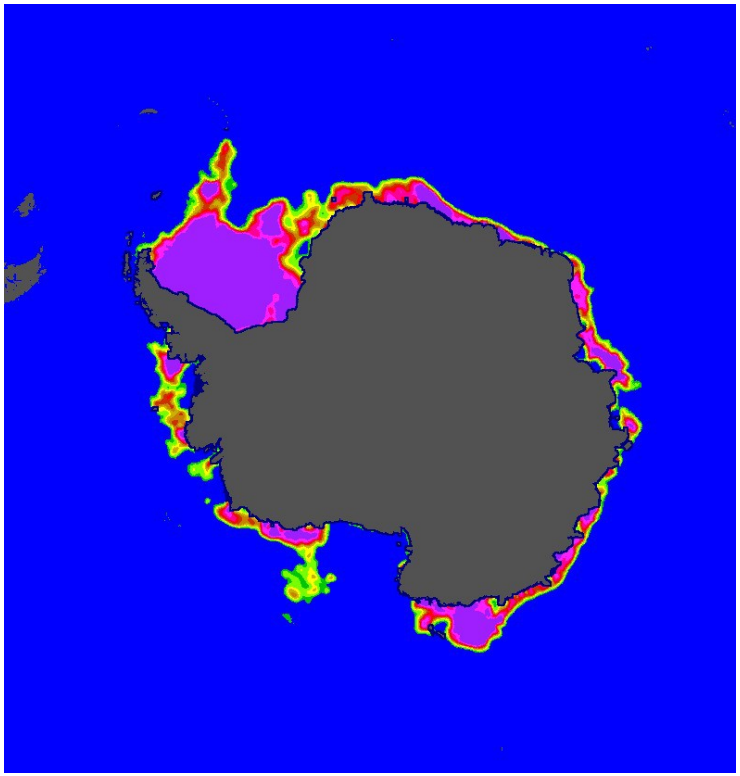
OSI SAF Sea Ice products

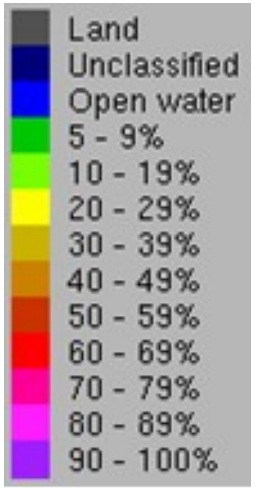
- EUMETSAT OSI SAF
- What does the sea ice look like?
- Current Sea Ice products
- Validation and monitoring
- Examples of use
-

OSI SAF
Ocean and Sea Ice

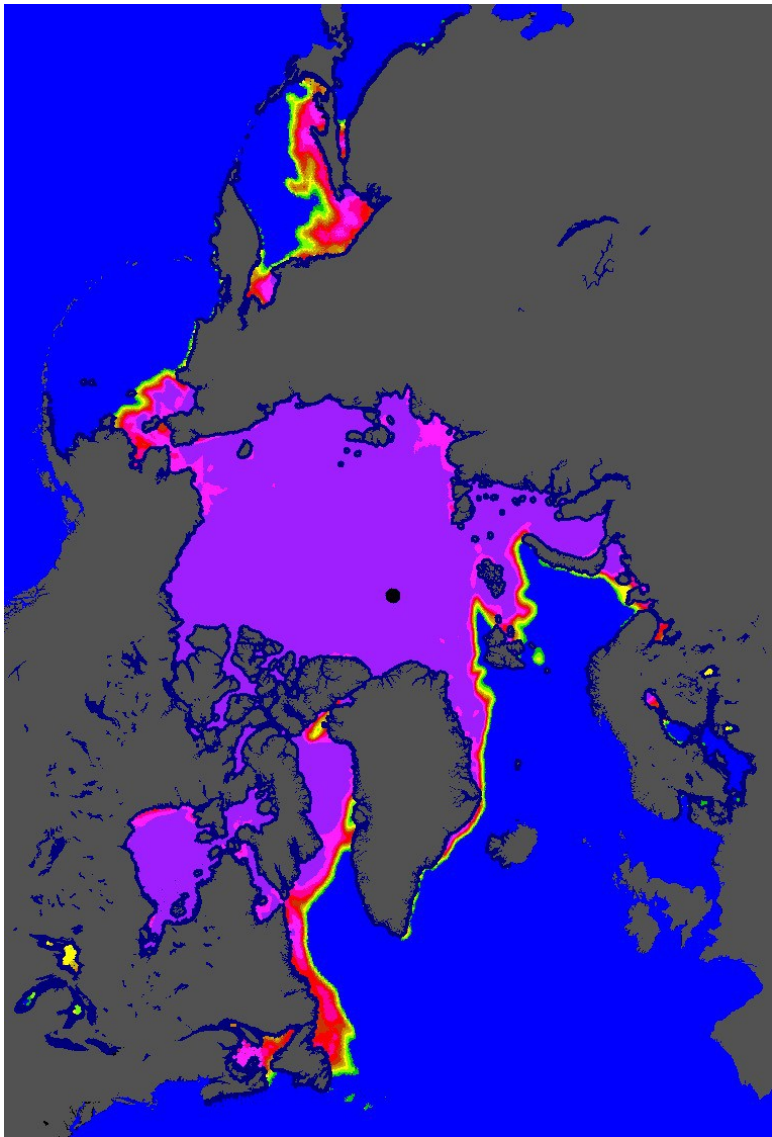
Current operational sea ice products

- Sea Ice Concentration





2014-02-06

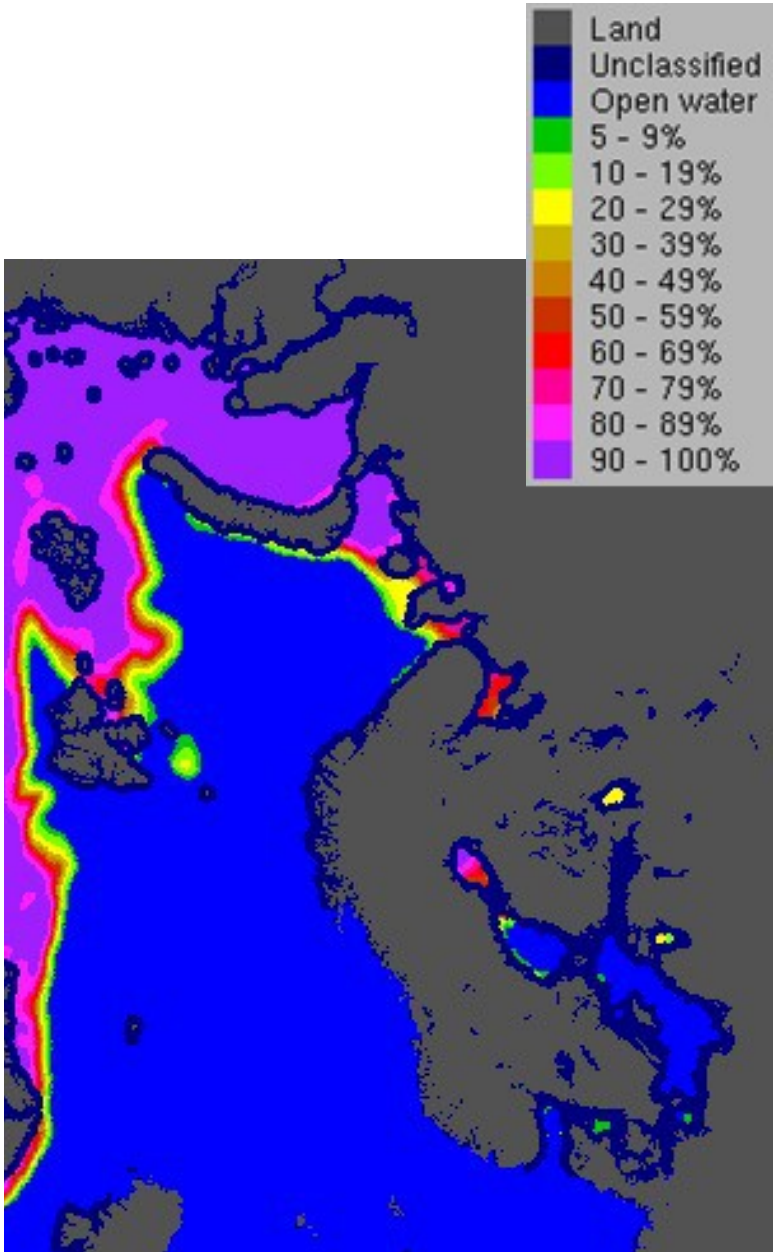


http://osisaf.met.no

OSI SAF
Ocean and Sea Ice

Sea Ice Concentration

- Uses PMW instrument SSMIS (19+37GHz) on board DMSP satellites
- Gives the fraction of sea covered by ice in percentage (0-100%)

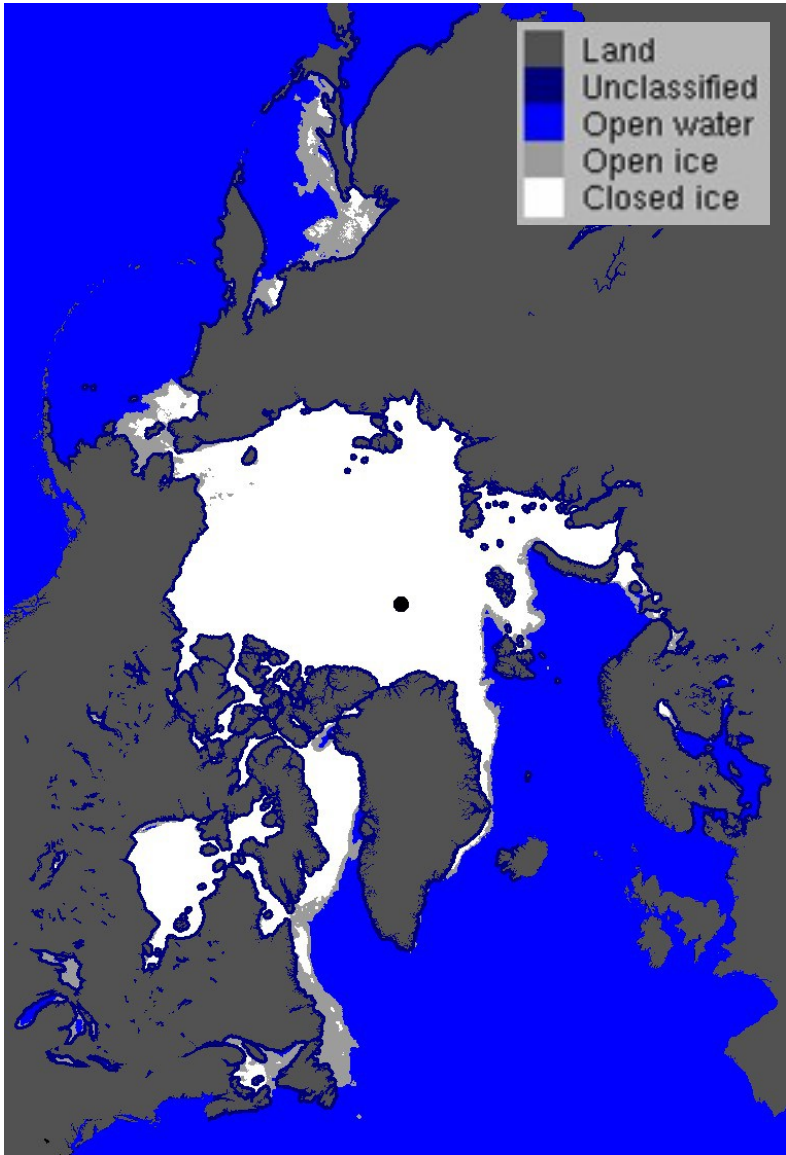


2014-02-06

OSI SAF
Ocean and Sea Ice

Sea Ice Edge

- Multi sensor product
  - SSMIS 19+37GHz
  - SSMIS 85 GHz
  - ASCAT backscatter
- Combines these instruments by calculating probabilities for ice and water

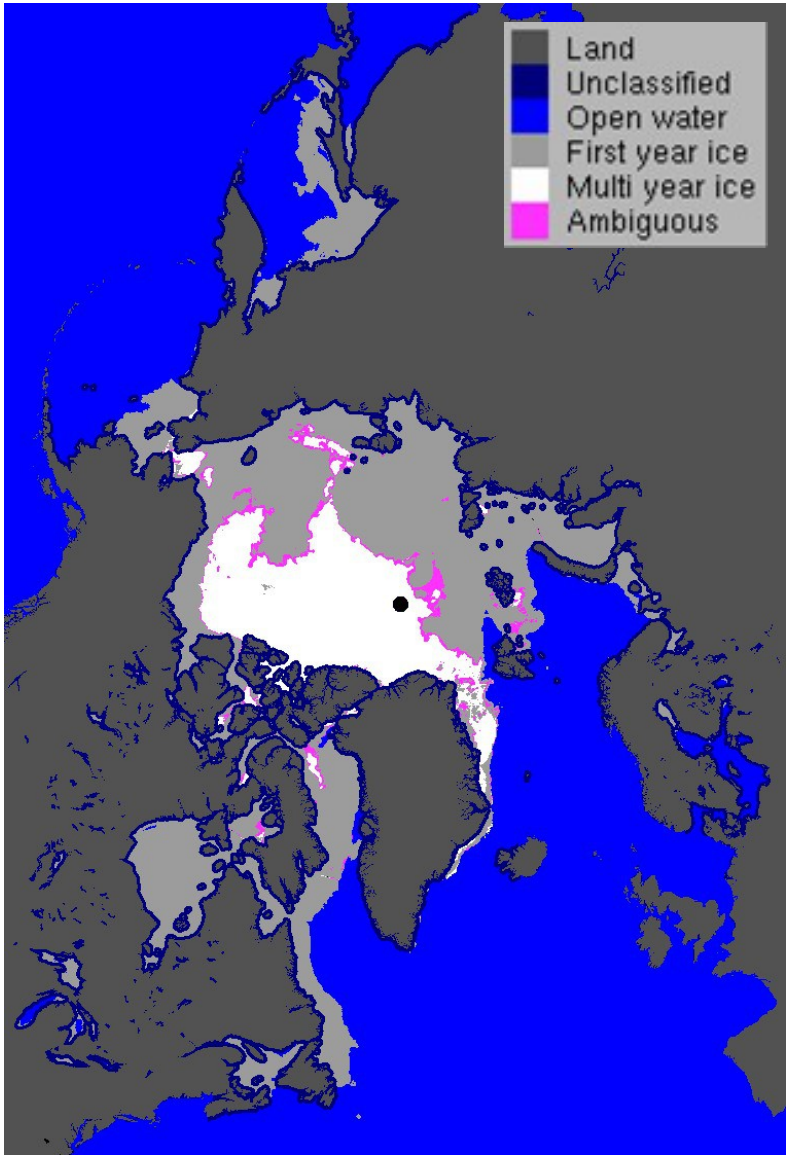


2014-02-06

OSI SAF
Ocean and Sea Ice

Sea Ice Type

- Multi sensor product
  - SSMIS 19+37GHz
  - SSMIS 85 GHz
  - ASCAT backscatter
- Combines these by calculating probabilities for first year and multi year ice
- Ice type is correlated with ice thickness

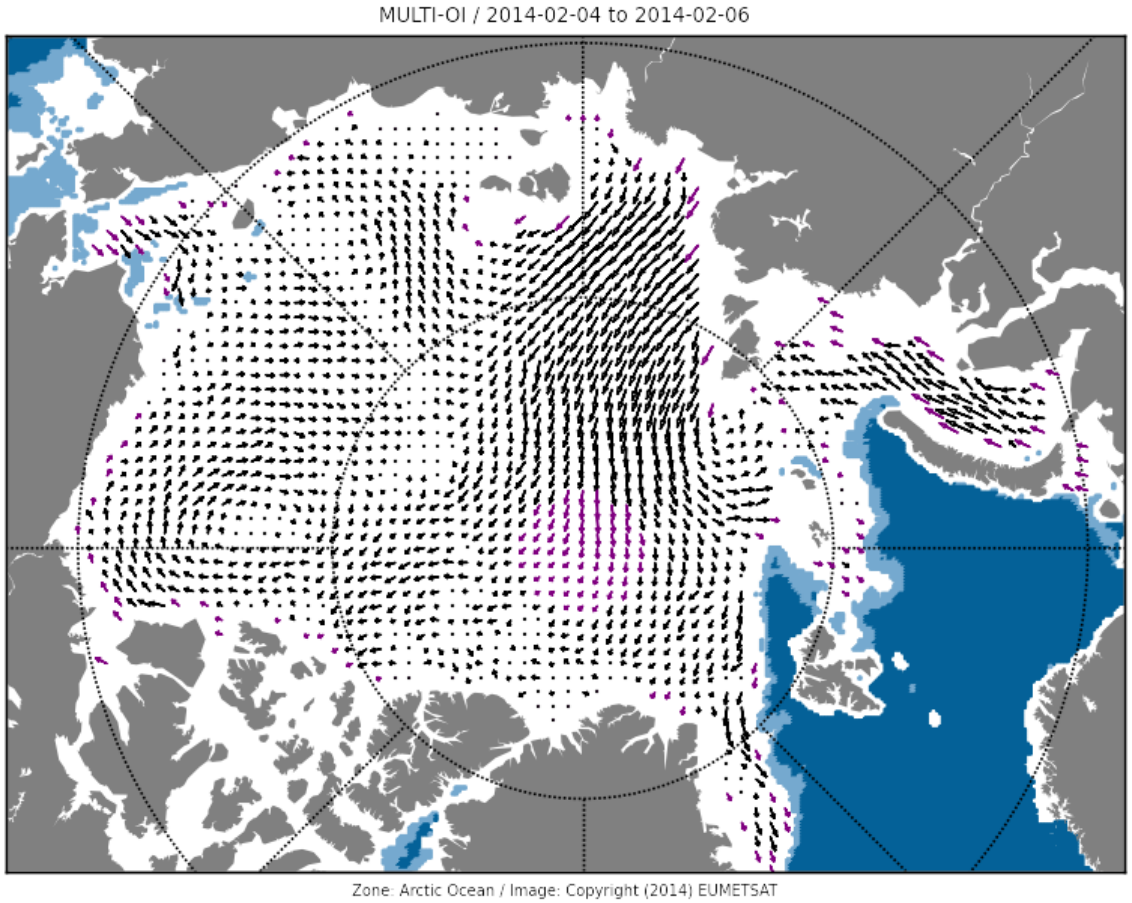


2014-02-06

OSI SAF
Ocean and Sea Ice

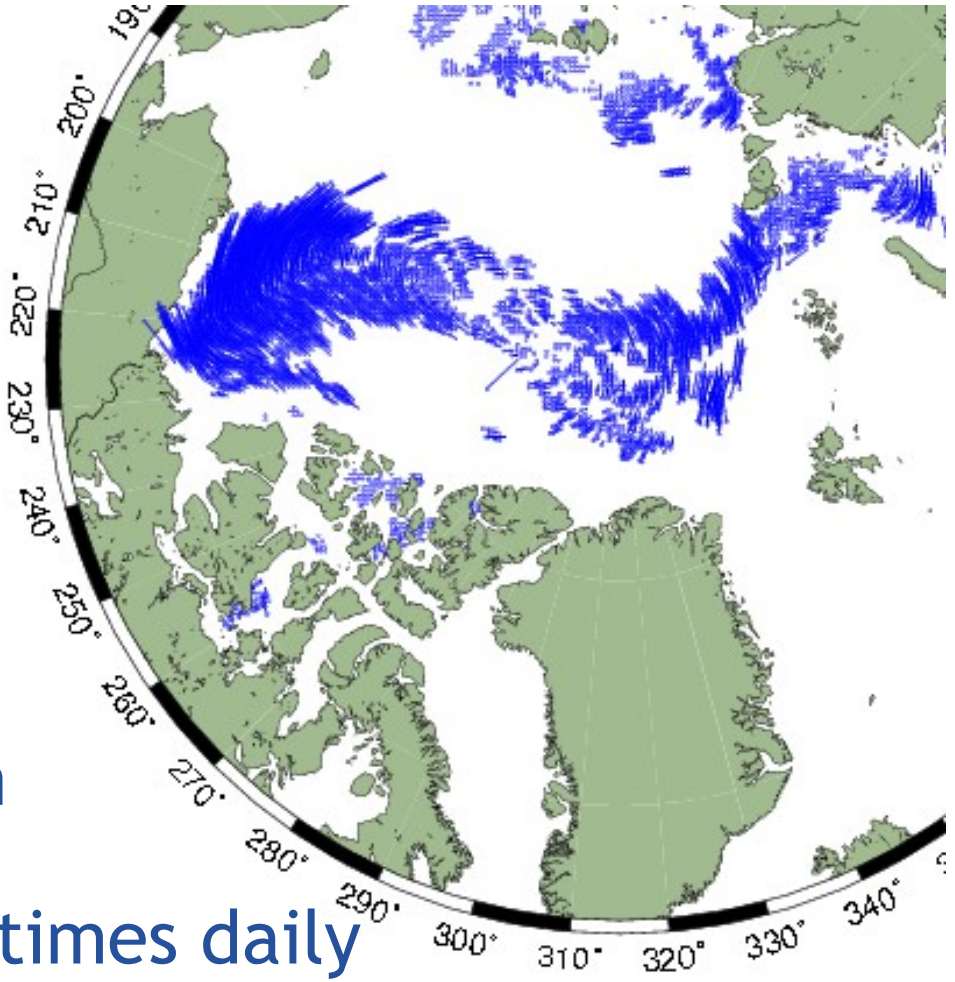
LR Sea Ice Drift

- Multi sensor product
  - SSMIS 85 GHz
  - ASCAT backscatter
  - (AMSR-2)



- Uses cross correlation between satellite images two days apart to detect how far the ice has moved in this period.

MR Sea Ice Drift

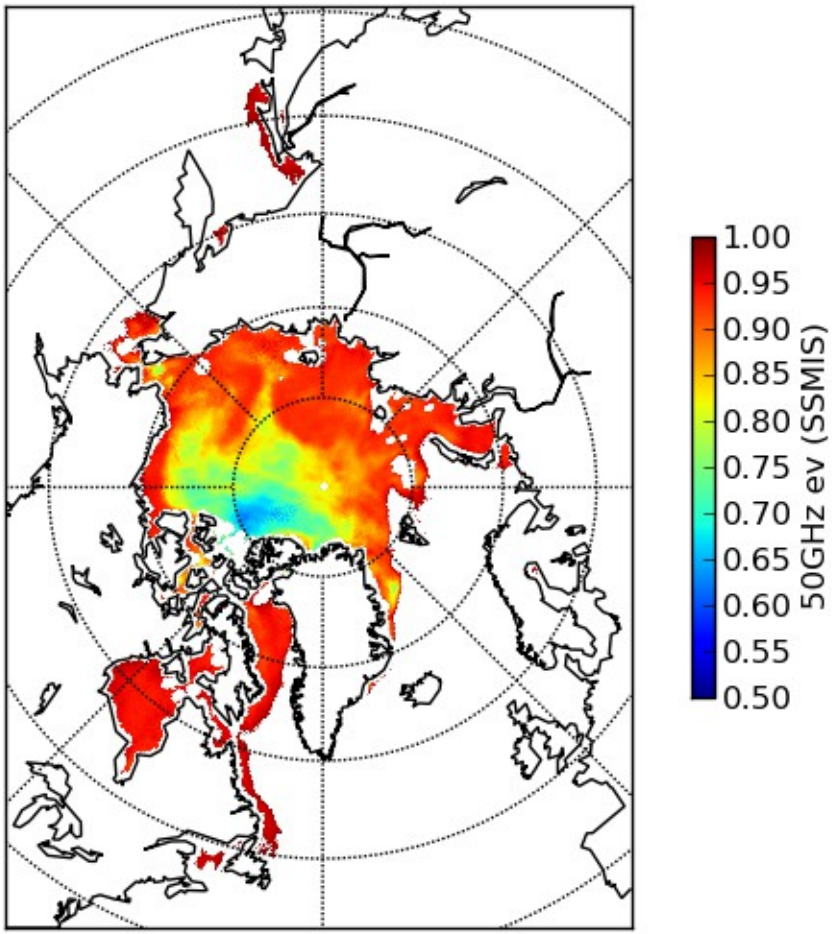


- Based on METOP AVHRR 1km data
- Uses VIS or IR channel depending on season
- Product resolution 20 km
- Gives 24 hours drift, 2-3 times daily

OSI SAF
Ocean and Sea Ice

Sea Ice Emissivity

- Estimate of sea ice emissivity at 50GHz
- Mainly purpose is to use in data assimilation of sounding instruments in NWP



2014-02-06

OSI SAF
Ocean and Sea Ice

Current operational sea ice products

- Delivered daily on polar stereographic grid, 10km grid size, centred on 12 UTC (ice drift 62.5km)
- Global coverage = NH + SH.
- Available on GRIB and NetCDF format.
- Each field has a set of quality flags (confidence level ++).
- Timeliness: 5 hours.
- Available through
  - FTP, http://osisaf.met.no (also archive)
  - EUMETCast, http://www.eumetsat.int
  - EUMETSAT Data Center (UMARF)

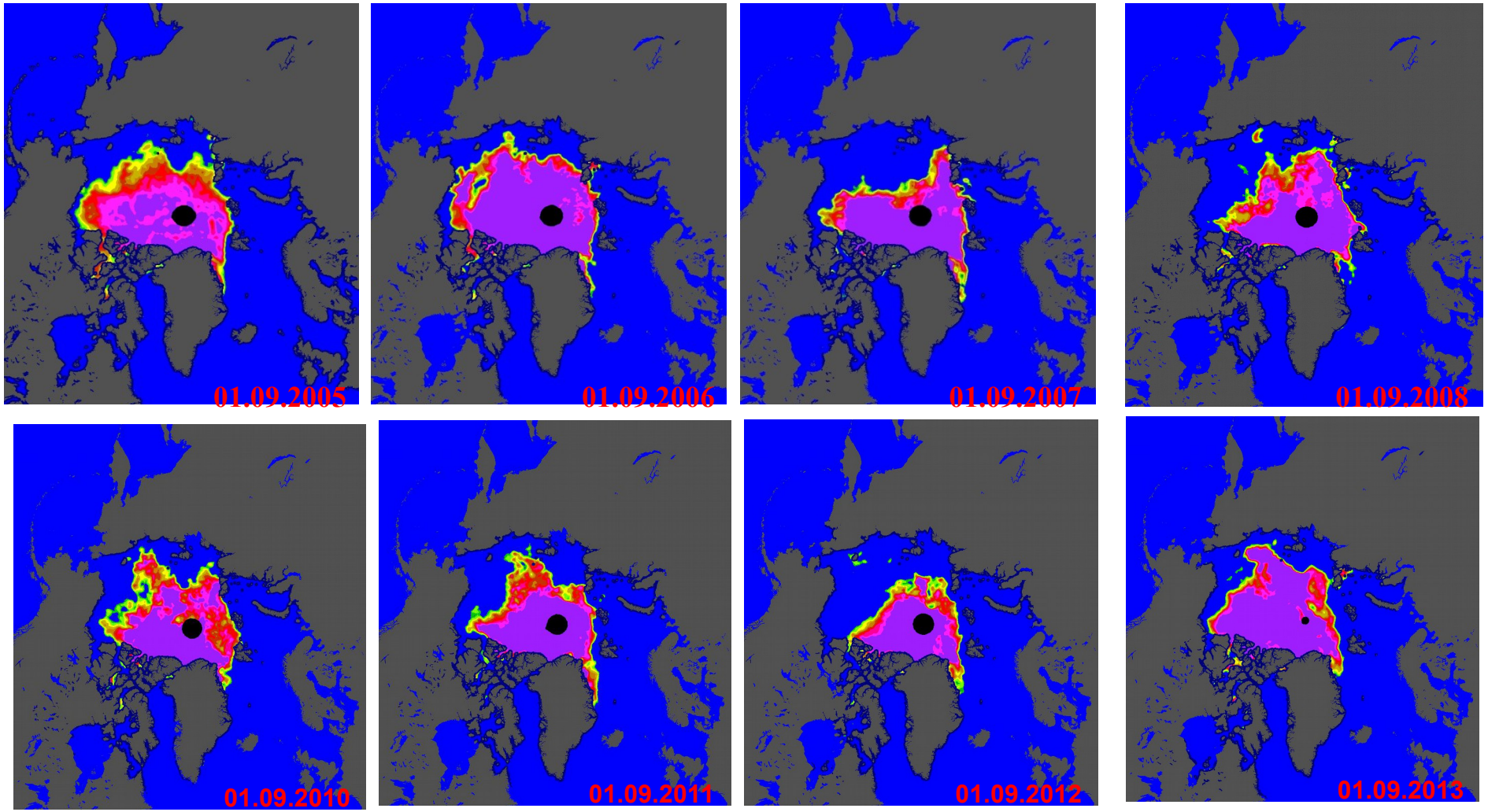
OSI SAF
Ocean and Sea Ice

Reprocessed Sea Ice Concentration

- OSI SAF operational sea ice products only available back to 2005
- Users want long time series, so we have reprocessed the sea ice concentration product
- Cooperation with UK MetOffice and NSIDC to reprocess SSM/I and SMMR back to 1978
- Improved concentration product with dynamical algorithm for better handling changes of satellites during the time series and therefore a more climate consistent data set
- Also include uncertainty estimate

OSI SAF
Ocean and Sea Ice

Reprocessed Sea Ice Concentration



OSI SAF
Ocean and Sea Ice

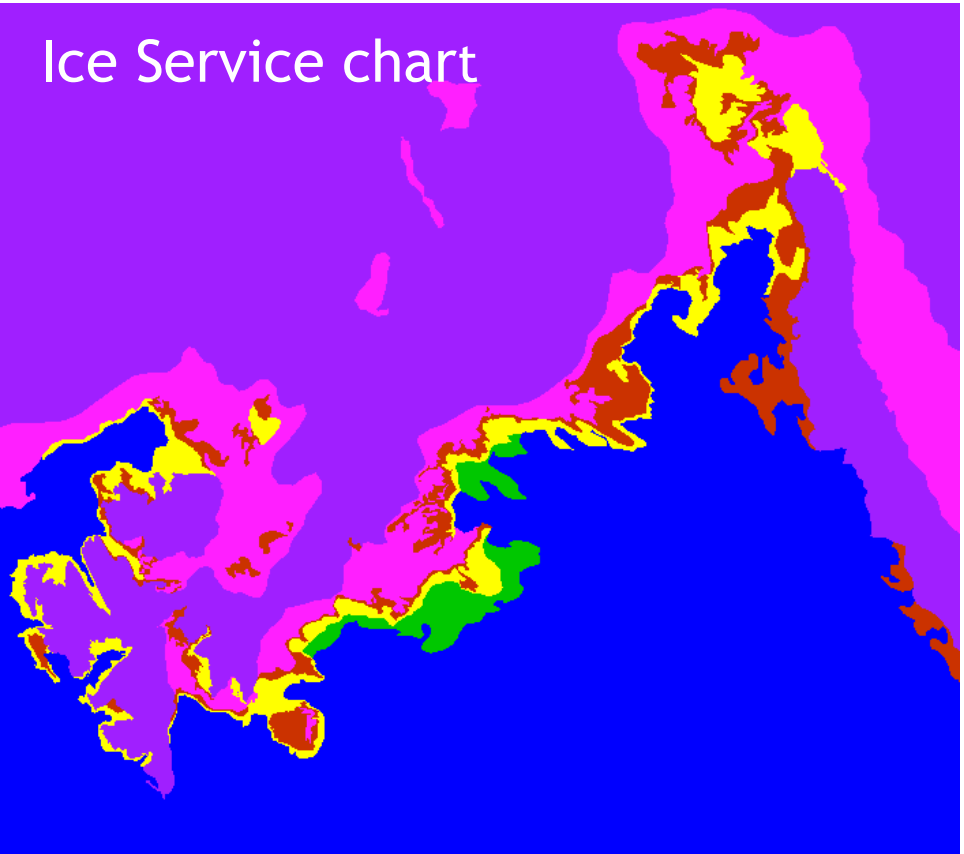
OSI SAF Sea Ice products

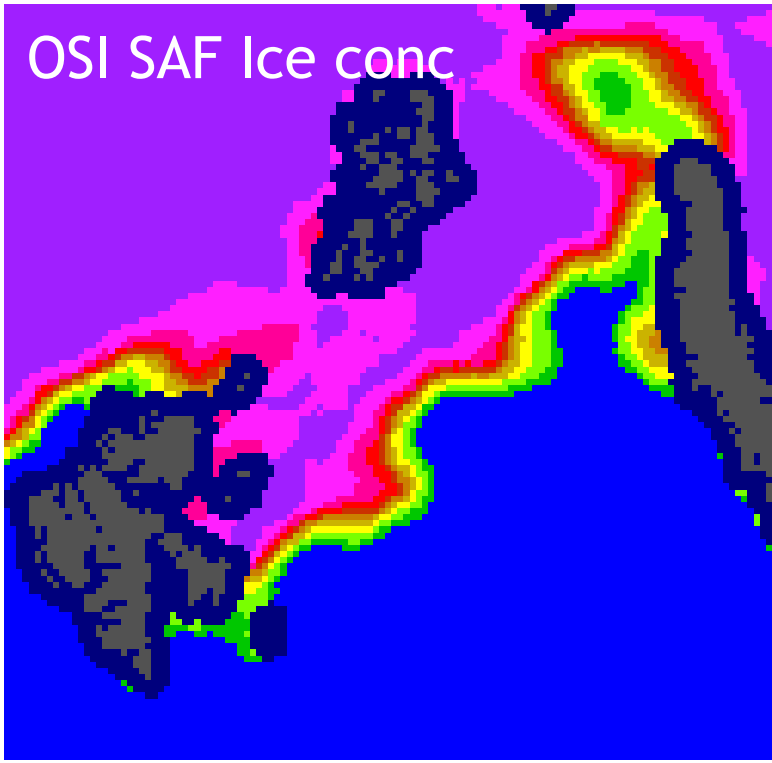
- EUMETSAT OSI SAF
- What does the sea ice look like?
- Current Sea Ice products
- Validation and monitoring
- Examples of use
-

OSI SAF
Ocean and Sea Ice

Validation and monitoring

- OSI SAF use navigational ice charts for validation of ice concentration and ice edge, and GPS trackers on the ice for ice drift

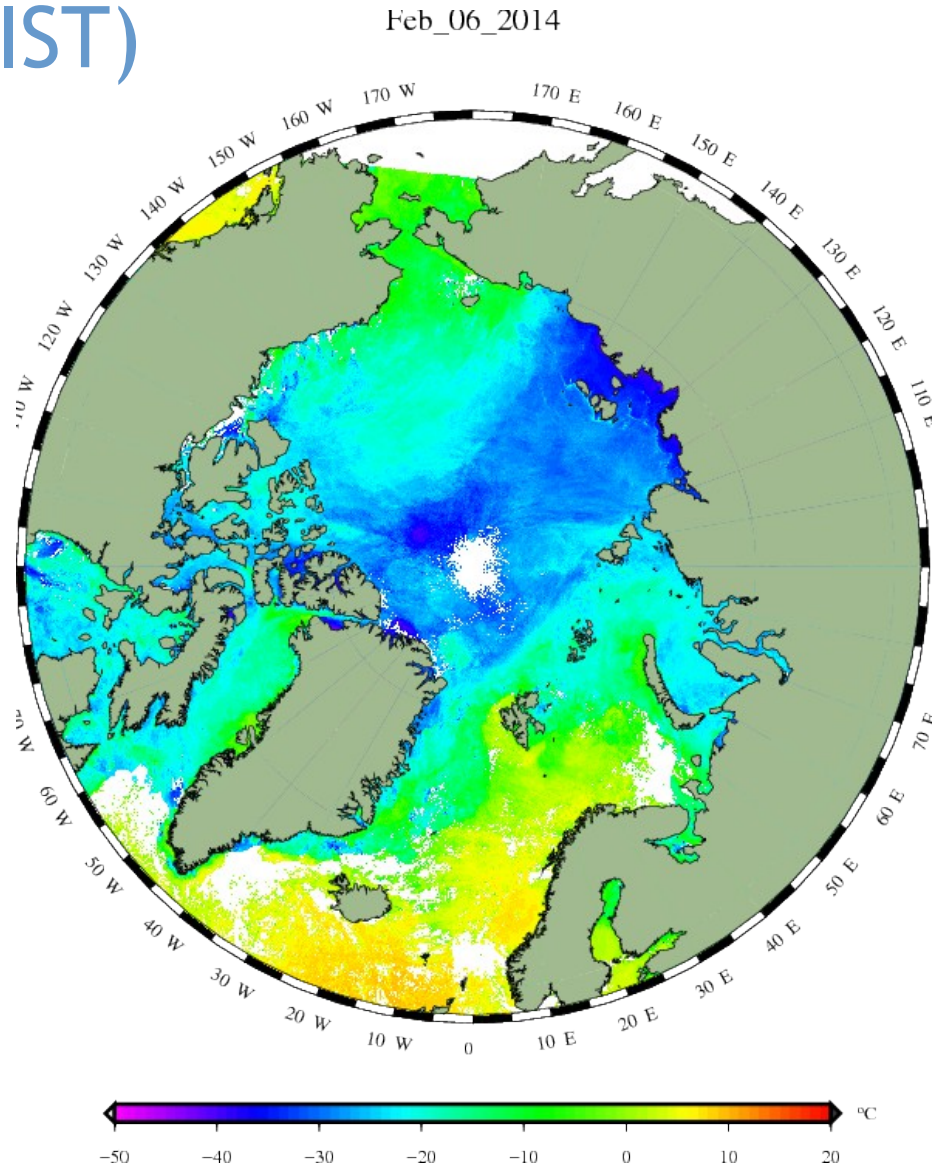




OSI SAF
Ocean and Sea Ice

Sea Ice Temperature (IST)

- Based on AVHRR IR instruments
- Image show combined SST and IST averaged over 3 days
- White areas are persistent clouds



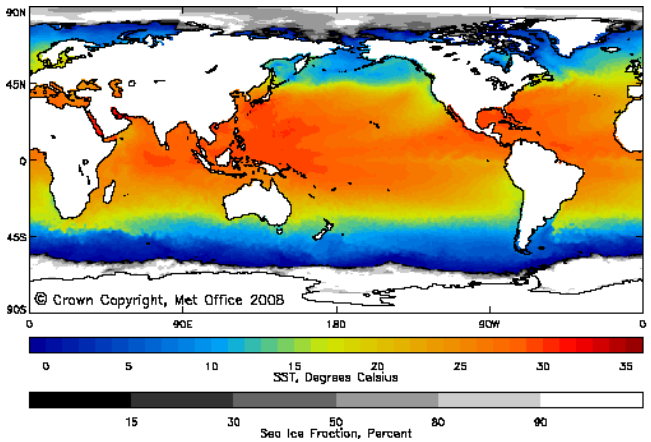
OSI SAF
Ocean and Sea Ice

OSI SAF Sea Ice products

- EUMETSAT OSI SAF
- What does the sea ice look like?
- Current Sea Ice products
- Validation and monitoring
- Examples of use
-

Examples of use

- Monitoring of sea ice, operationally and from a climate perspective
- Use in numerical models, weather and ocean (HIRLAM, UK MetOffice, ECMWF...)
- Environmental monitoring (polar institutes++)

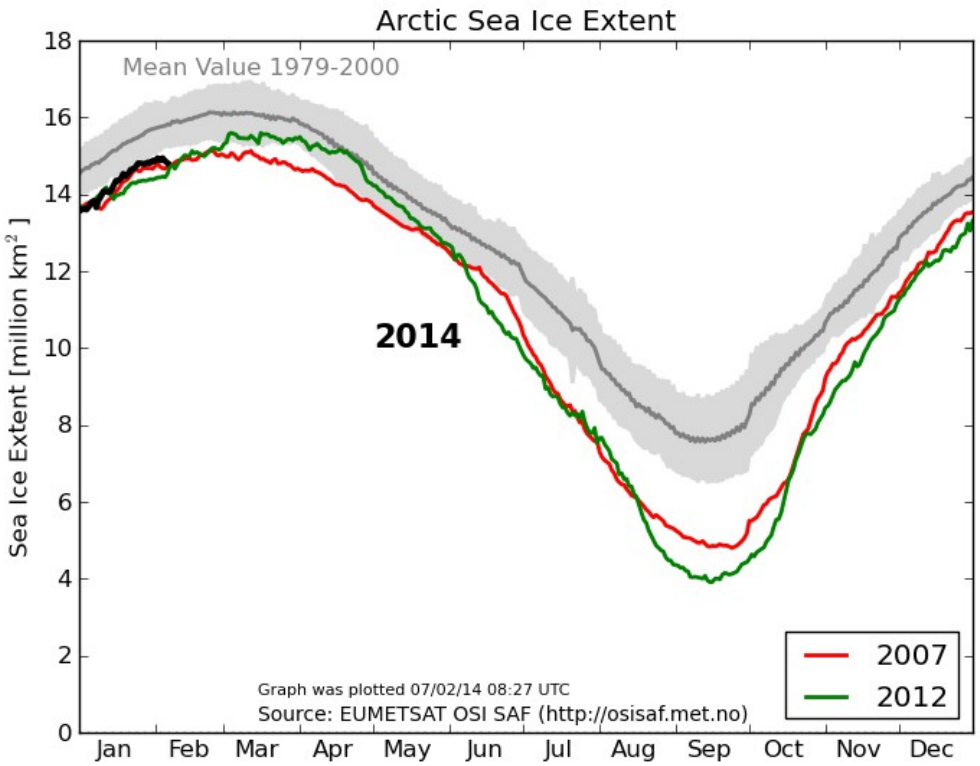


Conclusion

- OSI SAF provides daily global sea ice products, useful for many applications
- OSI SAF provides both near real time and reprocessed products
- For users that need more detailed ice information, like navigation in the Baltic waters, ice charts are more useful
- FMI provides daily ice charts for the Baltic Sea during the ice season

OSI SAF
Ocean and Sea Ice

Thank you for your attention!

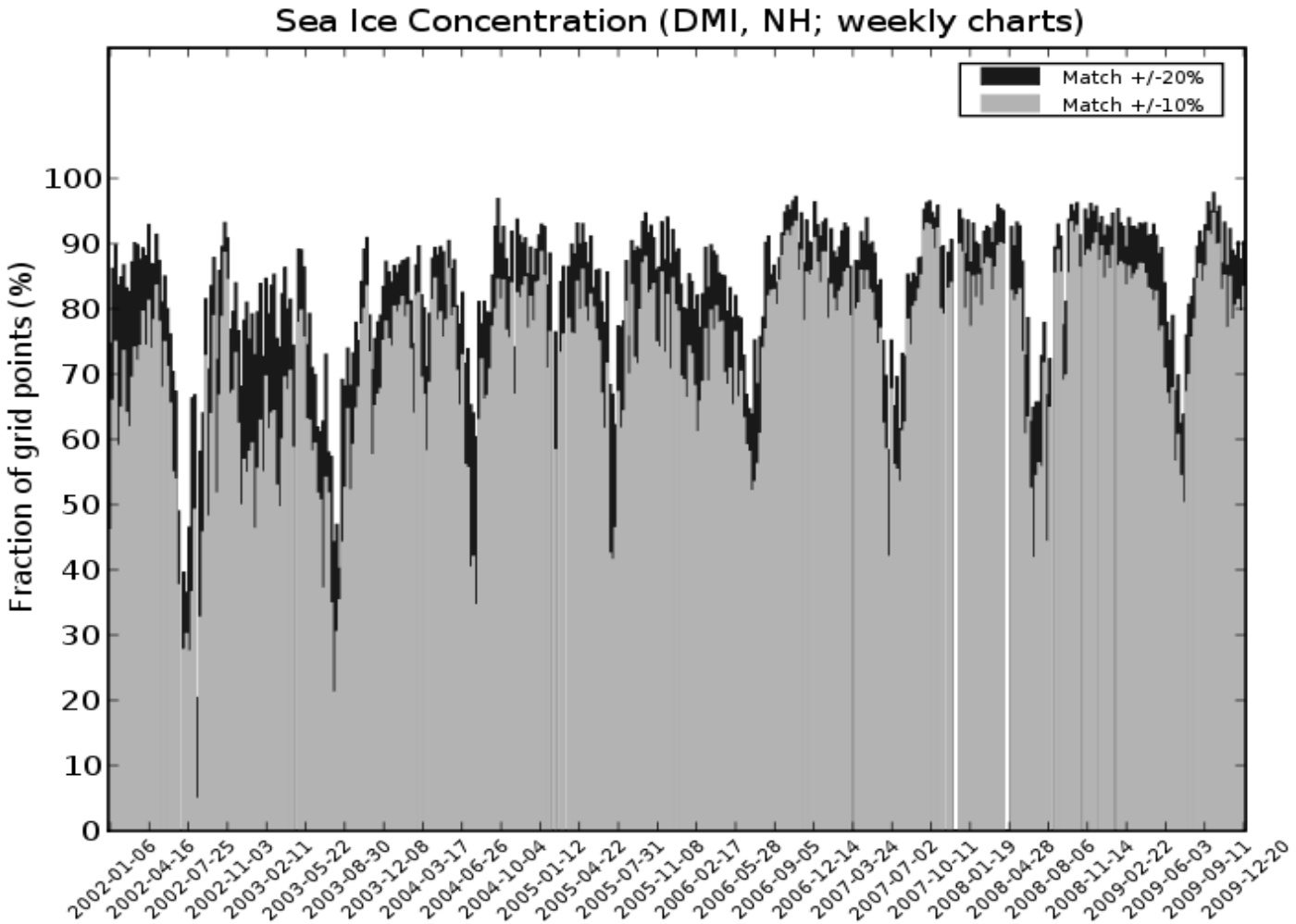


More information on http://osisaf.met.no

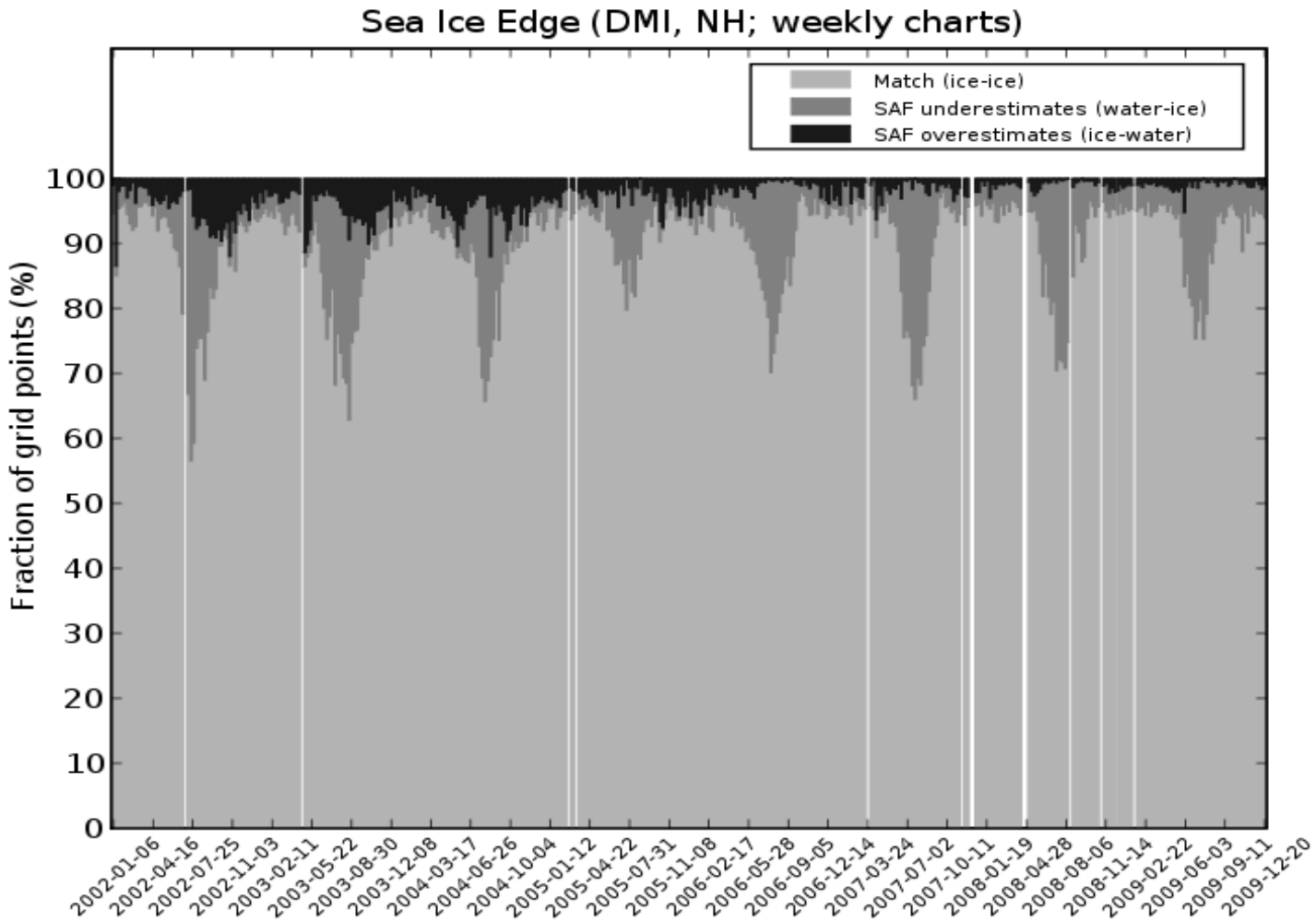
Extra slides

OSI SAF
Ocean and Sea Ice

Validation results ice concentration

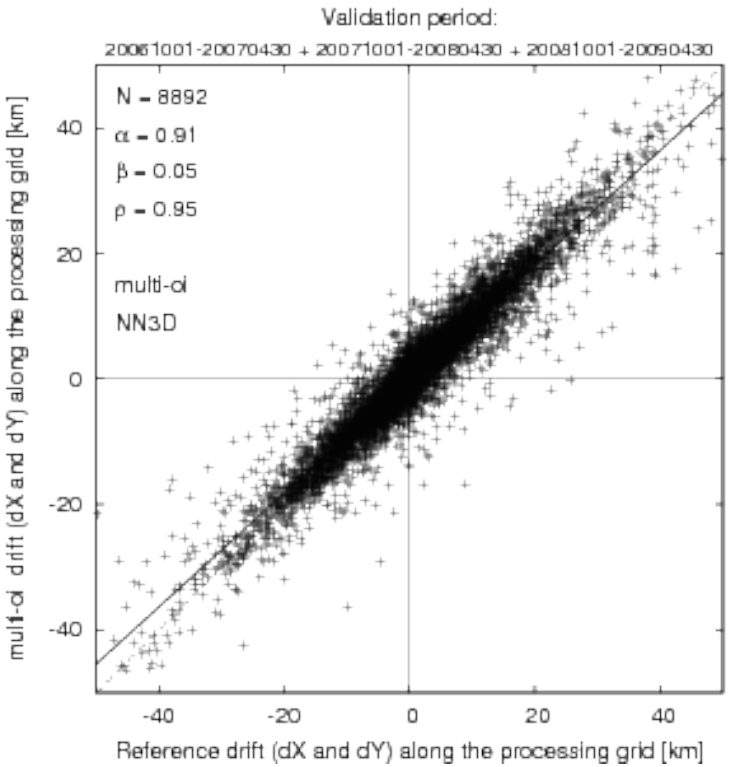


Validation results ice edge



Validation Sea Ice Drift

- Compare product with buoys and installations drifting with the ice
- Find good agreement for two days product
  - Correlation: 0.95
  - St.dev: 3.5km
  - Bias : -0.1km

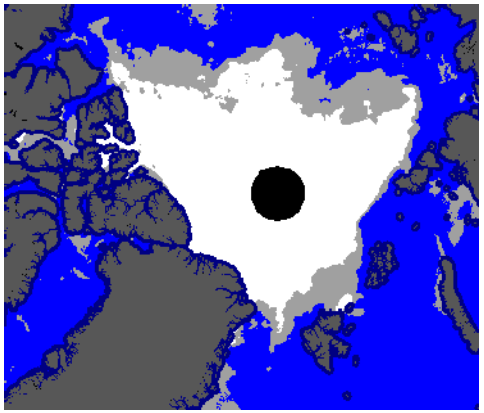


Acknowledgements: ITPs: Woods Hole Ocean. Inst., NP-35: Arctic & Antarctic Res. Inst., Tara: Damocles.

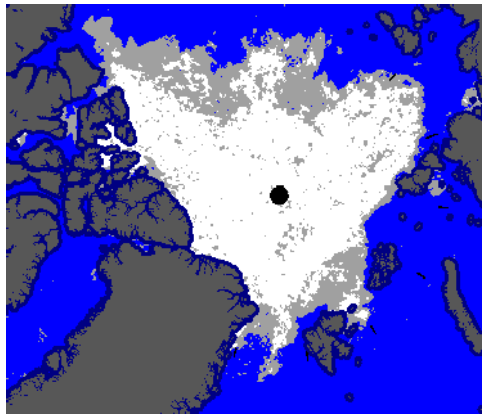
Multi sensor sea ice edge product

17. September 2008

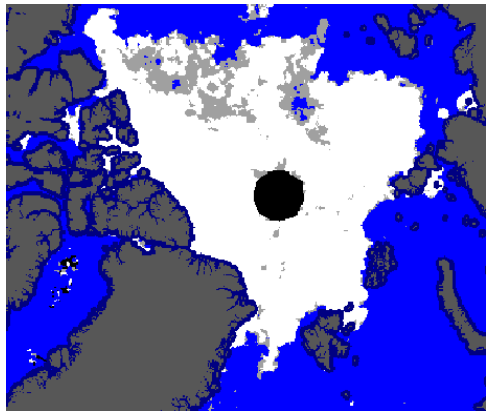
SSM/I 19/37GHz



SSM/I 85GHz



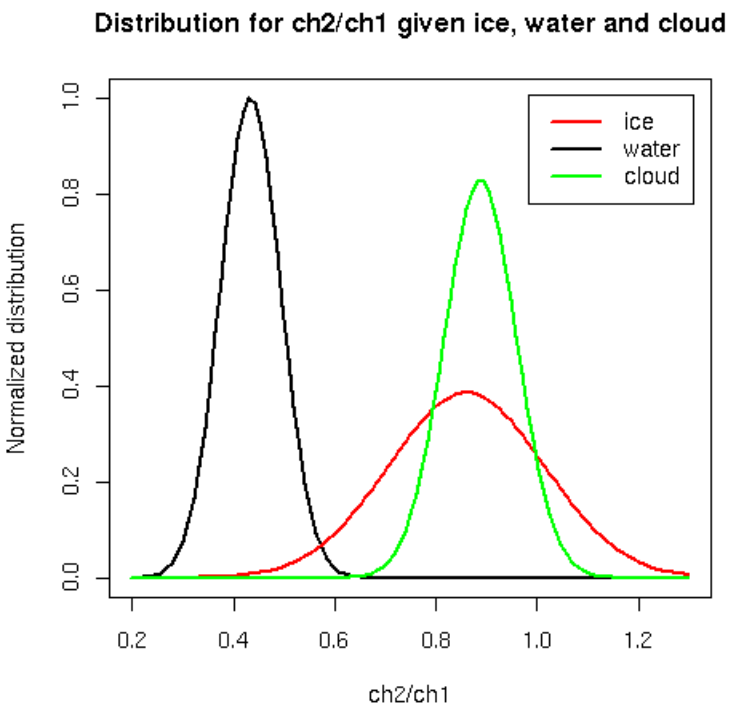
ASCAT

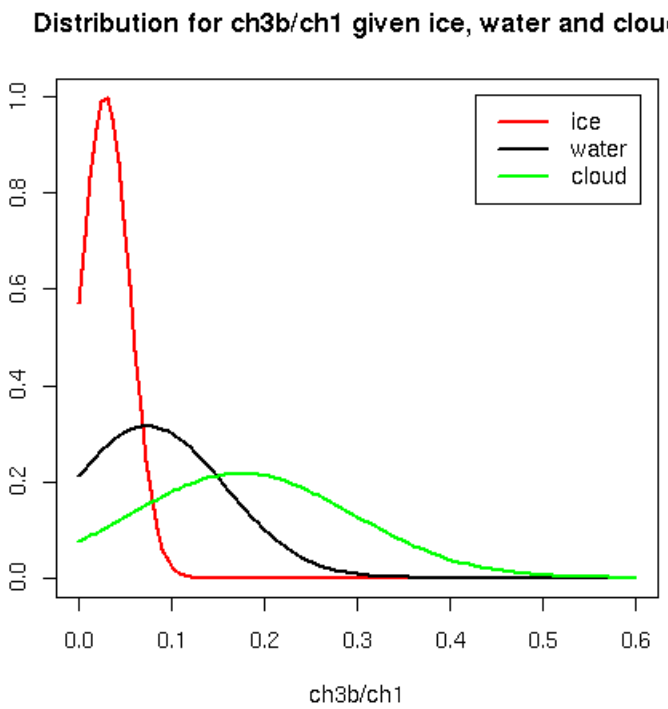


QuikScat

Combining Scatterometer and Passive Microwave

Probability Density Distributions





Error estimates

Spatially and temporally varying error estimates:

- Error due to atmospheric contribution, estimated from ERA-40 1987-2003 data
- Error due to sea ice emissivity uncertainty
- Error due to footprint mixing and resolution artefacts in marginal ice zone, estimated empirically from local gradient