Sea Ice CCI project Phase 2
2015-2018

Colocation meeting 29 Sept – 01 Oct 2015
Sea Ice Concentration 06 September 2015

Institute of Environmental Physics, University of Bremen,
Arctic sea ice extent 1978-2015

Arctic Sea Ice Extent Monthly Time Series

March Trend: -0.045/year
September Trend: -0.093/year

Graph was plotted 29/09/15 08:20 UTC
Source: EUMETSAT OSI SAF (http://osisaf.met.no)
Arctic and Antarctic ice concentration

Ice concentration in %

Uncertainty in %

Uncertainty = tiepoint + smearing + daily variability with a grid cell

AMSR-E
25 km EASE
20080103

Uncertainty =
7% point +
smearing +
daily variability within a grid cell

0 20 40 60 80 100
concentration of sea ice (%)

0 18 36 54 72 90
total uncertainty (one standard deviation) of concentration of sea ice (%)

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concentration of sea ice (%)

0 18 36 54 72 90
total uncertainty (one standard deviation) of concentration of sea ice (%)

3 – 4 %

> 50 %

20-30 %
Both OSISAF and SICCI will release a SIC dataset by the end of 2016.

OSISAF will release the SMMR+SSM/I+SSMIS time-series (1979-2015).

SICCI will release the AMSRE+AMSR2 time-series (2002-2015).
User feedback: sea ice concentration

24 users who had downloaded the data replied to the survey

• Comparison/validation of climate models and OGCMs
• Comparison with other established data sets and operational ice charts
• Algorithm studies
• Obtain uncertainties
• Study sea ice conditions in different parts of the Arctic
• Study ice edge variability and ice motion
• Study climate signal link between Arctic and lower latitudes
Ice thickness from ENVISAT radar altimeter

Monthly maps of FB and SIT (winter months)
100 km grid
Arctic coverage (< 82N due to satellite orbit)
Sea Ice Thickness: monthly mean retrievals from ENVISAT (October – March)
Sea Ice Thickness evaluation: Comparison to moored ULS data

- BGEP mooring ULS draft data
- Average data from 2 to 4 ULS for period 2003-2012

Positive bias of 0.5 m to 1.5 m
Depends on choice of snow depth & ice density

Conversion of SICCI freeboard to draft using Warren et al. snow depth
- MY density: 882 kg/m³
- FY density: 916 kg/m³
Monthly averaged NP positions and corresponded monthly averaged snow depth measurements. March, April, May for MY ice (Warren climatology, 1999)
ENVISAT thickness versus airborne EM thickness

- March 2011: RMSD: 0.34 m
- April 2011: RMSD: 0.54 m
- April 2010: RMSD: 0.74 m

Average over all EM data within 50 km radius circle centered at Envisat SIT grid cell center
Reduction in Arctic MY ice in last decade

Multiyear ice area fraction from scatterometer data (NSIDC)
Antarctic freeboard from radar altimeters

CryoSat-2

ENVISAT

Radar freeboard in m

September 2011
Extended RRDP SIT

- Snow and freeboard/draft observations from aircraft (OIB/CryoVEx), ULS buoys (BGEP), IMB (CRREL), snow depth buoys (AWI), and in situ measurements (NP)
- Model of snow depth (NEMO-LIM3)
- Snow climatology (Warren, 1999)
- Snow depth from satellite over first year ice (AMSR-E, SSM/I)
- Ice types from satellite (ASCAT, QuikSCAT, OSI-SAF)
- Surface roughness (ALS)

- Satellite measurements of freeboards:
  - CS-2, AWI, ESA CS-2 processor
  - ENVISAT, ESA CCI processor
  - ERS, ESA CCI processor
Round Robin Data Package - SIT

Yellow/cyan (quiklooks): OIB
Red dots: ULS BGEP
Green: NP drifting station
Blue: IMB, CRREL
Red lines: Snow depth buoys, AWI
Ongoing work with ice thickness

- extension of the Envisat RA-2 SIT time series by ERS-1/2 and CryoSat-2
- development of a consistent multi-mission sea-ice freeboard processor
- optimization of freeboard-to-thickness conversion
- development of an Antarctic SIT product

Special focus:
- Overlap between ENVISAT and CS-2
- Include seasonal observations (IMB, SD_AWI,NP 37-39)
- Fram Strait region, where snow depth information is sparse