Project

VALIDATION REPORT – Q1

Ice charts Greenland

Reference: MYO-WP14-SIW-DMI-ARC-SEAICE_HR-OBS-VALIDATION_Q1

Project N°: FP7-SPACE-2007-1	**Work programme topic:** SPA.2007.1.1.01 - development of upgraded capabilities for existing GMES fast-track services and related (pre)operational services
Start Date of project: 2009/04/01	**Duration**: 36 Months

WP leader: met.no	**Issue:** 1.0
Contributors: Leif Toudal Pedersen	
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Dissemination level:CO	

CHANGE RECORD

Issue	Date	§	Description of Change	Author	Checked By
1.0 1.1	2011-03-30 2013-02-28		New Update	Leif Toudal Pedersen Leif Toudal Pedersen	

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glossary and abBreviations

MFC	Monitoring and Forecasting Centre
Med	Mediterranean
NetCDF	Network Common Data Form
CF	Climate Forecast (convention for NetCDF)
SIW	Sea Ice and Wind
RMS	Root mean square
SDN	SeaDataNet (climatology)
PC	Production Center
PU	Production Unit
ftp	Protocol to download files
OpenDAP	Open-Source Project for a Network Data Access Protocol. Protocol to download subset of data from a n-dimensional gridded dataset (ie: 4 dimensions: lon-lat,depth,time)
Subsetter	MyOcean service tool to download a NetCDF file of a selected geographical box using values of longitude an latitude, and time range
WMO	World Meteorological Organization

Product introduction

The regional Greenland sea ice concentration product is an existing product provided by the Sea Ice Service in Copenhagen, DMI (dmi.dk). It covers Greenland waters with focus on the areas around south and south-west Greenland. The ice charts are primarily used for strategic and tactical planning within the offshore and shipping community. The products are also used for validation of ocean/ice models (Arctic and Global MFC) and the global SIW TAC products. Requirements are strict; demands are for detailed high quality products for several areas. The products are provided most week days including week-ends, but not all areas are covered every day. Twice a week an overview chart of all Greenland waters is produced. Delta development for MyOcean containg gridding of the product, adding land mask flag and generating a NetCDF file. For further information, see the Product User Manual [PUM]

Validation process

The Greenland Ice charts are routinely compared with OSISAF ice concentration maps for running quality control. This procedure allows monitoring of the icechart quality on an operational basis.

Validation of the high resolution regional ice chart of the Arctic Ocean is a challenging task due to lack of ground truth. In the production all available satellite data is used.

The interpretation of the satellite data is a subjective analysis by the operator on duty. To verify how this will influence on the final product we will at regular intervals compare the charts with Norwegian and Canadian charts for overlapping areas. The two products will be compared on a pixel basis and a confusion matrix containing ice concentration classes from the two analysts will be generated. This will give a measure of the uncertainty of the different ice concentration classes and the overall uncertainty of the product.

The calibration will be:

- ✓ Verify that the products are gridded correctly and CF-1.4 compliant NetCDF files are avalable at the MyOcean ftp server.
- ✓ Intercomparison between OSISAF ice concentrations and icechart concentrations
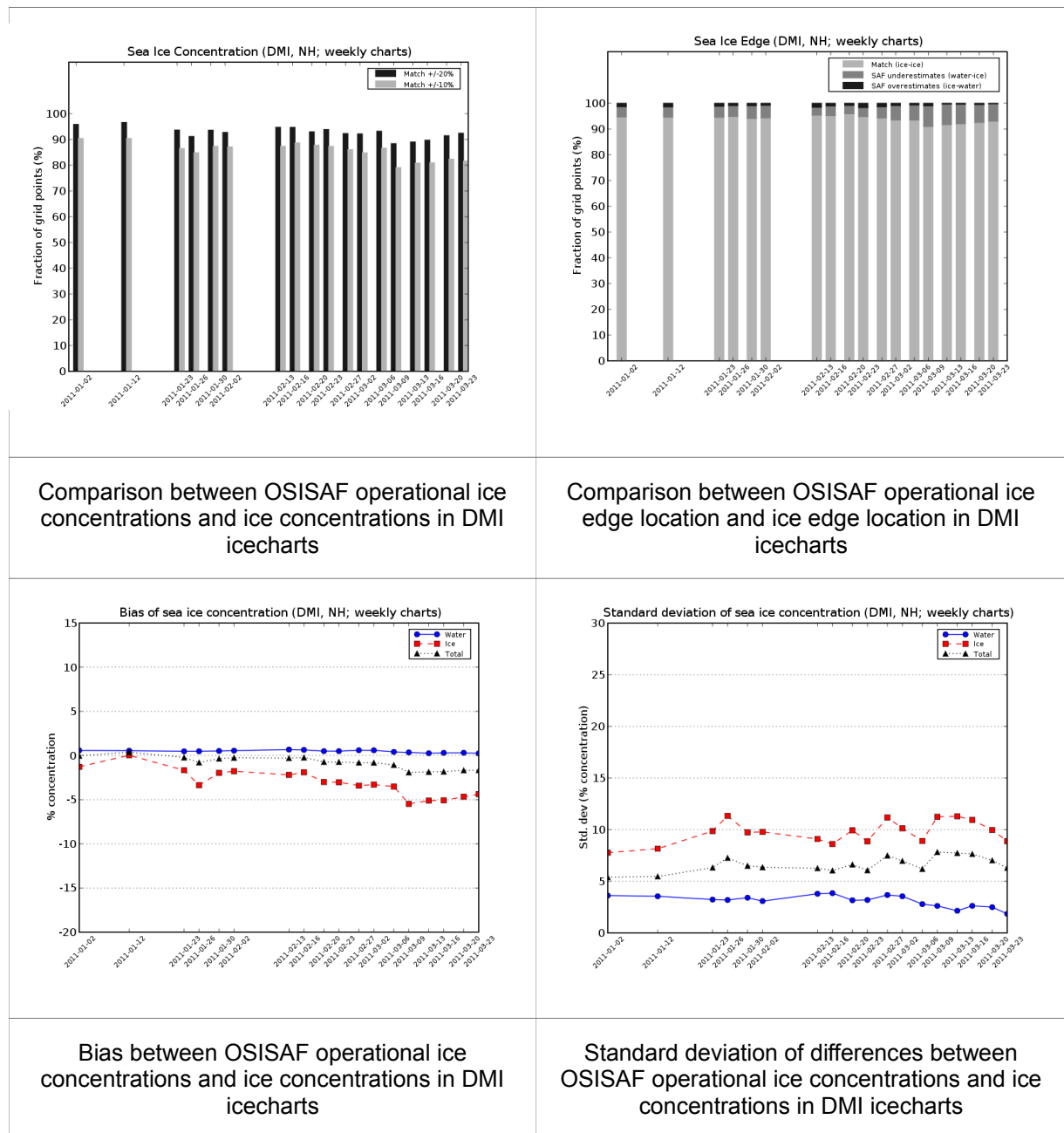- ✓ Document differences in the interpretation by different ice services.

OSISAF comparison (1st quarter of 2011)

Comparison between OSISAF operational ice concentrations and ice concentrations in DMI icecharts	Comparison between OSISAF operational ice edge location and ice edge location in DMI icecharts
Bias between OSISAF operational ice concentrations and ice concentrations in DMI icecharts	Standard deviation of differences between OSISAF operational ice concentrations and ice concentrations in DMI icecharts

Results from Q1 2011 for reference. For more recent results see section 1.4.

OSISAF comparison (1st quarter of 2013)

Comparison between OSISAF operational ice concentrations and ice concentrations in DMI icecharts	Comparison between OSISAF operational ice edge location and ice edge location in DMI icecharts
Bias between OSISAF operational ice concentrations and ice concentrations in DMI icecharts	Standard deviation of differences between OSISAF operational ice concentrations and ice concentrations in DMI icecharts
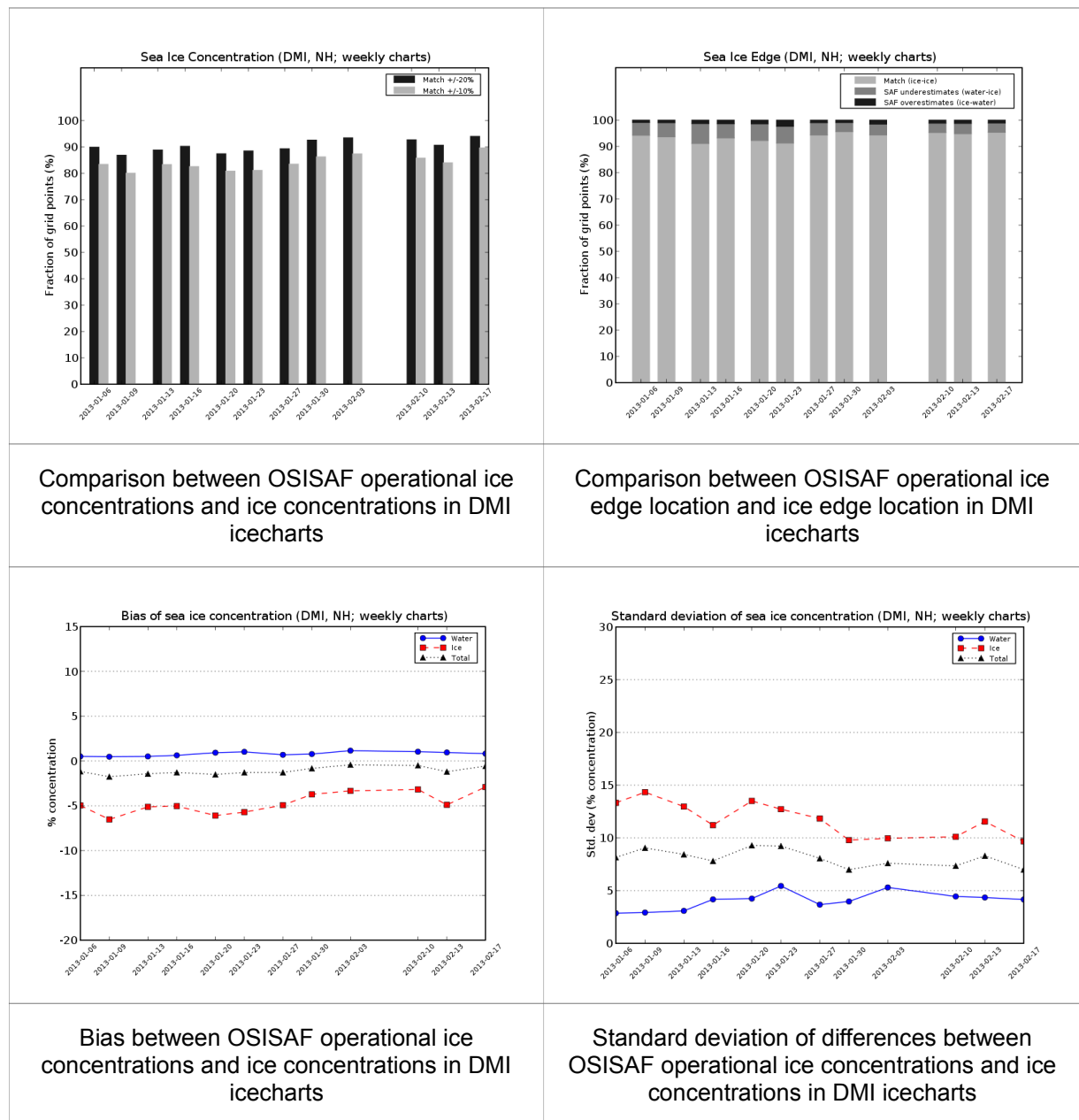
Since we do not know whether OSISAF or the icecharts in general are most correct, we report only on the differences between the two.

90-95% if ice edge locations are the same, but differences where icechart ice edge shows more ice than OSISAF are more frequent than the opposite. Between 80 and 85% of gridpoints have differences less than 10% and more than 90% of points have differences less than 20%.

Standard deviation of differences between icecharts and OSISAF are between 7 and 9% for the analyzed period. Biases are in the order of 5% with the icechart overestimating relative to the OSISAF SIC product.

Long term validation

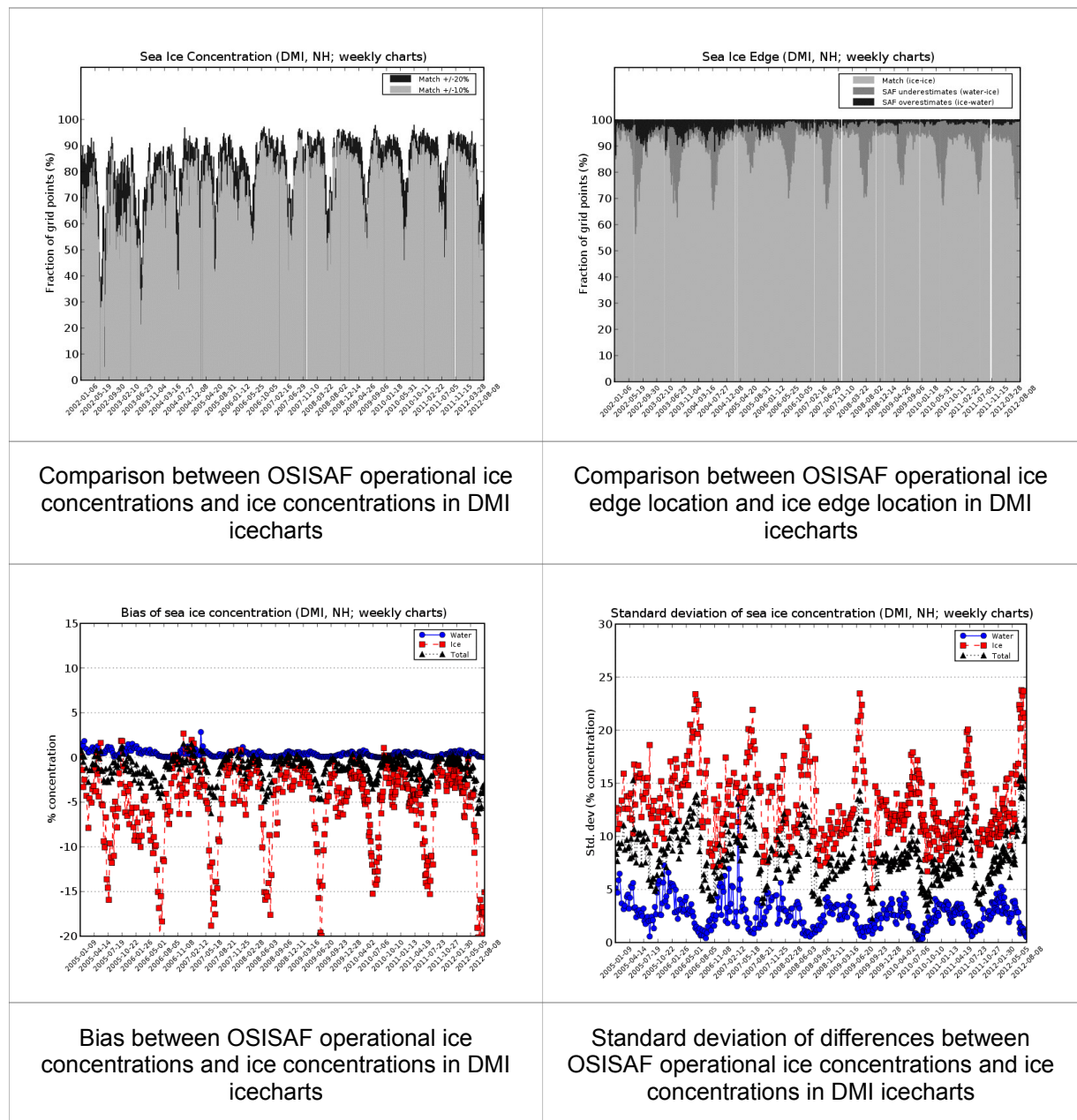I

Comparison between OSISAF operational ice concentrations and ice concentrations in DMI icecharts	Comparison between OSISAF operational ice edge location and ice edge location in DMI icecharts
Bias between OSISAF operational ice concentrations and ice concentrations in DMI icecharts	Standard deviation of differences between OSISAF operational ice concentrations and ice concentrations in DMI icecharts

Development of differences since 2005. Note the larger discrepancies during the Summer months.

Data avaliability at the met.no ftp server

The table below shows the availability of DMI icecharts in NetCDF format at the MyOcean data server.

Catalog http://thredds.met.no/thredds/catalog/siw_tac_greenland/2013/02/catalog.html as of February 25, 2013 at 20:00 UTC

ice_conc_overview_greenland_201302241200.nc	88.89 Mbytes	2013-02-25 14:23:32Z
ice_conc_overview_greenland_201302201200.nc	88.89 Mbytes	2013-02-21 12:23:06Z
ice_conc_overview_greenland_201302171200.nc	88.89 Mbytes	2013-02-21 08:02:42Z
ice_conc_overview_greenland_201302131200.nc	88.89 Mbytes	2013-02-21 08:02:38Z
ice_conc_overview_greenland_201302101200.nc	88.89 Mbytes	2013-02-21 08:02:34Z
ice_conc_greenland_201302232040.nc	88.89 Mbytes	2013-02-24 11:18:45Z
ice_conc_greenland_201302212050.nc	88.89 Mbytes	2013-02-22 09:53:01Z
ice_conc_greenland_201302202130.nc	88.89 Mbytes	2013-02-21 12:12:56Z
ice_conc_greenland_201302202035.nc	88.89 Mbytes	2013-02-21 12:12:51Z
ice_conc_greenland_201302191650.nc	88.89 Mbytes	2013-02-20 13:02:56Z
ice_conc_greenland_201302190835.nc	88.89 Mbytes	2013-02-19 12:43:13Z
ice_conc_greenland_201302182035.nc	88.89 Mbytes	2013-02-19 08:57:51Z
ice_conc_greenland_201302172110.nc	88.89 Mbytes	2013-02-18 11:52:31Z
ice_conc_greenland_201302162045.nc	88.89 Mbytes	2013-02-18 00:18:25Z
ice_conc_greenland_201302140930.nc	88.89 Mbytes	2013-02-15 00:23:11Z
ice_conc_greenland_201302131945.nc	88.89 Mbytes	2013-02-14 11:42:49Z
ice_conc_greenland_201302130810.nc	88.89 Mbytes	2013-02-13 13:42:58Z
ice_conc_greenland_201302121020.nc	88.89 Mbytes	2013-02-12 14:13:01Z
ice_conc_greenland_201302120840.nc	88.89 Mbytes	2013-02-12 13:23:29Z
ice_conc_greenland_201302112040.nc	88.89 Mbytes	2013-02-12 08:22:40Z
ice_conc_greenland_201302102110.nc	88.89 Mbytes	2013-02-11 12:02:35Z

CF validation

Output of CF-Checker follows...

```
CHECKING NetCDF FILE: /tmp/23381.nc
====================
Using CF Checker Version 2.0.1
Using Standard Name Table Version 15 (2010-07-26T08:53:14Z)
Using Area Type Table Version 1 (5 December 2008)


-----------------
Checking variable: crs
-----------------

-----------------
Checking variable: xc
-----------------

-----------------
Checking variable: yc
-----------------

-----------------
Checking variable: lon
-----------------

-----------------
Checking variable: ice_concentration
-----------------

-----------------
Checking variable: time
-----------------

WARNING (4.4.1): Use of the calendar and/or month_lengths attributes is recommended for time
coordinate variables
-----------------

Checking variable: lat
-----------------

-----------------
Checking variable: concentration_range
-----------------


ERRORS detected: 0

WARNINGS given: 1
INFORMATION messages: 0
```

Product User Manual

Ref   :MYO-WP14-SIW-DMI-ARC-SEAICE_TEMP-OBS-VALIDATION_Q1

Date   : 3/6/13

Issue   : 1.0

Further development

Intercalibration between met.no icecharts and DMI ice charts in overlap area (East Greenland). Intercalibration with Canadian Icecharts in Baffin Bay area.

Conclusion

Validation of the high resolution regional ice chart of the Arctic Ocean is a challenging task due to lack of ground truth. In the production the satellite data used is expected to have a resolution high enough to represent the ground truth of the mapped area. The interpretation of the satellite data is a subjective analysis by the operator on duty.

The above report is an attempt at validating the operational production of gridded icecharts for MyOcean using primarily the OSISAF lower resolution Sea Ice Concentration (SIC) product.

Reference:

[CF] http://cf-pcmdi.llnl.gov

[ECMWF] www.ecmwf.int

[NWCSAF] http://www.smhi.se/en/Research/Research-departments/Atmospheric-remote-sensing/automatic-cloud-analysis-the-nowcasting-saf-project-1.4875

[PUM] Product User Manual - Composite IST and High Latitude SST, version 1. https://wiki.met.no/siwtac/product_manuals

[OSISAF] http://www.osi-saf.org

[Stammer et al.] Stammer, D., Johanessen, J., LeTraon, P.-Y., Minnett, P., Roquet, H. and Srokosz, M. 2006. Requirements for ocean observations relevant to post-EPS. AEG Ocean Topography and Ocean Imaging, 6 March, Version 1.A.