Responses to Anonymous Referee #1's comments on the manuscript tc-2013-199

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This is an interesting article presenting a new database reconstructed from the Aquarius L-band radiometer/scatterometer observations, and made available on the web. This database will certainly be useful for scientific applications for the polar region analysis, since in the case of the Aquarius research mission, the data are not converted as much into geophysical products as for other operational satellite missions. As example, the Aquarius data are not gridded (swath track), some are contaminated by Radio Frequency Interferences. The proposed processing, specifically designed for Polar regions, fully justifies this database to make easier and efficient the analysis of these data for the scientific community, in particular for the cryospheric applications.

This article is divided into two parts: 1) the description of the database; 2) and some observations of each extracted parameter variations and behaviors over the Greenland and the Antarctic ice sheets, as well as over polar oceans (sea ice cover and salinity).

This makes this article relatively long. Maybe, to split it into two articles could render its reading easier? This is a suggestion only. If the authors keep the presentation as it, please clearly separate the two parts, in order to allow the reader only interested by the second part, to skip the first part (i.e. by including a short summary at the database at the beginning of the second part, with a recall of the abbreviations, in Table 3 for example).

In general, some more basic physical explanations would be useful to better follow the observed signal variations.
In selected figures, to add the standard deviation of the signal will illustrate the observed variability recorded in the database.

The publication of this paper is thus well justified with minor changes.

We thank the reviewer for these relevant comments and suggestions. They were useful in producing a refined description of the Aquarius weekly-polar-gridded products, and an improved description of the Aquarius observations and retrievals over the polar regions. Following the reviewer suggestion, we now present our study in two papers. This allows us to include additional text and material, especially more physical explanations when describing the observations, as recommended by the two reviewers. The papers are named as follows:

- Weekly-gridded Aquarius L-band radiometer/scatterometer observations and salinity retrievals over the polar regions, part I: Product description
- Weekly-gridded Aquarius L-band radiometer/scatterometer observations and salinity retrievals over the polar regions, part II: Initial product analysis

A minor reorganization of our text was done in order to allow a publication in two parts. A new abstract, introduction, and conclusion were written. In this response document, we address every comment and present the corresponding improvements made in the manuscripts. Regarding the two general comments:

Where mentioned by the reviewer, more basic physical explanations were provided (specific additions are presented in this document);

New materials were added about the brightness temperature (TB) standard deviations, such as two new maps presenting the TB standard deviation over the Northern and Southern Hemispheres, and updated version of former figure 7 so that it now includes the time series of TB standard deviations.

The Phased Array type L-band Synthetic Aperture Radar (PALSAR) sensor on the Japan's Advanced Land Observing Satellite (ALOS) should be mentioned in the introduction.
We added a new paragraph in the introduction to mention the different active L-band sensors that operated before the Aquarius scatterometer:
Active L-band sensors have a longer presence in space than passive L-band sensors. The Japanese Earth Resources Satellite 1 (JERS-1) operated an L-band (HH polarization) synthetic aperture radar (SAR) between 1992 and 1998. It was followed by an improved system, the Phased Array type L-band Synthetic Aperture Radar (PALSAR), that operated onboard Advanced Land Observing Satellite (ALOS) from 2006 to 2011. For the near future, a PALSAR follow-on mission is planned for launch in 2014. In August 2011, Aquarius added to the active L-band instruments the first space-borne L-band scatterometer.

P5923 L25 : penetration depth: several hundreds of meters, yes certainly in dry snow conditions, but thousands of meters ??
According to Surdyk (2002), estimates of penetration depths at ~1.4 GHz in solid ice at an incidence angle of 50º ($P^{\theta 50}$) can vary between ~900 m and 2000 m depending on the ice temperature (figures 3 and 5 in Surdyk, 2002). Aquarius incidence angles are lower (28.7º, 37.8º, and 45.6º). To convert the penetration depths estimates in Surdyk (2002) at 50º to Aquarius radiometer incidence angles, the following equation, mentioned in Surdyk (2002), can be used: $P^{\theta}=P^{\theta 50} \times \cos(\theta)/\cos(50)$. The factors $\cos(\theta)/\cos(50)$ to convert the penetration at 50º to the penetration depth at the Aquarius incidence angles are presented in the following table.

θ	cos(θ)/cos(50)
28.7º	1.36
37.8º	1.23
45.6º	1.09

A penetration depth estimated at ~2000 m at an incidence angle of 50º can be of ~2700 m at 28.7º. In addition, the penetration depth corresponds to the depth where ~63% of the radiation comes from. The remaining radiation comes from larger depth. In conclusion, the statement p. 5923, l. 25: "Thus, the L-band radiation can emanate from hundreds to thousands of meters deep [...]" is justified. We improved it as follows:
L-band dry snow and ice dielectric losses are very small (e.g., Mätzler, 1987; Warren et al., 2008), and the L-band radiation ***may*** *emanate from one to two orders of magnitude deeper than the radiation observed at 6.9 GHz (Surdyk, 2002).* ***Moreover, penetration depth increases as the incidence angle decreases. Thus, the L-band radiation observed by Aquarius sensors, with relatively low incidence angles down to $\sim$29$\mathrm{^o}$, can emanate from hundreds to thousands of meters deep*** *[...].*

P5924 L9 ... "three L-band radiometers..." : we understand later that there are 3 beams at respectively 3 incidence angles. Is there 3 different antennas? Better introduce this aspect here (later in the text, homogenize the terms: radiometer vs beam?).
We try to make a clear distinction between the term radiometer and beam. Throughout the manuscripts, we use only the term radiometer when referring to radiometer observations, and to the term beam when

referring the scatterometer observations at different incidence angles. We clarified the description of the sensors with this new paragraph:
Aquarius has one fixed dish, and it operates three L-band radiometers at three incidence angles, each providing Brightness Temperature (TB) at 1.413 GHz. The radiometers have one feed horn each, and they operate independently (with different electronic systems), hereinafter referred to as radiometer 1, 2, or 3 depending on the incidence angle.

Aquarius also has one scatterometer providing Normalized Radar Cross Section (NRCS) at 1.26 GHz (Yueh et al., 2012). The one scatterometer uses the same three feed horns as the radiometers, and its observations are thus coincident with the radiometers' observations. Hereinafter, we refer to NRCS observations from beam 1, beam 2, and beam 3 depending on the incidence angle. A finer description of the sensors is provided in Sections 2.1 and 2.2.

P5924 L12 The scatterometer frequency is at 1.26 GHz: why not 1.4 GHz? (give a reference here)
We added the following reference (see above for its inclusion in the text):
Yueh, S., Fore, A., Freedman, A., Chaubell, M. J., Tang, W., and Neumann, G. "Aquarius Scatterometer Algorithm Theoretical Basis Document, Version 1, Aquarius Project Document: AQ-014-PS-0019", Tech. Rep. AQ-014-PS-0019, NASA and CONAE, 2012.

We added explanation in section 2 (page 5927 when describing the scatterometer):
The Aquarius scatterometer does not operate at the same frequency as the three radiometers because the frequency band 1.400 -- 1.427 GHz is protected for passive sensors on Earth exploration satellites and radio astronomy space research (Radio Regulation, 2012). Moreover, operating the scatterometer at a slightly lower frequency protects the radiometer from direct contaminations.

Radio Regulation, Vol. 1: Articles (2012), International Telecommunication Union, pp 424, ISBN 978-92-61-14021-2.

P5925 L3 ..." temporal scale ... appropriate for studying the Earth's polar regions." The choice of averaging the data over 7 days is more a technical than a scientific choice. Indeed, as described later in the second part, the authors outline several times that some events that modify the signal (the brightness temperature TB and/or the Radar cross section NRCS) occur at a lower temporal scale than at a weekly scale: - melt/refreeze event at Summit , Greenland; - surface roughness variation (due to daily wind-induced variation); - sea ice cover evolution... The weekly scale is certainly very interesting for a lot of studies (in particular for long term inter- annual variations), but this could be a limitation for some particular cases. Thus to introduce this aspect more clearly as a technical constrain rather than as a scientific choice (the later not yet clearly demonstrated), and recall this limitation in the conclusion.
As mentioned page 5929, line 11: *The temporal resolution of the gridded product was defined by the time of revisit: seven days.* To clarify this aspect in the introduction, we deleted "weekly" page 5925, line 3, and added:
According to the orbit and sensor characteristics, the temporal resolution of the product was set to one week, corresponding to the time of revisit. Since the Aquarius' sensors are in a push-broom alignment, weekly-gridded product provides the largest spatial coverage.

A similar addition was made in the conclusion:
According to the orbit and sensor characteristics, the temporal resolution of the product was set to one week, corresponding to the time of revisit.

P5926 L 7 beam vs radiometer?

The distinction between beams and radiometers was clarified. See previous the response to a previous comment. Consistency throughout the manuscript was checked.

P5926 L13 " The higher Aquarius incidence angle..." not lower?

Space-based radiometers like SSM/I and AMSR-E operate at incidence angles of 53 – 55º, whereas the radiometers onboard Aquarius operate at 29.2º , 38.4º , and 46.3º. They thus operate at lower incidence angle than the other radiometers.

P5927 L12 what means "stability" here?

We rephrased as follows, with a new reference:

Scatterometer's sensitivity varies with incidence angle (Table 2), and the ***calibration*** *stability is within 0.1 dB* ***(Yueh et al., 2012)****.*

Yueh, S. and 28 others, Aquarius Satellite Salinity Measurements, Aquarius/SACD Science Team Meeting, Buenos Aires, April 2012, http://www.conae.gov.ar/prensa/Eventos/Day1MORNING2/YUEH.pdf

P5927 L13 : RFI : give a reference here. How is defined the RFI flag?

We added an entire paragraph to address this question:

Both passive and active L-band observations are impacted by Radio Frequency Interference (RFI). Although the L-band satellite missions operate their radiometers in a protected spectral band, RFI is an issue, especially in the NH. Aquarius has a high radiometric sensitivity and short-time sampling that enhance detection of low level RFI. ***The detection of RFI in the Aquarius radiometer observation is based on the algorithm of Misra and Ruf (2008), which identifies individual samples of the antenna temperature that deviate significantly from the average value of nearby samples over a very brief temporal window (ms). Mitigation is accomplished in subsequent processing steps by excluding contaminated samples before averaging all presumed RFI-free observations within a 1.44-s samples which is then converted to antenna temperatures. The RFI detection algorithm is applied independently to each radiometer channel. See section 7 of Piepmeier et al. (2013) for further detailed information. The detection and mitigation of RFI in the Aquarius scatterometer observation are based on two methods described in section 8 of Yueh et al. (2012). One method is based on a sensitive on-board RFI flagging technique, and the other is a ground-based, outlier flagging method.***

The following new references were cited:

Misra, S. and Ruf, C.S, "Detection of Radio-Frequency Interference for the Aquarius Radiometer," IEEE Transactions on Geoscience and Remote Sensing, vol.46, no.10, pp. 3123-3128, October 2008.

Yueh, S., Fore, A., Freedman, A., Chaubell, M. J., Tang, W., and Neumann, G. "Aquarius Scatterometer Algorithm Theoretical Basis Document, Version 1, Aquarius Project Document: AQ-014-PS-0019", Tech. Rep. AQ-014-PS-0019, NASA and CONAE, 2012.

P5928 L15 What about the atmospheric emission and transmissivity? And the radiation from celestial (galactic) sources? (which can be strong and spatially variable at L-band, LeVine D. M. and S. Abraham (2004), "Galactic noise and passive microwave remote sensing from space at L-Band," !IEEE Trans Antennas and Propagation, vol. 42, pp. 119-129). It is not clear if the average weekly TBs are corrected for these atmospheric contributions?

The processing for the Level 2 account for all these contributions for each 1.44 s sample observation, as described in details in the references provided in the manuscript (Wentz and Le Vine 2012, Le Vine et al. 2012, and Piepmeier et al. 2013). We understand that these references can be a lot of material to go through and that critical information about the product should also be reported in our manuscript for convenience. We tried to provide additional details about the data processing to address these specific points. Nevertheless, we hope the reviewer will understand the need to keep the description of the Level 2 processing as succinct as possible.

It should be noted that the atmospheric correction varies very little at L band. The surface pressure has the largest influence, but its impact on the variability of atmospheric emission is only a fraction of a Kelvin for pressure values found near sea level. At higher altitudes, with the large decrease in pressure, the atmospheric emission still varies by less than 1 K. This atmospheric correction is applied in the Level 2 product.

The text was changed to:
The Level 2 TB product is computed after empirical calibration of the measured antenna temperatures against a forward radiative transfer model over ocean surfaces ***(Le Vine et al., 2011). More details about the Level 2 processing can be found in Wentz and Le Vine 2012, Le Vine et al. 2012, and Piepmeier et al. 2013.*** *Briefly, the antenna temperatures are corrected for:*

- *the emission of extraterrestrial sources (Sun, Moon, Celestial Sky)****, that reaches directly the antenna through the side and back lobes;***
- *the effect of the integration over the antenna gain patterns;*
- *the Faraday rotation;*
- *and atmospheric effects* ***(upward emission, downward emission reflected at the surface, and attenuation of the signals from the surface).***

These corrections *provide the TBs at the Earth's surface. Over the oceans, the TB is corrected for the effects of surface roughness* ***(including the reflected/scattered galaxy and Sun)*** *using the scatterometer observations, and a simulated wind speed. The remaining TB for a smooth surface is converted into SSS using ancillary data for the sea surface temperature, and a model for the sea water dielectric constant.* ***Data sets provided in the weekly-polar-gridded products described here do not apply corrections to the Level 2 product.***

P5929 L1 It appears that the incidence angle and the orbit are also 2 other important characteristics of the product?
The incidence angle and the orbit during which the Aquarius observations were made are important characteristics when interpreting the data, but they do not define the grid characteristics (projection, spatial and temporal resolutions) of the product which are discussed in this paragraph. We tried to clarify by changing the beginning of the sentence from:
A gridded product has three main characteristics: [...]
To:
To create a gridded product the projection, spatial resolution, and temporal resolution must be specified.

P5931 Table 3 : I suggest to recall the meanings of the abbreviations in this Table 3 (NFP, ICEF, NRCF); to define the beams; SSS is a combined orbit product? Give the source of the SSS data. Even well described in the text, this will help the reader to synthetize clearly all the parameters of the proposed database in this Table.
Every abbreviation is now recalled in the table footnote. The source of TB, SSS, NRCS, and ICEF is now mentioned in the caption. We also mentioned the data source, all were extracted from the Level 2

product.

P5932 L11 Why differences in orbits are seen? (basic explanation here)
We added the following explanation:
The Aquarius Level 2 product version 3.0 has reduced the differences, though not completely eliminated them. While the origin of these differences has not been established yet, it is likely to be in part due to the reflected/scattered galaxy, and RFI contaminations. It is possible that residual RFI and sky contaminations impact the empirical calibration performed over the oceans, and therefore create biases dependent on the type of orbit. The correction for the reflected galaxy has been found insufficient, and an empirical adjustment was introduced for version 3.0. The galaxy contamination is very dependent on the type of orbit, because it is only significant when the contribution comes from a very limited region of the sky (e.g. the galactic plane). The different orientations of the beams for the ascending and descending passes, therefore, lead to different sections of the sky being seen by the reflected beam, and hence, very different contaminations. As illustrated in Figure 1, RFI is also very sensitive to beam orientation whether the spacecraft is in ascending or descending orbit. Some regions of significant RFI contaminations over the oceans are off the East coast of North America, and the Western European coast. Depending on the orbit type (ascending or descending), the antenna side lobes are pointing inland (where most of the RFI sources are located) or toward the open ocean. SSS retrievals in these regions likely have larger differences between the ascending and descending orbits.

P5932 L14 The effect of snow layering effect (variation of density layer, i.e. refractive index) is also very important in the Tb signal. See below.
For clarity, the sentence was changed from
Microwave observations are sensitive to snow properties (e.g. liquid water, grain size, density, temperature) (Ulaby et al., 1986; Mätzler, 1987) and to their ***vertical variations****.*
To
Microwave observations are sensitive to snow properties (e.g. liquid water, grain size, density, temperature) (Ulaby et al., 1986; Mätzler, 1987) and to their ***variations with depth (layering) (Zwally, 1977, Brucker et al., 2011****.*

P5932 L20 "first time" ? : SMOS is now also providing L-Band data over GIS and AIS ?
The sentence was "*This section aims at providing for the first time an overall presentation of the Aquarius weekly-polar-gridded TB over the Greenland Ice Sheet (GIS) and Antarctic Ice Sheet (AIS).*" "first time" refers to the presentation of Aquarius weekly-polar-gridded TB, and not L-band TB which would indeed be erroneous since SMOS operated before Aquarius. We deleted our statement.

P5933 Add (GIS) and later (AIS) in the title section
(GIS) and (AIS) were added in the two section titles.

P5933 L20 The lowest Tb : H or V? When?
Throughout the paragraph, we clarified the polarization (here V) and the radiometer. The sentence was rephrased as follows:
Inland (where snow is mostly dry), *the lowest TBs at V polarization are found* ***year round*** *in the central part of south Greenland at latitudes between ~62°N and ~68°N* ***(radiometer 3 observations are*** *~180 K* ***at V polarization, Figure 1****).*

P5935 Section AIS : Do not discuss the mixed contaminated pixels (continent and ocean), not really interesting for a general overview of the signal variation. Stay focus on the ocean in one part, and on

the continental zone in the other part. For the continental zone, the melting zones at low elevation have a very different behavior compared to the central dry zone. In the wet zone, the signal is dominated by the emissivity variations caused by the surface melting and then by surface ice layers. In dry zone, it is now known that the density profile plays an important role (in particular at H pol) and could explain the very low TB measured. Also variations in density between layers could explain the observed differences between H and V polarizations depending of the incidence angle. I suggest to add TB values at different angles in the Figure 7 (TB at Dome C). This will also promote the interesting adding values of the datasets at different incidence angles provided in the proposed Aquarius database.
We paid particular attention to keep the discussion of mixed grid cells to its minimum. However, at least one or two sentences about the low TB observations in the coastal regions are needed because they are predominant features. We think that clarifying up front the origin of these patterns will allow the readers to focus on the other (more interesting) patterns that have a lower visual attraction.

We added some text page 5935, line 9 discussing the microwave emission of the melt and dry-snow zones:
Low elevation regions experiencing seasonal melt events have a different passive microwave signature than the dry-snow zone at higher elevations. As described in Section 3.1 for observations over the GIS, TB time series in the melt zone are characterized by sharp TB variations due to the presence of liquid water. Once the liquid water content decreases, TB decreases too. Depending on the intensity of the melt event, snow properties (such as density) may significantly change, which modify the microwave emission. When assuming a specular reflection, reflection coefficient of dry snow depends on permittivity values (i.e. the real part of the dielectric constant), which in turn mostly depends on density. Thus, for observations over dry snow, density at the air/snow interface as well as vertical density variation within the firn/snow controls in part the difference between the vertical and horizontal polarizations.

Regarding the TB time series at the three incidence angles, and the two polarizations, we refer to Brucker et al. (2014, IEEE TGRS). This study presents the TB observed by each radiometer at Dome C, and addresses specifically the TB variations. It also contains a discussion about the influence of the snow surface properties (e.g. density) at the different incidence angles. The following text was added:
TB V increases as the incidence angle increases, whereas TB H decreases as the incidence angle increases. A detailed discussion of the main temporal TB variations and the effect of snow surface metamorphism on L-band TB observations is presented in Brucker et al. (2014a). The good sensitivity of Aquarius' radiometers made it possible to relate the significant TB variations of up to 2.5 K observed at Dome C in summer to changes in snow surface properties. The main TB variations correspond to periods with hoar crystals on the surface. Therefore, in spite of the deep penetration of the L-band radiation, evolutions of the snow properties near the surface, that usually change rapidly and irregularly, influence L-band observations.

If the reviewer still would like us to address further this topic in the present manuscript, we can add a figure and a description over the Mary Byrd Land, or over other regions of interest monitored by all radiometers. Nevertheless, we believe that information in figure 8 and the above text are sufficient.

P5937 Section Sea Ice. Include here some basic statements : sea ice increase leads to increase emissivity (decrease dielectric constant) and thus increase TB ...
We added the following paragraph with basic elements regarding passive microwave remote sensing of sea ice:
Microwave observations depend on the physical (and dielectric) properties of sea ice and its overlying snow cover, both of which evolve with time. The dielectric constant

of sea water is very high, and the dielectric loss increases as salinity increases, resulting in large surface reflectivity and low microwave TB of ice-free ocean (Dinnat et al., 2002).

Permittivity and dielectric loss values of sea ice are significantly lower, resulting in higher emissivities. Hence, TB increases as the ice fraction in the field of view increases. Experimental permittivity and dielectric loss at 1 GHz show decreasing values as brine volume decreases (Hallikainen and Winebrenner, 1992). Thus, TB values are higher over multi-year sea ice than seasonal sea ice, as brine is released. Microwave observations also depend on large scale properties of the sea ice cover, whether the sea ice cover is packed or fractured with the presence of leads (open water or new/thin ice).

Dinnat, E. P., Boutin, J., Caudal, G., Etcheto, J., and Waldteufel, P.: Influence of sea surface emissivity model parameters at L-band for the estimation of salinity, International Journal of Remote Sensing, 23, 5117–5122, doi:10.1080/01431160210163119, 2002.

Hallikainen, M. and Winebrenner, D. P. (1992) The Physical Basis for Sea Ice Remote Sensing, in Microwave Remote Sensing of Sea Ice (ed F. D. Carsey), American Geophysical Union, Washington, D. C.. doi: 10.1029/GM068p0029.

P5937 L28 "noise" is maybe not the appropriate term here: "variability"?

Yes, the term variability is more appropriated. We corrected the sentence.

P5939 Ice sheet NRCS signal: better precise the direction of the variation : NRCS increase or decrease ?

We added the following page 5939, line 13:

Overall, NRCS values decrease (i.e. become more negative) from the coast toward the highest elevations of the GIS.

We added the following page 5940, line 2:

At the three polarizations, NRCS observations reveal interesting differences between the two sides of the west Antarctic ice divide. ***On the Peninsula side,*** where snow accumulation ***is high, low NRCS values are observed. On the Ross ice shelf side, where snow accumulation is lower, NRCS values are higher.***

P5939 L27 Add "not shown" for the correlation discussed here.

As response to the other reviewer, we added a table to presented here. We thus did not add "not shown".

P5940 Sea ice effect on NRCS variation? Dielectric variation of the brine?...

We added the following basic physical explanations:

The large field of view of Aquarius scatterometer in conjunction with the spatial heterogeneity of sea ice make it challenging to attribute the changes in NRCS to specific geophysical properties. At C band, it was shown that the NRCS variation to changes in ice properties (such as brine volume, and wetness) depends on the incidence angle (Scharien et al., 2010). Using brine-snow dielectric parameterizations based on a dielectric mixture model for snow with brine inclusions (Drinkwater and Crocker, 1988), dry snow permittivity increases as brine volume increases, temperature increases, and density increases. Brine volume has the largest influence on the permittivity of dry snow.

*Scharien, R. K., T. Geldsetzer, D. G. Barber, J. J. Yackel, and A. Langlois (2010), Physical, dielectric, and C band microwave scattering properties of first-year sea ice during advanced melt, J. Geophys. Res., 115, C12026, doi:*10.1029/2010JC006257.

Drinkwater, M. R., and G. B. Crocker (1988), Modeling changes in the dielectric and scattering properties of young snow covered sea ice at GHz frequencies, J. Glaciol., 34(118), 274–282.

P5940 TB variation with frozen soil ? Significant decrease of dielectric constant of the frozen soil leading to increase emissivity and thus to increase TB...add the recent Mironov et al analysis on frozen soil. Also Mironov clearly shows strong differences between the TB variations as a function of incidence angle. Mironov V.L., K. V. Muzalevskiy, and I. V. Savin (2013), Retrieving Temperature Gradient in Frozen Active Layer of Arctic Tundra Soils From Radiothermal Observations in L-Band—Theoretical Modeling

, IEEE J. of Topics in Applied Observations and Remote Sensing, 6(3), 1781-1785.

We added the following basic physical explanations:

For a given frequency, polarization, and incidence angle, the TB of bare soil is a function of physical temperature, and soil moisture. From a theoretical standpoint, Mironov et al. (2013) investigated the possibility of retrieving both the surface temperature and the temperature gradient of the Arctic tundra soil (active layer) from L-band TB. Simulations of refractive index and normalized attenuation coefficient for different soil temperatures and moistures reveal a noticeable variation as soil temperature becomes positive (Mironov et al., 2013). This variation leads to an increase in TB and allows the determination of soil physical state using L-band TB observations.

P5941 SSS analysis. It is not clear why the SSS data are not flagged to avoid pixels with high ICEF values?

There is not a unique view of what constitutes a high ICEF and, more importantly, the ICEF can be quite uncertain as we show in the initial Fig. 11. Avoiding pixels based on an arbitrary ICEF threshold based on a sometimes inaccurate ICEF could result in removing SSS signal. In the present state of knowledge about ice, we think it is more valuable to provide the information about ICEF and let the users decide for themselves which pixels to exclude for their analysis. All the SSS and ICEF values present in the Level 2 product is considered unless flagged invalid.