Introduction & Motivation

For nearly a year, the drifting iceberg was tracked on the SMOS data.

Goals

- Examine the motion of spotted object: trajectory, averaged speed, distance...
- Examine the iceberg evolution in terms of brightness temperature measured by SMOS.
- Examine polarimetric characteristics for the DGG pixels corresponding to tracked iceberg.

Approach

- SMOS Level 1c browse Land and Sea Data were merged in order to produce weekly averaged global maps for the first Stokes parameter. This provides relevant insight into dynamics of processes observed by SMOS. Temporal evolution of the first Stokes parameter revealed set of several DGG pixels drifting from the Ross Sea eastwards. Comparison with ENVISAT images confirmed that spotted object is an iceberg (Figure 1).
- Figure 2 shows four snapshots with marked iceberg path (from January to December, 2011). In order to enhance floating object, the colour scale was modified on purpose. It is further applied to temporal analysis of (1).
- For the whole examined dataset, SMOS DGG pixels corresponding to the tracked iceberg, were extracted, in order to examine temporal evolution of brightness temperature. (see Figure 7)

Polarimetric characteristics, iceberg position, drift velocity - Analysis & Results

Polarimetric characteristics for selection of DGG pixels belonging to the iceberg were grouped into separate sets according to location and time criteria.

Figure 3: Selected set of polarimetric characteristics for the central pixels of the tracked iceberg.

In order to roughly estimate iceberg velocity, the distance between two consecutive locations has been computed with basic haversine formula. Estimated velocities are plotted along the trajectory (see Figure 5). This result should be compared with the same plot but for the first Stokes (Figure 6). Results from figures 5 and 6 are combined in the Figure 7, showing temporal evolution of V_{io} and (1). The line in the Figure 7 marks the averaged velocity V_{io} = 6.22 km/day computed with assumption about the great-circle distance (white line in the Figure 5).

Discussion & Conclusions

- The derived iceberg motion indicated significant change of direction in the middle of September (2011), when the iceberg drifted to more southerly position. Drifting from Antarctica, was accompanied with subsequent decrease of the brightness temperature. At the end of December, the signatures of detected iceberg were barely apparent, making further tracking not feasible.
- It seems highly probable that SMOS documented the final stage of evolution of B-15 iceberg, before its calving. Estimation of velocity, V_{io}, was made with the haversine formula. V_{io} is noted. It is mainly at final days of observations. The measurements for such an object are highly related to problems of accurate detection and positioning of the tracked object. Thus all velocities greater than 40 km/day should be rejected and not considered as the physical values.
- Distances, integrated along the trajectory: D_{g-c} = 2172 km, obtained from great-circle assumption. D_{g-c} = 2172 km
- Orientation analysis in the initial stage of tracking, based on various parameters, precision and it is the first approach to the application of such results as MEMLS (Microwave Emission Model for Land Sea Ice) for estimation of averaged V_{io}.

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