Towards a swath-to-swath sea-ice drift product for the Copernicus Imaging Microwave Radiometer (CIMR) mission.

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Across spatial and temporal scales, sea-ice motion has implications on ship navigation, the sea-ice thickness distribution, sea ice export to lower latitudes and re-circulation in the polar seas, among others. Satellite remote sensing is an effective way to monitor sea-ice drift globally and daily, especially using the wide swaths of passive microwave missions. Since the late 1990s, many algorithms and products have been developed for this task. Here, we investigate how processing sea-ice drift vectors from the intersection of individual swaths of the Advanced Microwave Scanning Radiometer 2 (AMSR2) mission compares to today's status-quo (processing from daily averaged maps of brightness temperature).

We document that the “swath-to-swath” (S2S) approach results in many more (two orders of magnitude) sea-ice drift vectors than the “daily-maps” (DM) approach. These S2S vectors also validate better when compared to trajectories of on-ice drifters. For example, the RMSE of the 24 hour Arctic sea-ice drift is 0.9 km for S2S vectors, and 1.3 km for DM vectors from the 36.5 GHz imagery of AMSR2.

Through a series of experiments with actual AMSR2 data and simulated Copernicus Imaging Microwave Radiometer (CIMR) data, we study the impact that geo-location uncertainty and imaging resolution have on the accuracy of the sea-ice drift vectors. We conclude by recommending that a “swath-to-swath” approach is adopted for the future operational Level-2 sea-ice drift product of the CIMR mission. We outline some potential next steps towards further improving the algorithms, and making the user community ready to fully take advantage of such a product.

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