8/23/2017



AMSR2+VIIRS ICE MOTION

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Ice Motion Team

PI	Organization	Team Members	Roles and Responsibilities
J. Key	NESDIS	A. Letterly (CIMSS)	AMSR2+VIIRS ice motion development and testing
		Y.K. Lee (CIMSS)	AHI ice motion development & quality assurance
		Y. Liu (CIMSS)	Original ABI code development



Ice Motion Products Overview





Ice Motion Products Overview

Sensor	Channel	Cell Resolution	Geographic Coverage
AMSR2	89.5GhZ, h- polarized	~5km	Arctic, Antarctic
VIIRS	M15 band	~1 km	Arctic (Antarctic in development)
AMSR2+VIIRS	Blended	~1km	Arctic



- Ice motion products include brightness temperature data from AMSR2, VIIRS, or both
- Ice motion products are updated daily over their region of geographic coverage
- Weekly- and monthly-averaged ice motion vectors are available for blended products
- Future tasks include running ice motion code on additional VIIRS channels (day-night band and NCC) for blending and comparison



- Ice motion computed from satellite imagery represents the displacement between acquisition times of the two images
- An automated, maximum cross-correlation (MCC) procedure is used to track displacements over Arctic/Antarctic composites





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- The MCC procedure assumes that ice found within the target window will not deform or rotate within the range of the search window.
- This assumption is generally valid over short distances in marginal ice areas, away from constrained ice zones.
- Computation time increases exponentially as the range of the maximum expected movement increases. Knowing typical ice speeds is crucial to efficient processing.



Ice Motion Example



 VIIRS M15 imagery, 48 hours apart showing ice exiting Baffin Bay



Ice Motion Example



• The ice floe feature within the smaller red rectangle should be tracked leaving Baffin Bay



0

5

Ice Motion Example

 Blended AMSR2+VIIRS output showed ice motion southward on the same days



10

Ice Movement (km/day)

15

25

20



VIIRS+AMSR2 Ice Motion



- VIIRS provides high spatial resolution, but clouds opaque in M15 band
- AMSR2 passive microwave data added for blending



VIIRS+AMSR2 Ice Motion

- Combining AMSR2+VIIRS ice motion vectors creates output with high spatial resolution, full Arctic coverage
- VIIRS only, AMSR2 only, and blended products available for Arctic

Blended Ice Motion 2017/03/10-11





VIIRS+AMSR2 Ice Motion

Sea Ice Motion: March 13



10

15

20

- March 13
 AMSR2+VIIRS motion
 vectors are shown,
 combined with sea ice
 concentration from
 passive microwave
- Filtering vectors using ice concentration may improve spring, summer performance



Initial Validation, Path Forward



MULTI-OI / 2017-03-13

Zone: Arctic Ocean / Image: Copyright (2017) EUMETSA

Comparing AMSR2+VIIRS with OSI SAF low-resolution drift product shows qualitative similarities



Initial Validation, Path Forward

- Future capabilities include LaGrangian tracking
- Eastern
 Greenland:
 head-to-tail
 summation of
 daily vector
 motions
 (March-July)





- Future products will be expanded to other VIIRS(+) channels:
 - Day-Night Band, NCC product
- Utilize extended suite of products to create weekly/monthly ice motion climatology.
- Establish zones of intensive ice monitoring in certain regions:
 - Alaskan coastline, oil and gas exploration sites



- Product imagery and ice motion vectors (ASCII) are available for download
 - AMSR2+VIIRS blended ice motion (ftp://stratus.ssec.wisc.edu/pub/aletterly/blended_AM SR2_VIIRS/)
 - VIIRS standalone ice motion (ftp://stratus.ssec.wisc.edu/pub/viirs_icemotion/arctic /)
 - AMSR2 ice motion (ftp://stratus.ssec.wisc.edu/pub/amsr2_icemotion/24 _hour/images/Arctic/)