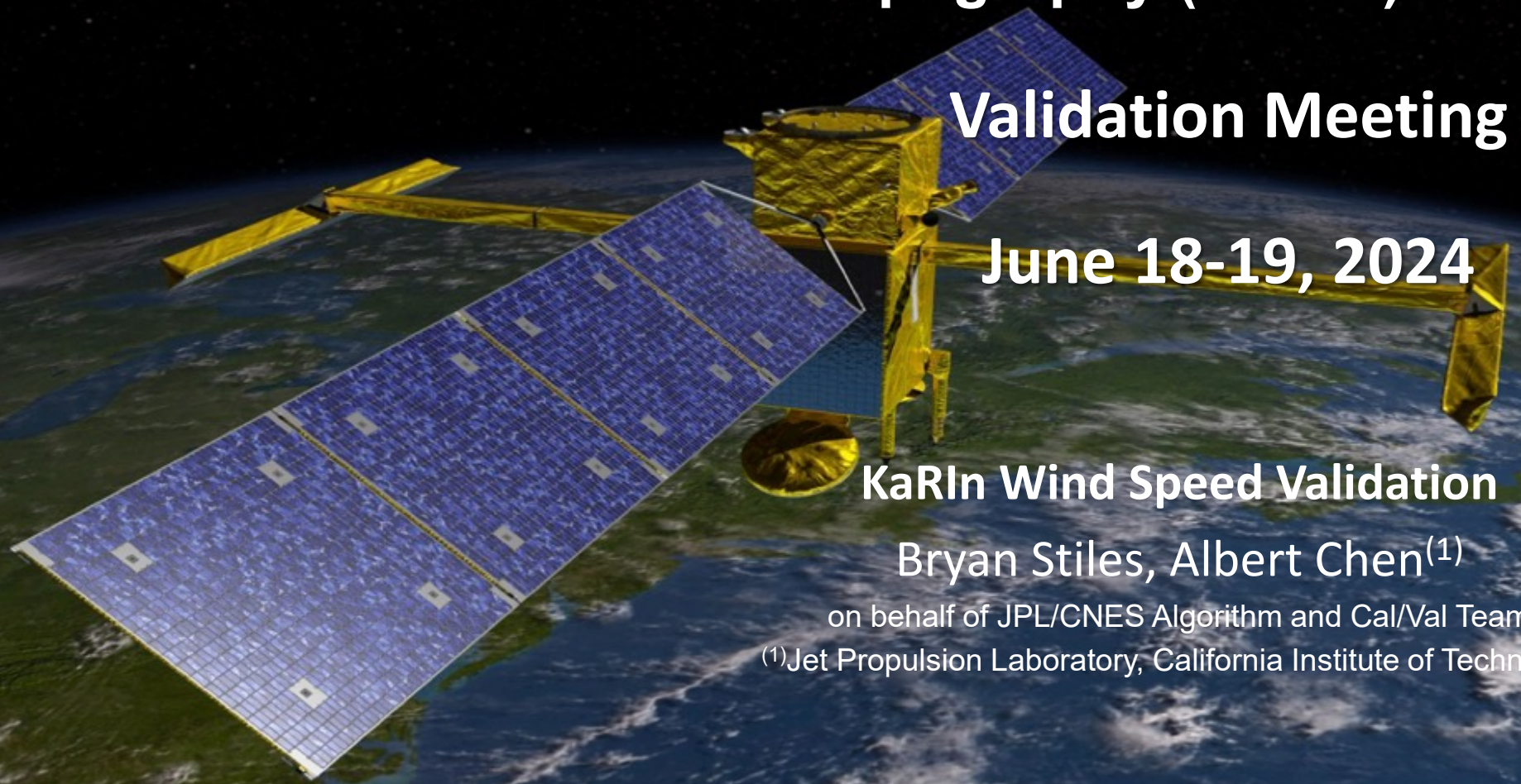
National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

Surface Water and Ocean Topography (SWOT) Mission

Validation Meeting

June 18-19, 2024



KaRIn Wind Speed Validation

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on behalf of JPL/CNES Algorithm and Cal/Val Team

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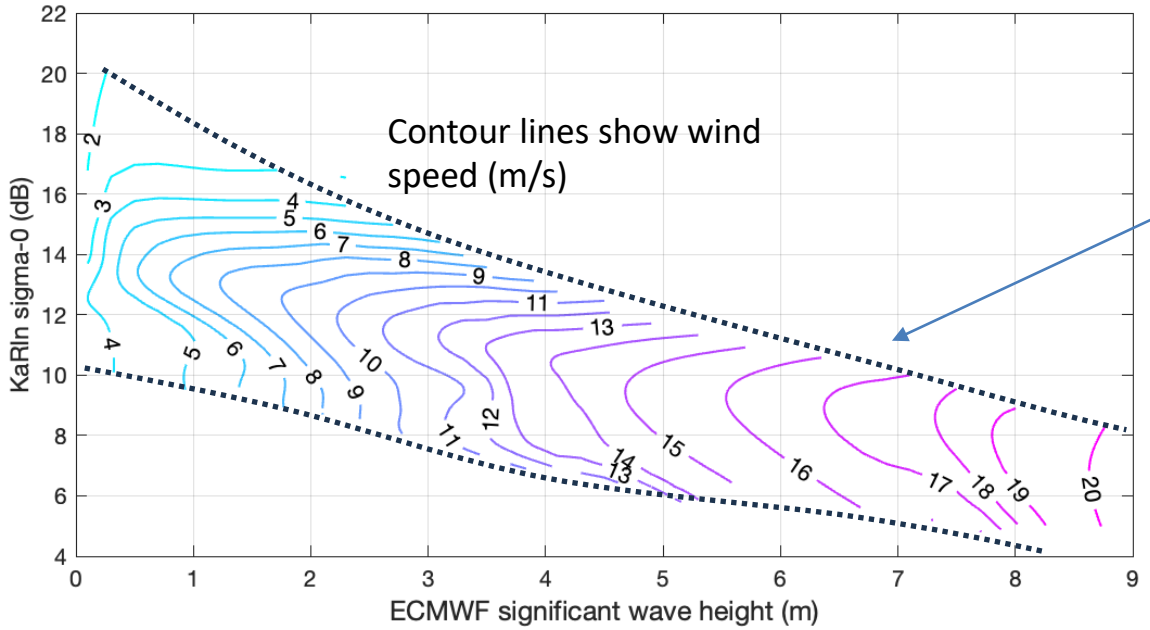
Wind Speed

- KaRIn wind speed is computed using an empirically-derived geophysical model function (GMF).
  - For Version C, the GMF was trained on ECMWF wind speed.
  - For the Developmental Version, the GMF is being further refined by training on Advanced Scatterometer (ASCAT) wind speed.
- The GMF gives wind speed as a function of sigma0, SWH, and incidence angle.

Version C Wind Speed GMF for incidence angle 2.5 deg
(approx. +/- 30 km cross-track)

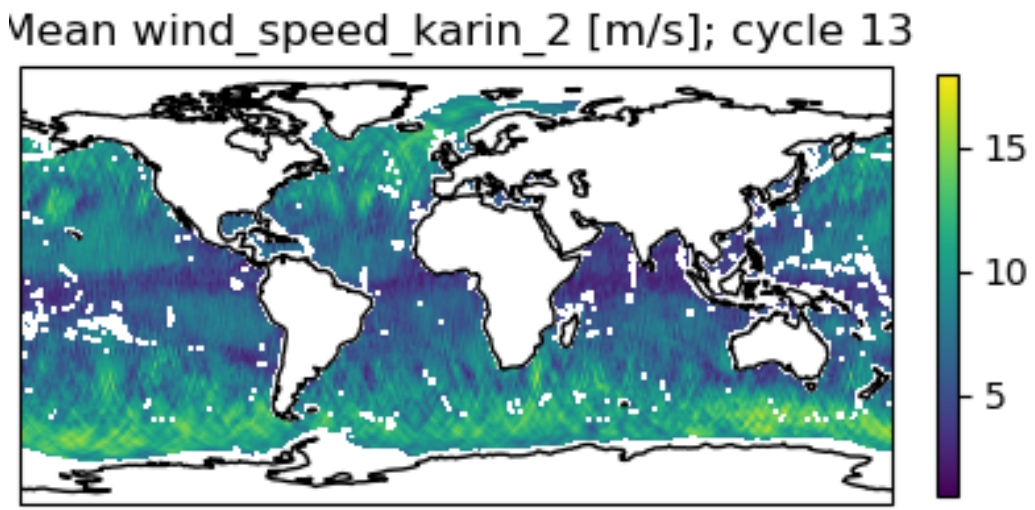


wind_speed_karin uses *sig0_karin*.
wind_speed_karin_2 uses *sig0_karin_2*.

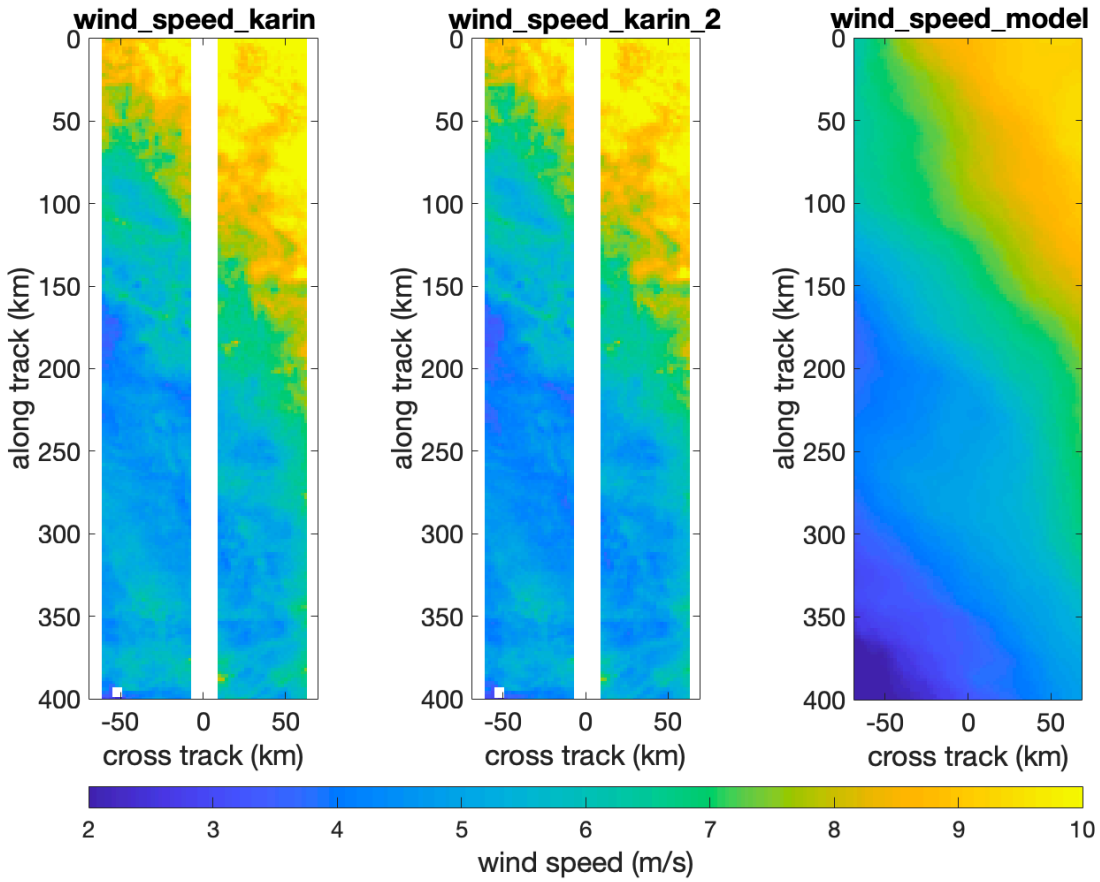
~98% of data fall within the dotted lines. The GMF is still defined but less reliable outside this region.

Wind Speed

- KaRIn and model wind speeds typically show reasonable agreement.
- Global mosaic shows results generally consistent with other wind speed measurements.

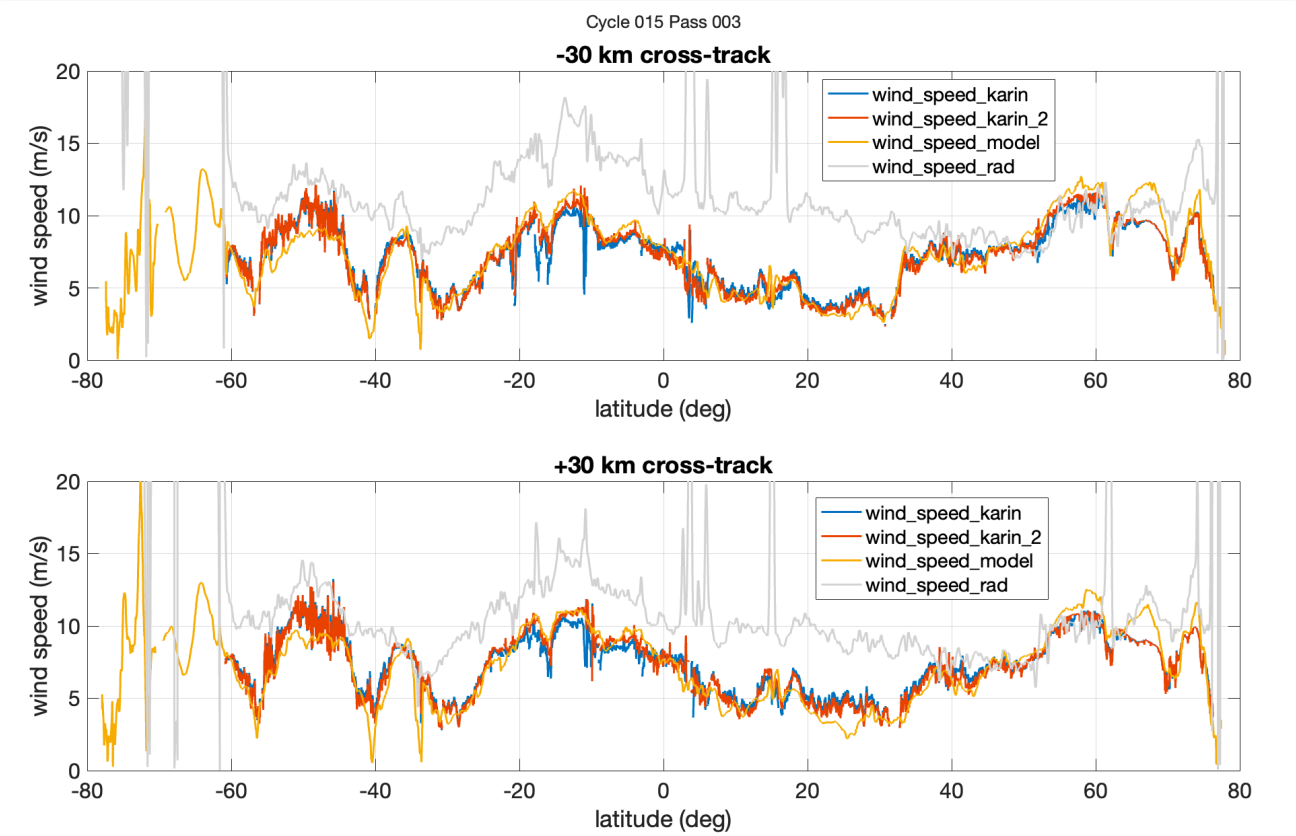


Cycle 015 pass 003, around 44.6° S



Wind Speed

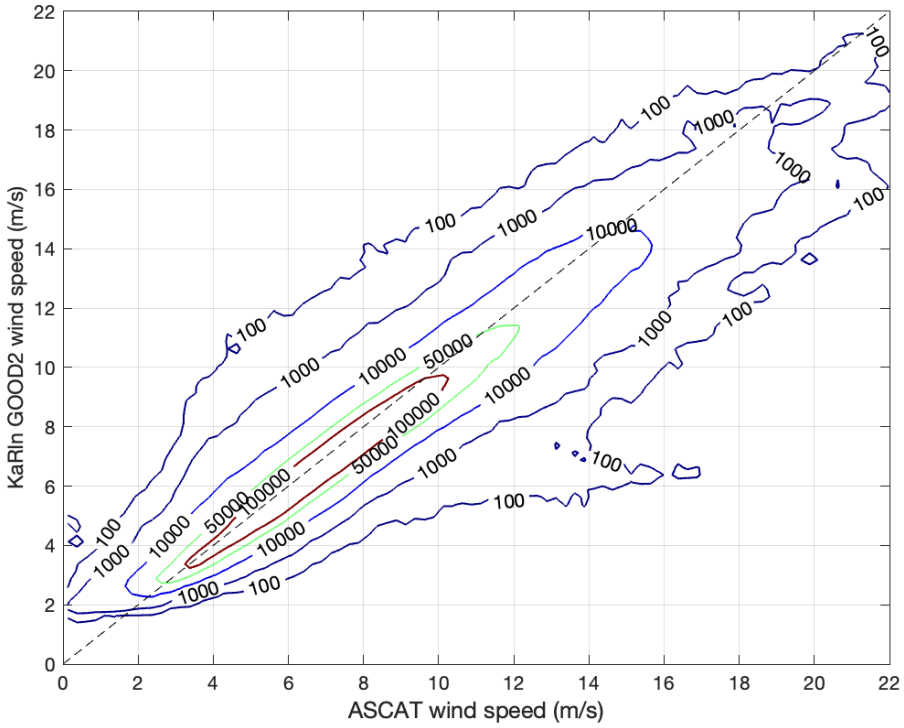
- L2 product also contains radiometer wind speed, but this is less accurate due to radiometer limitations.
- In Version C, the reported radiometer wind speed is left/right flipped (fixed in Developmental Version).



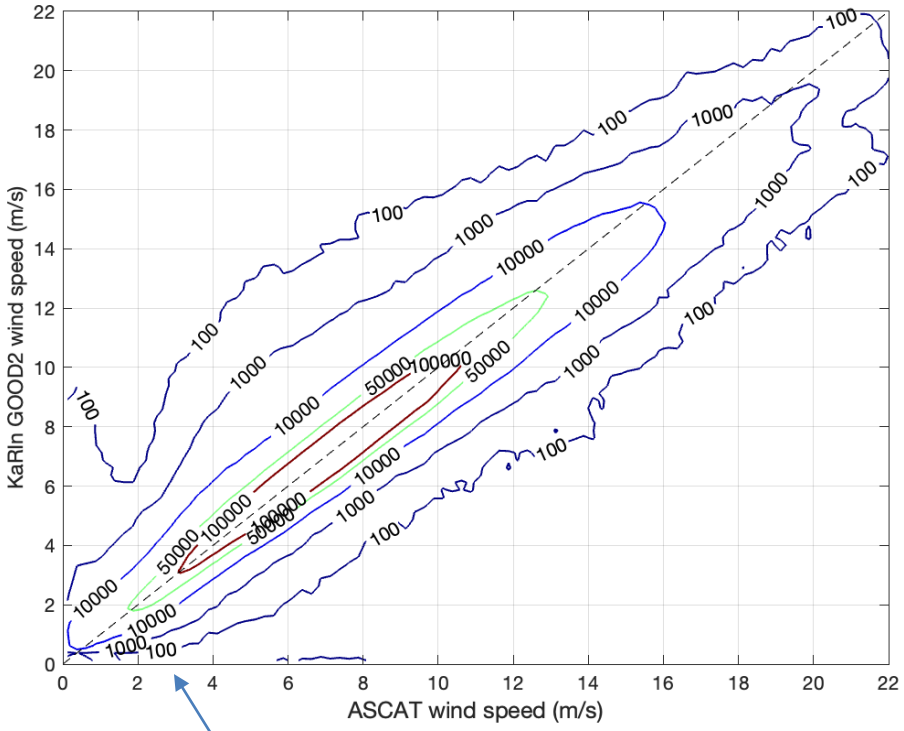
Wind Speed

- KaRIn wind speed validated by comparison against co-located ASCAT wind speeds, with time differences <30 min.
- Crest of joint histogram falls close to 1-to-1 line.

Version C



Developmental Version

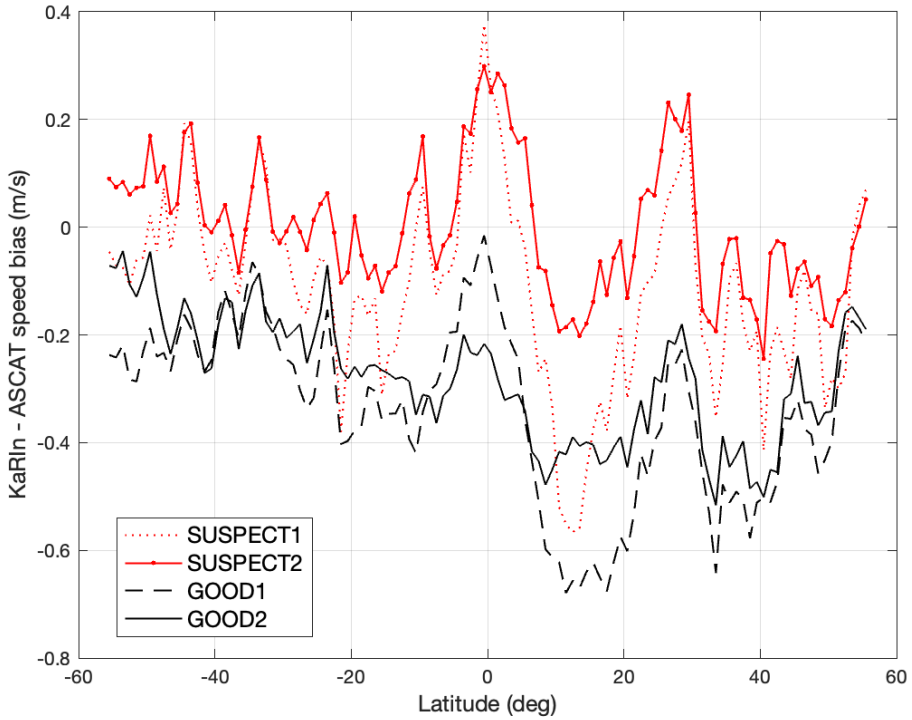


Improvement most notable at lower wind speeds.

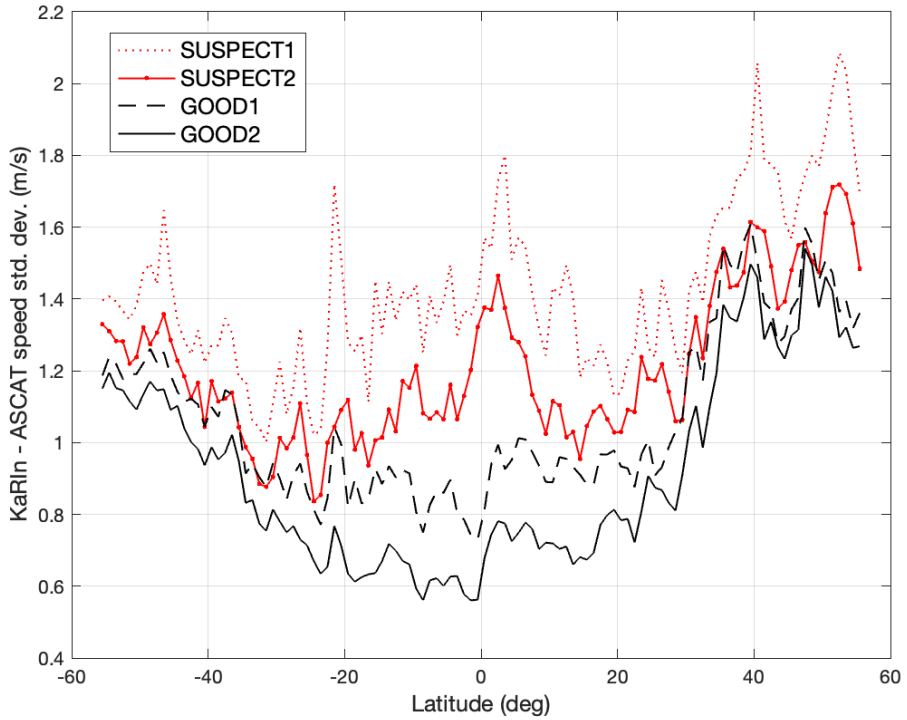
Wind Speed

- KaRIn wind speed performance shows minimal latitude dependence.
  - Bias between KaRIn and ASCAT has minimal latitude dependence.
  - Std.Dev. of difference has minimal latitude dependence.
- Validation focused on -55° S to 55° N, to avoid sea ice.

Bias between KaRIn and ASCAT



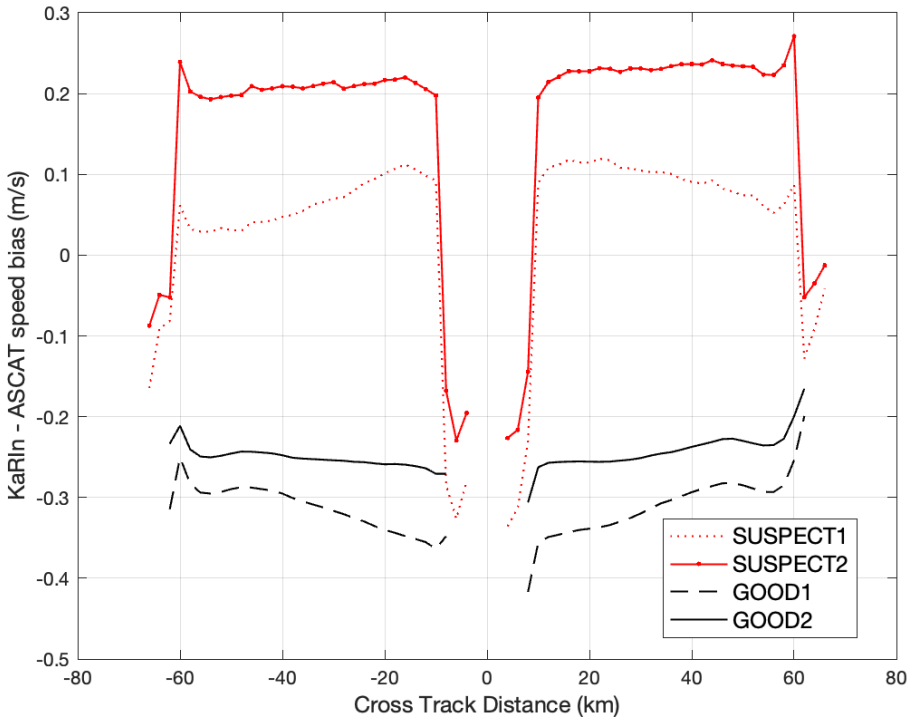
Std.Dev. of difference between KaRIn and ASCAT



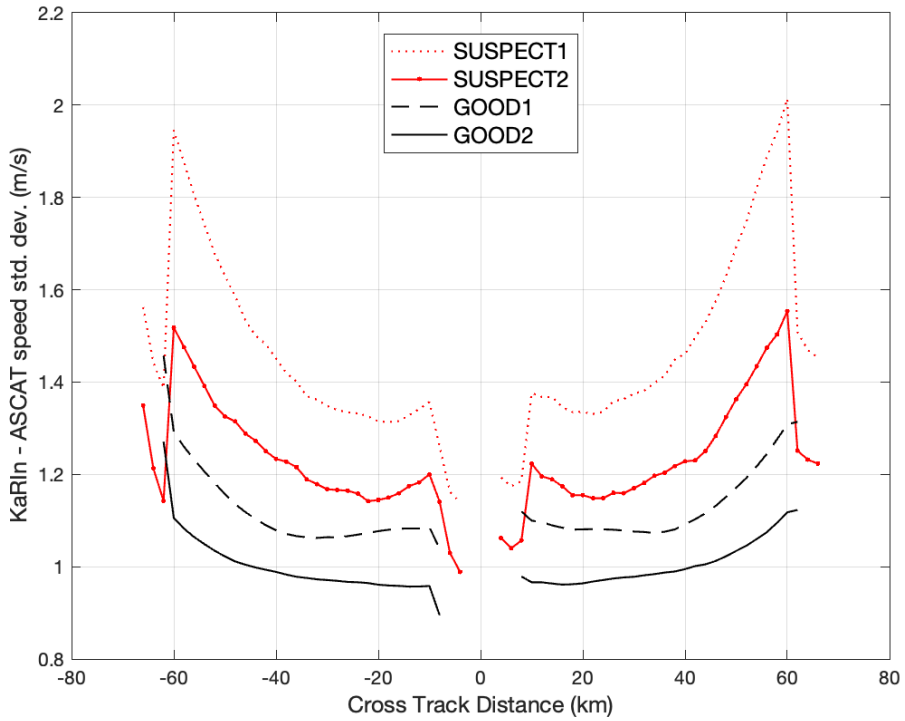
Wind Speed

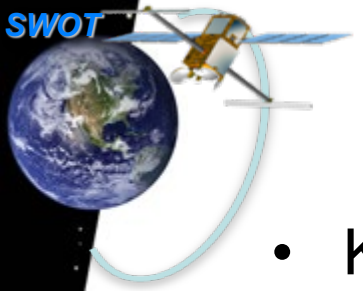
- Bias between KaRIn and ASCAT has minimal cross-track dependence.
- Std.Dev. of difference is somewhat worse at outer edges of swath.

Bias between KaRIn and ASCAT



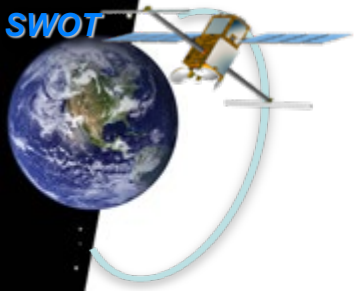
Std.Dev. of difference between KaRIn and ASCAT





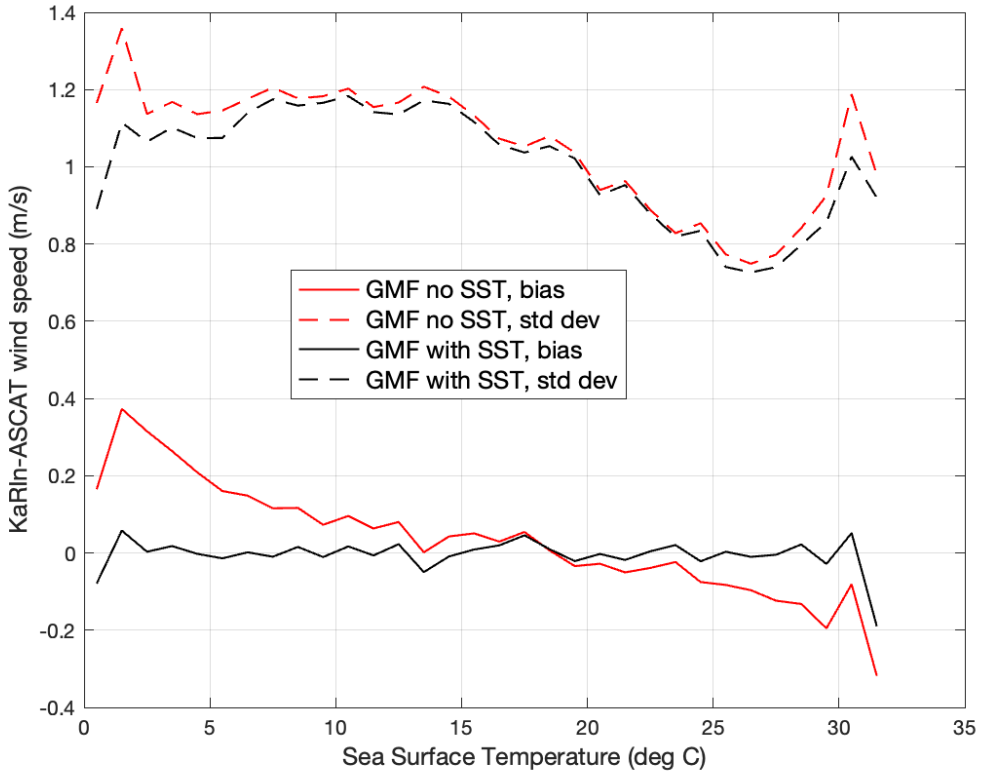
Summary

- KaRIn wind speed agrees well with ECMWF and has been validated by comparison against ASCAT.
- The KaRIn wind speed measurement will be further refined by improvements to the geophysical model function (GMF) in future releases.



Backup

Using SST for KaRIn wind speed



- To avoid sea-ice contamination the data used to make the plots excluded regions poleward of 55 degrees.
- The following data was also omitted
  - ASCAT/SWOT colocations separated by more than 30 minutes
  - Data with 20-km of coast or not over open ocean
  - Data with ssh_karin_2_qual > 0