

## Sea Ice motion/drift

- Download daily data from: <https://nsidc.org/data/NSIDC-0116/versions/4>
- u, v are in **cm/s** and not zonal/meridional but along the x/y directions (**horizontal/vertical**)
- To rotate use a rotation matrix: <https://nsidc.org/support/how/how-convert-horizontal-and-vertical-components-east-and-north>
- >> H1\_Sldrif\_regrid.py
  - Data are daily; compute monthly averages at the grid points where there are more than 20 data per month
  - Regrid from 25 km x 25 km to the altimetry grid 0.5 lat x 1. Lon

The directions in the data set are:

- u: toward the right on the grid
- v: upward (toward the top) on the grid
- East is clockwise
- North is outward from the center of the grid

To compute East and North components, apply a rotation matrix, which results in:

- E:  $u * \cos L - v * \sin L$
- N:  $u * \sin L + v * \cos L$ 
  - where L is the longitude
  - Note the negative sign in the second term of E

This can be checked by verifying that:

- at L=0°, a u-only vector (to the right) corresponds to east (positive E)
- at L=0°, a v-only vector (toward the top) corresponds to north (positive N)
- at L=90°, a u-only vector (to the right) corresponds to north (positive N)
- at L=90°, a v-only vector (toward the top) corresponds to west (negative E)

- downloaded: 3 April 2020
- Citation: Tschudi, M., W. N. Meier, J. S. Stewart, C. Fowler, and J. Maslanik. 2019. Polar Pathfinder Daily 25 km EASE-Grid Sea Ice Motion Vectors, Version 4. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: <https://doi.org/10.5067/INAWUWO7QH7B>. [3 April 2020].

## Sea Ice Concentration

- downloaded monthly data from: <https://nsidc.org/data/NSIDC-0051/versions/1> [Sea Ice Concentrations from Nimbus-7 SMMR and DMSP SSM/I-SSMIS Passive Microwave Data, Version 1; same as in Tiago's thesis, but monthly instead of daily]
- citation: Cavalieri, D. J., C. L. Parkinson, P. Gloersen, and H. J. Zwally. 1996, updated yearly. Sea Ice Concentrations from Nimbus-7 SMMR and DMSP SSM/I-SSMIS Passive Microwave Data, Version 1. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: <https://doi.org/10.5067/8GQ8LZQVL0VL>. [02 April 2020].
- Processing steps
  - > Convert map projection coordinates to geodetic ones
  - > Interpolate data from 25 km stereographic res to altimetry grid 0.5 lat x 1 lon

## Intersatellite offset

- > overlap period: November 2010 - March 2012
- > using the gridded DOT from Envisat and CS2:

- compute mean dynamic topography (MDT) from the Envisat data over the overlap period:

$MDT_{env} = \text{mean of } DOT_{env} \text{ during } 11.2010-03.2012$

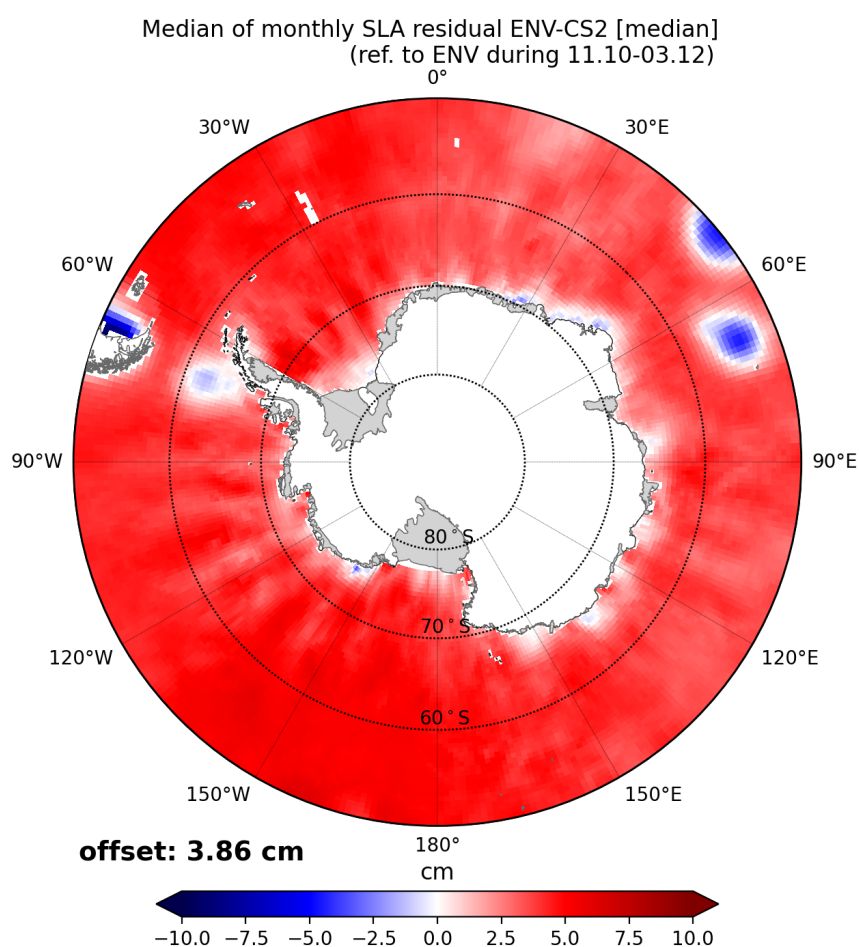
- compute anomalies in ENV and CS2 relative to  $MDT_{env}$ :

$SLA_{env} = DOT_{env} - MDT_{env}$

$SLA_{cs2} = DOT_{cs2} - MDT_{env}$

- for every month, compute (maps of) differences between  $SLA_{env}$  and  $SLA_{cs2}$ ; this produces **maps of monthly SLA differences**

- compute the **median** of these SLA differences in every grid cell (the mean gives a more spatially uniform residual) [this produces the figure below]



- compute the area-weighted average of the median of the SLA differences - this is the **intersatellite offset value [3.86 cm]** that is then applied to the binned CS2 data

- finally, the monthly gridded ENV DOT and the corrected CS2 DOT are averaged in the overlap period to merge the two satellites

\*\* the blue blobs in the figure should ideally not be there but I couldn't find a way to remove them and I just discarded them from the area-weighted average