Assessment of Near Real-Time OSCAR Surface Currents

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Introduction

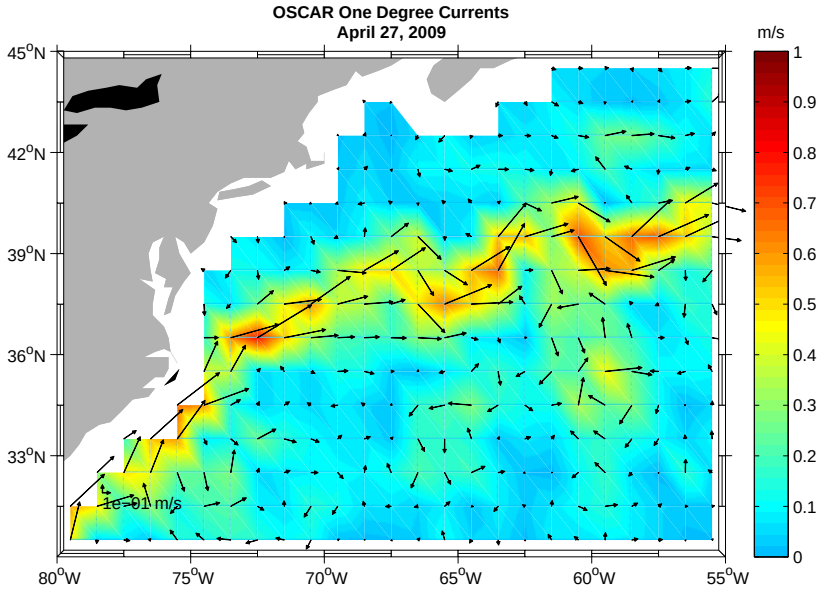
Ocean Surface Currents Analyses Realtime processing system (OSCAR) is a satellite-derived surface current database based on a combination of quasi-steady geostrophic, wind-driven dynamics, and thermal adjustment (Bonjean and Lagerloef, 2002).

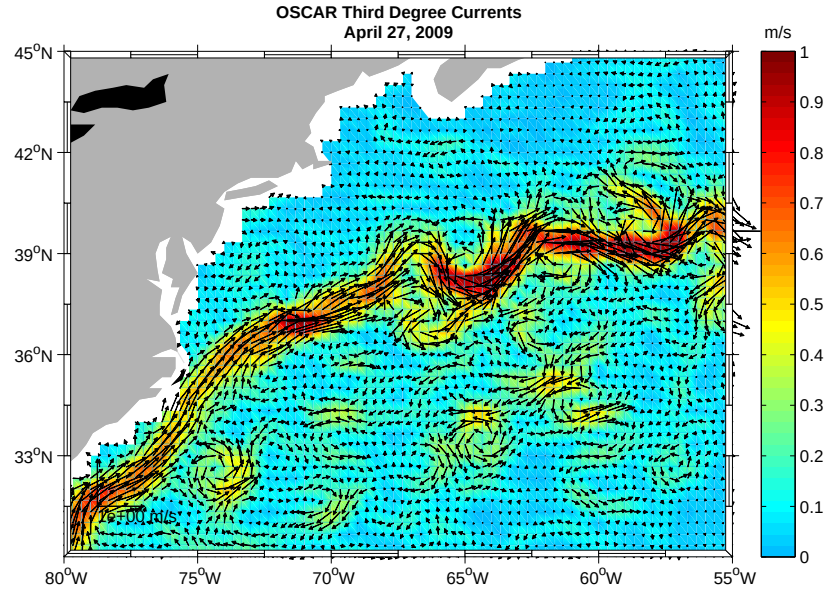
- The geostrophic term is computed from the gradient of surface topography fields (gridded AVISO and NRL)
- Wind-driven velocity components are computed from an Ekman/Stommel formulation using QuikSCAT winds (FSU/COAPS)
- with a thermal wind adjustment using satellite SST data (Reynolds Smith).
- Data available at http://www.oscar.noaa.gov and through PO.DAAC (http://podaac.jpl.nasa.gov/).

Introduction

- State of the improvements to the currently available OSCAR system
  - one degree to third degree
- Assessment of the very near real-time OSCAR currents
  - using NRL SSH fields
  - *versus* AVISO gridded DT and NRT
  - *versus* Drifters
- Conclusions and Future Improvements

OSCAR Latest Developments

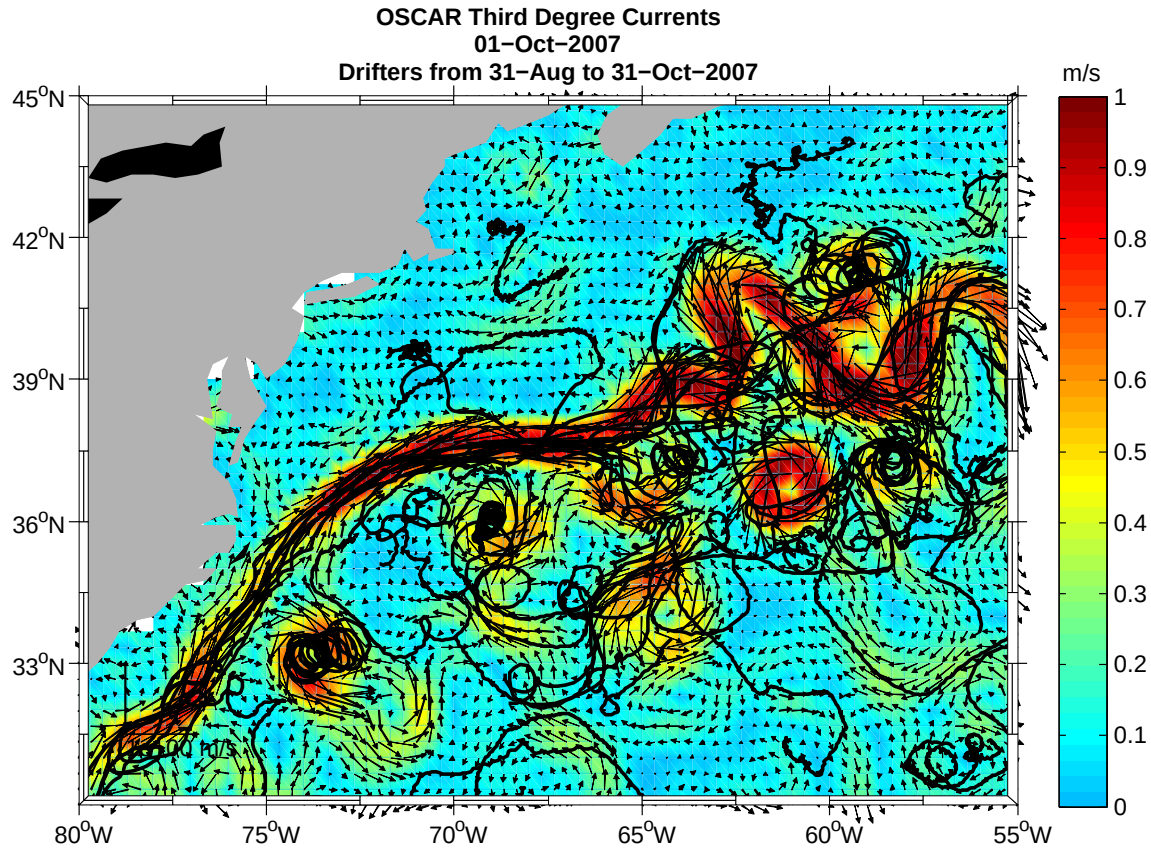




Developments to **OSCAR** : increased grid spacing from one degree to 1/3 degree

- SSH gradient calculation for geostrophic component revised to suit 1/3 degree grid with extensive Cal/Val
- Larger coverage of data towards coasts
- Improved model in equatorial region
- Fewer spuriously large values (mostly along coasts).
- Available at ftp://ftp.esr.org/pub/datasets/SfcCurrents/ThirdDegree/ and (≈ now) through PO.DAAC (http://podaac.jpl.nasa.gov/)

Assessment of Fields: Gulf Stream



- Currents are interpolated onto the drifter locations (which have been averaged over 1 day). Zonal and meridional currents *vs* drifter velocities.

Comparison with Drifters Gulf Stream

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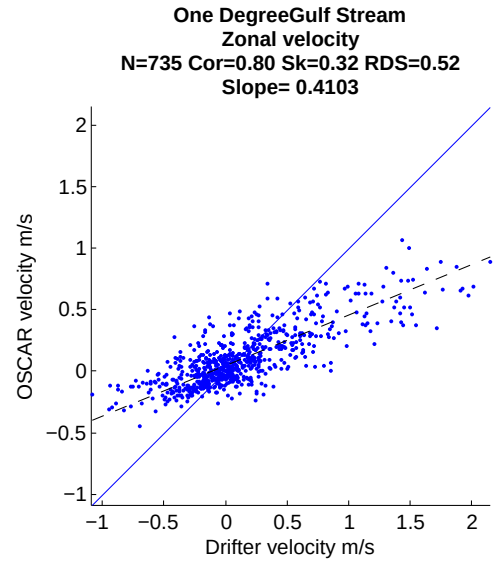
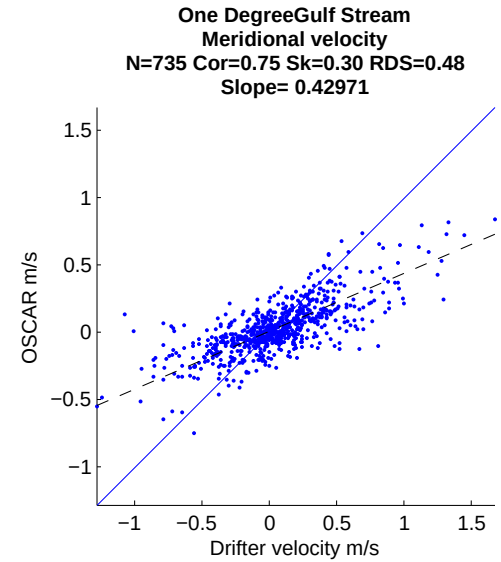
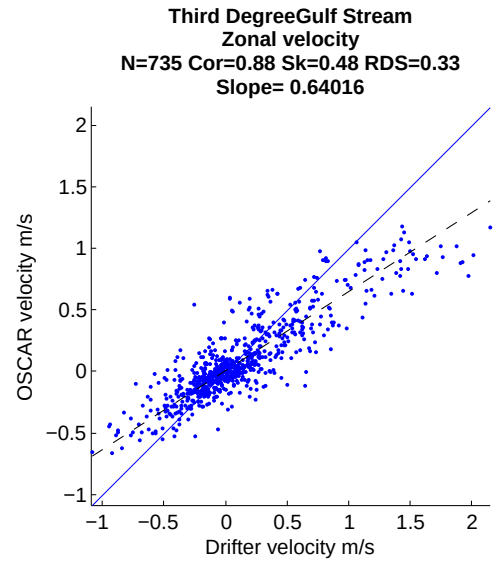
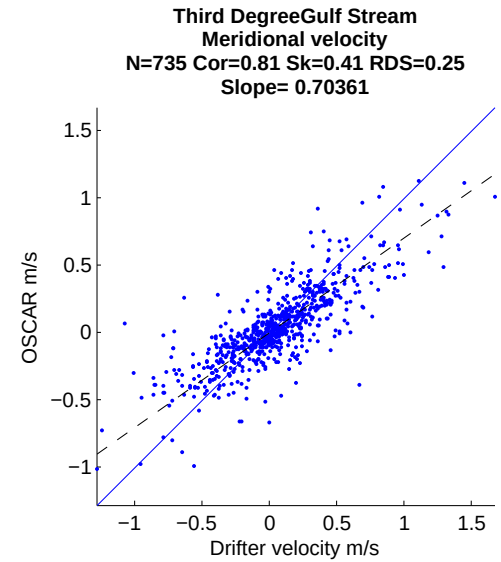




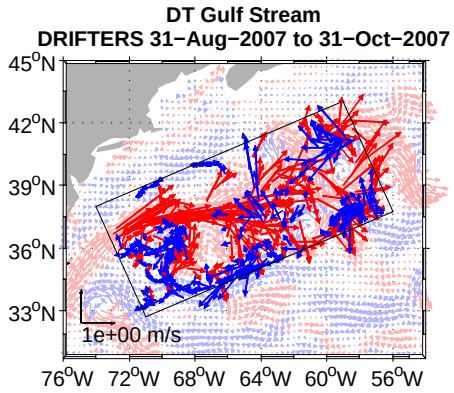


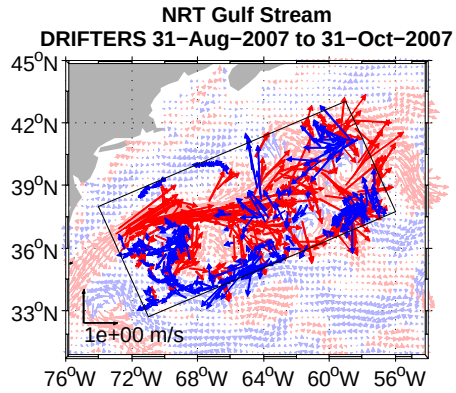


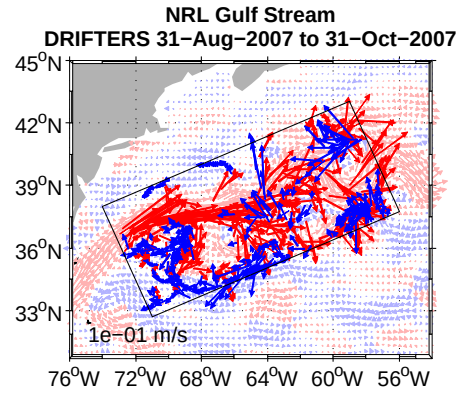
OSCAR SSH Near Real-Time

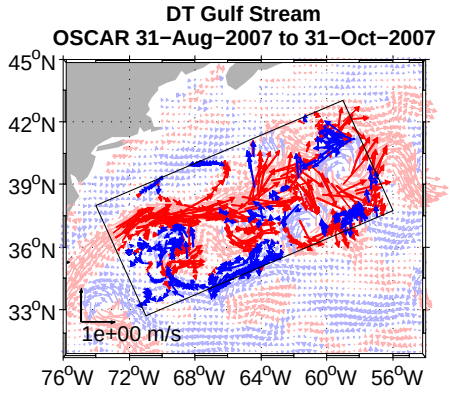
- OSCAR currents are output on a 5-day timebase, with a 10-day smoothing.
- OSCAR uses AVISO gridded MADT fields to calculate the geostrophic component of surface currents.
- Currents up until $\approx$ present day are calculated using NRL MODAS based SSH fields.
  - DT $\rightarrow$ NRT $\rightarrow$ NRL
  - The Naval Research Lab operational SSH fields are further processed using a linear prediction method - see Mindy Robinson's poster, "Evaluating a real-time satellite-derived surface current product in the Intra-Americas Sea".
- OSCAR currents are updated daily as NRT and DT fields become available (although output on a fixed 5-day timebase).

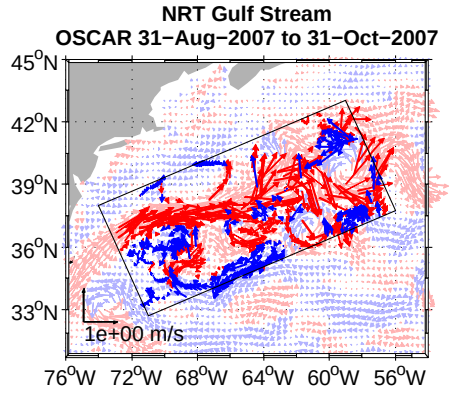
Gulf Stream Comparison with Drifters

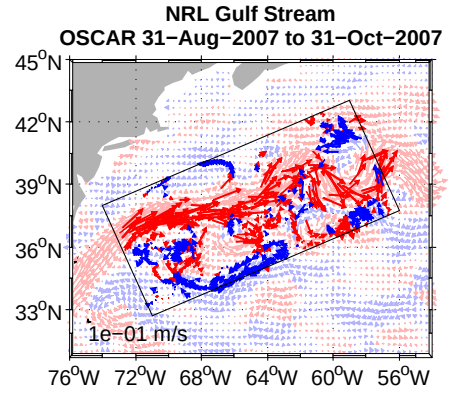






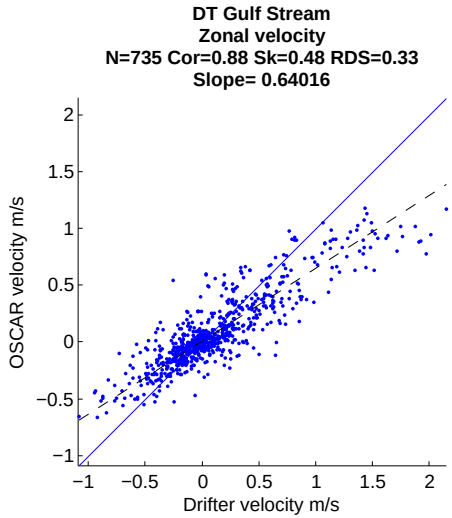


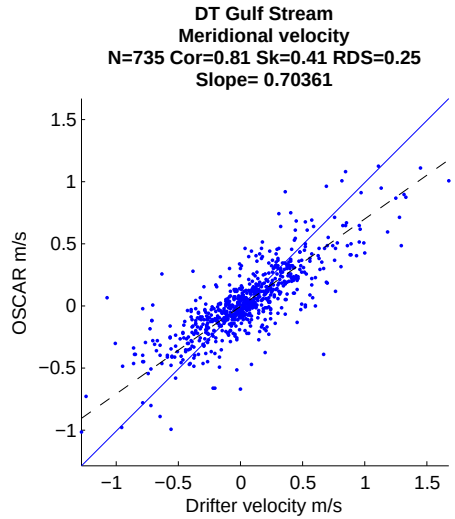


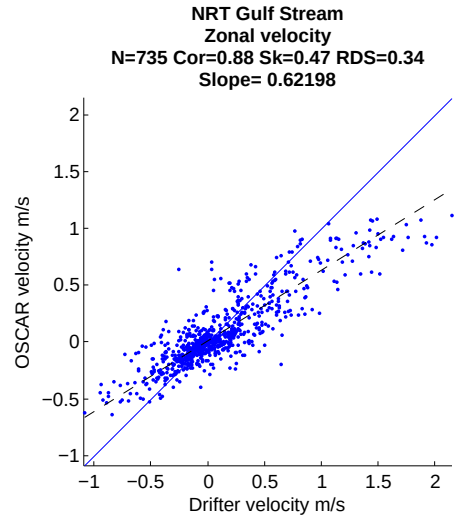


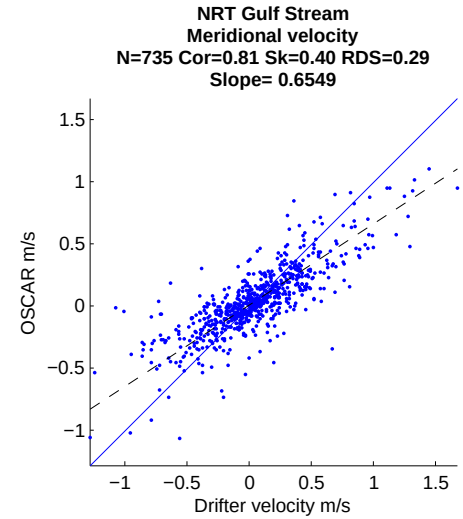
- DT and NRT very similar
- Amplitudes of NRL field generally smaller
- Overall features similar

Gulf Stream Comparison with Drifters

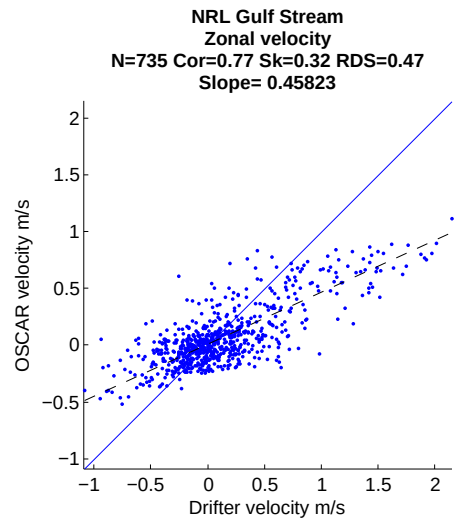


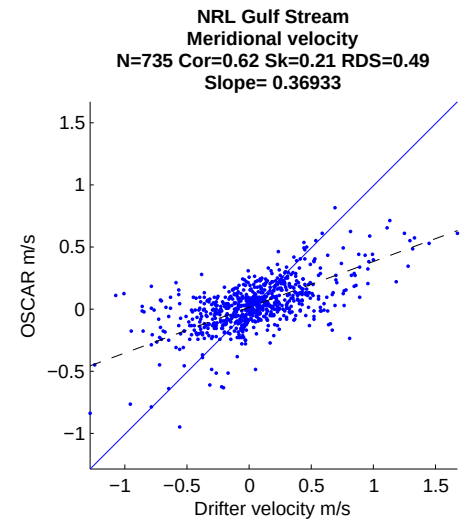




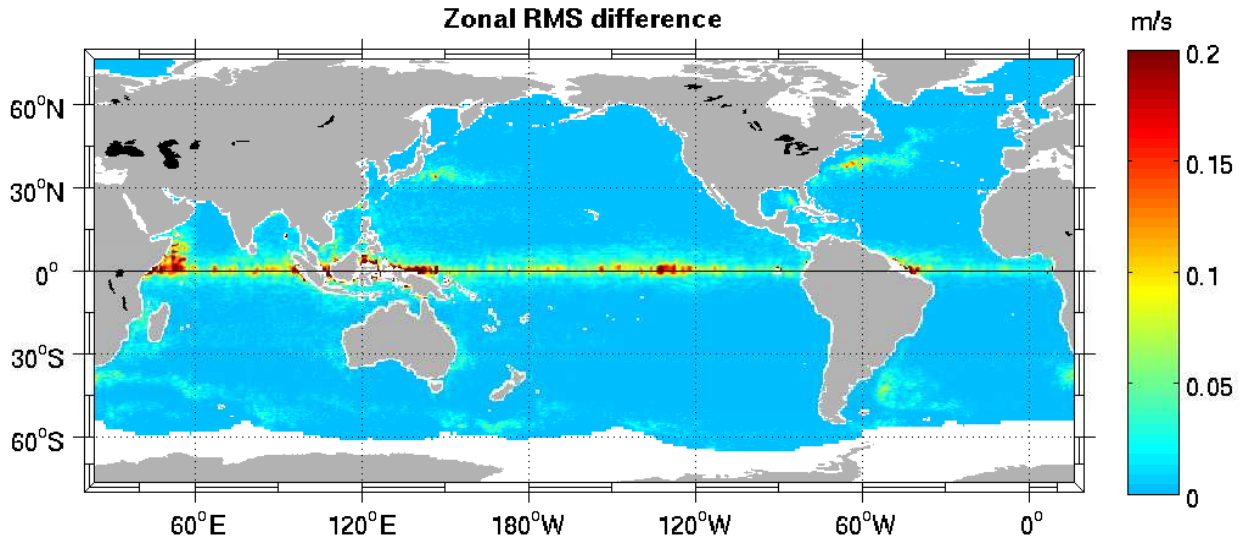


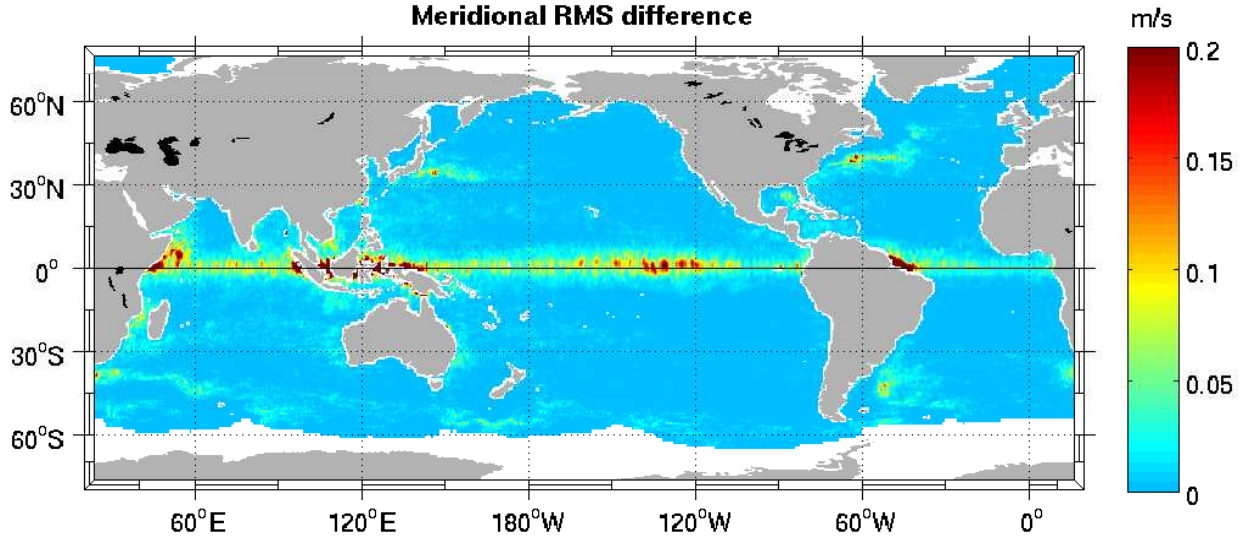
- Slightly better results for DT over NRT.
- More spread and lesser amplitudes with NRL fields, although still with high correlations, particularly in the zonal.



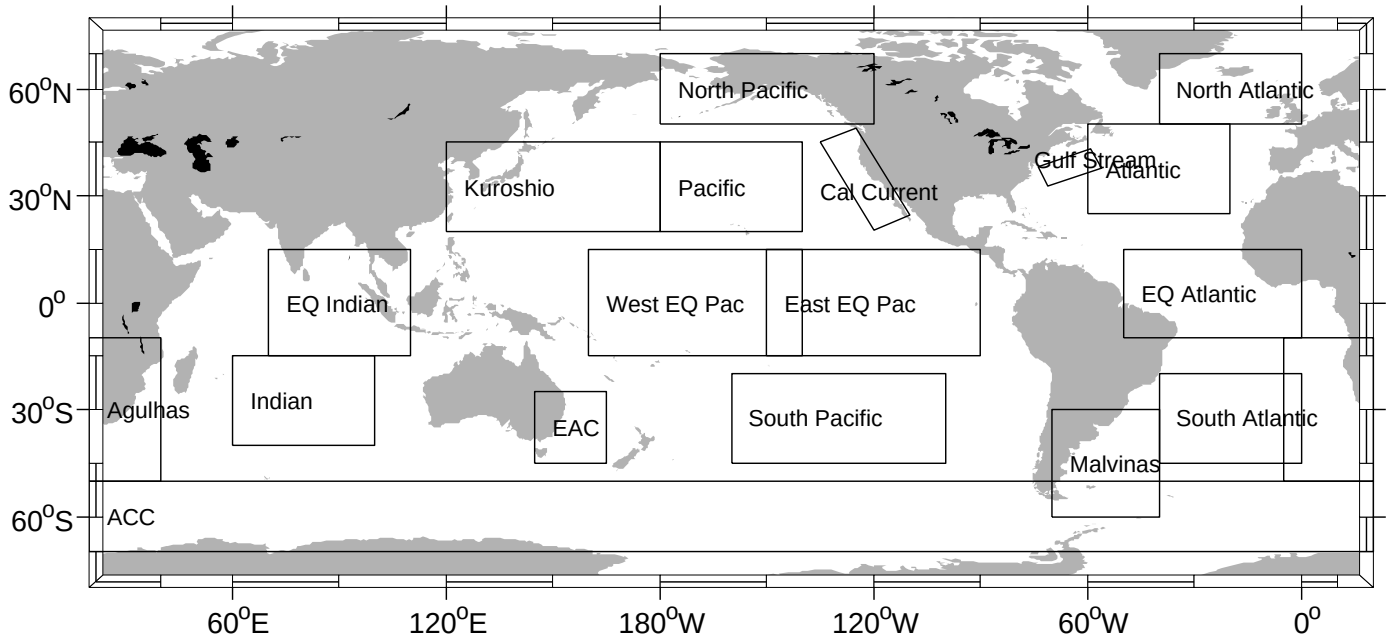


Global RMS Differences DT vs NRL



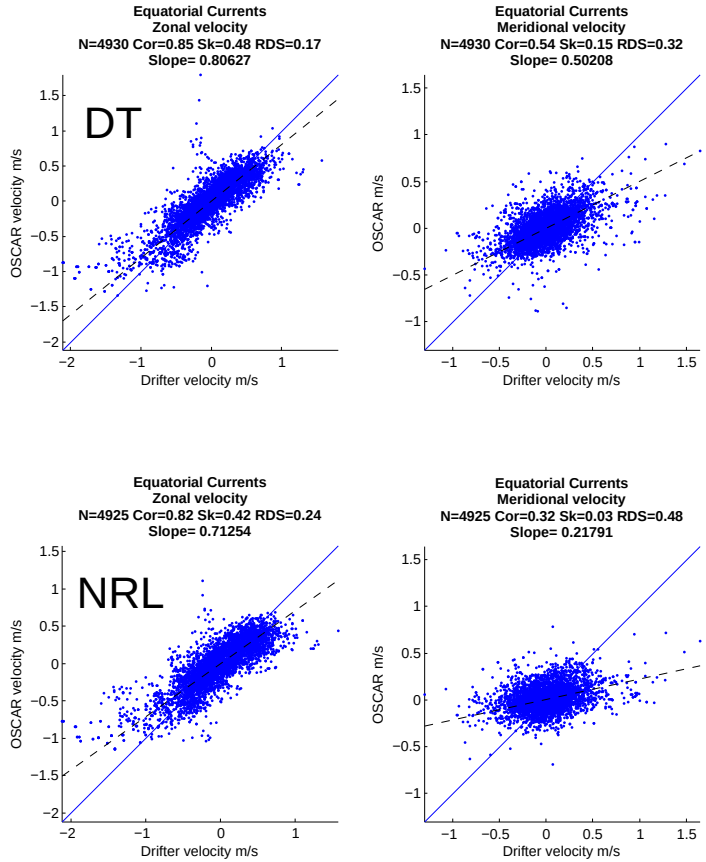


Dynamical Regions



- OSCAR currents compare best with drifters in areas with strong gradients in SSH.
- Examine performance of products by dynamical region: boundary currents, equatorial regions, ocean gyres, ACC.

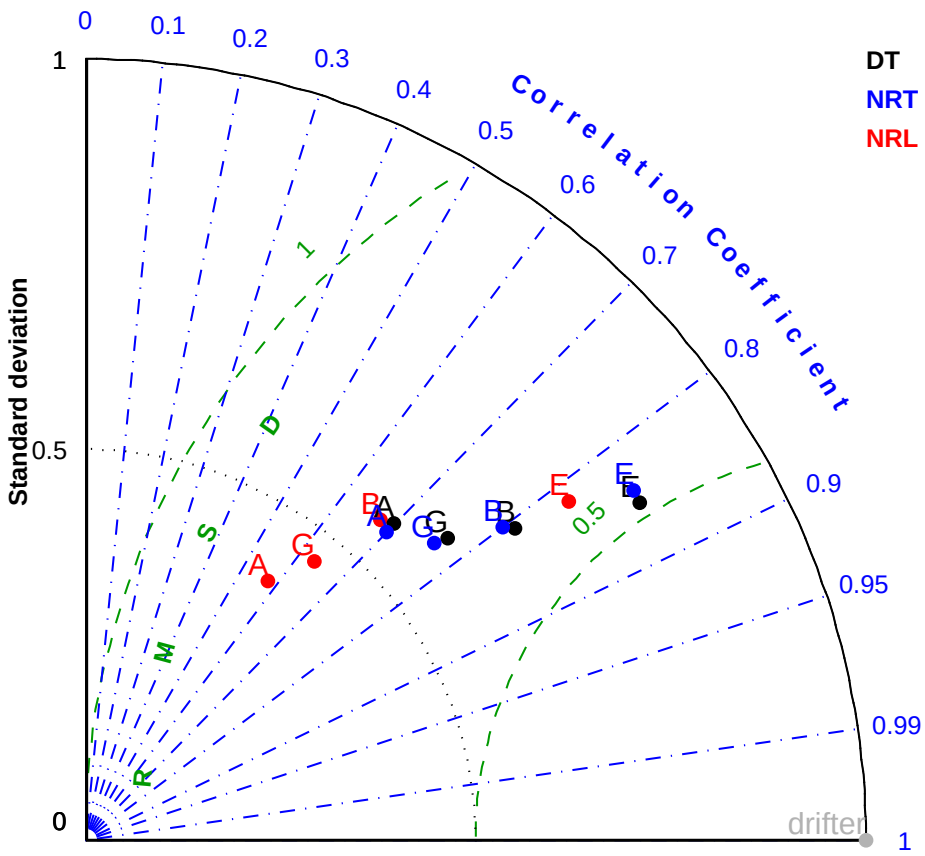
Regional Comparison with Drifters



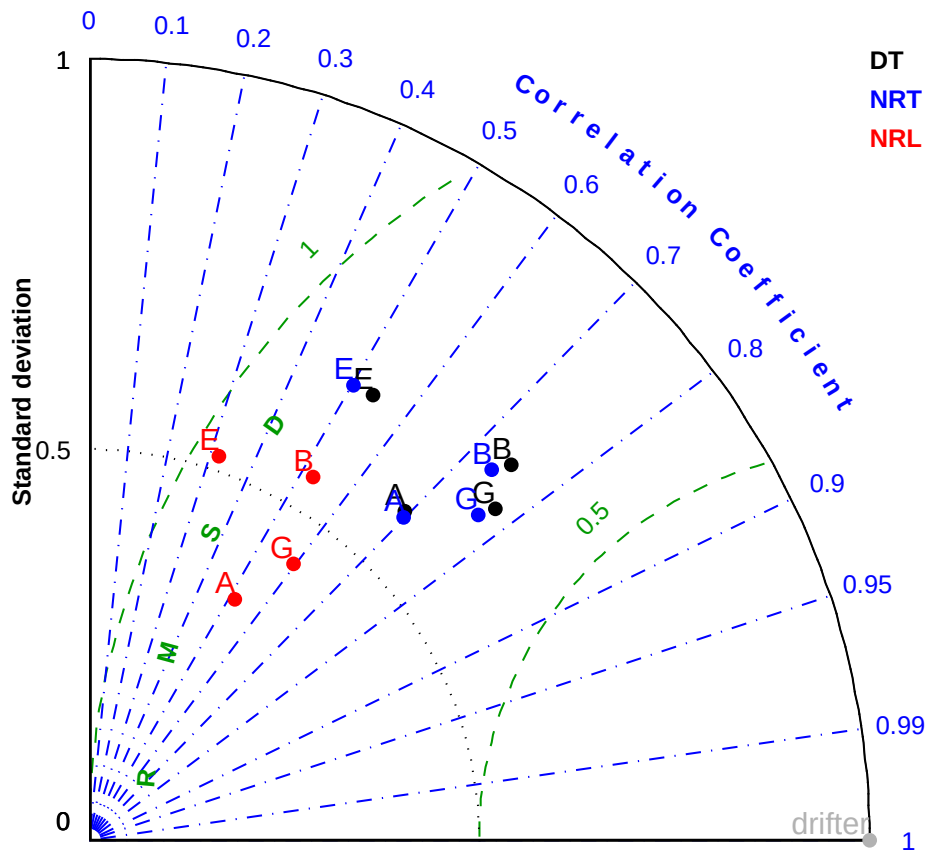
- Same general result of more spread and lower amplitudes with NRL SSH fields.

Overall Statistics: Taylor Diagrams

ZONAL VELOCITY
Boundary Currents(B), Equatorial(E), Gyre(G), ACC(A)



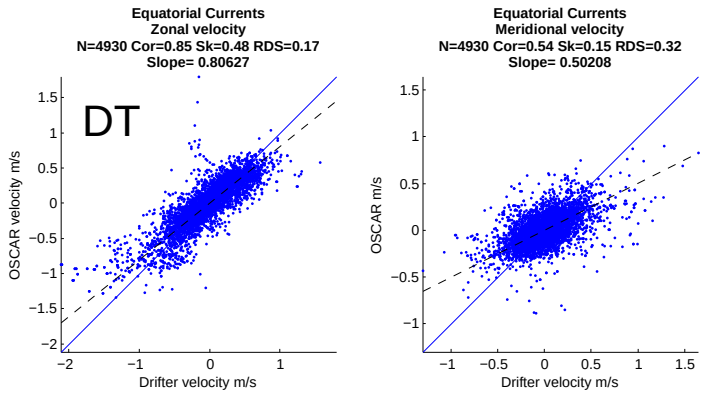
MERIDIONAL VELOCITY
Boundary Currents(B), Equatorial(E), Gyre(G), ACC(A)

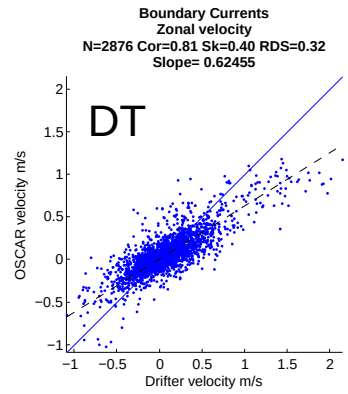


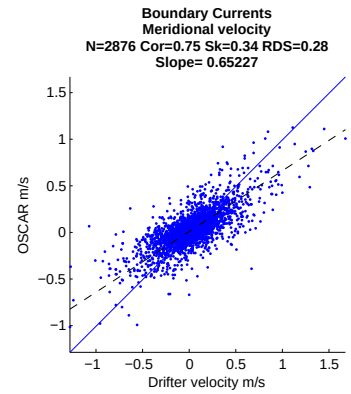
Summary

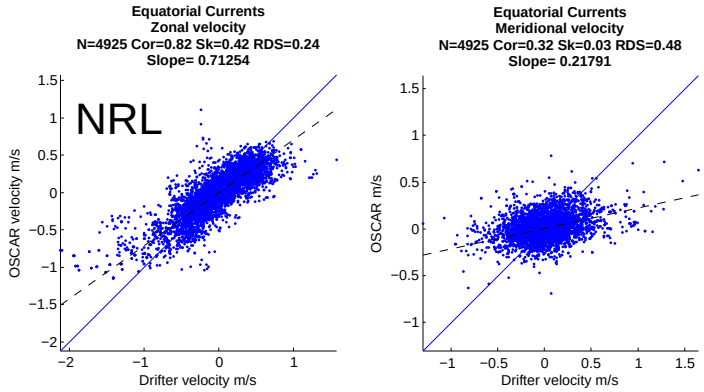
- DT and NRT-based currents are very similar and compare better with drifters than NRL-based currents
  - lower NRL amplitudes with more spread and lower correlations.
- All OSCAR surface currents (DT,NRT,NRL) compare well with drifter velocities in regions of strong SSH gradients: boundary currents and zonal equatorial component.
- Amplitudes are underestimated outside the above regions, with lower velocity correlations.
- Future Directions
  - Improve the wind-driven turbulent mixing scheme
  - Incorporate faster timescales in wind driven OSCAR component
  - Extend OSCAR capability to nowcast and forecast

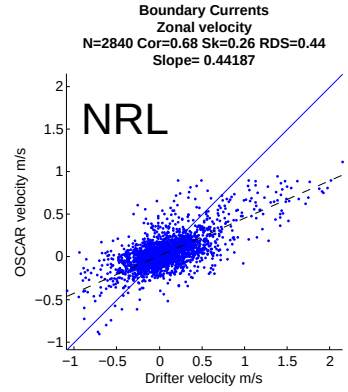
Regional Comparison with Drifters

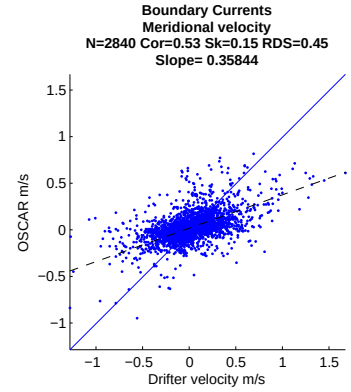












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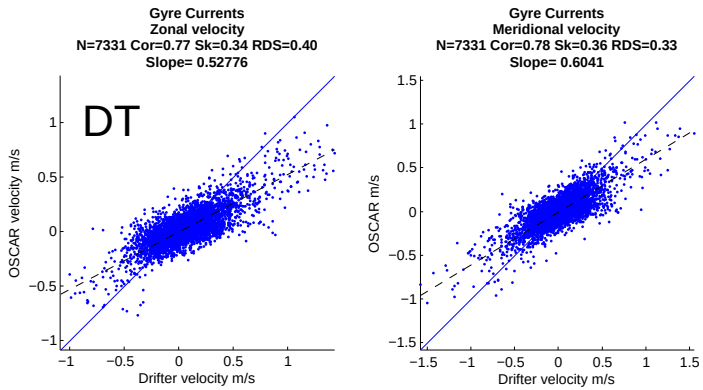

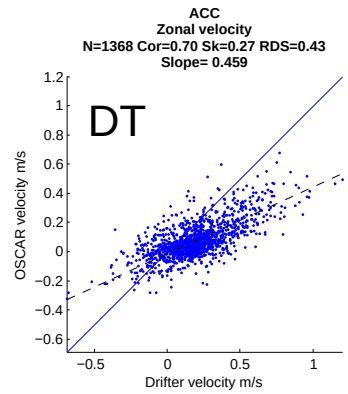

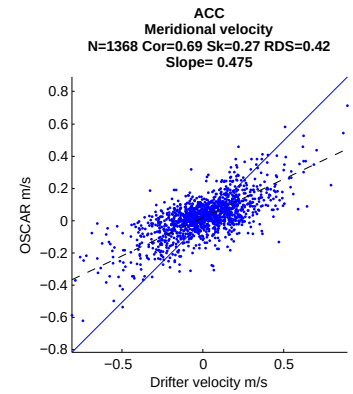

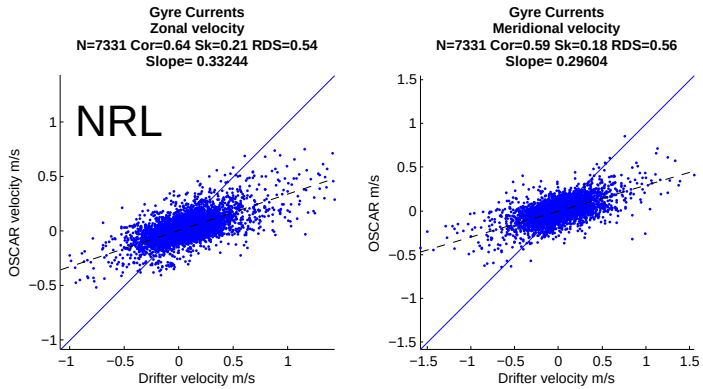

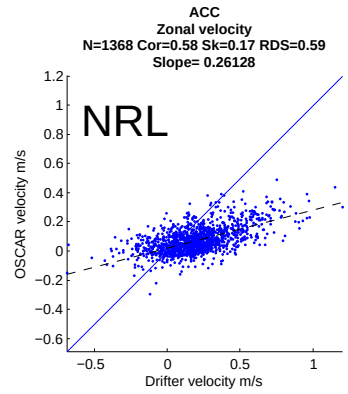

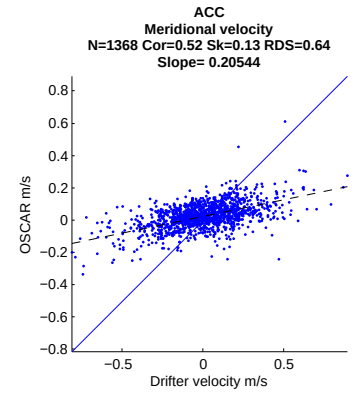

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