Assessment of Near Real-Time OSCAR Surface Currents

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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
  - \textit{versus} AVISO gridded DT and NRT
  - \textit{versus} Drifters
- Conclusions and Future Improvements
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/)
Currents are interpolated onto the drifter locations (which have been averaged over 1 day). Zonal and meridional currents vs drifter velocities.
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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.

\[ \text{DT} \rightarrow \text{NRT} \rightarrow \text{NRL} \]

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).
DT and NRT very similar
- Amplitudes of NRL field generally smaller
- Overall features similar
### Gulf Stream Comparison with Drifters

#### DT Gulf Stream
- **Zonal velocity**
  - N=735
  - Cor=0.88
  - Sk=0.48
  - RDS=0.33
  - Slope=0.64016

- **Meridional velocity**
  - N=735
  - Cor=0.81
  - Sk=0.41
  - RDS=0.25
  - Slope=0.70361

#### NRT Gulf Stream
- **Zonal velocity**
  - N=735
  - Cor=0.88
  - Sk=0.47
  - RDS=0.34
  - Slope=0.62198

- **Meridional velocity**
  - N=735
  - Cor=0.81
  - Sk=0.40
  - RDS=0.29
  - Slope=0.6549

#### NRL Gulf Stream
- **Zonal velocity**
  - N=735
  - Cor=0.77
  - Sk=0.32
  - RDS=0.47
  - Slope=0.45823

- **Meridional velocity**
  - N=735
  - Cor=0.62
  - Sk=0.21
  - RDS=0.49
  - Slope=0.36933

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- **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

Zonal RMS difference

Meridional RMS difference
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)
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
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