Synergetic use of remote sensing data for the study of the Azores and St. Helena current systems

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Context

Azores Current (AzC) vs. St. Helena Current (SHC), also known as Tristan da Cunha Current.

Currents: Previous studies suggest a similar forcing source for both currents independent of any geographical peculiarity (Juliano and Alves, 2007).

Similarities:
- Origin: western boundary currents (Gulf Stream and Brazil Current for AzC and SHC, respectively);
- Horizontal structure, intensity and meridional width;
- Interaction with North and South Atlantic currents (NAC and SAC, respectively);
- Associated subsurface adjacent countercurrent flows;
- Main cores found at similar latitudes (34ºN and 34ºS for AzC and SHC, respectively).

Differences:
- Zonal extension;
- Greater proximity between SHC and SAC;
- Proximity of the Agulhas Rings corridor.

Main aims:
- Assess the congenerancy of AzC and SHC and their associated fronts with data synergy of satellite altimetry (SLA, EKE, ADCP, SST), surface geostrophic velocity, SST and hydrography in situ data;
- Improve the knowledge of the South Atlantic variability, the Atlantic inter-hemispheric connections and the correlation of long-term oceanic variability with Atlantic phenomena of coupled atmosphere-ocean variability;
- Determination of the AzC and SHC axes from both altimetry (using the gradient of absolute dynamic topography and the direction of geostrophic velocity) and SST (maximum SST gradient) data and assess their spatial and temporal variabilities.

SST data processing:
- Data extracted from global optimally interpolated data product provided by NOA
- combined to-situ and IR SST products from AVHRR on board a series of NOAA satellites from Jan-1992 to Jun-2002, and further combined with MW SST products from AQUA on board Aqua from Jun-2002 to Sept-2011;
- Contextual median filtering (Belkin and Reilley, 2009);
- Spatial resolution: 0.25º-0.5º;
- 10-days composite grids;

Results:
- Preliminary results show the existence of significant EKE inter-annual variability for both AzC and SHC; largest EKE values for AzC are found in 1995-1996 and from 2007 onwards whereas for SHC these are centred in 2000 (Fig. 4);
- Previous studies for the period 1995-2006 show the existence of variability in the AzC axis position, being the AzC in its southermost position in 1995-1998 -- the ongoing study shall extend this analysis to 1992-2011 and to the SHC region;
- Unlike for the altimetry-derived SLA signature, no significant inter-annual variability has been so far detected for the current-associated thermal fronts (Fig. 5); the ongoing study shall further investigate this issue by analysing Eady gradient and exploring other data products and/or methodologies.

References: