

Vienna, Austria, 22-27 April 2012

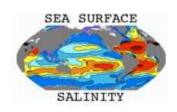
Seasonal dynamics of Sea Surface Salinity off Panama: the Far Eastern Pacific Fresh Pool

G. Alory¹, C. Maes², T. Delcroix², N. Reul³, S. Illig^{2,4}

¹LEGOS, OMP, CNAP, Université de Toulouse, Toulouse, France

⁴IMARPE, Callao, Peru





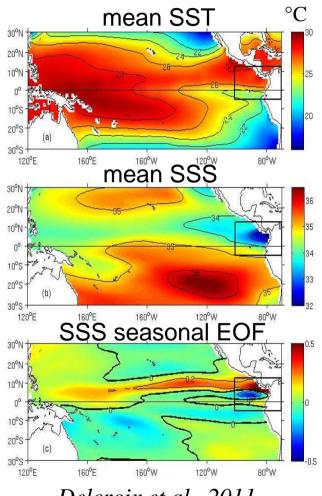




²LEGOS, IRD, Université de Toulouse, Toulouse, France

³LOS, IFREMER, Plouzané, France

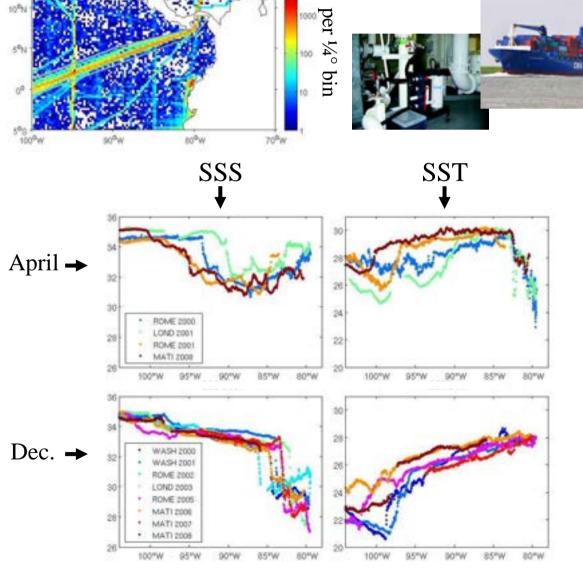
Why focus on SSS in this region?



Delcroix et al., 2011

- Between 2 climate relevant features: Eastern Pacific warm pool and equatorial cold tongue
- Minimum in SSS (<33: Far Eastern Pacific Fresh Pool) and maximum seasonal variability
- Strong air-sea-land interactions in this region: monsoon, gap winds... (e.g. Xie et al. 2005, Fiedler and *Talley 2006, Kessler 2006*)
- Potentially active role of salinity stratification on regional climate (de Boyer Montegut et al. 2007)
- Good test ground for new SSS satellite products (SMOS, Aquarius)

Main SSS data source: Voluntary Observing Ships



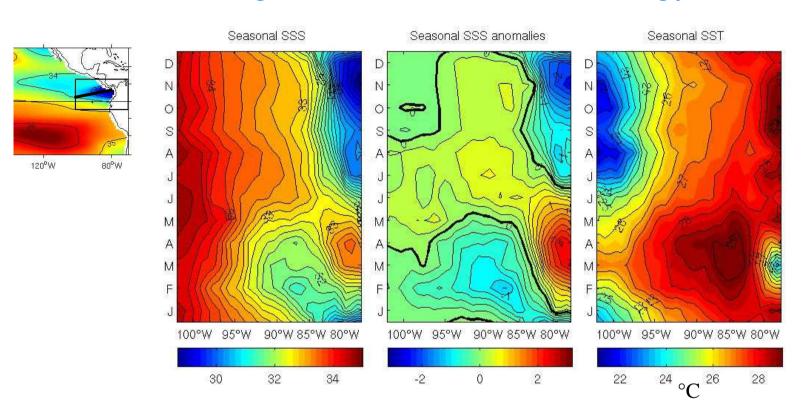
1950-2009 obs. density

Well-sampled TSG line from Panama canal to Tahiti

Transect snapshots

- Steep SSS fronts (up to 4 pss/1°) at Fresh Pool west/east boundaries with seasonal displacement >1000 km
- Not always related to SST fronts

Along-track SSS/SST climatology



• Life cycle of the Fresh Pool: - June-Dec: building

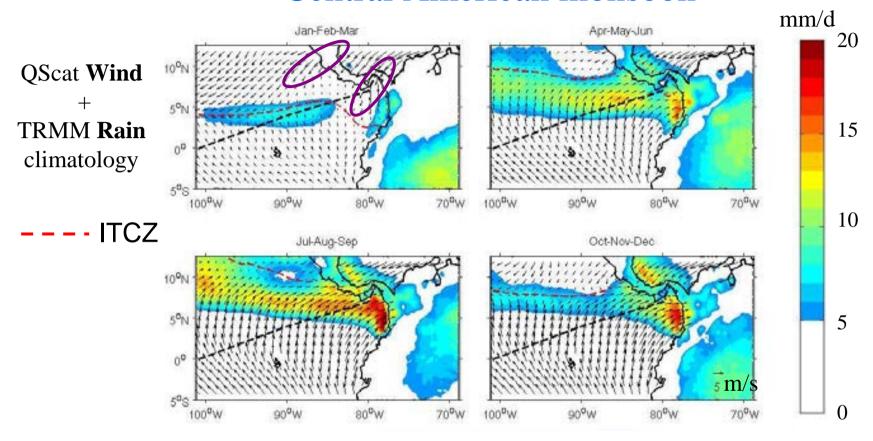
- Jan-Mar: westward stretching

- **Apr-May**: destruction

• SSS<33 generally associated with SST>28°C

Mar-Apr coastal SSS increase and cooling in phase

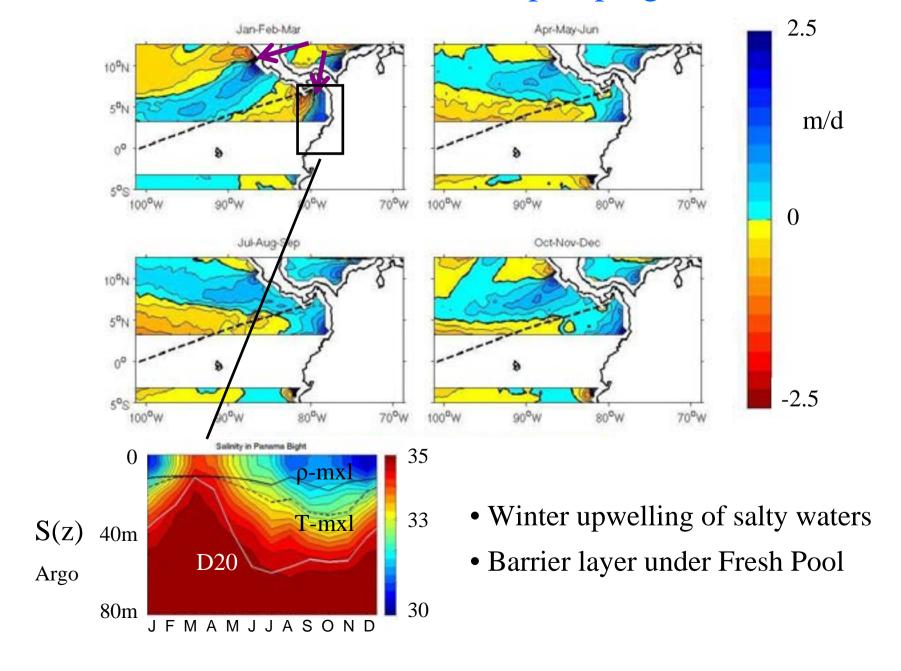
Central American monsoon



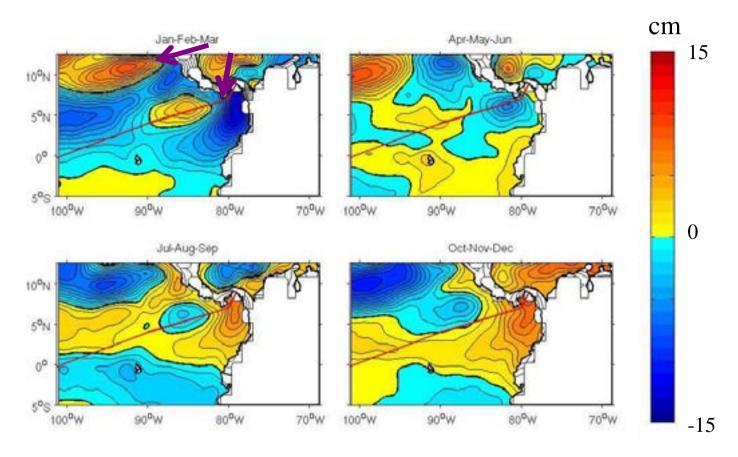
Seasonal north-south migration of ITCZ + high coastal topography:

- in summer, south-westerly winds and strong rainfall in Panama Bight
- in winter, strong north-easterly winds through mountain gaps (Papagayo, Panama) and low rainfall

Wind-driven Ekman pumping

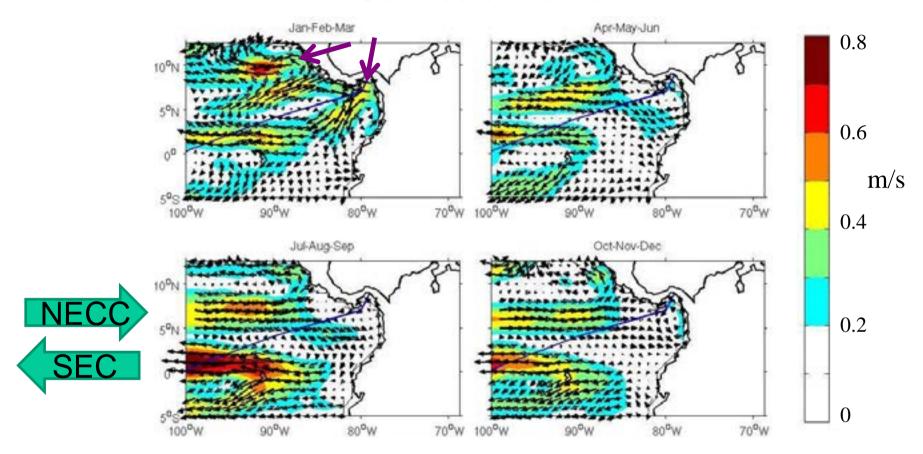


Sea Level Anomalies



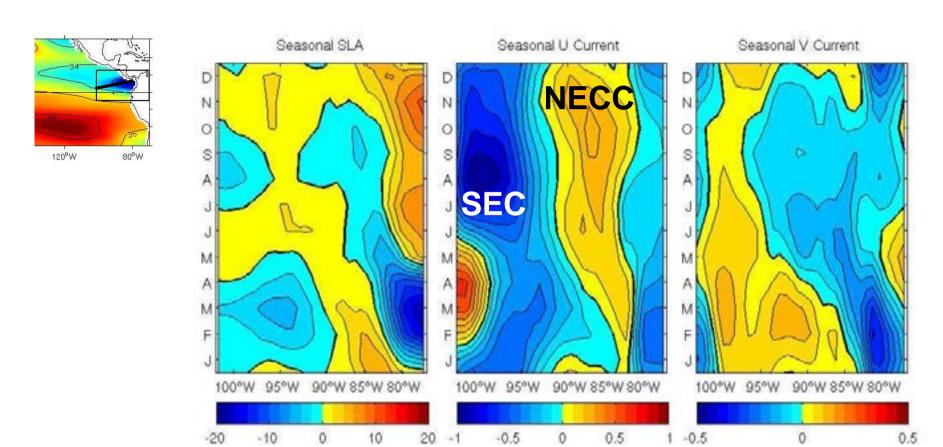
- Winter eddy dipoles
- Slow south-westward propagation
- SLA trough at 10°N = Costa Rica dome
- Associated with geostrophic currents

Surface currents



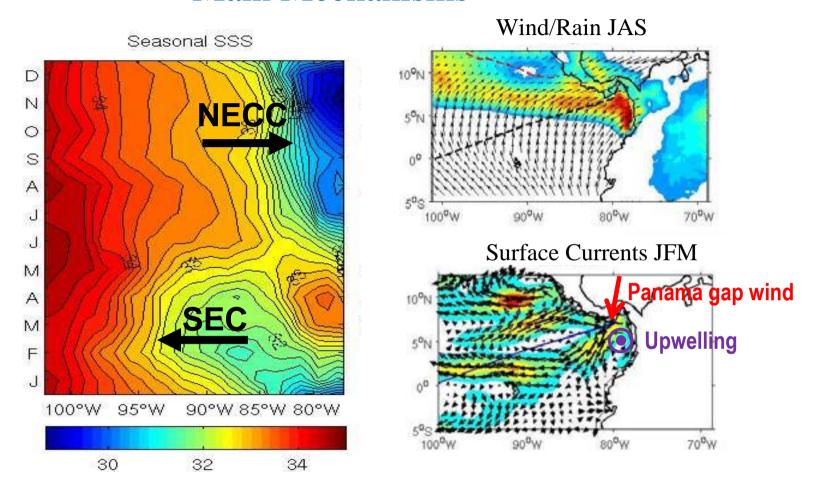
- Eastern end of the equatorial current system: South Equatorial Current (SEC), North Equatorial Counter-Current (NECC)
- NECC closely associated with ITCZ
- Winter gap winds create coastal cyclonic/anticyclonic circulation

Along track advection



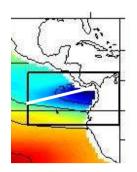
- JJAS: eastward NECC keeps Fresh Pool trapped to the coast and maintains strong SSS front
- JFM: westward stretching of Fresh Pool by SEC
- FMA: upwelling in Panama Bight propagating S-E

Main Mechanisms

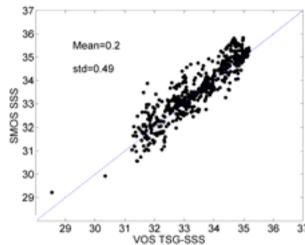


- Summer rain → building of Fresh Pool, SSS minimum
- Winter gap wind → Westward advection of Fresh Pool by SEC Upwelling → destruction of Fresh Pool

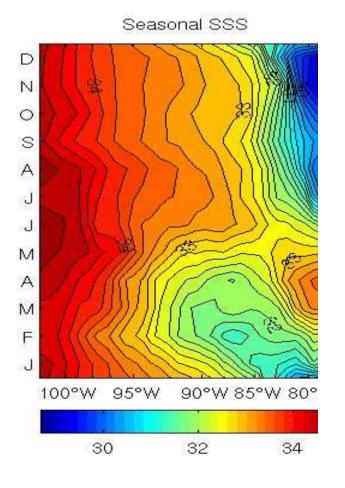
SMOS validation

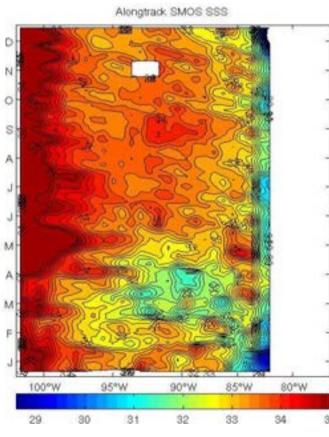


Alongtrack regression between TSG/SMOS colocated data Signal=10*Error



In situ Climatology vs SMOS 2010 (weekly, 1/4°)

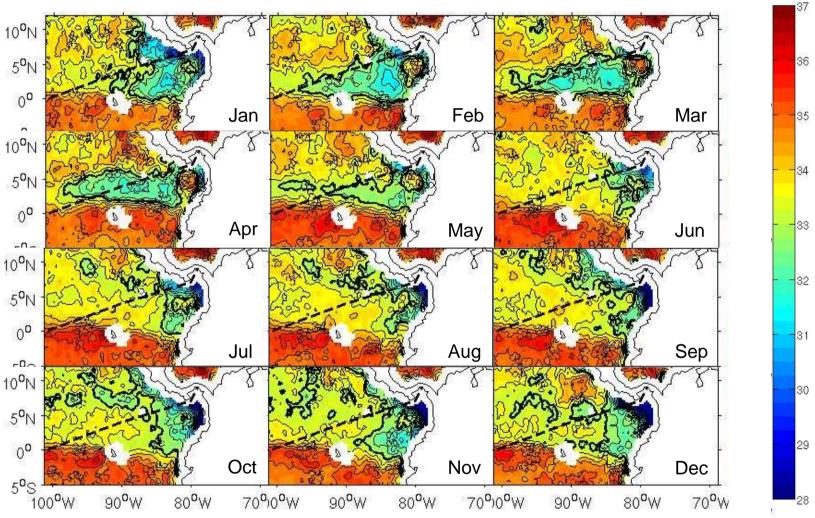




SMOS: seasonal

- + intraseasonal
- + **interannual** variability
- Main seasonal features appear
- Land contamination near coastline

SMOS 2010: monthly maps of Fresh Pool



SMOS captures main seasonal features of Fresh Pool, can monitor its spatial extension and associated SSS fronts

Conclusion and Perspectives

- The Far Eastern Pacific Fresh Pool (SSS<33) is a quasipermanent feature with the lowest mean SSS and maximum seasonal SSS variations in the tropical Pacific
- Its seasonal cycle results from strong regional oceanatmosphere-land interactions (monsoon)
- New SMOS satellite is able to monitor the Fresh Pool and complement *in situ* data

JGR paper out now!

- To quantify the relative contribution of different processes on the SSS seasonal cycle, regional modelling would be useful
- Potential role of vertical salinity stratification on the regional climate has to be explored