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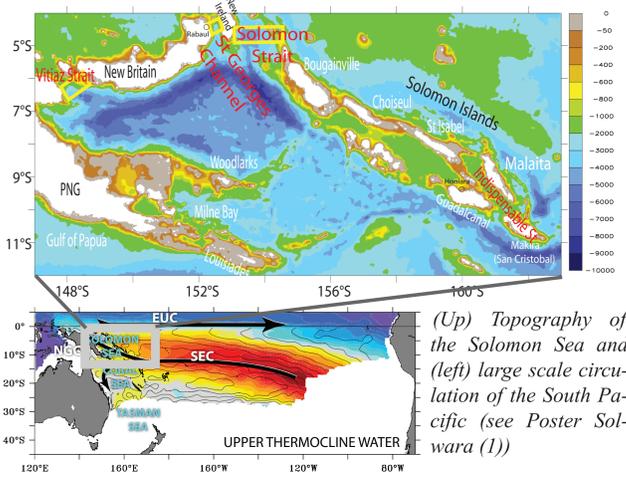
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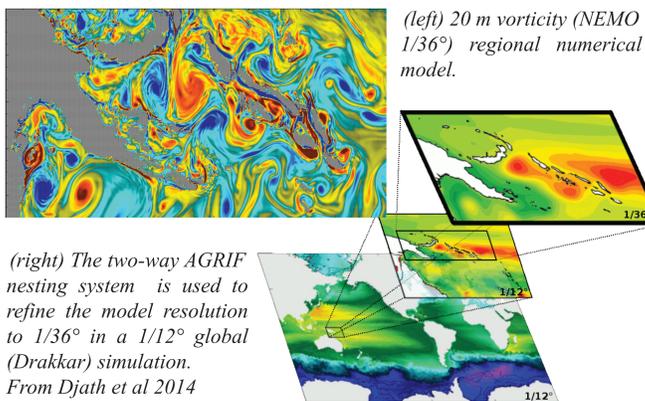
## The Solomon Sea



The Solomon Sea is the necessary passage for Coral Sea waters enroute to the equator. The Solomon Sea water transports, circulation and water mass transformations had virtually not been studied until this project. The Solomon Sea has a large opening into the Coral Sea to its south, but only three narrow passages allow water to flow to the Equator.

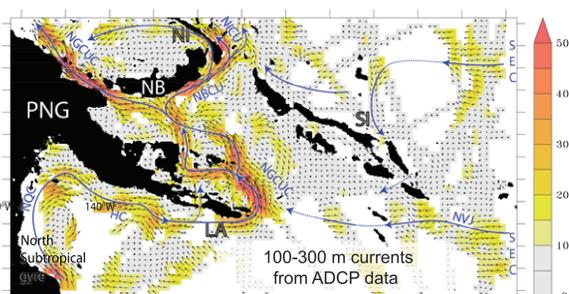
## Inside circulation

A special effort was dedicated to modeling the Solomon Sea, as the numerous islands and straits pose challenges that require high resolution with appropriate settings to resolve the flow in the passages. The flow partition between the passages, and therefore the route to the equator is highly sensitive to model topography and parameterizations. A 1/12° numerical simulation was first developed at LEGI (Melet et al. 2010a), followed by a 1/36° resolution that is currently analyzed, providing new insights about mesoscale and sub-mesoscale dynamics (Djath et al. 2014).



Concurrently, historical current measurements were compiled and analyzed (Cravatte et al. 2011, figure below), as well as altimetric data that, with appropriate treatment near the numerous islands, could provide a description of the oceanic variability and mesoscale activity (Melet et al. 2010b; Gourdeau et al. 2014). A description of the Solomon Sea average circulation, seasonal and interannual variability, as well as water mass mixing within simulations could be obtained by combining simulation results with these observations (e.g. Melet et al. 2010a, 2013, Grenier et al. 2011, 2014).

A compilation of historical ADCP data from research vessels permitted to obtain a depiction of the 0-300m circulation that is broadly consistent with the models. From Cravatte et al. 2011



## Objectives

The Solomon Sea is both a choke point and a place of intense boundary current and possible water mass mixing for the thermocline waters heading towards the equatorial undercurrent.

This circulation carries climate signals (poster Solwara (1)), as well as trace elements, including iron that controls biological activity at the equator. Such supply is believed to result from continental margins/ocean exchanges.

This project aims at

- 1) Evaluating the total transports through the Solomon Sea and pathways to the equator
- 2) Describing the inside circulation of the Solomon Sea
- 3) Understanding the water mass transformation and geochemical sources along the way
- 4) Measuring trace elements exchanges along the margins

The approach is multidisciplinary, involving in-situ observations, repeated monitoring and high-resolution modeling, in order to improve our knowledge of in- and outgoing transports, sources of geochemical elements, and water masses transformations along their path toward the equator.

(Flash talk by Jeandel et al.)

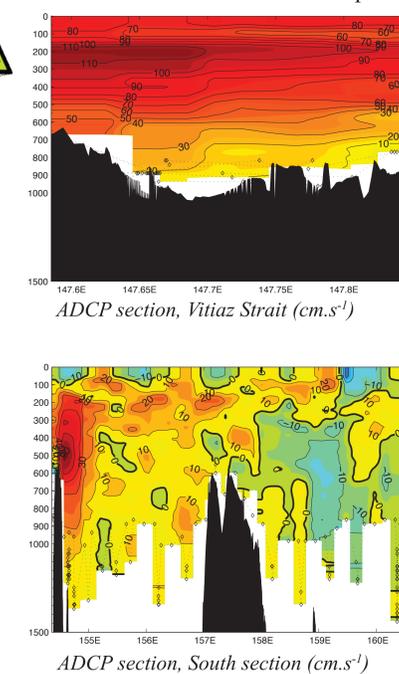
## Pandora Cruise and SPICEMoor

A multidisciplinary cruise was completed in July 2012 on French R/V L'Atalante through a France-USA collaboration, to document physical and geochemical water properties in the Solomon Sea.

The cruise included classical hydrology sections, macronutrients, and 24-48h time-series stations, with Trace Elements and Isotopes sampling, providing information on short term hydrology variability, and its impact on geostrophic calculations.

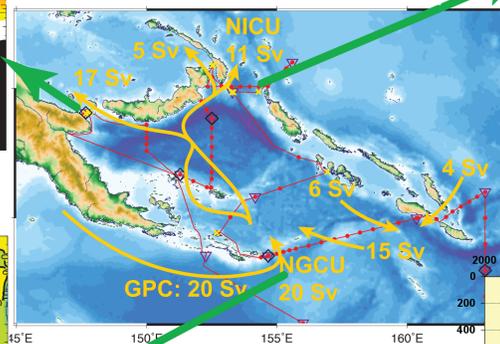
**Overall 83 stations were achieved for a total of 134 casts, most to 2000m or more, including 93 LADCP profiles, 30 "clean" CTD casts for trace elements sampling, and 6 in-situ pumps deployments.**

During the whole cruise, 2 shipboard RDI VM-ADCPs recorded the current field to 1000-1500m depth.



### Pandora track and transports

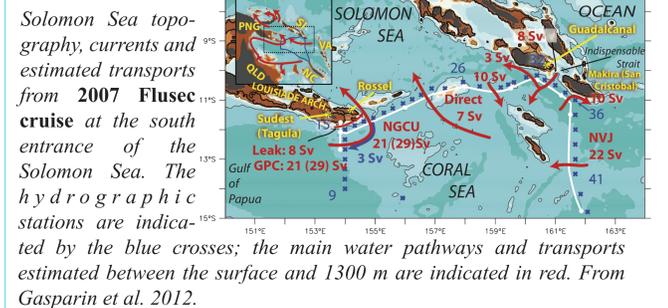
● CTD stations; ▼ "clean" CTD stations; ◆ in-situ pumps; ▣ moorings. VM-ADCP currents and transports (0-900m) are indicated by orange arrows and numbers. NICU=New Ireland Coastal Undercurrent



Pandora data site accessible from: <http://www.obs-vlfr.fr/proof>

## Flusec Cruise: South entrance

A first high-resolution survey in 2007 revealed the main pathways at the entrance of the Solomon Sea. Most of the 30 Sv of subtropical waters transported into the Coral Sea enters the Solomon Sea: a large part is transported by the Gulf of Papua Current (GPC), which turns abruptly to the north and merges into the New Guinea Coastal Undercurrent (NGCU), on its way to the equator.



During Flusec cruise, a first glider was released from Rossel Island. This started a long, ongoing time series of repeated glider measurements coordinated by SIO and NOAA/PMEL with IRD contribution. Associated with Pressure inverted echosounders, they provide estimates for the upper ocean heat transport towards the equator (Davis et al. 2012).

## Perspectives

In March 2014, 7 moorings will be recovered and 4 moorings will be re-deployed in the Solomon straits to extend the transport time series (LEFE MoorSPICE project). This will provide the stage for unprecedented description of the transport partition and variability among the straits.

A very large amount of parameters was measured during Pandora and data treatment and analyses are ongoing, regarding physical, geochemical and biological aspects.

## References

- References on poster Solwara (1)
- 18 peer-reviewed publications related to the Solomon Sea within Solwara (Project site <http://solomonseaoceanography.org>)
- JGR Special Issue on Western Pacific Ocean Circulation and Climate (articles in review; 2014)
- Data or metadata available from Solwara and SPICE web sites.

**Preliminary result:** Vertically averaged transports measured during Pandora were generally larger than previous estimates. The flows entering the Solomon Sea in the South and exiting through the straits in the North were found in approximate balance, at 30-33 Sv.

