Monitoring the Indonesian Throughflow in Makassar Strait

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Project Summary

The ocean is segmented into basins: Atlantic, Pacific, Indian, and marginal seas. The form and efficiency of inter-ocean exchanges between these basins govern the large-scale ocean characteristics, including sea surface temperature (SST) that the projects onto the climate system, with impact on marine ecosystems. The 'mega'-archipelago between Southeast Asia and Australia, the only tropical interocean pathway, offering a maze through which warm Pacific water spreads into the Indian Ocean, the Indonesian Throughflow (ITF; fig 1, 2), influencing large-scale oceanic heat and freshwater inventories. The ITF responds to, and affects, the larger scale ocean and climate system, and so acts as a measure of that large, complex network. Makassar Strait carrying 80-85% of the ITF is a key, cost effective site to build the needed time series that essentially integrates the larger scale ocean and atmosphere.

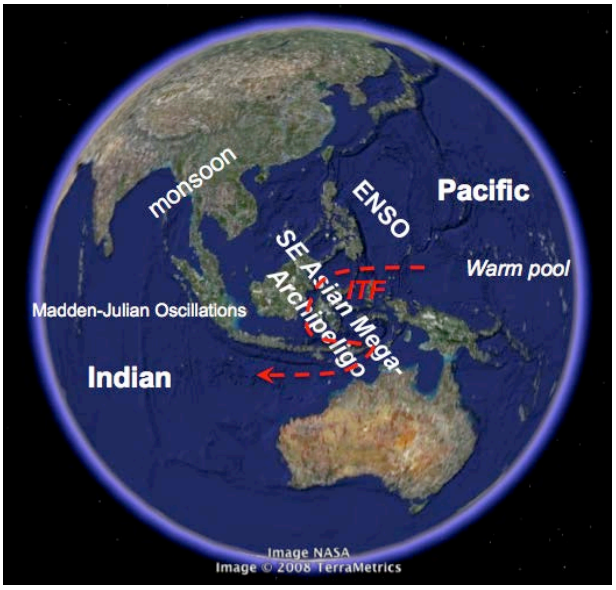

Figure 1. The 'mega'-archipelago between Southeast Asia and Australia, the only tropical interocean pathway, offering a maze through which warm Pacific water spreads into the Indian Ocean, the Indonesian Throughflow (ITF; figure 1), influencing large-scale oceanic heat and freshwater inventories. The ITF responds to, and affects, the larger scale ocean and climate system, and so acts as a measure of that large, complex network.

The Makassar Strait throughflow time series, at 2°51' S; 118°28' E; 2147 m, in the Labani Channel 45 km wide constriction of Makassar Strait (fig 2), began with NSF funded Arlindo program in 1996-1998, and continued with NSF funded INSTANT 2004-2006 (November) and NOAA OCO 2006 (December), with the most recent recovery in August 2011. The NOAA OCO project is a cooperative program between the Lamont-Doherty Earth Observatory of Columbia University and the Agency for Marine & Fisheries Research, Ministry of Marine Affairs and Fisheries, Indonesia.

The NOAA funded Makassar mooring is part of a growing international effort to observe the ITF. The Australian Integrated Marine Observing System [IMOS; see: http://imos.org.au/waimos.html] Indonesian Throughflow Moorings forms an important companion the NOAA-OCO funded Makassar mooring. The Korea Ocean Research & Development Institute (KORDI) is developing an additional international companion program. A. Gordon is a member of the KORDI science advisory group specifically for coordination of ITF observations. KORDI plans to deploy ITF observing moorings in the Maluku and Halmahera seas in 2013 or 2014 to observe the inflow paths from the Pacific Ocean into the eastern Indonesian seas.

Figure 2. The Pacific Gateway to the Indonesian Seas and Indian Ocean is dominated by two portals: The Mindanao/Halmahera passage into the Sulawesi Seas, and the Luzon Strait that feeds the South China Sea throughflow that plays a surprisingly large role in governing the nature of the Indonesian Throughflow (ITF). Makassar Strait Throughflow mooring site (2004-2011) is identified by an X.

The NOAA-OCO Makassar time series data through August 2011 is available in delayed mode at: http://www.ldeo.columbia.edu/res/div/ocp/projects/MITF/

Intended users of the resulting data and products are the ocean and climate modeler communities, as the ITF is indicative of larger scale ocean and climate system. Additionally, Makassar Strait has much oil activities. Knowledge of the currents in Makassar Strait enables safer operations and mitigation of possible oil spill. I have informed oil company personnel [at ConocoPhillips, Niko Resources (Limited, Marathon Oil, EXXON-Mobil] of the NOAA-ITF program and provided the time series.