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# The Oceanography of the Philippine Archipelago

## Introduction to the Special Issue

A MOST IMPRESSIVE feature stretches some 2800 miles from Australia to Asia—an array of islands, straits, and seas of various sizes and depths that incorporates the Indonesian and Philippine domains. This regional mix of land and ocean is located at the nexus of the El Niño-Southern Oscillation and the Asian monsoon, where waters of the Pacific western boundary currents weave their way into the Indian Ocean. It is exposed to a monsoon climate and strong tidal activity, making this “mega” archipelago of the Southeast Asian seas a challenge to observe and to model. Because enhanced understanding of ocean dynamics within archipelago configurations is required to improve our capability to predict oceanic spatial and temporal variability, the Office of Naval Research sponsored the Philippine Straits Dynamics Experiment (PhilEx), a Department Research Initiative (DRI) for the Philippine region. PhilEx participants included US and Philippine researchers from numerous institutions, and integrated in situ and remote observational methods with global and regional model components.

PhilEx investigators posed a series of specific research questions: How do the archipelago stratification and circulation patterns respond to remote and local forcing? What are the dominant physical and dynamical balances that characterize the flow and mixing at different locations and scales within the Philippine Archipelago? How well do models simulate the observed characteristics? What are effective paradigms for representing archipelago dynamics? During cruise planning, it became apparent that the complexities of flow within the network of straits and seas required high-resolution observations—and it was also clear that a basic exploratory element was needed to better define the regional waters of the Philippine seas.

There were four major PhilEx expeditions aboard R/V *Melville*: the exploratory cruise in June/July 2007, the Joint US/Philippines Cruise in November/December 2007,

the Intensive Observational Period cruise of January/February 2008 (IOP-08), and a second Intensive Observational Period cruise in February/March 2009 (IOP-09). They provided regional synoptic views of the ocean stratification and circulation by using conductivity-temperature-depth sensors/lowered acoustic Doppler current profilers (CTD/LADCP) and underway surface data from instruments that included hull-mounted ADCPs and towed vehicles.

Observations obtained over a specific time interval are likely not to sample the environmental climatic condition. For example, the 2008 winter season was anomalously wet, and as may be expected, the observed regional surface layer had anomalously low salinity. The model results help place specific observational periods in the context of longer-term conditions. Additionally, the cruise-based observational periods are linked together with time-series observations from moorings and sensors aboard untethered drifters, gliders, and profilers. Land-based high-frequency radio provided high-spatial-resolution surface current information within Panay Strait. Remote observations of sea surface temperature, ocean color, and sea level from Earth-orbiting satellites completed the observational PhilEx suite of tools, all of which contributed to the products of a variety of models, such as the HYbrid Coordinate Ocean Model (HYCOM), Regional Ocean Modeling System (ROMS), and Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS). In addition, observations from ongoing programs provided information on the larger-scale setting for the PhilEx program.

This special issue of *Oceanography* presents PhilEx revelations that include many fascinating features of horizontal and overturning circulation patterns occurring across a broad range of spatial and temporal scales within the Philippine region.

— Arnold L. Gordon and Cesar L. Villanoy, Guest Editors