Late Holocene events in the Sibuyan Sea, Philippines, based on calcareous nannofossils, granulometry, and sediment geochemistry

Dorothy Joyce Marquez
University of the Philippines, National Institute of Geological Sciences, Diliman, Quezon City, Philippines, 1101; ddmarquez@up.edu.ph

Alyssa M. Peleo-Alampay
University of the Philippines, National Institute of Geological Sciences, Diliman, Quezon City, Philippines, 1101; ampeleoalampay@up.edu.ph

Zhifei Liu
Tongji University, State Key Laboratory of Marine Geology, Shanghai 200092, China; lzhifei@tongji.edu.cn

This study compares core sediments from the northern (Cores GC4A and MC4-2) and southern (Core GC3A) sub-basins of the Sibuyan Sea that were collected during PhilEx Magellan expedition onboard the RV *Melville*. Relative and absolute nannofossil abundances were calculated from raw counts and then correlated with grain size data that was measured using laser particle size analysis and major oxide percentages and elemental ratios that were measured by X-ray fluorescence spectrometry.

The nannofossil assemblage was comprised mainly of *Gephyrocapsa oceanica* and *Florisphaera profunda*. The total nannofossil abundance was generally higher in the northern sub-basin. The lower nannofossil abundance in the southern sub-basin may be due to higher terrigenous input as evidenced by higher $\%Al_2O_3$, $\%Fe_2O_3$, $\%SiO_2$, and %MgO. In the northern sub-basin, total nannofossil and *G. oceanica* abundances were inversely correlated with $\%Al_2O_3$, $\%Fe_2O_3$, and $\%SiO_2$. The precipitation and run-off proxy, %Ti, followed the trend of these three major oxides, a further indication that increased rainfall and subsequent increase in terrigenous input resulted in lower nannoplankton productivity during these periods.

%Major oxide and %Ti decreased in both basins from 500–600cal YBP to 300–400cal YBP to 200–300cal YBP, which coincides with known insolation anomalies within the Little Ice Age (LIA, 200–600cal YBP). Furthermore, the southern sub-basin also revealed an abrupt decrease in grain size from 500–600cal YBP to 200–300cal YBP to 100–200cal YBP, and finally to 50–100cal YBP. Ni/Co, a bottom-water oxygenation proxy, revealed that the southern basin was always oxygenated and that the northern basin was anoxic from the LIA (~300cal YBP) to present. On the other hand, the northern basin shifted from being dysoxic to oxic during the Medieval Warm Period (MWP, ~700–1000cal YBP).

Possible local events may have occurred during the intervals 1,200–1,400cal YBP, 1,600–1,800cal YBP, and 2,100–2,300cal YBP as shown by abrupt shifts in calcareous nannofossil abundance, grain size, % major oxides, and %Ti and Ni/Co. These variations in productivity, sedimentation, and oxygenation were influenced by changes in monsoon strength through time.