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Distribution and constraining factors of planktonic and benthic foraminifers in bottom sediments of the southern South China Sea

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Consisted of shallower Sunda Shelf, deeper Zengmu Basin, and Nansha Trough Basin, the southern South China Sea (SCS) provides an ideal scene for oceanography studies. Spreading all over nearly from 50 to 3000m at depth, a total of 93 surface sediment samples were collected to analyze the environmental factors constraining the foraminiferal distribution pattern in the southern South China Sea (SCS). Species distributions and stable isotopic compositions were combined to reveal the controlling factors, such as depth, salinity, substrate, runoff, currents, and cold seep activities. Water depth is the dominant factor controlling both assemblage composition and $\delta^{18}\text{O}$ of benthic foraminiferal tests. The 1000 m isobath separates the sites into two clusters (Cluster A and B), which are dominated by deep-water species and shallow-water species, respectively. The sites in the deep-water zone (Cluster A) are characterized by lower absolute abundances, species richness and Shannon Index values (a measure of diversity), and higher proportions of planktonic foraminifers compared with the sites in the shallow-water zone (Cluster B). Increasing proportions of agglutinated tests with depth and rapidly decreasing proportions of planktonic foraminifera in the Nansha Trough Basin provide evidence of calcium dissolution occurring at a depth corresponding with previous reports. Oxygen stable isotopes ($\delta^{18}\text{O}_\text{B}$) of benthic foraminifera become more positive with depth only up to 1000 m and remain constant beyond. Differences in the proportion of agglutinated and porcelaneous tests in the shallow-water zone suggest that terrestrial runoff from nearby river systems (Mekong River and northern Borneo rivers) and seasonal surface currents (SCS Southern Cyclonic Gyre and SCS Southern Anticyclonic Gyre) jointly influence the distribution patterns of foraminifera in the study area. Enrichment of planktonic $\delta^{18}\text{O}$ is a response to cold waters brought by the SCS southern cyclonic gyre during winter. An upwelling current (Winter Natuna Off-Shelf Current) containing higher amounts of organic matter/nutrients contributes to the depleted $\delta^{13}\text{C}$ of planktonic foraminifera and to the abnormal abundance of foraminifera at the sites within its area of influence. The dominance of the foraminifer *Melonis barleeanus* at sites belonging to Subcluster A1 and the stable isotope compositions of benthic foraminifera ($\delta^{18}\text{O} > 0$, $\delta^{13}\text{C} < 0$) across the sites suggest the influence of active cold seeps in the southern SCS. This research highlights the complexity of environmental variables that interact to influence the foraminiferal assemblages and geochemistry in the southern South China Sea, which could serve as a model for paleoenvironmental and palaeoceanographic reconstructions.