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Determining Seasonal Variations of Benthic Foraminiferal Communities in the Southern Ocean

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The Southern Ocean with the Antarctic Circumpolar Current (ACC) acts to thermo-isolate the continent. Because of this separation, the Southern Ocean has unique seasonal qualities. During summer months, primary productivity is very high. In the winter months, formation of sea ice prevents sun light from reaching surface waters, therefore limiting productivity. The short seasons of productivity and long winters in Antarctica combined with seasonal changes in deep ocean temperatures, salinity, and fluxes of organic matter impact foraminiferal population dynamics. Fluctuations in primary productivity, as well as living foraminiferal assemblages have been documented around the Antarctica Peninsula, but the impact of surface productivity on these foraminiferal assemblages is poorly understood. This is a study of the relationship between seasonal primary productivity and benthic foraminiferal assemblages. Surface sediment samples from 600 meters and 1000 meters water depth were collected during two seasonal cruises: early April to record the productivity of the end-of-summer bloom and late June to sample the less-productive winter period. A total of 336 samples were collected from 7 sites in the southern Bransfield-northern Gerlache Strait. The samples were processed using standard techniques with the 63 micron to 150 micron and greater than 150 micron size fractions analyzed independently. A total of 81 species were identified. Seventy species were found in June and seventy one in April, fifteen species of foraminifera were unique to April and thirteen to June. Foraminiferal abundance was greater in the 63 micron size fraction in both seasons with the 150 micron size fraction having greater diversity. The abundance of total living (stained tests) opportunistic benthic foraminiferal species from the 7 sampled sites show distinct temporal differences, allowing us to identify seasonal assemblages. Fluctuating populations of foraminifera in fossil samples can be interpreted as changes in local or global climate. This study stands as a modern analog for fossil foraminiferal assemblages, and provides important information to help interpret paleoenvironmental conditions related to seasonlality. Understanding the population dynamics of these assemblages will improve the ability to assess past ecological conditions and reveal paleoclimate and seasonal environmental cycles.