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High-Resolution Sedimentation Rates at IODP Sites U1424 and U1427 since the late Pliocene from spectral-analyzing GRA Bulk Density and RGB Color Profiles

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Sedimentation Rates (SRs) for IODP Sites U1424 (lat/lon coordinates: 40^{o}11.40'N, 138^{o}13.90'E; water depth: 2808 mbsl) and U1427 (lat/lon coordinates: 35^{o}57.92'N, 134^{o}26.06'E; water depth: 330 mbsl) were calculated by performing spectral analysis in the depth domain on both RGB color and Gamma-Ray-Attenuation (GRA) bulk density data. Inversion and integration of SRs versus depth from spectral analysis yielded detailed SR profiles in both time and depth domains. Our results show a greater variability in calculated SRs and differed from those established through coarse-scaled biostratigraphy and paleo-magnetic data. Our data analyses produces pulses of distinct high SRs for certain depth/age intervals at both sites, with time lags for such features possibly due to variable oceanographic conditions near-shore for Site U1427 versus those at Site U1424 further offshore. Both GRA and RGB profiles reveal a distinct periodicity in the waveband of Milankovitch cycles and other prominent periodicities in the 10-to-1ky period range. This observation suggests climate variabilities and trends in SRs responding to insolation patterns during the past 1 Myr at both sites and extending to 4.5 Myr for Site U1424. With only few identified eccentricity (100ky) cycle segments throughout the entire normalized spectral amplitude profile, our high-resolution Age-Depth model was tuned to obliquity (41ky) and precessional (19-23ky) cycles to achieving a strong fit with corresponding low-resolution models based on biostratigraphy, paleo-magnetic and, at least for Site U1424, augmenting volcanostratigraphy data. According to our Age-Depth models, relatively low SRs occur when evolutive amplitude spectra are dominated by periods in the range of obliquity and eccentricity. In contrast, significant SR peaks at both sites often occur when strong precessional amplitudes coexist with all other cycles. Lower SRs at Site U1424 have been interpreted to reflect a decrease in diatom flux and relative increase in detrital fraction. By contrast moderate to higher SRs were associated with lower GRA density and due to a higher diatom flux. At Site U1427 a noticeable wax-and wane pattern in SRs corresponds to a predominance of precessional cycles in evolutive spectra. Such cyclicity has been also identified in records from other world regions (i.e. Australia; equatorial Africa, off India) and related to orbital solar cycles and wind patterns associated with the Monsoon. At the deep-water Site U1424 we model SR patterns which roughly correspond with those observed off SW Africa (southern part of the Benguela Current System) for the past 2.5 Myr. This possibly provides evidence for a teleconnection between the Southern and Northern hemispheres, where variabilities in the Northern polar front and ice sheet flows caused corresponding climatic and tectonic changes throughout the Pleistocene. By contrast, SR profiles calculated for the shallow-water Site U1427 represent perhaps more local and regional climate, sea level and bioproductivity variabilities than those modeled for the deep-water Site U1424. Thus, the variable dominance and coexistence of the various Milankovitch cycles in our records obtained at IODP Sites U1424 and U1427 might therefore reflect the complex interplay and control of the high-latitude (i.e., obliquity) with the low-latitude (i.e., precessional) of the orbital forcing spectrum.