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North Atlantic Drift Sediments Constrain Eocene Tidal Dissipation and the Evolution of the Earth-Moon System.

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Cyclostratigraphy and astrochronology are leading methods for determining geologic time. While this technique is dependent on the accuracy of astronomical calculations, the chaos of the solar system limits the confidence of these calculations when applied to ancient periods. High-resolution paleoclimate records, such as those found in Middle Eocene drift sediments from the Newfoundland Ridge (Integrated Ocean Drilling Program Sites (IODP) Expedition 342), offer a unique opportunity to reverse this approach. These sediments, with their high sedimentation rates and distinct lithological cycles, provide an ideal setting for this type of study. However, the stratigraphies of IODP Sites U1408-U1410 are complex and contain several hiatuses. We have overcome this challenge by creating a composite of the two sites and constructing a conservative age-depth model. This has allowed us to create a reliable chronology for this high-resolution sedimentary archive. We have used two different techniques to extract astronomical components (g-terms and precession constant) from proxy time-series, which have produced consistent results. Our study has found that astronomical frequencies are up to 4% lower than those reported in astronomical solution La04. These results provide new constraints on the variability of g-term on

million-year timescales, as well as evidence that the g4-g3 "grand eccentricity cycle" may have had a 1.2-Myr period around 41 Ma, instead of its current 2.4-Myr periodicity. Our estimates of the precession constant also confirms previous indications of a relatively low rate of tidal dissipation in the Paleogene. The Newfoundland Ridge drift sediments thus offer a reliable means of reconstructing astronomical components, providing a new target for future astronomical calculations.