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Orbitally forced variations of the ocean tide at Milankovitch time scales and their reflection in the sedimentary record - a perspective

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The varying eccentricity and orientation of the Earth' axis produce variations in the ocean tides. Insolation is related to the square of the distance to the Sun, tidal forces to the 3rd power. Thus changes of eccentricity produce greater relative variations in the ocean tides than in insolation. The 18.6 year lunar nodal cycle offers an analogue without changes in insolation, with variations in tidal amplitude of the order of 4% - 5%. In a variety of cases the lunar nodal cycle has been demonstrated to modulate tidal currents, coastal development, ocean mixing, and biological productivity. Similarly, in periods of high eccentricity, orbitally induced variations of the ocean tide must have significant effects on a variety of oceanographic and sedimentary processes. This may explain certain as yet less well understood aspects of orbitally induced cycles in the stratigraphic record related to ocean mixing, organic productivity and sedimentation in tide-influenced shallow marine carbonate and siliciclastic settings.