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A 2.3 Million Year Lacustrine Record of Orbital Forcing from the Devonian of Northern Scotland

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Detailed sedimentological examination of well exposed onshore sections through the continental Middle Devonian succession of northern Scotland have been augmented with offshore well data to allow the construction of a continuous 2.3 million year record of orbital forcing. The Middle Devonian of Northern Scotland comprises a succession of cyclic lacustrine deposits. The onshore exposures of this succession, although well exposed, are disrupted by faulting. Hand held gamma logging of onshore exposures has allowed direct ties to be made to adjacent offshore well data which provides a continuous record through the lacustrine succession. Further onshore sections, shown to be representative of those identified in the offshore data, help define the orbital periodicities influencing sedimentation and furthermore, provide insights in to the response of the lacustrine system through time.

Periodicities reflecting the Precessional (19 886 years) and Eccentricity (100 000 years) cycles are shown to be dominant by the direct measurement and extrapolation of depositional rates in well exposed sections as well as the analysis of ratios between primary and, modulating, secondary cycles. The demonstration of a robust link between gamma log response and lithology in the onshore cycles allows the offshore data to be to be interrogated for evidence of the long term climatic forcing of sedimentation. Fourier analysis has confirmed the presence of regular cycles throughout the succession which vary in thickness similarly to the onshore records. Variations in cycle thickness and symmetry are related to a trend from an underfilled to a balanced fill lacustrine basin. Of further importance is the period of each cycle during which lacustrine conditions, and therefore lake level controlled accommodation, existed.