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Milankovitch forcing of siliciclastic sediment flux in Middle Eocene deep-marine deposits, Ainsa basin, Spanish Pyrenees

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Outcrop gamma-ray spectroscopy was used to investigate the extent of Milankovitch cyclicity in the Middle Eocene Ainsa basin, Spanish Pyrenees. Part of this research was to test the hypothesis of Pickering & Bayliss (2009) that the deposition of the ∼25 sandy submarine fans (representing ∼8-10 Myr) was linked to the 400-kyr long eccentricity cycle. This study, combined with that of Quarmby (2010), was undertaken in the Banāston system of the Ainsa basin. A hand-held portable gamma-ray detector (Radiation Solutions 125 Super-Spec) was used to carry out sampling at 20 cm intervals through ∼380 m of stratigraphy. K, Th, U and total-count data were obtained from the essentially very fine-grained, laminated to thin-bedded, sandstone-marlstone deposits, interpreted as mainly interfan and fan lateral-margin deposits. K, Th and U contents are used as proxies for sand content, heavy detrital minerals and organic content, respectively. Time series analysis of the spectral gamma-ray data identified constituent frequencies using the REDFIT (Schulz & Mudelsee 2002) method. The method shows significant peaks ($\geq$90% confidence) that may correspond to the ∼100-kyr, ∼41-kyr and ∼20-kyr Milankovitch modes. Applying the average spectral misfit (ASM) method (Meyers & Sageman 2007) to these frequencies, suggests an optimum sediment accumulation rate of ∼30 cm/kyr for the Banāston system. These results suggest the temporal duration of interfan deposition was ∼400-kyr, thereby lending credence to the hypothesis that the long eccentricity cycle was likely a fundamental influence on siliciclastic flux to the Ainsa basin.