

Using extraterrestrial ^3He concentration to examine changing sedimentation rates within a precession cycle

SARAH LUCAS^{1*}, CHRIS BALLENTINE¹, STUART A. ROBINSON¹, HUGH C. JENKYN¹, SIETSKE BATENBURG¹

¹Department of Earth Sciences, South Parks Road, Oxford, OX1 3AN, UK. (*correspondence: sarah.lucas@linacre.ox.ac.uk)

Use of extraterrestrial ^3He concentration as a proxy for sedimentation rate in marine sediments allows the construction of high-resolution timescales. An instantaneous sedimentation rate is determined for each sample measured, allowing this method to be used in investigating changing sedimentation rates on a sub-precessional scale, as well as constructing timescales over sections with rapid fluctuations in lithology.

We build on the techniques established by Patterson and Farley [1] by releasing helium from samples using a laser heating system in order to reduce blanks, and expand the range of lithologies to which this method has been applied to include organic-rich black shales.

The study area, the Umbria-Marche basin, Italy, has long been of palaeoclimatological interest because extensive pelagic cyclically bedded successions spanning the Late Jurassic to the Eocene are encoded with records of rapid climate perturbation (for example the Mesozoic Oceanic Anoxic Events).

In the Cenomanian (Upper Cretaceous) Scaglia Bianca Formation, cycles of limestone and black cherts and/or thin black shales have been interpreted as precession cycles [2]. A high-resolution timescale has been constructed over one such cycle, to investigate how its 21ka timespan is apportioned within these different lithologies. Variation in sedimentation rate within the limestone unit, which makes up the bulk of the cycle by thickness, is examined in detail and compared with other sedimentological and geochemical records.

[1] Patterson and Farley (1998) *Geochim. Cosmochim. Acta* **62**, 3669-3682. [2] Batenburg *et al.* (2016) *Clim. Past Discuss.* 2016, 1–23.