**Supplementary Material**

for paper 638441

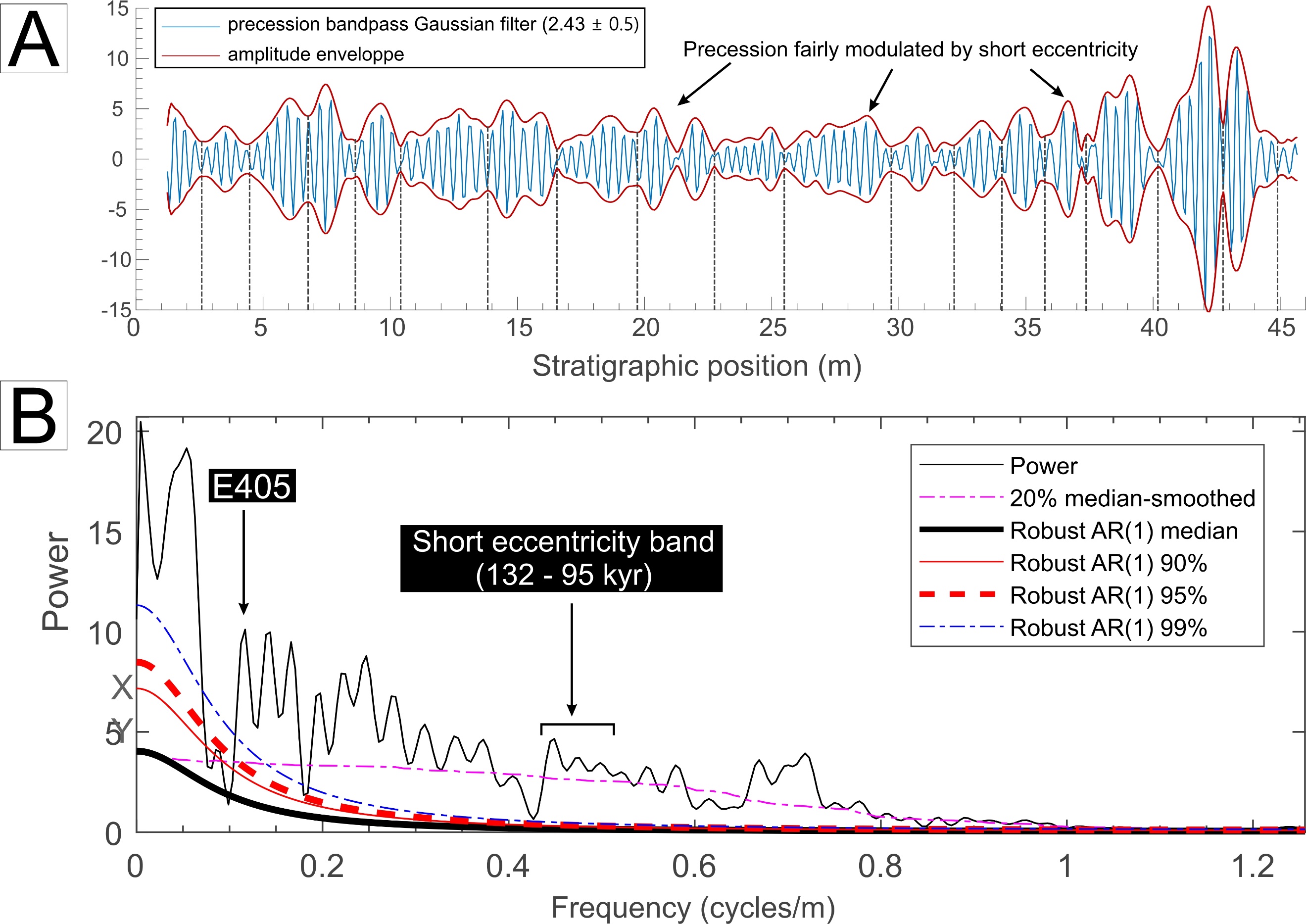
“Linking the variation of Sediment Accumulation Rate to short term sea-level change using cyclostratigraphy: case study of the Lower Berriasian hemipelagic sediments in central Tunisia (Southern Tethys)”

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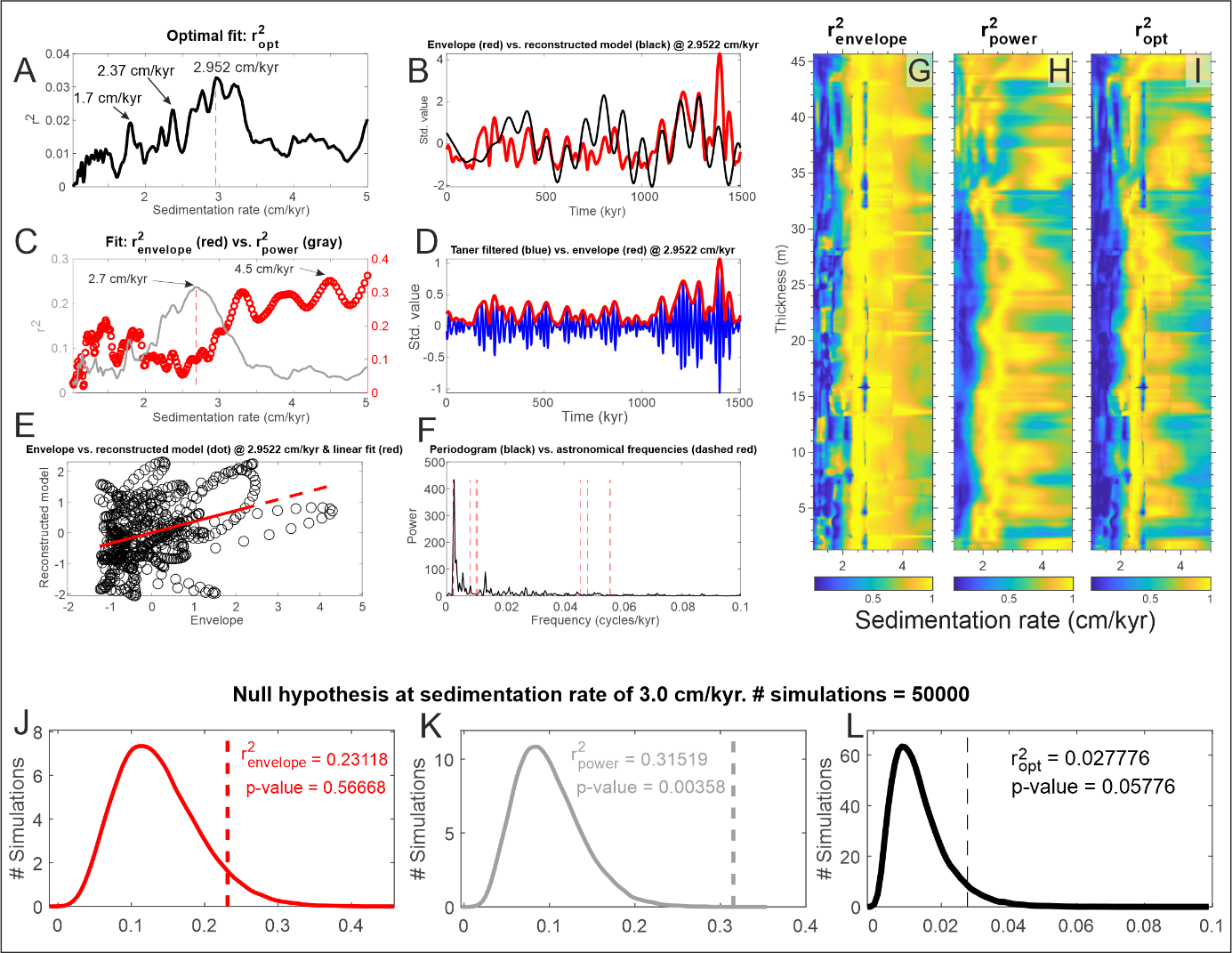
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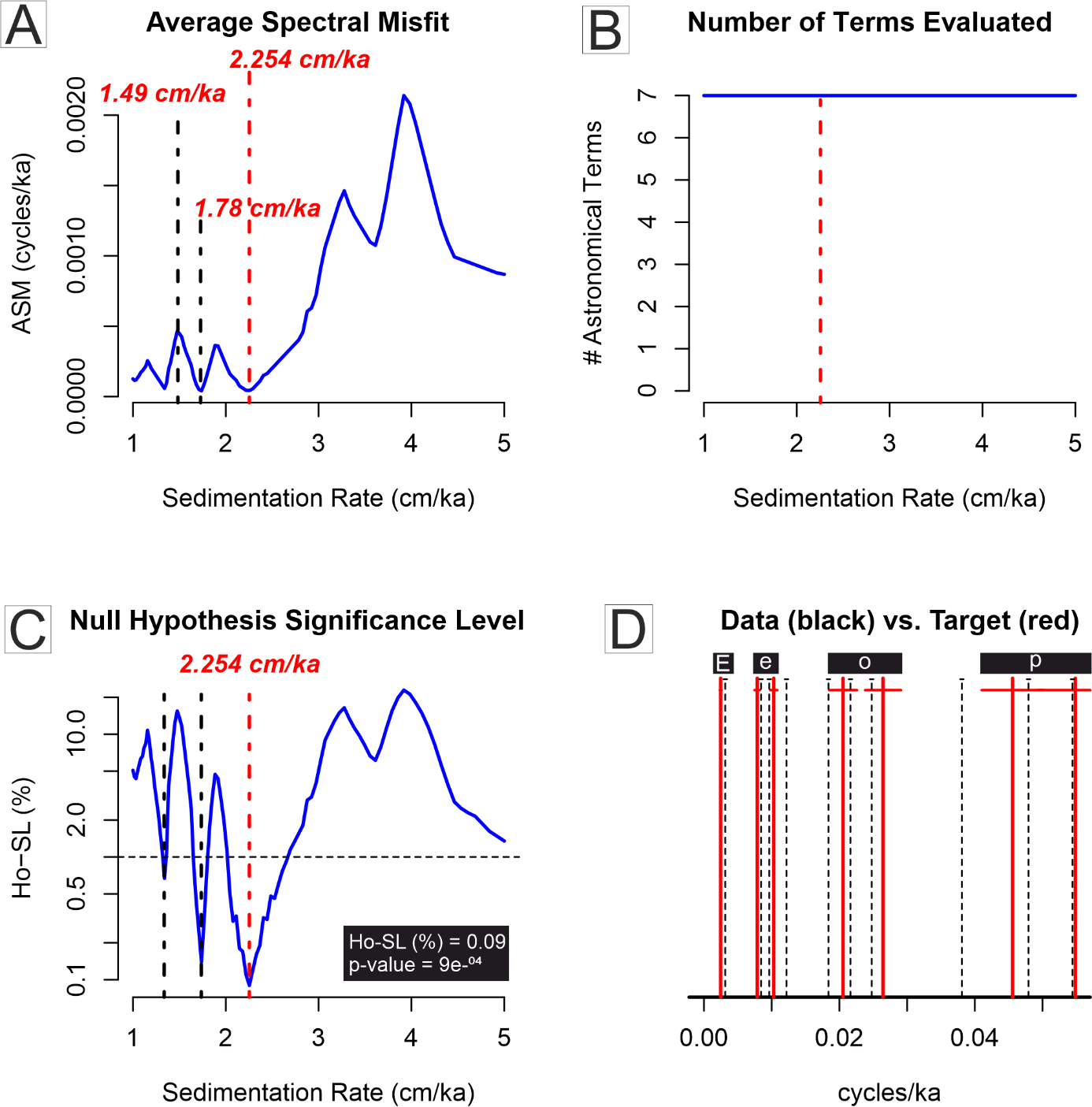
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**Supplementary Figure S1.** Amplitude modulation applied on the frequency bandwidth that we consider to be the precession band. (**A**) The MS time series was filtered at a bandwidth centered around the frequency of 2.45 m-1 (precession band) and the MTM applied on the envelope of the amplitude variation yields a power spectrum (**B**) with a significant peak at the frequency that corresponds to short eccentricity (0.411 m-1). This result supports our interpreted Milankovitch frequencies revealed by the MTM in **Figure 5**.

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**Supplementary Figure S2.** TimeOpt (**A–F**) analysis, evolutive TimeOpt (eTimeOpt) (**G–I**) analysis using a moving normalized) window of 12 meters (**G–I**) and Monte Carlo simulation (**J–L**) results for the lower Sidi Khalif MS series for 200 test sedimentation rates from 1 to 5 cm/kyr. The Taner filter passband was set to flow = 0.045 cycles/kyr and fhigh = 0.069 cycles/kyr; the roll-off was set to 1012. The input orbital eccentricity model frequencies and precession index frequencies are from the La2004 solution. (**A**) The combined Pearson correlation coefficient r2opt = r2envelope × r2power indicating an optimal sedimentation rate of 2.952 cm/kyr. (**B**) Comparison of the precession band amplitude envelope (red) and eccentricity model (black) for the optimal sedimentation rate of 2.9522 cm/kyr. (**C**) Pearson correlation coefficient vs. test sedimentation rate for the amplitude envelope of the precession index band (r2envelope) and eccentricity model (r2power). (**D**) Taner-filtered precession band and amplitude envelope. (**E**) Paired amplitude envelope and eccentricity model points illustrating the correlation at the optimal sedimentation rate of 2.952 cm/kyr. (**F**). Unsmoothed power spectrum of the MS series evaluated as a time series at the optimal sedimentation rate of 4.642 cm/kyr. (**G**) Squared Pearson correlation coefficient for the amplitude envelope fit (r2envelope). (**H**) Squared Pearson correlation coefficient for the spectral power fit (r2power). (**I**) Results from the combined envelope and spectral fit (r2opt). (**J**) 50000 Monte Carlo simulations of AR1 red noise at the sedimentation rate indicated by the amplitude envelope of the precession index band (4.5 cm/kyr; r2envelope = 0.23118; p = 0.56668). (**K**) 50000 Monte Carlo simulations of AR1 red noise at the sedimentation rate indicated by the orbital eccentricity model (2.7 cm/kyr; r2power = 0.31519; p = 0.00358). (**L**) 50000 Monte Carlo simulations of AR1 red noise at the optimal sedimentation rate (2.9522 cm/kyr; r2opt = 0.027776, p = 0.05776).

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**Supplementary Figure S3.** ASM of untuned MS series applied over a range of sedimentation rates from 1 to 5 cm/kyr, using the astronomical target frequencies of Berger et al., 1992 around 145 Ma. The analysis was performed using Astrochron package (Meyers, 2014) under R software as updated in Meyers et al., 2012 (following the approach outlined in Meyers and Sageman (2007), and the improvements of Meyers et al., (2012)).

**Supplementary Table S1.** Frequency ratios of orbital periods of the Berriasian stage (Laskar et al., 2004)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| in kyr | *P2 (18)* | *P1 (22)* | *O (27)* | *O (36)* | *O (45)* | *e (100)* | *E (405)* |
| *P2 (18)* | 1 |  |  |  |  |  |  |
| *P1 (18)* | 0.81 | 1 |  |  |  |  |  |
| *O (27)* | 0.66 | 0.81 | 1 |  |  |  |  |
| *O (36)* | 0.5 | 0.61 | 0.75 | 1 |  |  |  |
| *O (45)* | 0.4 | 0.48 | 0.6 | 0.8 | 1 |  |  |
| *e (100)* | 0.18 | 0.22 | 0.27 | 0.36 | 0.45 | 1 |  |
| *E (405)* | 0.044 | 0.054 | 0.066 | 0.088 | 0.11 | 0.246 | 1 |

**Supplementary Table S2.** Frequency ratios of the untuned MS (black) and %CaCO3 (dark blue) MTM significant peaks

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| in meter | 0.34 | 0.41 | 0.57 | 0.66 | 0.87 | 2.25 | 10 |
| 0.34 | 1 |  |  |  |  |  |  |
| 0.41 | 0.81 | 1 |  |  |  |  |  |
| 0.57 | 0.66 | 0.81 | 1 |  |  |  |  |
| 0.66 | 0.5 | 0.61 | 0.75 | 1 |  |  |  |
| 0.87 | 0.4 | 0.48 | 0.6 | 0.8 | 1 |  |  |
| 2.25 | 0.18 | 0.22 | 0.27 | 0.36 | 0.45 | 1 |  |
| 10 | 0.044 | 0.054 | 0.066 | 0.088 | 0.11 | 0.246 | 1 |
| in meter | **0.31** | **0.43** | **0.56** | **0.63** | **0.83** | **2.14** | **10.15** |
| 0.34 | 1 |  |  |  |  |  |  |
| 0.43 | 0.72 | 1 |  |  |  |  |  |
| 0.56 | 0.55 | 0.76 | 1 |  |  |  |  |
| 0.63 | 0.49 | 0.68 | 0.88 | 1 |  |  |  |
| 0.83 | 0.37 | 0.51 | 0.67 | 0.75 | 1 |  |  |
| 2.14 | 0.14 | 0.2 | 0.26 | 0.29 | 0.38 | 1 |  |
| 10.15 | 0.03 | 0.04 | 0.055 | 0.062 | 0.081 | 0.21 | 1 |