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What cycles are recorded in continental Most Basin (Czech Republic, late Burdigalian)?

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Understanding to climate dynamics requires identification of orbital forcing as a piece of a jigsaw puzzle. High-frequency climate changes could be the reason of discrepancies among Miocene climate reconstructions from sediment archives. Nearly all continental sediment sequences have some repetitive patterns, of which causes can be manifold; orbital forcing (climatic cycles) is only one option. There are two main reasons for this uncertainty: 1) recording mechanisms of climate changes in a real sediment basin are site-specific and ambiguous (and usually not known, or not reported) and 2) autocyclic behaviour (inherent chaos) and tectonics can also produce repetitive patterns and statistics itself is not capable to reveal that their nature is not climatic. On the other hand, most pale-ontological climatic reconstructions have temporal resolution in order of Myr (or at best in tenths of Myr), which cannot really reflect the expected climate dynamics.

We have studied about 250 m thick clastic syn-rift sediment sequence in the Most Basin in the Ohře Graben (Czech Republic). In the mature-rift stage, a basin-wide lake existed there for <1 Myr during the late Burdigalian (before Mid-Miocene Climate Optimum). The palaeogeography of the lake watershed changed due to rift evolution, which is an important but still only roughly described variable. Tectonic pulses probably affect the accomodation space, a network of feeding rivers and/or a basin outflow pathway during the lake existence. The clear and well-correlated variations in Sr and K concentrations in the sediments suggest orbital components (multitaper spectral estimation and misfit relative to theoretical Milankovitch frequencies). There is a question, whether the formal statistics (without understanding the actual recording mechanism and excluding other repetitive environmental changes) is sufficient to confirm climatic basis for these variations, although such approach can be found in numerous current studies.

The proof that we really handle Milankovitch cycles in the Most Basin lacustrine mudstones is a consistency of cyclostratigraphy-based sedimentation rate (16-20 cm/kyr) which allowed assignment of one complete inverse magnetozone (100 m thick monotonous lacustrine mudstones) to C5Cr or C5Dr chrons in the late Burdigalian (there are no other plausible options respecting the small mammal biozone MN3a in the early rifting stage). The simplest interpretation of the Milankovitch cycles in our sediment succession is variability in precipitation in Central Europe at a scale of tens to hundreds kyr.