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A distinct cooling predates the Mid-Miocene Climate Optimum in Central Europe

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Epicontinental seas with their vast climate-sensitive shelf areas comprise a valuable archive for paleoclimatology. In many cases, their sedimentary records document the impact of global climate patterns as well as regional aberrations thereof with higher accuracy than records of the open ocean.

Based on an evaluation of more than 170 localities, a review of the paleoclimatic record of the mid-Burdigalian (late Eggenburgian-late Ottnangian; c. 17.2-19.2 Ma) Central Paratethys Sea and its adjacent continental hinterland reveals a quick deterioration of climate from subtropical to temperate conditions around 18.1 Ma. The signal is present in marine and terrestrial proxies: a temperature drop of c. 2-3 °C is estimated for surface and bottom waters of the Central Paratethys and a less pronounced drop of c. 1.5 °C for terrestrial climate. Based on the regional stratigraphic frame-work temperate conditions lasted for approximately 300 ka. Climate recovery towards subtropical conditions started not before c. 17.8 Ma heralding the Miocene Climatic Optimum.

Synchronous tectonic and paleogeographic events suggest a two-step model to explain this pattern: (1) The closure of the Tethyan Seaway towards the Indo-Pacific Ocean and a renewed connection of the westernmost branch of the Western Tethys with the Central Paratethys via the North Alpine Foreland Basin resulted in a major change of circulation patterns. The inflow of warm surface waters from the Indo-Pacific ceased resulting in cooling of the Mediterranean and Paratethys seas. (2) Subsequently, the trend towards temperate conditions was amplified by an Antarctic glaciation (isotopic event Mi1b, c. 17.8-17.9 Ma) resulting in a short-term drop in global temperatures causing subsequent cooling of the marine water and the terrestrial climate.

More studies on continuous sedimentary records from drill sites are in progress and will further help to document and understand regional paleoclimate. The present study shows exemplary the importance of epicontinental seas as high-resolution recorders of past climate on a local and global scale.

A new Early Miocene barnacle lineage and the roots of sea-turtle fouling Chelonibiidae (Cirripedia, Balanomorpha)

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The origin of the mainly sea-turtle fouling balanomorph family Chelonibiidae is still poorly documented. Aside from an erratic Eocene occurrence, assigned to an extinct subfamily, the extant subfamily Chelonobiinae did not appear in the fossil record before the Late Miocene. Now, a new lineage is recorded as an extinct sister-group of the Chelonibiinae. The new subfamily is known so far only from the proto-Mediterranean and the Paratethys seas and ranged from Early Miocene to Late Pliocene times. Members of the subfamily are characterised by large walls with tripartite rostra which display distinct sutures on the external surface. The tripartite rostrum, however, has evolved independently several times in the evolution of the balanomorphs and cannot be treated as synapomorphy. The subfamily comprises one new genus and two species. The sculpture of the host substratum is preserved as imprints along the carino laterals of one specimen. Although the pattern of ridges and furrows cannot be identified with certainty, the similarities with the sculpture of the carapax of modern *Caretta* suggests the new genus as earliest record of sea-turtle fouling in balanids. The co-existence of members of both subfamilies during the Miocene and Pliocene documents a higher diversity of chelonibiids in pre-Pleistocene times and indicates that Chelonibiinae were able to out compete their supposed sister-group with the onset of the glacial cycles.

Lepadiform and scalpelliform barnacles from the Oligocene and Miocene of the Paratethys Sea

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Oligocene and Miocene lepadiform and scalpelliform barnacles are still poorly known. The records are isolated and spotty. Ten species of stalked barnacles are known from the Oligocene and Miocene of the Paratethys Sea. These comprise 2 lepadiform and 8 scalpelliform species. Only 2 species are recorded from the Oligocene, whereas 4 are documented from the Early Miocene and another 4 from the Middle Miocene. Only one Oligocene and one Miocene

species occur in two different Paratethyan basins in roughly coeval environments and only a single Middle Miocene species is also known from the adjacent Mediterranean Sea. This pattern points to an extremely poor documentation of this group in the post-Eocene deposits of central and southern Europe. Thus, the diversities during the Oligocene and Miocene remain low and range from one to four species. A slight increase during the Langhian might be correlated with the Mid-Miocene Climate Optimum but could also be simply related to the larger extant of Middle Miocene deposits.
Stalked barnacles are highly informative in terms of palaeobathymetry, often indicating bathyal or at least deep sublittoral environments. Therefore, they are important index fossils for palaeobathymetric and palaeogeographic reconstructions in the Paratethys. Especially, the abundance of the lepadiform *Poecilasma* in evaporitic deposits of the Middle Miocene Badenian Salinity Crises may serve as new evidence for a deeper marine depositional environment. As extant *Poecilasma* are deep water dwellers, these occurrences are important proxies for deep marine basins in the Carpathian Foredeep during the Middle Miocene.

Palaeocene/Eocene and Lower Eocene monoaperturate pollen from Austria

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Pollen from two localities in Austria will be re-evaluated and illustrated: 1) New samples from the Lower Eocene Krapfeld locality (Carinthia) is characterized by a diverse terrestrial microflora that reflects real megathermal conditions (HOFMANN & ZETTER 2001, ZETTER & HOFMANN 2001) and 2) the Palaeocene/Eocene boundary locality (Salzburg County), in which the terrestrial microflora is less diverse and comprises more mesothermal elements, such as various *Normapolles* taxa. The difference between more mesothermal climatic conditions during the Palaeocene/Eocene transition and more megathermal climatic conditions during the lower Eocene can be particularly well established by the presence or absence and diversity of sulcate and monoporate pollen types occurring in both localities. At krappfeld there is a dominance of mainly Arecaceae (e.g., various Calamoid types and *Nypa*), and to a lesser extant Araceae (*Proxapertites* type) and Chloranthaceae (*Emmapollis*) in contrast to abundant *Sparganium* and Restoniaceae, only two Arecaceae and one Araceae (*Lysichiton*-type) in the Salzburg area.

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Reconstructing the formation of microbialites in post-glacial coral reefs using lipid biomarkers and stable isotopes

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At Tahiti (Central Pacific), the post-Last Glacial Maximum (LGM) reef-succession typically consists of coral framework encrusted by coralline algae and later by thick (up to 15 cm) microbial carbonate crusts, so called reef-microbialites. These microbialites make up as much as 80 % of the rock volume (CAMOIN et al. 1999). Similar deglacial microbialites occur in coral reefs off Vanuatu (South-West Pacific; CABIOCH et al. 1999), whereas only thin crusts of microbial carbonates were observed in Holocene coral reefs off Belize (Caribbean) and from the Maldives (Indian Ocean; GISCHLER 2008, GISCHLER et al. 2008). After sea-level stabilized approximately 6000 years ago, microbialites ceased to form in these coral reefs. Their occurrence in post-LGM reefs is believed to reflect environmental change during the rapid last deglacial sea-level rise (CABIOCH et al. 1999, CAMOIN et al. 1999).
To improve our understanding of the genesis of reef-microbialites, we used lipid biomarkers extracted from the microbial carbonate and the stable isotopic compositions of sulfur and oxygen in carbonate-bound sulfate as well as the stable isotopic compositions of sulfur in sulfide minerals to identify microbes and processes inducing microbialite formation during the last sea-level rise. Detected sterols, saturated and monounsaturated short-chain fatty acids are predominantly derived from both marine primary producers (algae) and bacteria, whereas long-chain fatty acids and long-chain alcohols derived mainly from higher land plants representing terrestrial input. Bacterially-derived branched fatty acids (10-Me-$C_{16:0}$, *iso*- and *anteiso*-$C_{15:0}$ and -$C_{17:0}$) and mono-*O*-alkyl glycerol ethers (MAGEs) are biomarkers of intermediate to high specificity for sulfate-reducing bacteria (SRB). These branched fatty acids as well as MAGEs are exceptionally abundant in the microbial carbonates from Tahiti (HEINDEL et al. accepted) and Vanuatu compared to the deglacial inter-reef sediment from Tahiti. In microbial crusts from Belize and the Maldives, the biomarker signal of SRB is weak. The isotopic values of the carbonate-bound sulfate in microbialites from Tahiti and Vanuatu ($\delta^{34}S$: 21.9 to 22.2‰, $\delta^{18}O$: 11.3 to 12.4‰) are higher than that of a coral ($\delta^{34}S$: 21.3‰, $\delta^{18}O$: 10.5‰), recovered from the same post-glacial reef-interval off Tahiti, and modern seawater ($\delta^{34}S$: 20.3‰, $\delta^{18}O$: 8.6‰), which indicates bacterial sulfate reduction. The sulfide minerals (mainly pyrite) in microbialites from Tahiti and Vanuatu yield low $\delta^{34}S$ values from -43.2 to -