

Advances in understanding the Neogene Mediterranean-Paratethyan System

Marine connectivity fluctuations during the Badenian, in the Carpathian Foredeep-Central Paratethys

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The Badenian (Middle Miocene) of the Carpathian Foredeep in the Central Paratethys experienced dramatic paleoenvironmental transformations, ranging from brackish conditions to fully marine and hypersaline settings. These fluctuations were primarily driven by changes in marine connectivity, which governed phases of transgression, restriction, and evaporite deposition. A major marine transgression dated at ~15 Ma led to widespread flooding of the Central Paratethys, marking a crucial phase of increased connectivity with the Mediterranean realm. However, this marine influence was short-lived, as restriction and salinity buildup culminated in the Badenian Salinity Crisis between 13.81 ± 0.08 and 13.32 ± 0.07 Ma, leading to extensive evaporite deposition. While these major events are well-documented, the transitional phases remain poorly understood. Specifically, the environmental conditions preceding the marine flooding, the dynamics of the transition from marine to evaporitic settings, and the post-evaporitic recovery following the crisis require further investigation. Here, we analyze a series of stratigraphic sections from the Carpathian Foredeep, integrating sedimentological, geochemical, and paleontological data with a comprehensive review of previous research. By reconstructing the full spectrum of paleoenvironmental evolution during the Badenian, we aim to clarify the mechanisms driving salinity fluctuations and marine connectivity shifts in the Central Paratethys, shedding new light on the interplay between regional tectonics, eustatic changes, and climatic factors.