



## **Modelling the connectivity between sedimentary basins at short time scales and reduced amplitudes: inferences for Paratethys connectivity during the Messinian Salinity Crisis.**

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During orogenic growth, sedimentary basins can evolve independently as a result of separation from regional or global sea level(s). The common situation is that the sea level between these isolated basins does not vary significantly and the height of the separating barrier is low, especially during the early stages of mountain growth. In particular, the post-Oligocene evolution of the Paratethys is characterised by the endemic evolution of numerous sub-basins which have often connectivity events. One such relevant connectivity event takes place during the Messinian Salinity Crisis, when the Eastern Paratethys was characterised by a regional level in the Black Sea and suspended lakes levels in the neighbouring smaller areas such as the Dacic basin. In restricted conditions, depocenters are controlled by the interaction between basin fill, lithospheric flexure and erosion of the separating barriers together with other processes such as climate, hydrology balance and the rates of base level drop. We use a difference element model which combines tectonic with surface processes to analyze the parameters controlling the occurrence and timing of sediment shifts from the isolated basin to the open seas. Modelling indicates that these shifts are controlled by the height of the barriers and the rate of sea-level change, which will cause delays between 0.2 and 0.7Ma compared to basins without such barriers. These delays will create local base levels in isolated basins for a time interval up to 1.8Ma. During the base level drop temporary moments of connection exist between the isolated basin and open

sea. The flexural rigidity has only a limited influence on the timing, occurrence and magnitude of sedimentation shifts. Modelling predicts clear sequence stratigraphic patterns driven in particular by the existence of the barrier, such as forced clinoforms. These features observed during modelling are in agreement with the observations in the Dacic and Black Sea basins, especially for rates and magnitudes of change during the Pontian/Messinian event. The connection between the two basins was established only at a later stage during the cycle of the sea-level change by erosion and fill of the Dacic basin, which created a subsequent dramatic increase of sedimentation rate in the Black Sea.