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Jurassic carbonate microfacies, sea-level changes and the Toarcian anoxic event in the Tethys Himalaya (South Tibet)

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Detailed microfacies analysis of carbonate rocks from the Tingri and Nyalam areas of South Tibet allowed us to reconstruct the evolution of sedimentary environments during the Early to Middle Jurassic. Based on texture, sedimentary structure, grain composition and fossil content of about 500 thin sections, 17 microfacies overall were identified, and three evolutionary stages were defined. Stage 1 (Rhaetian?-lower Sinemurian Zhamure Formation) was characterized by siliciclastic and mixed siliciclastic-carbonate sedimentation on a barrier shore environment, stage 2 (upper Sinemurian-Pliensbachian Pupuga Formation) by high-energy grainstones with rich benthic faunas thriving on a carbonate platform, and stage 3 (Toarcian-lower Bajocian Nieniexiongla Formation) by low-energy mudstones intercalated with frequent storm layers on a carbonate ramp. Besides, Carbon isotope analyses (δ13Ccarb and δ13Corg) were performed on the late Pliensbachian-early Toarcian interval, and the organic matter recorded a pronounced stepped negative excursion -4.5‰ corresponding to characteristics of the early Toarcian oceanic anoxic event globally, which began just below the stage 2-stage 3 facies shifting boundary.
The comparison between the Tethys Himalaya (South Tibet) and the tropical/subtropical zones of the Western Tethys and Panthalassa was carried out to discuss the factors controlling sedimentary evolution. The change from stage 1 to stage 2 was possibly induced by sea-level rise, when the Tibetan Tethys Himalaya was located at tropical/subtropical latitudes in suitable climatic and ecological conditions for carbonate sedimentation. The abrupt change from stage 2 to stage 3 is interpreted as a consequence of the early Toarcian oceanic anoxic event, accompanied by obvious carbon-isotope negative excursion and sea-level rise. The failed recovery from the carbonate crisis in the early Bajocian, with continuing deposition on a low-energy carbonate ramp, is ascribed to the tectonic moving towards higher latitudes.