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Jurassic-Cretaceous continental margin of Southeastern Russia: Outcrop sequence stratigraphy, sedimentation and tectonics

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Data on the composition and distribution of the sedimentary complexes of the Late Mesozoic continental margin of Southeastern Russia and their boundaries permit reconstruction of the tectonic evolution stages using different units of outcrop sequence stratigraphy separated by unconformities.

Four siliciclastic megasequences extending from the Bureya ancient massif (microcontinent) to Sakhalin have been recorded within the Jurassic-Cretaceous continental margin of SE Russia: Sinemurian-Oxfordian (MS-1), Volgian-Barremian (MS-2), Aptian-Cenomanian (MS-3), and Turonian-Maastrichtian (MS-4). Lateral facial profiles for each megasequence were constructed across the continental margin to a distance of 700 km. Megafossils (ammonites, buchiids and inocerams) and radiolarians were used for stratigraphic subdivision. During the Jurassic-Cretaceous, the studied region was affected by both Boreal and Tethys transgressions, as indicated by mixed faunal assemblages. The tectonic regime changed from passive continental margin in the Jurassic to active and transform in the Cretaceous.

The first megasequence (Sinemurian-Oxfordian) includes five sequences on the margin of the Bureya Massif being separated by unconformities indicating regressions in the earliest Pliensbachian, Toarcian, in the earliest Aalenian, and at the end of the Bathonian. On the Bureya Massif margin in MS-1 a regressive succession is clearly demonstrated by changing from coastal-marine to continental coal-bearing in the latest Jurassic. To the east, in the direction of deeper parts of the basin, the sequences are divided indistinctly, unconformable boundaries are replaced by conformable, shallow-water shelf environments are replaced by the environments of a deeper shelf (siltstones and mudstones) and slope (turbidites), and finally by siliceous-clayey shales and cherts of a deep-water basin.

The second sequence (Volgian-Barremian) comprises Volgian-Valanginian and Hauterivian-Barremian sequences, the first of which is subdivided into 3 parasequences which reflect transgressive-regressive cycles. The coastal line shifted to the east, although the character of facial changes from west to east remained the same in the Volgian-Barremian sequence. The Hauterivian-Barremian sequence is reliably defined only in the eastern part of the basin (turbidites). The western part of the basin was apparently elevated at that time due to intensive left-lateral strike-slip displacements and eroded.

The third megasequence (Aptian-Cenomanian) involves two sequences: Aptian-mid-Albian and mid-Albian-Cenomanian. During the Aptian to mid-Albian, island arcs began to emerge both on the continental margin and in the sea basin, as supported by the volcanic material admixture in the sediments, including turbidites. Sedimentation took place in the back-arc, inter-arc and forearc basins (as in the case of the Philippine Sea).

Mid-Albian-Cenomanian sequence formed in the complex conditions. On the one hand, it was a period of maximal global Cretaceous transgression and on the other Late Albian was a time of collision, formation of scaly-thrust structure in East Russia, onset of the formation of East Sikhote-Alin marginal-continental volcanic belt and as a consequence shrinking of the sea basin area in the belt back and its eastward migration. Such conditions caused a complex of volcanic sedimentary rocks in the back-arc (Priamurie) and forearc (West Sakhalin) basins to form.