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Sedimentary Fe/Mn layers buried deeply below the bottom surface in Lake Baikal

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In Lake Baikal, constantly oxygenated water column results in intensive accumulation of iron and manganese in surface oxidized sediments. However, in the region of underwater Academician Ridge Fe/Mn layers and crusts are also found deeply (meters) below the water-sediment interface. Formation of such crusts was firstly related to climatic fluctuations in the region (Deike et al. 1997), later - to tectonic events in the lake. We believe that in Baikal depression, the weathering crust, sub-aerial cover, and accompanied Fe, Mn, and P ores developed during the Cretaceous-Paleogene and Neogene epochs, characterized by warm and wet climatic conditions. Later on, the depression's diurnal surface was flooded by water basins newly formed in the region, however fragments of this surface are widely spread both on the land and the lake bottom in the regions of Olkhon Island and Academician Ridge. As a result of the Late Pleistocene tectonic movements, the surface of Academician uplift was submerged below the present lake's level. Covered this surface ancient (pre-Baikalian) ore-bearing formations were also submerged. Age of sedimentary Fe/Mn crusts buried deeply below the bottom surface in the region of Academician Ridge is about 100 Ky (Deike et al. 1997; Granina et al. 2003), and it agrees with suggestion on the crusts burial due to tectonic movements that have started in this part of the lake about 120 Ky ago. There are different evidences supported this hypothesis (Mats et al. 2000; Granina et al. 2003); new ones presented in this paper are the following: i) A map firstly constructed using the regional geological data clearly shows that location of the continental Fe and Mn ores and phosphorites in the Central Western Prebaikalie and shore-land near the Olkhon Island (Preolkhon'ie) is rather close to nearby area of the lake bottom, where Fe/Mn crusts are deeply buried within the sediments. This testifies in favor of their subaerial origin and relation to the continental ores on the western lake shore. Some of the buried crusts are bedded directly in subaerial sands; the others were re-deposited under conditions of extremely low content of organic carbon in ambient sediments. ii) The first data are presented on the elemental composition of deeply buried Fe/Mn crusts (layers) obtained by SR-XRF method as described in (Phedorin et al. 2000). They indicate that crusts are enriched compared to ambient sediments not only in Fe and Mn, but also in Cu, Sr, Cr, and V; in some cases - in Ni, Pb, and Mo. The Cr and V enrichment needs to be further explained since these elements show no any accumulation in the recent Baikal sediments (Muller et al. 2002). The highest enrichment (6-8 times) is found for As and U. Many of buried crusts are highly enriched in P as may be exemplified by data presented in (Deike et al. 1997). Some of them were identified as U-bearing phosphorites (Zhmodik et al. 2001). The highest U content (up to 260 ppm) was recorded in secondary vivianite found at 316 cm depth in sediment core from Academician Ridge (Fagel et al. 2005). In general, the concentrations of Fe, Mn, and P oxides in deeply buried crusts have the same order of magnitude as the highest concentrations recorded in continental phosphorites of the Sarminsky and Ozersky deposits located on the western Baikal shore. Thus new data presented show that Fe/Mn crusts buried deeply below the water-sediment interface in some areas of Lake Baikal may be inherited from ancient ores formed under quite different climatic and sedimentological conditions. They could serve as markers of past tectonic events started in the Late Pleistocene.

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