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# Possible mechanisms of the Neotectonic crustal uplift and subsidence

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Crystalline shields such as the Baltic and Aldan ones have been rising for billions of years. In some deep sedimentary basins, e.g., in the East Barents and North Caspian ones the formation of 20 km of sediments took hundreds of Myr. During their lifetime crystalline shields and deep basins were drifting with the lithospheric plates for thousands of kilometers. This indicates that the preservation of the signs of vertical movements was mainly associated in them with the properties of the underlying lithosphere and to a less extent with the processes in the underlying mantle.

Strong acceleration of vertical crustal movements took place on the continents in the Pliocene and Pleistocene. The uplift occurred over about 90% of the land area. It ranges from 100-200 m on the East European Craton, to 4-5 km on the Tibetan and Andean plateaus. In some regions, e.g., in the Tarim and South Caspian basins rapid subsidence occurred concomitantly to the uplift in the adjacent mountain ranges. Strong acceleration of the subsidence took place in some shelf regions at the time of rapid uplift on the adjacent land. This did not considerably change the position of the shoreline as in Southern Africa and Arctic Eurasia.

Rapid Neotectonic uplift and subsidence predominantly occurred long after the termination of shortening and stretching of the crust as, e.g., on the Precambrian cratons formed $\geq$500 Myr ago which cover about 70% of the land. In a state of isostasy the uplift and subsidence without significant shortening and stretching of the crust required a density decrease and increase in the lithospheric layer. Concomitant occurrence of the uplift and subsidence in closely spaced regions indicates their common cause. We suggest that they resulted from metamorphism in the crust initiated by infiltration of fluids of a deep origin. Rapid uplift in the Pliocene and Pleistocene occurred in rocks which had been deeply metamorphosed earlier at a large depth and temperature and emerged to a lower depth after removal of a thick layer of rocks by erosion. In a dry state and at a moderate temperature T = 350-400 C they remained metastable. But in a presence of fluids owing to low-temperature metamorphism, diaphthoresis, hydrous minerals replaced the high-temperature rocks with expansion by 5-10%. This gave rise to pronounced uplift at the surface. Rapid subsidence occurred in basins where under a thick sedimentary pile mafic rocks in consolidated crust subsided to a great depth where the formation of dense garnet-bearing gneisses, amphibolites or eclogites takes place.

In many regions metamorphism changed considerably the crustal structure. In the North Caspian and East Barents basins the Moho boundary has risen to the top of the lower crust where high-velocity mafic eclogites were formed after gabbro. On the Tibetan plateau and Tien Shan hydration produced diaphthoritic rocks which gave rise to the formation of low-velocity and high-conductivity layers within the crust.