Holocene vertical movement of the east coast of Kamchatsky Peninsula (Kamchatka) based on coastal marine terraces

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Recent geological and geomorphologic studies of aggradational Holocene coastal terraces provided new data on rates and directions of vertical movement of the coastal areas of the Kamchatsky Peninsula (Pinegina et al., 2010), deformation of which may reflect the mode of the interaction of the northwest-moving Komandorsky Island block with the Kamchatka mainland (Geist, Scholl, 1994; Gaedicke et al., 2000; Freitag et al., 2001). Based on 32 shoreline profiles and about 300 excavations we , quantify vertical movement using differential elevations of paleosurfaces dated with marker tephra layers (Pedoja et al., in prep).Variation in elevations both along single profiles and between adjacent profiles were examined (Figure 1).

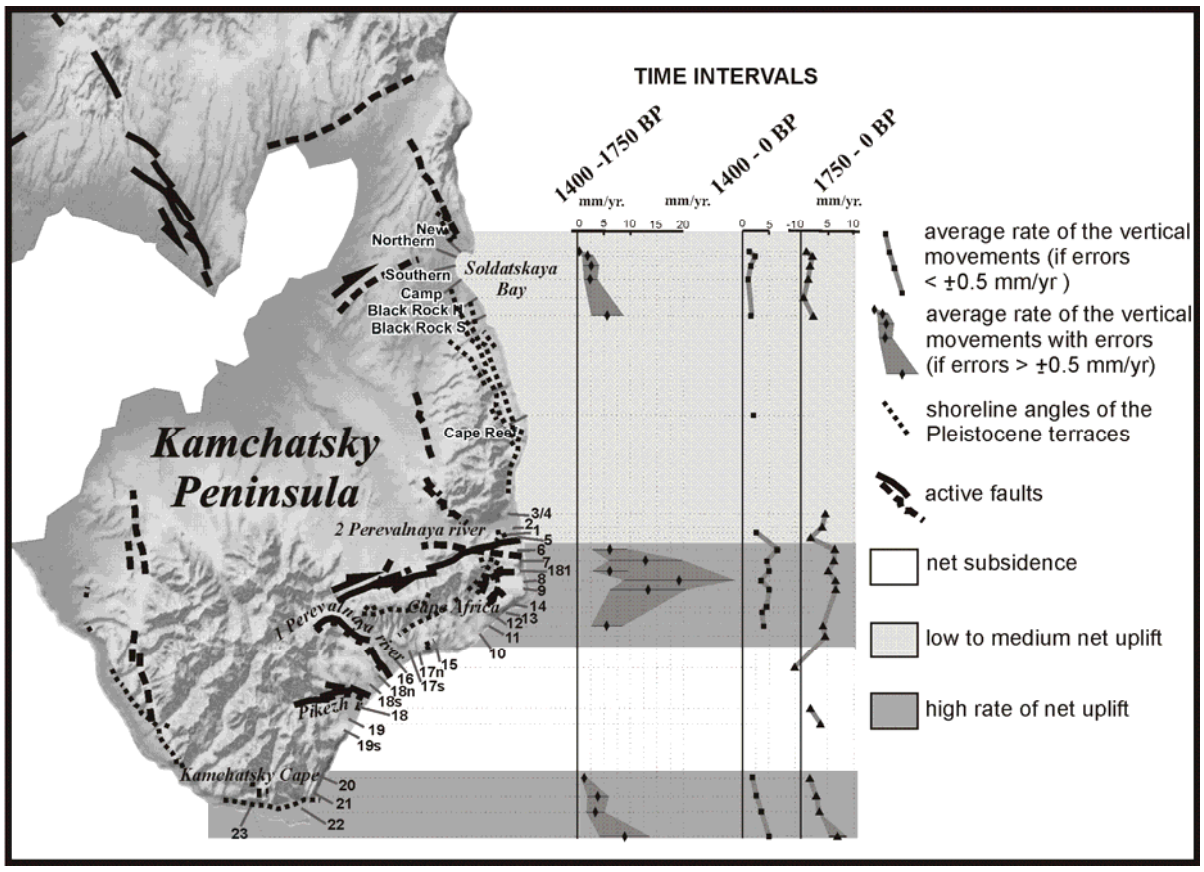

Figure 1. Average rate of Holocene vertical movements (mm/yr or m/ka) along the east coast of Kamchatsky Peninsula

Based on our data we conclude that:

1) Average rates of vertical movement of the Kamchatsky Peninsula coastal area during the last ~2000 years varied in the range between -1.04±0.07 and +6.79±1.71 mm/yr. The most intensive Holocene vertical movement took place around the Cape Africa and Cape Kamchatsky. Coasts surrounding uplifted mountainous massifs of these capes also experienced net positive vertical

movement, suggesting that Holocene deformation inherited the longer-term trends of the Pleistocene.

2) The values of average rates of vertical movement differ from one time interval to another for the same coastal localities. The highest gradients in along-coast rate variation took place during an interval about 350 years long, between ~250 and ~600 AD.

3) The analysis of our data and comparison with instrumental seismological (GCMT catalogue) and geodetic (Kirienko, Zolotarskaya, 1989) data lead us to hypothesize that coastal deformation of marine terraces was most likely coseismic. The primary structures producing earthquakes and coseismic deformation could be onshore faults and their underwater extensions, and offshore faults.

4) We found a spatial correlation between active-fault distribution (Kozhurin, 2007) and parts of the coast where parameters of vertical movement rapidly change. We infer therefore that coastal vertical movement and movement on active faults are the interrelated effects of a single process of deformation of the Kamchatsky Peninsula block.

Our data strongly suggest that since at least the late Pleistocene (Pedoja et al., in prep.) Cape Africa and Cape Kamchatsky have been experiencing uplift. We interpret these movements to be a consequence of NW-SE directed crustal shortening of the Kamchatsky Peninsula block and probably its thrusting over the Kamchatky Strait.

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