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Estuarine evidence of postseismic transients in 17th-century Hokkaido and 20th-century Chile

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We present estuarine evidence of postseismic deformation in two subduction zones; one is Kuril, and the other is Chile subduction zones.

[Kuril subduction zone, northern Japan]

The 17th-century multi-segment earthquake along the southern Kuril trench induced postseismic deepslip that probably lasted for decades, as judged from stratigraphy and paleoecology along the Pacific coast of eastern Hokkaido. Unusually large tsunami hit Mochirippu before the tidal marsh emerged and left extensive 2-5 cm thick sand sheet on the coast. The sand is both underlain and overlain by tidal-flat or tidal-marsh mud. However, the mud above the sand grades upward into peat that contains volcanic ash layers from late in the 17th century. The upward sequence of mud, sand, mud, and peat implies that an earthquake (marked by the tsunami deposits) predates gradual coastal uplift (marked by the transition from mud to peat). Land-levels reconstructed using diatoms show several decimeters of preseismic subsidence, no coseismic change, and at least 1 m of postseismic uplift. The volcanic ash layers show that the uplift started before 1667 and ended by 1694.

[Chile subduction zone, southern Chile]

Postseismic uplift of the 1960 Chilean earthquake provided stratigraphic and paleoecological evidence. The delta of the Rio Coihuin is in middle along the 1960 rupture zone and 10 km east of Puerto Montt, which was at the inland limit of the coseismic downwarp in 1960. The delta contains three terraces and a family that has farmed the terrace provided detailed accounts of changes in land level since the 1960 earthquake. The highest terrace had been inundated by tidal water during the monthly high tide and dominated by a tidal marsh plant, Salicornia sp., before the 1960 event. The middle terrace had been also dominated by other tidal marsh plant, Juncus balticus and Scripus americanus that the family used for their craft. However, after the event, the terraces emerged and the tidal vegetation changed. The highest terrace became freshwater upland forest, and the middle terrace increased Agrostis alba and Salicornia sp. Tidal flat changed to the present lowest terrace dominated by Puccinellia sp. Guided by this testimony, we checked deposits beneath the middle terrace beside the family's house. These deposits consist of peat, mud, sand, and volcanic ash layers. The uppermost peat-over-mud contact probably represents emergence that the family has been watching after the 1960 earthquake. Judging from the present vegetation and changes in vascular plant fossils around peat-mud contact, land-level change after the 1960 event shows at least 1m.