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Extensive Holocene tropical peat and carbon accumulation within a subsiding intraforeland basin (Pastaza fan and Ucamara floodbasin), Peruvian Amazonia

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Several studies discuss the role of the Amazon Basin in the global carbon cycle, but the existence of extensive tropical peat deposits in lowland Amazonia has been suggested only recently. These up to 5.9 m thick peat deposits documented from a floodplain environment in Western Amazonia have accumulated at high rates (0.94−4.88 mm per year) acting as a strong carbon sink (Lähteenoja et al. 2009). The tectonic environment of Western Amazonia is a foreland belt formed during the uplift of the Andes Mountains as a result of shallow subduction and compressive foreland shortening (Räsänen et al. 1987, Dumont 1996). These foreland basins are characterized by high subsidence rates, up to 4–11 km of sediment deposits as well as river aggradation and avulsions (Räsänen et al. 1987). We studied peat and carbon accumulation in the Pastaza-Marañón intraforeland basin, which consists of the volcanogenic Pastaza alluvial fan and the Ucamara meandering river floodbasin. Together, they form the largest modern tropical system of fluvial aggradation, whose potential to accumulate peat is considerable.

In 13 wetland sites detected in Landsat TM satellite images, we measured peat thickness along a transect and collected peat samples for determination of total organic content, carbon content, dry bulk density, AMS radiocarbon age and peat and carbon accumulation rates. According to the results, the Pastaza fan and the Ucamara floodbasin harbor thick peatlands, whose existence has not been previously discussed. All the study sites had either a continuous peat deposit over clastic sediments or a complex stratigraphy of successive layers of clastic sediments, clayey peat and pure peat. Thickness of these heterogeneous deposits varied from 0.20 to 7.5 m. Bulk density, total organic content and carbon content varied from 0.01 to 0.26 g/cm3, from 37 to 99 %, and from 19 to 59 %, respectively. The complex stratigraphies (encountered especially in the Ucamara floodbasin) are obviously created by alternating phases of peat accumulation and clastic sedimentation from rivers, formation of crevasse splays being a probable process causing peat burial. That most peat deposits located inside the Pastaza fan were relatively pure, thick and little disturbed suggests that river dynamics has not been active in the area during peat accumulation.

In the Landsat TM satellite images, a large proportion of this ca. 120 000 square kilometers wide intraforeland basin seems to be covered by potential peatlands. In this extensive area, peatland-related greenhouse gas fluxes could be important, especially during future increased drought. Nevertheless, in a subsiding foreland basin, buried peat can move so much downwards that it is converted into brown coal or lignite and is not anymore within the destructive influence of potential climate change induced drought. Consequently, carbon is removed from the short-term cycle between biosphere and atmosphere. Because the processes generating peat burial and subsidence are still active, the intraforeland basin may currently act as a particular carbon sink.

Dumont JF (1996) Neotectonics of the Subandes-Brazilian craton boundary using geomorphological data: the Marañon and Beni basins. Tectonophysics, 257, 137-151.

Lähteenoja O, Ruokolainen K, Schulman L, Oinonen M (2009) Amazonian peatlands: an ignored C sink and potential source. Global Change Biology, 15, 2311–2320.

Räsänen ME, Salo JS, Kalliola RJ (1987) Fluvial perturbance in the Western Amazon Basin: regulation by long-term sub-Andean tectonics. Science, 238, 1398-1401.