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Carbon accumulation in high-altitude peatlands of the Central Andes of Peru

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Despite covering only 6 – 8% of the world's land surface, peatlands contain around one third of the global organic soil carbon (C) and are an important component of the global C cycle. Most studies of peatland C dynamics have been carried out on boreal and subarctic peatlands, but less is known about peatlands at lower latitudes, yet there are significant peatland C stocks in these regions that may be more vulnerable to future climate change because they are closer to the climatic limit of peatland distribution. In South America, peatlands in high altitudes called "bofedales" represent one of the most important water resources and also provide key environmental services that support both Andean mountain biodiversity and the wellbeing of human populations. Nowdays, the need for conservation and wise use of these ecosystems is increasingly being recognized. So, a useable assessment of peatlands in the global C cycle requires accurate estimates of carbon pools and fluxes. In order to understand the impact of different altitudes on the growth, production and carbon accumulation, several short (about 30 cm) peatlands cores were collected in the headwater of the Cachi river basin, in the Central Andes of Peru. Two Distichia muscoides cushion plant-dominated "bofedales" which elevations exceed 4000 m were studied. The sedimentation rates, based on radiocarbon dating of peat samples from the two sites studied, were very variable. Cores from the bofedal located at 4200 m present an age of approximately 55 years, while the site at the highest altitude site has an age of approximately about 450 years. Our results point out very different rates of sedimentation in the two peatlands that may be related to the climatic changes observed during the recent past, with a direct consequence on the carbon accumulation rates. In the determination of the annual growth, we observed that this one presented smaller values in the first centimeters of the peatland with lower elevation, while in the other studied site the opposite happened. Finally, the mean carbon accumulation rate ranged from 10 to 350 gC m-2 yr-1, being faster than peatlands in other mountain or boreal regions and among one of the most rapid rates of potential accumulation known for high-altitude ecosystems on Earth. Our findings highlight the importance of high-altitude peatlands in the Andes for the global carbon cycle.