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The high hydraulic conductivity of three wooded tropical peat swamps in northeast Peru: measurements and implications for hydrological function.

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Lowland tropical peatlands are a significant component of the global carbon cycle, and are estimated to store c. 88.6 Pg C (Page *et al.*, 2011). The form and functioning of peatlands depend strongly on their hydrology, but there are few data available on the hydraulic properties of tropical peatlands. In particular, the saturated hydraulic conductivity (K) has not previously been measured in Neotropical peatlands.

This study used piezometer slug tests to measure K at two depths (50 and 90 cm) in three contrasting forested peatlands in the Peruvian Amazon: Quistococha, San Jorge, and Buena Vista. These sites broadly represent the range of sites that have been described from western Amazonia (Lähteenoja *et al.*, 2009a,b, 2011), but the full variety of Amazonian peatlands remains to be explored. Measured K at 50 cm depth varies between 0.00032 and 0.11cm s^{-1}, and at 90 cm it varies between 0.00027 and 0.057 cm s^{-1}. Median K values are higher than comparable data from many temperate peatlands, although they are similar to those obtained in a Norfolk sedge fen (*cf.* Baird *et al*., 2004). They are at least an order of magnitude lower than published K values from Southeast Asian peatlands, but this may be due to differences in measurement method.

Linear mixed effect models show that small scale heterogeneity across a few metres does not make a significant contribution to variance in $K (p > 0.05)$, but that spatial heterogeneity in K values from areas > 200 m apart accounts for c. 20 % of the within-site variance. K values differ significantly between the sites, and between-site differences account for c. 18 % of the variance in the dataset. The relationship between depth and K is less straightforward: whilst depth is a significant determinant of K at Quistococha, at San Jorge and Buena Vista this is not the case.

Simulations using a simple hydrological model suggest the relatively high K values could lead to lowering of the water table by more than 10 cm within 25 m of the peatland edge for domed peatlands, if subjected to a drought lasting 30 days. For a drought lasting 90 days and with a peatland model that incorporates a lower drainable porosity, this zone could extend for up to 72.5 m into the peatland. However, under current climatic conditions, even with high K, peatlands would be unable to shed the large amount of water entering the system via rainfall through subsurface flow alone. We conclude that most of the water leaves these peatlands via overland flow and/or evapotranspiration.

References: Baird *et al.* (2004) *Hydrological Processes* 18, 275–291; Lähteenoja *et al.* (2009a) *Global Change Biology* 15, 2311–2320; Lähteenoja *et al.* (2009b) *Catena* 79, 140–145; Lähteenoja *et al.* (2011) *Journal of Geophysical Research* 116, G02025; Page et al. (2011) *Global Change Biology* 17, 798–818.