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Multi-proxy, high-resolution record of peatland development and its drivers during the last millennium from the subalpine Swiss Alps

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We present a record of peatland development during the last 1'000 years from Mauntschas mire in the eastern Swiss Alps (Upper Engadine valley; 1818 m a.s.l.) inferred from testate amoebae (proxy for acidity and mire surface wetness), stable isotopes of carbon and oxygen (δ18O, δ13C) in Sphagnum (proxy for water vapour pressure), peat accumulation rates, charcoal (indicating local burning), pollen and spores (proxies for human impact), and plant macrofossils (reflecting local vegetation and trophic state). Past human impact on the local mire was strong but fluctuating AD 1000–1570 ($\pm$ 50 a; depth–age model based on 29 AMS-14C dates) with local irrigation of nutrient-enriched water and grazing. Human impact was minor AD 1570–1830 ($\pm$ 30 a) with partial recovery of the local mire vegetation, and it was absent AD 1830 ($\pm$ 30 a)–present when hummock formation took place. Correlations among surface wetness, acidity, δ13C, and δ18O, carried out both with the raw data and with linear trends removed, suggest that the factors driving peat development changed over time, since only amoeba-based acidity and surface wetness co-varied during all the three aforementioned periods. Δ18O correlated with δ13C and surface wetness only in the periods AD 1830–present and AD 1570–1830, respectively; δ13C correlated with surface wetness only during AD 1000–1570. We attribute this instability among proxies to shifts in the local mire conditions. Human impact was probably the main factor for peatland development blurring most climate signals.