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Last millennium multiproxy high-resolution palaeoenvironmental study based on a subalpine peatland

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Subfossil testate amoebae (Protists) and stable oxygen isotopes supported by pollen were used to reconstruct the hydrological history of the last 1000 years from Mauntschas mire in the south-eastern Swiss Alps (Upper Engadin valley; 1818 m a.s.l.). This peatland, located at the bottom of an Alpine valley, recorded local hydrological changes that could be related to precipitation/temperature changes since AD 1000. Using a testate-amoeba training set, which was developed from samples collected in 2007 from peatlands in the same valley, we reconstructed depth to the water table (DWT) in Mauntschas mire. During the instrumental period (starting AD 1864), DWT were correlated with measured temperatures and winter precipitation. Over the last millennium the following changes were inferred: (i) since AD 1000 the presence of Archerella flavum indicated wet conditions; (ii) the habitat became moistest towards AD 1300; (iii) after AD 1300 testate amoebae indicated a gradual decrease of the water table; (iv) during AD 1580–1630 A. flavum indicated increased moisture - this wet period coincided with a cold anomaly recorded in the Alps; (v) between AD 1670 and 1715 the water table decreased again; (vi) another pronounced wet phase was recorded AD 1715–1850 with the maximum water table ca. AD 1780; (vii) during the instrumental period (1864–2003) the water table decreased gradually, following the trend of increasing temperatures. Among the pollen, the maximum wetness during the Little Ice Age (ca AD 1800) was reflected by pollen maxima of Cyperaceae and Selaginella. When climate became warmer and drier after AD 1850 (end of the Little Ice Age), Sphagnum spores were abundant. There was good agreement between DWT and the Pinus non-cembra pollen, suggesting temperature as the common driving factor. The stable oxygen isotopes (d18O) from Sphagnum stems showed similarities with DWT, with an anti-correlated phase at the end of the 19th century.