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Fire, vegetation, and Holocene climate on the southeastern Tibetan Plateau inferred from a high-resolution lake sediment record

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Lacustrine sedimentary cores can provide continuous records of local environmental change on millennial scales during the Holocene, through the accumulation and preservation of specific organic molecular biomarkers. In order to reconstruct Holocene fire events and vegetation changes occurring on the southeastern Tibetan Plateau and the surrounding areas, we used a multi-proxy approach, investigating multiple biomarkers preserved in core sediment samples retrieved from Paru Co, a small lake located in the Nyainqentanglha Mountains (29^{o}47'45.6" N, 92^{o}21'07.2" E; 4845 m a.s.l.). Biomarkers include *n*-alkanes as indicators of vegetation, polycyclic aromatic hydrocarbons (PAHs) as combustion proxies, fecal sterols and stanols (FeSts) as indicators of the presence of humans or grazing animals, and monosaccharide anhydrides (MAs) as specific markers of vegetation burning processes. Insolation changes and the associated influence on the Indian summer monsoon (ISM) affect the vegetation distribution and fire types recorded in Paru Co throughout the Holocene. The early Holocene (10.7 - 7.5 cal kyr BP) *n*-alkane ratios demonstrate oscillations between grass and conifer communities, resulting in respective smouldering fires represented by levoglucosan peaks, and high-temperature fires represented by high-molecular-weight PAHs. Forest cover increases with a strengthened ISM, where coincident high levoglucosan to mannosan (L/M) ratios are consistent with conifer burning. The decrease in the ISM at 4.2 cal kyr BP corresponds with the expansion of regional civilizations, although the lack of human FeSts above the method detection limits cannot address local anthropogenic influence to fire and vegetation changes. The late Holocene is characterized by a relatively shallow lake surrounded by grassland, where all biomarkers other than PAHs display only minor variations. The sum of PAHs steadily increases throughout the late Holocene, suggesting a net increase in local to regional combustion that is separate from vegetation and climate change.