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Greenhouse gas emissions from forested floodplain soils, Danube National Park, Austria

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Favorable hydrological properties combined with periodic input of organic matter and nutrients dispose floodplain forests as potential “hot spots” of carbon (C) and nitrogen (N) cycling. Despite the positive effects on productivity and C sequestration, the high N and C availability in soil and the specific hydrological conditions might incline floodplain forests to act as substantial sources of the natural greenhouse gases nitrous oxide (N2O) and methane (CH4). We assessed soil CO_2, N2O and CH4 fluxes in the floodplain forests of the Danube National Park, Austria (with about 10.000 ha the largest semi-natural flood plain along the Upper Danube). GHG fluxes were measured manually along six gradients, spanning from frequently to less frequently flooded sites. At one gradient we additionally installed auto-chambers to measure in GHG fluxes in daily resolution. During 2017, N2O and CH4 fluxes followed the expected pattern showing lower CH4 consumption and higher CH4 production at the frequently flooded sites, respectively. CO_2 and N2O emissions were highest at the frequently flooded site as well. Nevertheless, CH4 and N2O emissions were much lower than expected and we yet did not observe emission peaks after flooding. The pattern may, however, change with ongoing measurements, since 2017 was an explicitly dry year with low flooding intensity.