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Management practices and controls on methane emissions from sub-tropical wetlands

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It is well documented that green house gas concentrations have risen at unequivocal rates since the industrial revolution but the disparity between anthropogenic sources and natural sources is uncertain. Wetlands are one example of a natural ecosystem that can be a substantial source or sink for methane (CH4) depending on any combination of climate conditions, natural and anthropogenic disturbances, or ecosystem perturbations. Due to strict anaerobic conditions required for CH4-generating microorganisms, natural wetlands are the main source for biogenic CH4. Although wetlands occupy less than 5% of total land surface area, they contribute approximately 20% of total CH4 emissions to the atmosphere. CH4 is one of the most damaging green house gases with current emission estimates ranging from 55 to 231 Tg CH4 yr-1. The processes regulating CH4 emissions are sensitive to land use and management practices of areas surrounding wetlands. Variation in adjacent vegetation or grazing intensity by livestock can, for example, alter CH4 fluxes from wetland soils by altering nutrient balance, carbon inputs and hydrology. Therefore, understanding how these changes will affect wetland source strength is essential to understand the impact of wetland management practices on the global climate system. In this study we quantify wetland methane fluxes from subtropical wetlands on a working cattle ranch in central Florida near Okeechobee Lake (27o10'52.04"N, 81o21'8.56"W). To determine differences in CH4 fluxes associated with land use and management, a replicated (n = 4) full factorial experiment was designed for wetlands where the surrounding vegetation was (1) grazed or un-grazed and (2) composed of native vegetation or improved pasture. Net exchange of CH4 and CO_2 between the land surface and the atmosphere were sampled with a LICOR Li-7700 open path CH4 analyzer and Li-7500A open path CO_2/H20 analyzer mounted in a 1-m3 static gas-exchange chamber. Our results showed and verified that CH4 emissions from subtropical wetlands were larger when high soil moisture was coupled with high temperatures. Grazing alone, does not appear to alter net ecosystem CH4 emissions from subtropical semi-native and improved wetlands. Pasture type is a stronger indicator of wetland methane potential. Wetlands embedded in improved pastures exhibited periods of increased methane emission that was particularly noticeable during the wet season (July- Nov). These results help quantify GHG emissions from subtropical wetlands under different management practices while demonstrating the differences in these fluxes based on the surrounding ecosystem.