Measuring Surface Extent of High-Elevation Tropical Wetlands to Estimate CO_2 Fluxes

Abstract

Wetlands play an active role in the carbon cycle and emit significant quantities of greenhouse gases (GHGs) such as methane (CH_4) and carbon dioxide (CO_2) to the atmosphere. On a global scale they are estimated to have a CO_2 flux of 0.439–0.683 Pg C yr^{-1}, these contributions generate a positive feedback to climate change. However, small ponds (< 0.001 km^2 in surface area) are still not included in Earth system models because it is particularly hard to detect them on maps or satellite images. On this study, we developed a method to measure the surface extent of wetlands in the paramo, a high-elevation tropical ecosystem of the Andes, to estimate their CO_2 flux. All the wetlands in this study were found to emit CO_2 into the atmosphere. We found the CO_2 flux ranged from 1,713 to 101,304 $\mu MolCO_2$ /m^2/day and we estimated the daily flux to range from 99,283 to 23,904,732 $\mu MolCO_2$/day.