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Sensitivity of Amazon Carbon Balance to climate and human-driven changes in Amazon

Wednesday, 28 August 2019

20:00 - 20:30

Scripps Seaside Forum - Samuel H. Scripps Auditorium

Abstract

Amazon is the major tropical land region, with critical processes, such as the carbon cycle, not yet fully understood. Only very few long-term greenhouse gas measurements is available in the tropics. The Amazon accounts for 50% of Earth's tropical rainforests hosting the largest carbon pool in vegetation and soils (~200 PgC). The net carbon exchange between tropical land and the atmosphere is critically important because the stability of carbon in forests and soils can be disrupted in short time-scales. The main processes releasing C to the atmosphere are deforestation, fires and changes in growing conditions due to increased temperatures and droughts. Such changes may thus cause feedbacks on global climate.

In the last 40 years, Amazon mean temperature increased by 1.1ºC. The length of the dry season is also increasing. We observed a reduction of 50.5mm in the annual mean precipitation during this same 40 years period. Precipitation reduction occurred mainly in the dry season, exacerbating vegetation water stress with consequences for the carbon balance.

To understand the consequences of climate and human-driven changes on the C budget of Amazonia, we put in place the first program with regional representativeness, from 2010 onwards, aiming to quantify greenhouse gases based on extensive collection of vertical profiles of CO_2 and CO. Regular vertical profiles from the ground up to 4.5 km height were performed at four sites along the main air-stream over the Amazon. Here we will report what these new data tell us about the greenhouse gas balance and its controls during the 2010-2017. Along this period we performed 513 vertical profiles over four strategic regions that represent fluxes over the entire Amazon region. The observed variability of carbon fluxes during these 8 years is correlated with climate variability (Temperature, precipitation, GRACE) and human-driven changes (Biomass Burning). The correlations were performed inside each influenced area for each studied site.

It was observed a persistent C source from the Amazon (natural plus anthropogenic sources) to the atmosphere. Amazon was a consistent source of 0.4 ± 0.2 PgC/year on average considering the Amazon area of 7.2 million km^2. Fire emission is the main source of carbon to the atmosphere, which is not compensate by the C removal from old-growth Amazon forest.

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