Poster Presentation
Theme 1.2: The Contemporary Carbon Cycle - Emerging Approaches and Novel Observation Techniques
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A New Approach to estimate GHG content of air entering the Amazon basin for purpose of GHG fluxes using air column budgets

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Amazon humid forests are an important part of the tropical climate system and are a large pool of organic carbon which can be released rapidly both as a result of human destruction as well possibly in response to changing climate. In 2000 we started to measure regularly vertical profiles over the Brazilian Amazon Basin to estimate GHG balances as a large scale diagnostic of longer-term changes and short term responses to climate anomalies. To estimate Amazon Basin regional fluxes based on vertical profile data, we use an air column budget technique. To do so we profit from the primary air flow pattern over the basin with trade winds entering the basin along the North-east Atlantic coast, then travelling westwards towards the Andes, from where the air flow is bent south-eats-wards returning back towards the sea. Thus we can estimate fluxes from the difference in air column greenhouse gas content at a site in the Amazon basin and the air column content of air entering the basin, and an estimate of the time it takes for air parcels to travel from the Atlantic coast to the site in the Amazon. To estimate travel time we use back-trajectories calculated based on meteorological fields [Hysplit[1] GDAS 1degree] One approach to estimate the greenhouse gas air column content of air entering the basin is to express air entering the basin as a mixture of northern hemisphere and southern hemisphere air. Specifically we use as end-members air concentrations measured at Barbados (RPB, NOAA site) and Ascension (ASC, NOAA site) respectively. To estimate fractional contributions we use a linear mixing model expressing in situ measured SF6 as a weighted sum of SF_6 measured at the two NOAA background sites. Because flux estimates are very sensitive to SF_6 precision and accuracy we have developed an alternative approach. Instead of determining weights from SF_6 we base the weights on the latitude where a back-trajectory extending backwards in time from the site intersects a line connecting RPB, ASC (until 30°S). Now we use RPB, ASC and CPT (Cape Point; 34.35°S, 18.49°E). We will describe in detail the method and show tests of the approach using the SF_6 based method which we trust for the years 2010 and 2011, but less for the following years because the NOAA quantification method change and our continue during more 4 years in the old linear quantification method. This difference produce slightly bias over time.
While we developed this method for the Amazon it similarly could be applied to other regions with clearly defined wind patterns.
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Poster Session (see poster session schedule)