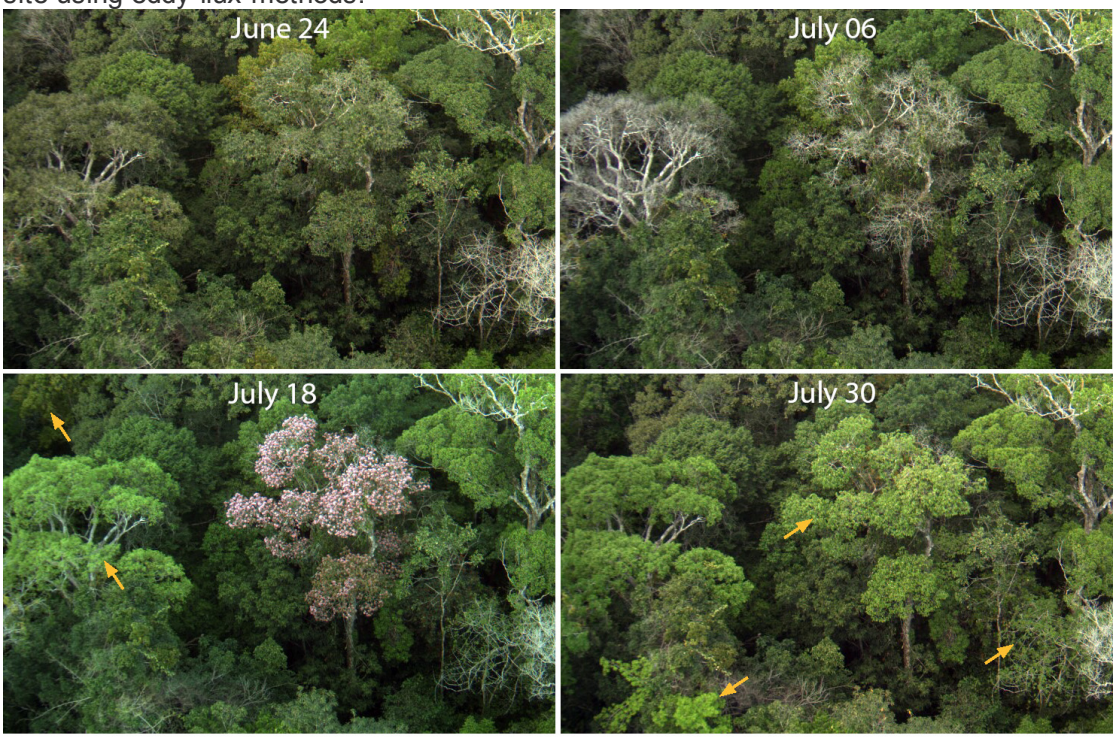
B11G-0107 Seasonality of Central Amazon Forest Leaf Flush Using Tower-Mounted RGB Camera

Monday, December 15, 2014 08:00 AM - 12:20 PM
Moscone West
Poster Hall

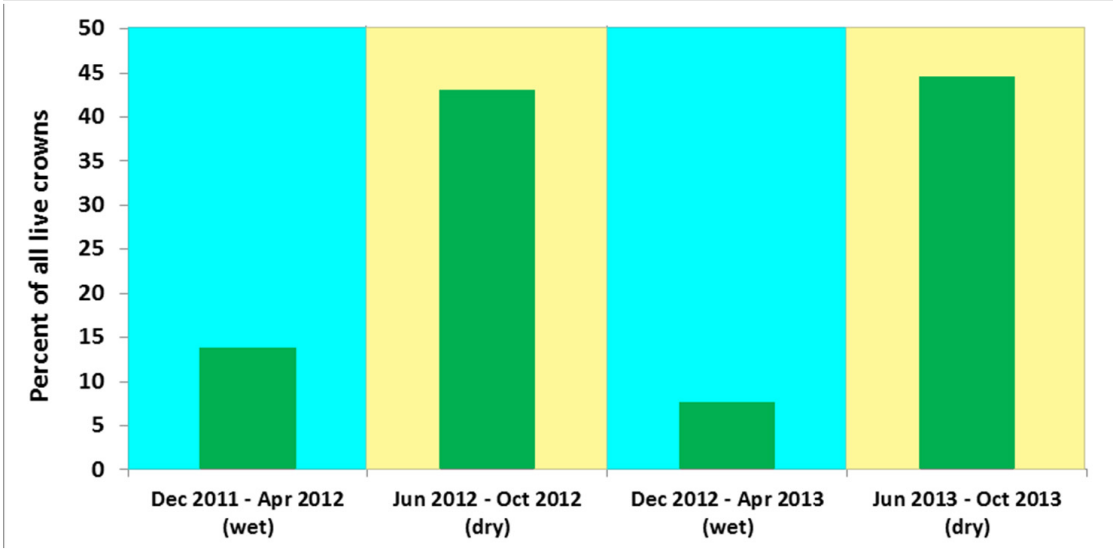
Tower-mounted RGB cameras can contribute data to the debate on seasonality of photosynthesis in Amazon upland forests and to improved modelling of forest response to climate change. In late 2010 we began monitoring upper crown surfaces of ~65 living trees or vines from a 54m tall eddy-flux tower on a well-drained clay-soil plateau. This Central Amazon site (60.2091 W, 2.6092 S) is in a large forest reserve. We deployed a Stardot Netcam XL RGB camera with a 1024 x 768 resolution CMOS sensor, 66^{o} HFOV lens, fixed oblique south view, fixed iris, fixed white balance and auto-exposure. Images were logged every 15 seconds to a passively cooled FitPC2i with heat-tolerant SSD drive. Camera and PC automatically rebooted after power outages. Here we report results for two full years, from 1 Dec 2011 through 30 Nov 2013. Images in six day intervals were selected near local noon for homogeneous diffuse lighting under cloudy sky and for a standard reflected radiance (± 10%). Crowns showing two easily recognized phenophases were tallied: (1) massive flushing of new light-green leaves and (2) complete or nearly complete leaf loss.

On average, 60% of live crowns flushed a massive amount of new leaves each year. Each crown flush was completed within 30 days. During the five driest months (Jun-Oct), 44% of all live crowns, on average, exhibited such massive leaf flush. In the five wettest months (Dec-Apr) only 11% of live crowns mass-flushed new leaves. In each year 23% of all live crowns became deciduous, usually a brief (1-2 week) preamble to flushing. Additional crowns lost old dark-green leaves partially and more gradually, becoming semi-deciduous prior to flushing.

From these two years of camera data we infer that highly efficient leaves of 2-6 months age (high maximum carboxylation rate) are most abundant from the late dry season (October) through the mid wet season (March). This coincides with peak annual photosynthesis (Gross Ecosystem Productivity) reported for this same Central Amazon site using eddy flux methods.



Time series spans 37 days in the 2013 dry season, showing a portion of monitored canopy of Central Amazon upland forest. Five crowns with rapid and massive flush of new leaves are indicated with yellow arrows, all briefly deciduous prior to flush



Percent of all lives crowns showing massive new leaf flush in the five wettest and five driest months of each year; each tree counted once per year; transition months not shown

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