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ABSTRACT BOOK

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Our methodology is a novel tool to accurately predict long-term ecological consequences in Congo Basin forests under both constraints of climate change and selective logging. One of the main immediate applications would be to check if classical SFM strategies, such as Reduced Impact Logging (RIL), Improved Forest Management (IFM) or post-logging sylviculture, are still valid when the ecological complexity and the climate sensitivity of tropical forests are duly taken into account. As an envisaged development, a coupling with a logging company model could allow to predict climate change impact on the economics of forest-based sectors, including tax revenues and socio-economic local benefits. More generally, our work could contribute to the improvement of climate-smart policies for Central African forests, a critical issue in the current context of deployment of the mechanism of Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+).

P-2215-04

The AmazonFACE research program: assessing the effects of increasing atmospheric CO2 on the ecology and resilience of the Amazon forest

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Despite being suggested, for nearly 20 years now, as a process of utter importance for the resilience of the Amazon forest and maintenance of the global carbon cycle, the existence, magnitude and duration of a supposed "CO2 fertilization" effect in tropical forests remains largely undetermined. Reducing this uncertainty is critical to the future of the Amazon region as well as for global assessments of ecosystem vulnerability to climate change. In this presentation we will introduce the AmazonFACE (Free-Air CO2 Enrichment) research program, an experiment of unprecedented scope and importance in a primary, old-growth forest of the Amazon basin near Manaus, Brazil - the first of this kind in a tropical forest. The experiment will simulate an atmospheric CO2 composition of the future in order to help answer the question: "How will rising atmospheric CO2 affect the resilience of the Amazon forest, the biodiversity it harbors, and the ecosystem services it provides in light of projected climatic changes?" Amazon-FACE is divided in three phases: (I) pre-experimental ecological characterization of the research site (Jun.2014-Nov.2015); (II) pilot experiment comprised of two 30-m diameter plots, being one maintained with atmospheric [CO2] at +200ppmv and the other with ambient CO2 concentration (Dec.2015-Nov.2017); (III) fully-replicated long-term experiment comprised of four pairs of FACE plots maintained at ambient or elevated CO2 concentrations for 10 years (Dec.2017-Nov.2027). The forest inside these plots will be scientifically scrutinized from the top-most canopy leaves to the deepest roots in terms of carbon metabolism and cycling, water use, nutrient cycling, forest community composition, and interactions with environmental stressors. A multi-disciplinary team of scientists namely from Brazil, USA and Europe will employ state-of-the-art tools from deep in the soil to above the forest canopy. The resulting data sets will be valuable resources for a broad community of scientists, especially for ecosystem and climate modelers.

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Evidence of Ecological Resilience Clusters to climate typology in the Amazon Rainforest: a methodological proposal

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Resilience is usually defined as the capacity of an ecosystem to absorb disturbance without shifting to an alternative state and losing function and services. This concept encompasses three distinct processes: resistance, the magnitude of disturbance and the speed of return to the original structure, which are fundamentally different but rarely distinguished. Successfully increasing the resilience of natural systems may therefore have important implications for human welfare in global climate change scenarios. Forest areas contribute in maintaining the moisture due to evapotranspiration exchanges. Severe droughts and periods with diverse anthropogenic pressures are threatening the ecological resilience in the Amazon region. This research intended to identify the areas with a differentiated resilience capacity in the Brazilian Amazon. Some climate data were used in this study, such as: annual rainfall, total rainfall during the less rainy trimester, total rainfall below 100 and 60 mm, minimum air temperature and vapour pressure deficit. We used biophysical data (NDVI, GPP, FPAR and LAI) to assess the temporal response of vegetation in order to express the effects of seasonal conditions and variations in weather and climate conditions. The biophysical data were obtained from the MODIS satellite, and the altitude data was provided by TOPODATA. The data integration was performed based in the correlation analysis for detecting redundancies between variables. Since the original data were highly correlated, we used the Principal Component Analysis (PCA) to identify which variables should be incorporated in the assessments of areas with ecological resilience. The year of 2005 was used due to the strong El Niño as well as the high deforestation records of the year 2004. The year of 2013 was our reference as average climate conditions. The first component to generate the maps was able to clarify 40.5% (2005) and 41.7% (2013). We have considered climate typology and resilience in the Brazilian Amazon as reference in the evaluation of these ecological thresholds by integrating the variables in ArcGIS.We were able to identify 8 zones with ecological features of transitional, which indicates the distinctions in their climate resilience. Analysing the years 2005 and 2013, it is clear that different climate typologies were rebuilt after the 2005 severe drought. The positive values in 2013 indicate that same classes have been recovered in eight years showing zones with differentiated resilience capabilities. These differentiated resilience capabilities may be associated to the effect of anthropogenic land-use change, but overall to natural ecological resilience of the Native Forest. The results indicate that the 17.2% increase in areas with high rainfall in the far west Amazon, in 8 years, indicate the great capacity of recovery of this native forests (with ecological resilience in the range of 0.7 to 0.8). The proposed methodology evidence that the response of biophysical variables from satellite information combined with typological climate conditions allow us to differentiate the diversity in resilience ecological capacity of the Amazon.

P-2215-06

Potential of tropical rainforest microrefugia to sustain tropical biodiversity in Northeast Brazil

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