Comparing properties of natural biogenic with biomass burning particles in Amazonia

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The Large Scale Biosphere Atmosphere Experiment in Amazonia (LBA) is a long-term (20 years) research effort aimed at the understanding of the functioning of the Amazonian ecosystem. The strong biosphere-atmosphere interaction is a key component of the ecosystem functioning. Two aerosol components are the most visible: The natural biogenic emissions of particles and VOCs, and the biomass burning emissions.

Two aerosol and trace gases monitoring stations were operated for 4 years in Manaus and Porto Velho, two very distinct sites, with different land use change. Manaus is a very clean and pristine site and Porto Velho is representative of heavy land use change in Amazonia. Aerosol composition, optical properties, size distribution, vertical profiling and optical depth were measured from 2008 to 2012. Aerosol radiative forcing was calculated over large areas. It was observed that the natural biogenic aerosol has significant absorption properties. Organic aerosol dominates the aerosol mass with 80 to 95%. Light scattering and light absorption shows an increase by factor of 10 from Manaus to Porto Velho. Very few new particle formation events were observed. Strong links between aerosols and VOC emissions were observed. Aerosol radiative forcing in Rondonia shows a high -15 watts/m^2 during the dry season of 2010, showing the large impacts of aerosol loading in the Amazonian ecosystem. The increase in diffuse radiation changes the forest carbon uptake by 20 to 35%, a large increase in this important ecosystem.

Compositional heterogeneity of the upper mantle beneath the Siberian craton: Reconciling thermal, seismic and gravity data

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We present a new regional model for the upper mantle structure below the Siberian craton. The model includes (i) thermal model of the lithosphere structure constrained by surface heat flow data, (ii) seismic velocity heterogeneity constrained by global tomography models corrected for temperature variations in the upper mantle, (iii) and a new regional model for the density structure based on the GOCE satellite gravity data. We also present a new regional seismic crustal model SibCrust, which is used to calculate crustal correction to gravity field. Thermal model and seismic tomography models are used as independent constraints on lithosphere thickness, required to convert mantle residual density anomalies to density heterogeneity. New regional upper mantle model is compared with regional and world-wide petrological data on upper mantle velocities and densities constrained by mantle-derived xenoliths. The results indicate a significant compositional heterogeneity of the lithospheric mantle of the region. Seismic velocity and density anomalies cannot be explained by variations in mg# alone. Compared to the adjacent orogenic belts and the West Siberian basin, density structure of the cratonic mantle is in a close agreement with isopicnic condition, although significant regional variations are well correlated with basement topography.

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