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THE CLOSE LINKS BETWEEN THE BIOLOGICAL FUNCTIONING OF AMAZONIA AND ATMOSPHERIC CHEMISTRY.

Atmospheric chemistry and the coupling between biogenic and anthropogenic emissions

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Amazonia is a place where the biology of the forest andatmospheric chemistry are very well coupled. Feedbacks are very strong betweenecosystem functioning, trace gases and aerosol emissions, cloud cover,precipitation, radiation balance and other key issues. In the wet season, alarge portion of the Amazon region constitutes one of the most pristinecontinental areas, with very low concentrations of atmospheric trace gases andaerosol particles. The Large Scale Biosphere Atmosphere Experiment in Amazonia hasstudied the links between the functioning of the forest and the atmosphericcomposition for more than 20 years. Amazonian aerosols were characterized indetail, including aerosol size distributions, aerosol light absorption andscattering, optical depth and aerosol inorganic and organic composition, amongothers properties. Trace gases analyzedincludes VOCs, ozone and CO. The central Amazonia site showed low aerosolconcentrations ($PM_{2.5}$ of 1.3±0.7 μg m^{-3} and 3.4±2.0 μg m^{-3}in the wet and dry seasons), with a median particle number concentration of 220cm^{-3} in the wet season and 2,200 cm^{-3} in the dry season.Aerosol mass spectrometry shows that organic aerosol accounts to 81% to thenon-refractory PM1 aerosol loading. The trace elements associated with naturalbiogenic aerosols were K, P, Zn, and organic carbon. Aerosol light scatteringand absorption coefficients were very low during the wet season, increasing bya factor of 5, in the dry season due to long range transport of biomass burningaerosols reaching the forest site in the dry season. Aerosol single scatteringalbedo (SSA) is a low value of 0.84 in the wet season. The mean directradiative forcing of aerosols at the top of the atmosphere (TOA) during the dryseason was a significant -5.6±1.7 Wm^{-2}, averaged over the AmazonBasin. This change in the radiation balance caused increases in the diffuseradiation flux, with an increase of Net Ecosystem Exchange (NEE) of 18 to 29%for relatively high AOD. From this analysis, it is clear that land use changein Amazonia shows alterations of many atmospheric properties, and these changesare affecting the functioning of the

Amazonian ecosystem in significant ways.