Relationship between Amazon biomass burning aerosols and rainfall over La Plata Basin

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The La Plata Basin is the fifth largest hydrographic basin in the world and the second largest in the continent. It has a very large hydroelectric potential with several plants placed on its rivers. Located on one of most densely populated regions in South America, sustaining its domestic consumption and its agricultural activities and, thereby, representing an important economic role in the region. During the dry season in the Amazon and Central Brazil there is a high concentration of aerosol particles associated to biomass burning associated to human activities, mainly agriculture and deforestation (Artaxo et al., 2002; Freitas et al., 2005; Martins et al., 2009). These aerosol can act as CCN (Cloud Condensation Nuclei), potentially changing the cloud microphysics, as well as the radiative properties and lifetime of clouds (MARTINS et al. 2009). Eventually, this aerosols are advected by the Low Level Jet to La Plata Basin (Freitas et al., 2005), and may generate impacts in rain production in the region (Silva Dias et al., 2009). In this scenario this research investigates the relationship between the aerosols, that come from biomass burning in the Amazon region and Central Brazil, and rain over the La Plata Basin. The focus is spring time and early summer (September, October, November and December) period and we use Empirical Orthogonal Function – EOF combined. EOF combined relates patterns of meridional fluxes of moisture and temperature at 850 hPa, vorticity at 500hPa and divergence at 200hPa, which are typical large scale conditions associated with mesoscale convective systems in the La Plata Basin. Thus, it's analyzed the relationship between aerosols and rainfall for days where the three first modes of the EOF are significant. Using this methodology, an exploratory analyses is presented of the CCN effect in the precipitation over the region of interest for days with similar dynamic and thermodynamic patterns. Aerosols are quantified through AOD (Aerosol Optical Depth) data in the wavelength of 440nm obtained from AERONET, rainfall from TRMM-3B42 and reanalysis 2 from NCEP/DOE. Preliminary results indicate that, under favorable large scale patterns, high values of daily rainfall are associated with two extreme modes of aerosol concentration, clean and polluted atmosphere.

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