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Climatic variation in the southern hemisphere and aerosol and trace gas transports and distributions

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Climatic changes in the Southern Hemisphere impact aerosol and trace gas emissions associated with Biomass Burning from South America, Southern Africa and Australia. A conceptual model of how the climatic changes impact the distributions of those emissions is presented. This model incorporates empirical observations of daily meteorological processes that influence the emission and transport of Southern Hemisphere aerosols and trace gases observed during a series of large-scale intensive atmospheric chemistry and remote sensing validation activities. Observations of atmospheric transports associated with aerosol and trace gases from biomass burning and industrial emissions used in this paper originate from the Southern African Fire-Atmosphere Research Initiative (SAFARI-92) and its follow on activity, the Southern African Regional Science Initiative (SAFARI 2000). Results produced during additional campaigns, most notably, the Brazilian-led Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) will also be utilized.

Sixteen years of Total Ozone Mapping Spectrometer Aerosol Index observations during the southern hemisphere biomass burning season (July 1 – October 31) provide information concerning the distribution and intensity of these emissions as they vary from El Nino (dry) to La Nina (wet) years. Emphasis is placed on up-scaling the knowledge gained during focused campaigns and the retrospective analysis of TOMS AI data to create a conceptual model of the linkages and processes of the physical and biological system on a hemispherical scale. Conclusions are drawn concerning the

systematic response of southern hemisphere aerosol emissions and transports as they vary with differences in the phase of ENSO where South America and southern Africa are linked during El Nino and southern Africa and Australia are linked during La Nina conditions. Human induced alterations to the coupled land-atmosphere exchanges will also be discussed conceptually as a potentially important driver of the system.