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Synthesis of remote sensing active fire detection data for Amazonia: Lessons learned from LBA

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The demand for information on fire activity in Amazonia has significantly increased in the past two decades with the growing concern about the fate of the tropical forests. Satellite active fire detection products represent the primary data source of fire information for Amazonia, which includes near-real time data from polar orbiting instruments such as the Advanced Very High Resolution Radiometer (AVHRR) series and the Moderate Resolution Imaging Spectroradiometer (MODIS) aboard Terra and Aqua satellites, and from geostationary systems such as the Geostationary Operational Environmental Satellite (GOES) East imager series. Airborne remote sensing instruments also provide invaluable information over fewer opportunistic/selected fires. Biomass burning is a major factor influencing land use and land cover change in Amazonia, its carbon dynamics, sustainability and system functioning, including important effects on the hydrological cycle. Consequently, it became a hot topic within the Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA). Here we report on the summary findings about the LBA-Eco Phase III synthesis project entitled “Analysis of long-term fire dynamics and impacts in the Amazon using integrated multi-source fire observations” (LC-35 group investigation). Using multi-source fire data derived from in situ data collection, airborne remote sensing, Landsat-class type imagery, and moderate-to-coarse spatial resolution data (AVHRR, MODIS, GOES), we provide a summary overview of fire activity in Amazonia over the past decade. We analyzed several million fire pixels detected from 1997-present, including detailed imaging of thousands of maintenance and conversion fires mapped by the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) and Landsat Enhanced Thematic Mapper Plus (ETM+) instruments. Our results highlight the spatial and temporal trends in fire activity across Amazonia, including important data quality information (e.g., omission and commission errors affecting the near-real time MODIS and GOES active fire detection data). We describe the relationship between fire activity and vegetation characteristics, deforestation, precipitation, and cloud distribution in Amazonia, which combine to create contrasting regional fire regimes across the area.