Variability of Meteorological Parameters and Their Association with the Vegetation Stress during 2001-2016 in Brazil Using Satellite Data

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With growing populations, hydrological cycles are severely impacting megacities. Water collection systems in these cities are being affected by extensive population growth. In general, increasing atmospheric pollution is directly and indirectly related to population growth. In mega cities, due to increasing pollution, the meteorological parameters, surface and air temperature, water vapor and rainfall are severely affected which also correlates with vegetation growth and crop yield. We have carried out a detailed analysis of multiple satellite data sets between 2001-2016 and studied surface, atmospheric, meteorological parameters, and water vapor from GPS stations deployed in various locations throughout Brazil. Our detailed analysis of satellite data in varying regions in the north-east, north-west and mid regions of Brazil show dramatic changes in meteorological parameters. These changes have one to one correspondence with the vegetation index during period 2001-2016. The meteorological conditions (relative humidity, water vapor, surface and air temperature) are found to be very dynamic over the years, the pronounced changes in these parameters show the cause of drought in different regions of Brazil especially in Sao Paulo and north-eastern parts of Brazil. We have also analyzed LANDSAT images over the past years that show pronounced changes in water reservoirs throughout the drought affected regions. Our detailed analysis shows shift in the climate patterns, thus, cities face new challenges in regards to their sustainable water management practices. We have also analyzed sea surface temperature of the adjacent ocean and found pronounced relations between the sea surface temperature and vegetation growth which could be associated with a strong El-Nino between 2015-2016. Additional analysis of Vegetation Health (VH) data derived from observations of NOAA operational polar-orbiting satellites during a strong 2015-2016 El Nino indicated that northern Brazil was under intensive vegetation stress. A similar situation was observed during two other strong El Nino cases in 1997-98 and 1982-83. During La Nina, northern Brazil was normally wet.

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