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Variations in atmospheric Carbon Dioxide and its association with rainfall and vegetation over Cape Rama, India

Y.K. Tiwari, J.V. Revadekar, and K. Ravi Kumar
Center for Climate Change Research, Indian Institute of Tropical Meteorology, Pune, India (yktiwari@gmail.com)

As India is supporting a population of around 1.2 billon and experiencing a steep rise in energy demand, Indian subcontinent is of critical importance to the understanding of how climate drivers and elevated atmospheric CO_2 interacts to influence the functioning of ecosystem and biosphere. Accumulating evidences suggests that increasing level of atmospheric CO_2 could change in rainfall patterns. In this paper we have studied variability and growth rate of atmospheric Carbon Dioxide (CO_2) over Cape Rama, India and its association with rainfall and vegetation over this region. Cape Rama is a maritime site located at the west coast of India. It is a unique site which experiences a seasonal reversal wind pattern. During summer monsoon it receives air masses having marine signatures while during remaining period it receives typical west coast region (continental India) characteristics. This study reveals that summer monsoon (JJAS) precipitation and monthly values of CO_2 concentration during the season are well correlated. Negative correlations are seen with CO_2 concentrations of concurrent months of the season as well as subsequent months. However the magnitudes of correlation coefficients are decreased till hot pre-monsoon season (MAM). This is mainly because, the connection between water availability and plant growth is obvious, terrestrial biosphere growth absorbs CO_2 from the air (photosynthesis), causing the carbon sink. Annual cycle and interannual variability show negative relationship between CO_2 concentration and vegetation over the region. However, CO_2 show higher magnitude increasing trend than the decreasing trend of NDVI. Amplitude of decreasing phase of vegetation is higher than the amplitude of increasing phase. Opposite features are seen in standardized anomalies of Carbon Dioxide. This study is unique in its nature whereas longer and dense network data set may be required to confirm the results.