Investigating Response of Global Vegetation to ENSO Events Between 1987 and 1997 Using NDVI Data

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Abstract
El Nino Southern Oscillation (ENSO) influences extensive regions around the globe causing global weather changes and affecting both marine and land ecosystems. ENSO events are also frequently held responsible for much of the variation in carbon fixation by terrestrial biosphere pool. The timing and size of the response of eight global vegetation biomes to ENSO events between 1987 and 1997 were investigated employing monthly Normalized Difference Vegetation Index (NDVI), temperature and precipitation data and monthly anomalies of sea surface temperature in the tropical Pacific. Lagged correlation analyses were used to identify times when the relationship between vegetation condition and ENSO is most robust and standardized NDVI departures were computed to estimate the size of vegetation response to ENSO. Warm ENSO phases appear to have delayed (7~17 months) and protracted negative impacts on vegetation in all biomes related in most cases to a decrease in precipitation but rarely to an increase of temperature. This impact starts earlier in the tropical and subtropical regions but delays in the temperate and cold regions. Positive/negative impacts of warm/cold ENSO phases on global vegetation are instantaneous and brief. Interestingly, the result also indicates that ENSO has significant impacts on Boreal forests which were previously considered to have little or weak association with ENSO. Almost in all biomes, warm ENSO phases tend to result in below average NDVI while cold and neutral phases tend to result in above average NDVI with significant departures being more frequent during cold and neutral phases.

Keywords
ENSO, Climatic Parameters, Terrestrial Vegetation, NDVI, Lagged Correlation