

Response of tropical terrestrial gross primary production to the super El Niño event in 2015

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The Gross Primary Production (GPP) in tropical terrestrial ecosystems plays a critical role in the global carbon cycle and climate change. The strong 2015–2016 El Niño event offers a unique opportunity to investigate how GPP in the tropical terrestrial ecosystems responds to climatic forcing. This study uses two GPP products and concurrent climate data to investigate the GPP anomalies and their underlying causes. We find that both GPP products show an enhanced GPP in 2015 for the tropical terrestrial ecosystem as a whole relative to the multi-year mean of 2001–2015, and this enhancement is the net result of GPP increase in tropical forests and decrease in non-forests. We show that the increased GPP in tropical forests during the El Niño event is consistent with increased photosynthesis active radiation as a result of a reduction in clouds, while the decreased GPP in non-forests is consistent with increased water stress as a result of a reduction of precipitation and an increase of temperature. These results reveal the strong coupling of ecosystem and climate that is different in forest and non-forest ecosystems, and provide a test case for carbon cycle parameterization and carbon-climate feedback simulation in models.

Keywords: gross primary production, tropical terrestrial ecosystem, El Niño-Southern Oscillation