Geophysical Research Abstracts
Vol. 21, EGU2019-11933, 2019
EGU General Assembly 2019

Leaf phenology of secondary dry dipterocarp forest species responded to strong El Niño 2015/2016 in western Thailand

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Recent observations indicate that strong El Niño events are becoming more frequent with global warming leading to severe and more prolonged drought periods in Southeastern Asia. Here we assess the impact of the strong El Niño event that occurred during the dry season of 2015-2016 on the phenology of 12 secondary dry dipterocarp forest species between March 2015-April 2018. Climate parameters measured at our site indicate that this strong El Niño was associated with less rainfall, lower soil water content, and warmer and drier conditions compared to normal years. Species were clustered into 5 distinct groups depending on their phenological responses to the El Niño-induced drought using hierarchical model with Euclidean distance-based method. Group 1, including Shorea obtuse, Shorea roxburghii, Croton oblongifolius and Litsea glutinosa showed a complete deciduousness only during the drought period of the year with the El Niño event and incomplete deciduousness during the drought periods of normal years. Group 2 including Shorea siamensis, Sindora siamensis, Phyllanthus emblica and Xylia xylocarpa showed a complete deciduousness during both El Niño and normal years. Group 3 including the single species Lannea coromandelica showed longer period of complete deciduousness than any other groups in both type of years but lasting even longer during the El Niño year. Group 4 includes one species Erythrophleum succirubrum which have a later leaf emergence compared to the other species during normal years but which was strongly advanced during the El Niño year. Group 5 including Dipterocarpus obtusifolius and Ellipanthus tomentosus which showed incomplete deciduousness during both normal years and El Niño years, but the degree of deciduousness was enhanced during the El Niño year. Our results indicate contrasted phenological changes of co-existing tree species growing in a dry dipterocarp forest in response to severe and long drought periods induced by El Nino. This study helps for improving our understanding of dry dipterocarp forest vulnerability and adaptability to extreme climatic events expected to increase in magnitude and frequency in the future.

Keywords: Dry dipterocarp forest, El Niño, Hierarchical Model, Leaf phenology
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