

Detecting the Borneo ecosystem changes caused by 2015 El Nino events using Satellite SIF data

*Kazutaka Murakami¹, Makoto Saito¹, Hibiki M Noda¹, Haruki Oshio¹, Yukio Yoshida¹, Kazuhito Ichii^{2,1}

1. National Institute for Environmental Studies, 2. Chiba University

In the Asian monsoon, there is a high risk that forest fire will increase due to drought frequency increases in the future. El Nino events for 2014-2016 were the largest in recent years and it had a large impact on the tropics, such as significant reduction of precipitation and severe forest fires on Borneo Island in Southeast Asia. Borneo is a very important land for considering biodiversity, ecosystem services, and it has a very large carbon stock.

In recent years, satellite observations of Solar Induced chlorophyll Fluorescence (SIF) has been used to obtain information on photosynthetic production or environmental stress for plants. The temporal changes in the satellite-based SIF can be a good index to evaluate the changes in ecosystem functions. A lot of studies have discussed the relationships between SIF and ecosystem functions on various spatial scales from point to global. Although several studies focused on a regional scale, there is not much the case that detecting directly the regional ecosystem change from the SIF data. Regional scale such as country level research is the optimal scale for human activities that are neither too broad nor too small to see the effects of climate change. In the previous studies, vegetation indicators such as NDVI and EVI have been widely used for such scales. In these days, long-term SIF data, observed by various satellites (GOSAT, GOME-2, etc.) is available. Therefore, satellite-based SIF could be an indicator for observing terrestrial ecosystems.

The purpose of this study is that detecting the impact on 2015 El Nino in Borneo Island by using three satellite SIF (GOSAT, GOME-2, and OCO-2) and, indicating the usefulness of SIF data. We found that the SIF values dropped during El Nino events. The reduction in SIF might be caused by the droughts occurred during this period and increased fires. This trend was indicated particularly in the southern hemisphere of Borneo Island.

Keywords: SIF, Borneo, 2015 El Nino