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Detection and Characterization of Fire Activity and Burned Area over Central Kalimantan Peatland Area under the Influence of Drought from Satellite Observation

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Equatorial Asia is one of the most extremely vulnerable tropical rainforest in the world that is directly affected by ENSO cycle. As a consequence, it will experiences the reduction in precipitation due to the existing of anomalous surface westerlies that reduce the local rainfall, followed by severe droughts during the dry season. Drought conditions are favorable for fire and haze occurrence, especially when normally moist fuels are drying out, leading to potentially flammable and thereby susceptible to fires. Hotspot monitoring is one of the activities to control the occurrences of forest and land fires disaster by conducting heat detection through remote sensing satellite and geographic information systems. This study aims to evaluate and characterize the impact of climate variability on fire activity to understand the drought and fire conditions under which they occurred. In this study, we explore the relationship between hotspot data, emission, burned area and precipitation.

For this purpose, a long-term precipitation dataset TRMM 3B42 was utilized to examine abnormally dry years. This study also used the Global Fire Emission Dataset version 4.1 (GFED4s) to examine the biomass burning carbon emissions and burned area during 2006-2016. MODIS sensors from TERRA and AQUA satellite were used to count the total daily hotspots which have confidence level above 80% in the grid area with a spatial resolution of 0.250x0.250. The fire had occurred repeatedly in southern-central Kalimantan (ex-site of mega rice project) especially in Pulang Pisau district. The fires often occur during abnormally dry years especially induced by El-Nino episode. Precipitation anomaly and sea surface temperature anomaly over the Maritime Continent show strong positive correlation during July to October. This indicates less precipitation and resulting drought condition was due to the lower than normal sea surface temperature around the southern part of the Maritime Continent which weakened the convective activity. We found that during the 10 years period (2006-2015) hotspots in the study area annually peaked in September and October, and the burned area with hotspots exceeding 500 per month is continuously increasing from year to year.

Key Words: fire activity, hotspot, burned area, drought, maritime continent