

**Impact of el niño, indian ocean dipole, and madden–julian oscillation on land surface Temperature in kuching city Sarawak, during the periods of 1997/1998 and 2015/2016: A pilot study**

**ABSTRACT**

The severe El Niño events of 1997/1998 and 2015/2016 caused significant disruptions in Southeast Asia, particularly in Borneo, resulting in hazardous haze and acute water shortages. This study examines the influence of El Niño, the Indian Ocean Dipole (IOD), and the Madden– Julian oscillation (MJO) on regional climate, using time-series data from February 1993 to December 2020. Data from El Niño, IOD, and MJO indices were integrated with Landsat 5 and 8 land surface temperature records, allowing for a detailed analysis of their combined effects on regional temperature and precipitation patterns. Time-series trend decomposition and the generalized linear mixed model approach identified the Oceanic Niño Index (ONI) as a significant driver of temperature increases and dry spell occurrences during the peak El Niño years. On the other hand, ONI correlated strongly with mean monthly temperatures, underscoring its dominant influence. In addition, the IOD was found to significantly affect regional temperatures with a regression coefficient of 0.38867 ( $p = 0.0455$ ), indicating its significant but less pronounced impact compared with ONI. These findings clarify the dynamics between key climate indices and their impact on regional climate extremes, offering critical insights for improving climate resilience and adaptation in tropical regions.