ABSTRACT

El Niño Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) are climate phenomena that affect rainfall in tropical regions, including Indonesia. By analyzing the impact of ENSO and IOD interactions on drought and wetness events with the main focus on the Kupang and Surabaya cities which are determined by the Standardized Precipitation Index (SPI) as an indicator of drought conditions. Using the Convolution Neural Network (CNN) deep learning model, the interaction of ENSO and IOD is re-simulated to prove how accurate the model is to re-simulate the interaction phenomenon of the two climate phenomena. The data used include monthly rainfall from BMKG observation stations and corrected CHIRPS data from 1992-2023 which are processed into SPI1 (1-month SPI). The CNN model is trained using monthly ENSO and IOD interaction data from 1981-2023. The results of the study show that when the interaction of ENSO and IOD occurs, which usually indicates dry conditions, it produces insignificant drought conditions in the cities of Kupang and Surabaya and SPI1 shows normal conditions in the years of ENSO and IOD positive strong in 1997-1998, 2015-2016, and 2023. However, during the transition phase from ENSO and IOD positive to negative, SPI1 shows significant wet conditions. In the event of ENSO and IOD negative strong which usually indicates wet conditions, SPI1 can capture and reflect this phenomenon with very wet conditions. With this, the interaction of ENSO and IOD has a very complex influence on rainfall in Indonesia. The CNN model used shows very strong performance with a coefficient of determination (R-squared) value of 0.9214 on the test data. It can be concluded that the CNN model is very good for re-simulating the interaction of ENSO and IOD. Through re-simulation, the CNN model is expected to provide an effective mitigation strategy for potential drought or excessive rainfall disasters based on accurate historical data and support the development of more sophisticated learning models in the future.

Keywords**:** *ENSO, IOD, interactions ENSO and IOD, SPI, CNN*