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**Eddy Covariance Measurements of Carbon dioxide (CO<sub>2</sub>) Exchange in Pichavaram Mangrove Ecosystem, Southeast Coast of India**

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**Abstract**

Net Ecosystem Productivity (NEP) and Net Ecosystem Exchange (NEE) of carbon dioxide (CO<sub>2</sub>) between the mangrove forest and the atmosphere were assessed during May 2016 to April 2017 in the Pichavaram mangrove ecosystem in India. An eddy covariance (EC) flux tower of about 10 m height was established in the middle portion of the mangrove forests to have a maximum carbon footprint from the mangroves. The EC tower was established to investigate whether the mangrove ecosystem acts as a sink or source of CO<sub>2</sub>. The monthly mean CO<sub>2</sub> concentration varied from 376 ppm in July 2016 (during day time) to 466 ppm in December 2016 at night time. The EC based NEE showed a positive CO<sub>2</sub> flux ranging from 4  $\mu\text{mol m}^{-2}\text{s}^{-1}$  in July 2016 to 6  $\mu\text{mol m}^{-2}\text{s}^{-1}$  in February 2017 during the night time. This was mainly due to respiration of the mangrove ecosystem. Negative CO<sub>2</sub> flux values ranging from – 8  $\mu\text{mol m}^{-2}\text{s}^{-1}$  (March 2017) to -18  $\mu\text{mol m}^{-2}\text{s}^{-1}$  (August 2016) was observed during daytime, due to photosynthesis. The monthly analysis of the NEE during the daytime and night clearly indicate that the NEP of the Pichvaram mangrove was found to be positive throughout the study period suggesting that the Pichvaram mangrove ecosystem acts as a sink for CO<sub>2</sub>. The measured annual Net Ecosystem Productivity during the study period was 345 g C m<sup>-2</sup> year<sup>-1</sup>, which is higher than the NEP reported for Sundraban mangroves (249 g C m<sup>-2</sup> year<sup>-1</sup>). The total Gross Primary Productivity (GPP) and ecosystem respiration (Re) of the study area for the annual cycle was 2305 g C m<sup>-2</sup> year<sup>-1</sup> and 1072 g C m<sup>-2</sup> year<sup>-1</sup>, respectively. A long term study is needed to draw a logical conclusion on carbon sequestration potentials of this mangrove as well as to find out the role of environmental factors controlling CO<sub>2</sub> fluxes.

**Keywords:** Pichavaram Mangrove, Carbon dioxide, Eddy covariance, Net Ecosystem Productivity, Carbon sequestration