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Application of a Neural Network Algorithm to Estimate the Nutrients Concentration in the Peruvian Upwelling System

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The Peruvian coastal upwelling system (PCUS) is one of the most productive in the world ocean. The Peruvian Marine Research Institute (IMARPE) has been monitoring the PCUS since the 1960's with an increase in the frequency and spatial distribution of measurements since the early 2000's focusing on temperature, salinity and oxygen. In recent years, autonomous gliders have started to be routinely deployed by IMARPE, collecting a large amount of profiles. However, there is still a gap for the high-resolution sampling of biogeochemical parameters such as nutrients (nitrate, phosphate and silicate).

New methods using machine learning to reconstruct missing data have been developed recently with promising results (Sauzède et al, 2017; Bittig et al., 2018; Fourrier et al., 2020). In particular, a recent global approach using neural networks (NN) named CANYON-B (CArbonate system and Nutrientes concentration from hYdrological properties and Oxygen using a Neural network) was developed in order to fill those gaps and infer nutrients' concentrations from the more sampled variables of temperature, salinity and oxygen (Bittig et al., 2018).

In this work we show the application of this global CANYON-B algorithm to the PCUS using all the historical IMARPE's CTD casts. Moreover, we trained a new NN and compared its outputs with the ones from CANYON-B, demonstrating the benefits of training the NN with the extensive regional data set collected by IMARPE.