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Prediction of sea surface current around the Korean peninsula using artificial neural network

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Prediction of sea surface current is essential for various marine activities, such as disaster monitoring, fishing industries, search and rescue operations, etc. Continuous improvements in numerical models make it possible to predict a more realistic ocean with the help of data assimilation and fine spatial resolution. On the other hand, the well-developed ocean model requires high computational power and time, making it hard to be utilized for near-real time forecast sometimes. To compensate the high computational costs, there is a need to develop novel approaches with efficient computational costs combined with the numerical model outputs. In that way, artificial neural networks could be one of the solutions because they need low computational power since it utilizes pre-trained networks. Here, we present a current prediction framework applicable to the seas around the Korean peninsula using three dimensional (3D) convolutional neural networks. The network is based on the 3D-Unet structure and modified to predict ocean currents using oceanic and atmospheric variables. In the forecast process, it is optimized to minimize the error of the next day's ocean current field and its recursively predicting structure allows more days to be predicted. The network's performance is evaluated by changing input days and variables to find the optimal surface current prediction artificial neural network model, which demonstrates its strong potential for practical uses near future.