High-resolution operational forecasts of ocean surface currents for optimal ship routing

Precise knowledge of ocean surface currents in real-time allows us to optimise ship routes at a fine-scale in order to reduce fuel consumption and save time. We present a machine learning method to provide 7-day operational forecasts of ocean surface currents. Our convolutional neural network is trained only on real observations, and does not require regional numerical models or observation system simulation experiments (OSSEs) to learn ocean dynamics. We can thus train and evaluate our model across many different regions. We validate our model's performance on in-situ data obtained from drifters and data from instruments on board ships, and show improved performance in comparison to alternative commonly-used forecasting methods. Our machine learning model is a convolutional neural network which inputs past satellite observations - including altimetry and sea surface temperature measurements - and predicts future ocean states. It uses an encoder-decoder architecture with a positional encoding module, which

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