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Application systems of the FIO ocean forecasting system using Lagrangian methods

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Lagrangian methods have been widely used and playing more and more essential roles in the analysis of ocean physical processes, pollution prediction, ecosystem protection and fisheries. Using the Lagrangian methods based on the high resolution coupled ocean model, we report several specific studies. The numerical modelling team from First Institute of Oceanography (FIO), Ministry of Natural Resources (MNR) of China, developed an ocean forecasting system based on the global (1/10°) wave-tide-circulation coupled model, as well as the regional model (1/24°) for China and adjacent seas. Basing on this system and its products, we developed the global ocean radionuclides model to investigate the long-term transport, distribution and evaluation of 137Cs in the ocean both from the Fukushima nuclear accident in March of 2011 and nuclear tests during the past 60 years; established the search and rescue system which has successfully applied in the rescue of the Phuket boat capsizing accident in July 2018; established the Enteromorpha prediction and tracking models for the protection of the marine environmental hazard from Enteromorpha, and to identify the origin area of this harmful green tide; developed the stock enhancement model of edible jellyfish to mimic the distribution of the human-released jellyfish and identify the connectivity between the releasing site and the fishing ground in Liaodong Bay of Bohai Sea, China. With the combination of the statistical methods, we established the near-term forecast and long-term projection system of the oil spill to forecast and evaluate the influence of the oil spill from the “Sanchi” collision accident on the ocean. All of these applications are verified and essential for protecting the oceans.