Development of a high-resolution coastal forecasting system with a 4DVAR assimilation scheme

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We have been developing a high-resolution coastal forecasting system with a horizontal resolution of about 2km, which aims to be a next generation coastal forecasting system in Japan Meteorological Agency (JMA). The coastal model (model-CST) covers western part of the Japanese coastal region and is nested into a western North Pacific model (model-WNP) with a horizontal resolution of 10km. Initialization of the model-CST is performed by Incremental Analysis Updates (IAU) using assimilated fields of the model-WNP.

A Four-Dimensional Variational (4DVAR) scheme is employed for the assimilation system with the model-WNP. In this scheme, amplitudes of vertical coupled Temperature and Salinity (T-S) EOF modes are used as control variables, which compose the vertical correlation matrix of the background errors. This method is based on the same strategy as that used in the present operational 3DVAR assimilation system in JMA. In addition, the 4DVAR system adopts the IAU scheme for initializing the forward model in order to filter out high-frequency noises. Because the IAU scheme works as an Incremental Digital Filtering (IDF) during backward integration of the adjoint model, high frequency noises in the adjoint variables can also be filtered out.

In the presentation, improvements in assimilation results using the 4DVAR scheme and their impacts on coastal sea level variability will be shown.