We successfully apply the ensemble Kalman filter (EnKF) data assimilation scheme to the East Sea Regional Ocean Model (ESROM, Kim et al., 2009) so that we construct E-ESROM (EnKF equipped East Sea Regional Ocean Model). The E-ESROM is composed of 16 ensembles and thousands of observation data are assimilated at every assimilation step into its parallel version, which significantly reduces the required memory and computational time. To resolve rank deficiency problem and to prevent the collapse of ensembles, we employ various schemes such as localization and inflation of the background error covariance and disturbance of observations. Sea surface temperature from the Advanced Very High Resolution Radiometer and in-situ temperature profiles from various sources including Argo floats have been assimilated into the EnKF system. Reanalyzed products from the E-ESROM have been compared with the observed hydrographic datasets in the Ulleung Basin of the East Sea. The overall root-mean-square error between 100 m temperature field reproduced by the E-ESROM and the observed 100-dbar temperature field is 2.38 °C and correlation is a mean value of 0.71 for the inter-comparison period.