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Variational assimilation of simulated ocean acoustic tomography data in an ocean model

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In the concept of large scale observing system for the ocean, ocean acoustic tomography is an original tool to monitor the ocean interior. Analysis of tomographic travel time using inversion gives an estimate of the temporal evolution of the heat content along the observed sections, an important quantity to monitor the ocean climate evolution. At lower scales than the cell size defined by the observational array, it is not possible to estimate the ocean temperature field without using other sources of information. A possible approach is to combine the tomographic observations with a numerical dynamical ocean model to obtain a complete description consistent with the data on a given time interval. We propose to explore a variational method using the adjoint technic to assimilate those integral data. We studied the case of a basin scale observational array, as the one deployed in the Mediterranean sea for the Thetis 2 experiment. Only travel time anomalies due to the sea water properties are considered. The ability of tomographic data to constrain the ocean model circulation is evaluated using simulated observations with a model solution. This approach called twin experiments, allows to compare the result after assimilation with the "true" solution.