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Thermocline characterization on modeled and observed temperature profiles: a technique for model error evaluation

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The thermocline position in the water column is an important variable in hydrodynamic modeling. Its characterization allows to verify the model accuracy, and analyze the parameter choice made by the modeler, such as the choice of the turbulence closure. A correct representation of the surface ocean boundary layer is also very important in order to correctly represent the air-sea exchanges. Moreover, coupled physical-biological models require a good representation of the thermocline position, in order to correctly represent the population dynamics at the surface layers.

We present a technique to calculate the parameters of the thermocline: depth, width and temperature. These are calculated by a least-squares fitting of individual temperature profiles (from model and observations) to a sigmoid function. The residual is also obtained, giving an estimate of the goodness of the fit. The parameters calculated allow for a comparison of the model thermocline to observations.

Our approach consists in comparing the model thermocline depth, width and temperature to observations. By examining separately the accuracy of the model thermocline depth and temperature, we gain insight in the processes that need correction in the model. For example, if the model thermocline is too deep compared to observations, or the width of the thermocline is incorrect, mixing parameters and surface momentum fluxes should be revised. However, if the depth is well represented but the temperature is incorrect, the surface heat fluxes may be the source of the error. By simply comparing model and observed temperature profiles we are not able to differentiate between error sources. The technique presented here stands therefore as a useful method for

model evaluation.