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## Does the interior of the ocean hide a major part of the eddy field?

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In ocean research, mesoscale eddies typically are detected through surface signatures based on satellite data. The assumption is that most eddies are surface intensified and have a vertical structure consistent with a surface intensified mode. However, in-situ eddy observations, especially in the tropical oceans, showed that the vertical eddy structure is often more complex than previously assumed (higher baroclinic modes), and a diverse subsurface eddy field is present, which does not show any surface signatures at all. Our objective here is a first step towards a quantification of the occurrence of subsurface relative to surface eddies. To do this, we use an actively eddying model to compare the subsurface eddy field to its surface signatures in order to be able to estimate which vertical eddy structures prevail and how much of the eddy field is hidden in the subsurface. In addition, the model results are compared against an unprecedented assemblage of observations of subsurface eddies in the tropical oceans. In a first step we focus on eddies in the model that are detectable at the surface for more than 120 days. We found that around 60 % of the detected eddies have a vertical structure associated with a surface intensified mode as previously assumed which are characterized by a strong surface signature. Around 40 % of the eddy field have a vertical structure associated to a higher baroclinic mode. They are often called “intrathermocline” eddies and are characterized by a rather weak surface signature. In a second step we track subsurface eddies (lifetime > 120 days) in the model by identifying density layer thickness anomalies and connect them with possible surface signatures. Around 30 % of the total eddy field of the model, are hidden in the subsurface with no detectable surface signature. In conclusion, our results show that subsurface eddies form a substantial contribution to the total eddy field. Consequently it is difficult to estimate the impact of the eddy field on the ocean when only working with surface based satellite data.