Novel use of time-lapse seismic images and in-situ hydrographic data for detecting changes at the interface between oceanic water layers

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The presence of horizontally spreading interfaces between water layers in the ocean requires an equilibrium between processes that cause them to grow and those that destroy them. Results from numerical simulations show that such interfaces can be developed from weeks to decades in an idealized system. Owing to the sparse temporal and spatial coverage, it has not been possible to provide empirical constraints for these models. We here present a novel method of combining time-lapse seismic images and physical oceanographic data to provide the first robust observation constraint on the changes at the leading edge of an interface between two water layers. Based on our recently published results (Tang, Tong, Hobbs & Morales Maqueda, Nature Communications, 2019), we discuss the novel approach and its implications for studying the links from the mesoscale to the finescale and then to the microscale processes that control how interfaces evolve. We conclude by highlighting the potential of our approach to studying the dynamics of other physical oceanographic processes.

Tang, Q., Tong, V.C.H., Hobbs, R.W. *et al.* Detecting changes at the leading edge of an interface between oceanic water layers. *Nat Commun* **10,** 4674 (2019). https://doi.org/10.1038/s41467-019-12621-8

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