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Simulating and forecasting the ocean general circulation: where do we stand?

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The lecture will review the major advances in observing and modelling the ocean general circulation that permit the construction of real time ocean forecasting systems, and drive the evolution of ocean climate models. We shall first illustrate how observation from space has demonstrated the ubiquity of mesoscale synoptic eddies in the ocean, and we shall discuss how this discovery has changed the framework of ocean model developments. A major result of this synergy between models and observations that will be presented is the emergence of operational oceanography which now routinely provides real time analyses and forecasts of the major physical properties of the ocean at the global scale. Reanalyses of the past ocean circulation are now also being produced, that provide pertinent information on the changes that occurred in the ocean properties in the last 20 years. The freshwater fluxes between the oceans and land, atmosphere and cryosphere as active drivers of the ocean circulation in a various range of scales will be illustrated.