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From weather to ocean predictions: an historical viewpoint

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This presentation overviews the historical development of predictions in the atmospheric and oceanic sciences. Predictions are one of the crucial scientific endeavors that require basic understanding of geophysical fluid dynamics and the set up of an infrastructure to collect observations in real time and share them across the world. Ocean forecasts for practical applications need to consider sea level, wave, current, temperature, and salinity predictions simultaneously, to mention just the physical components. However, solving all of these variables simultaneously was too difficult because of the limited knowledge of processes and the computational requirements. Knowing that the energy containing variability peaks at different time scales for different state variables and that spectral gaps exist, a practical framework for ocean predictions emerged: the dynamic evolution of the sea level was decoupled from the evolution of surface waves, and short-term sea level variability was decoupled from currents, temperature and salinity predictions. The wind waves and the sea level were thus the first to be forecast, followed by the ocean currents in the seventies. The work of Professor A. R. Robinson's group of Harvard University, who produced the first mesoscale ocean predictions for the deep ocean regions is historically reviewed for the first time. The scientific and technological developments that made accurate ocean predictions possible are linked with the gradual understanding of the importance of the oceanic mesoscales and their inclusion in the numerical models. Ocean forecasting developed first at the regional level, due to the relatively low computational requirements, but by the end of the 1990s, it was possible to produce global ocean uncoupled forecasts and coupled ocean-atmosphere seasonal forecasts.