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# Assimilation of Observations into Numerical Models

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Assimilation of meteorological or oceanographic observations is the process by which observations are combined together with a numerical dynamical model of the flow in order to produce as accurate as possible a description of the state of the flow. Assimilation can be considered as a problem in bayesian estimation, made particularly difficult by the very large numerical dimensions involved, and by the complexity of the underlying dynamics. Two main classes of algorithms exist for assimilation. In sequential assimilation, the most recent estimate of the state of the flow is constantly updated with new observations. In variational assimilation, the assimilating model is globally adjusted to the observations distributed over a period of time through minimization of an appropriate scalar objective function. Assimilation, which has become a major component of numerical meteorology and oceanography, is progressively extending to other fields, such as atmospheric and oceanic chemistry, or surface hydrology. It also plays a critical role in such applications as the definition and optimization of observing systems, or the study of the predictability of the atmospheric or oceanic circulation.

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