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Assimilation of Lagrangian Data in a Variational framework

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We present a review of our work on Lagrangian Data Assimilation in a Variational Framework. Variational Data Assimilation aims at finding an optimal trajectory, solution of a given model, that is consistant with past observations of the modelled system. The observations we are interested in assimilating are of Lagrangian type: float positions and image sequences.

At present time, Lagrangian observations are underused by numerical forecasting systems, despite the data availability. Float position observations are provided e.g. by the ARGO program floats, which are GPS-tracked every 10 days. Satellite observations of atmosphere and ocean provide everyday huge quantity of visual information (such as eddies, fronts).

Observation operators for floats and image sequences are quite similar in nature and are based on passive tracers advection. For floats the observed positions are then straightforward to assimilate, although their non-linear aspect makes it quite difficult to use. For image sequences, the passive tracers dynamics are interpreted as images. The turbulent structure of these images is then compared to the observed image sequence, both of them being represented in a set of curvelets.

First we will describe our methods, our observation operators and observation misfit definitions. Then we will present the first results on twins experiments.