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Data Assimilation for a Stochastic Rotating Shallow Water Model

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Earth's climate system is mostly represented by large-scale patterns, but previous studies have shown that specific small-scale physical mechanisms have a strong impact on the large-scale phenomena. Therefore, the small-scale processes must be represented properly. The Stochastic Rotating Shallow Water (SRSW) model can address this issue. It models the evolution of a two-dimensional rotating shallow water system via a stochastic partial differential equation. The deterministic part of the SPDE consists of a classical rotating shallow water equation, while the stochastic part involves a transport type noise which is representative when studying turbulence from a fluid dynamics standpoint. The resulting stochastic equation can be written in a potential vorticity form and it preserves important physical properties of the original deterministic equation. We investigate a data assimilation problem via the SRSW model and using real observations corresponding to the pressure and velocity vector fields.