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Toward data-driven methods in geophysics: the Analog Data Assimilation

Redouane Lguensat (1), Pierre Tandeo (1), Pierre Ailliot (2), Manuel Pulido (3), and Ronan Fablet (1)

(1) IMT Atlantique; UMR 6258 LabSTICC; Technopole Brest Iroise, 29238 Brest; France, (2) Universit\'e de Bretagne Occidentale, UMR 6205 LMBA; 6 avenue Le Gorgeu, 29200 Brest; France, (3) Universidad Nacional del Nordeste, UMI-IFAECI/CNRS and CONICET, Corrientes, Argentina

The Analog Data Assimilation (AnDA) is a recently introduced data-driven methods for data assimilation where the dynamical model is learned from data, contrary to classical data assimilation where a physical model of the dynamics is needed. AnDA relies on replacing the physical dynamical model by a statistical emulator of the dynamics using analog forecasting methods. Then, the analog dynamical model is incorporated in ensemble-based data assimilation algorithms (Ensemble Kalman Filter and Smoother or Particle Filter).

The relevance of the proposed AnDA is demonstrated for Lorenz-63 and Lorenz-96 chaotic dynamics. Applications in meteorology and oceanography as well as potential perspectives that are worthy of investigation are further discussed. We expect that the directions of research we suggest will help in bringing more interest in applied machine learning to geophysical sciences.