EGU22-8659
https://doi.org/10.5194/egusphere-egu22-8659
EGU General Assembly 2022

Asymptotic behavior of the forecast-assimilation process with unstable dynamics

Dan Crisan[1] and Michael Ghil[2]
[1]Imperial College London, Faculty of Natural Sciences, Mathematics, London, United Kingdom of Great Britain – England, Scotland, Wales (d.crisan@ic.ac.uk)
[2]Ecole Normale Supérieure, Laboratoire de Météorologie Dynamique, Paris, France (ghil@lmd.ipsl.fr) University of California, Los Angeles (UCLA)

Extensive numerical evidence for real and/or simulated data shows that the assimilation of observations has a stabilizing effect on unstable dynamics in numerical weather prediction and elsewhere. In this talk, I will discuss mathematically rigorous considerations showing why this is so. In particular we prove that the expected value of the Wasserstein distance between the forecast-assimilation (FA) process starting from the true initial conditions and FA process wrongly initialized can be controlled uniformly in time. Under suitable circumstances, the number of observations required to achieve this stabilization can be much smaller than the number of model variables. In particular, it suffices to observe the model's unstable degrees of freedom.