Bérengère Dubrulle (SPEC, CEA)

Can we predict weather?: New tools for an old problem

According to everyone's experience, predicting the weather reliably for more than a few days seems an impossible task for our best weather agencies. Yet, we all know of examples of "weather sayings" that allow wise old persons to predict tomorrow's weather sometimes better than the official forecast. In the late 50' and 60's, Lewis Fry Richardson, then Edward Lorenz set up the basis on the resolution of this puzzle, using observations, phenomenological arguments and low order models. Going beyond Richardson and Lorenz is hard, because of the complexity of weather and of its equations of motions. Mathematics is arduous, numerical simulations exceed present super computer capacities, observational data submerge our data centers and their analysis is greedy in computational resources. In this talk, I will show how the weather puzzle can be reinvestigated using new tools based on projection of equations of motion onto an exponential grid allowing to achieve realistic/geophysical values of parameters, at a moderate computational and storage cost. Time permitting, I will also discuss how the tools and the numerical findings can be extended to experimental velocity fields.

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*Team Bang : A. Barlet, P. Bragança, A. Cheminet, F. Champagnat, P. Cornic, Ch. Cuvier, F. Daviaud, B. Dubrulle, J-M. Foucault, A. Harikrishnan, J-P. Laval, J. LeBris, B. Leclaire, B. Musci, V. Padilla, C. Wiertel