Discrete models for atmospheric turbulence

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In this talk we introduce a discrete model for atmospheric turbulence, which was originally derived by Helmholtz from the Euler equations.

We state some of it basic properties and show how we can derive an effective PDE, the so-called mean field limit, from the discrete Hamiltonian system, by using a variational principle.

Furthermore, we discuss the extension of these methods to generalized surface quasi-geostrophic models and show how tools from probability theory can help us to get more information about turbulence phenomena.

The content of this talk is based on work in collaboration with Marco Romito (University of Pisa), the presentation tries to avoid technicalities and to be accessible to a mixed audience.