

Physical and geophysical vortices

The purpose of this work will be to describe the evolution of the solutions of PDEs coming from fluid mechanics, with various applications such as naval conception and meteorology. We cite here some of the models in view: primitive equations of the ocean and of the atmosphere and the Shallow Water equations. The particularity of this project is that we are interested in studying the solutions with a strong vortex, solutions which present an important mathematical complexity. From the mathematical point of view, the study of very turbulent flows can be seen as a superposition of point vortices. The first studies start with the pioneering work of Marchioro and Pulvirenti (the setting of the problem can be found in the book by Marchioro and Pulvirenti, « Mathematical Theory of Incompressible Nonviscous Fluids »).

We intend to adapt the methods developed in an abstract and idealized context to the models used by physicists. The work will be guided by regular interactions with the colleagues from Pprime institute, thus ensuring the pertinence of our models and results, by comparing the theoretical results obtained with the physical measurements.