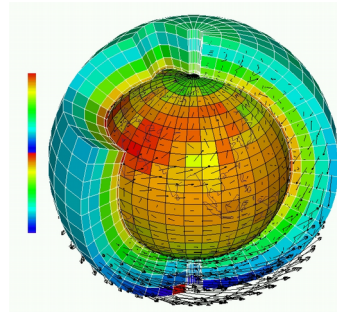
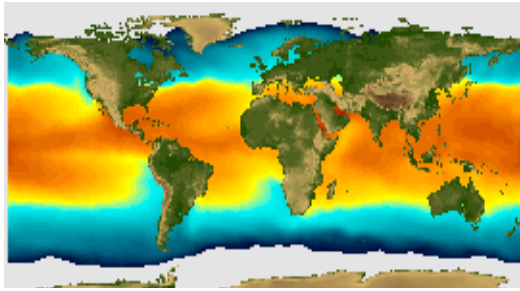


MASTER M2 OACOS/WAPE



Course AD, NUM-2.2 – Introduction to data assimilation

3 ECTS

Instructor in charge: Marc Bocquet (marc.bocquet@enpc.fr)

Instructors: Vivien Mallet, Olivier Talagrand, Emmanuel Cosme, Loïk Berre

Objectives:

Data assimilation is the set of techniques meant to optimally estimate the state of a geophysical system using observations on that system and a numerical model of that system. Because geophysical fluids are chaotic and simulated with imperfect models, data assimilation has become mandatory in meteorological and ocean forecasting, in the re-analysis of the past states of the atmosphere and the ocean, and is increasingly used in many fields of the geosciences (atmosphere, ocean, climate, atmospheric chemistry, air quality, cryosphere, biosphere, etc.). Data assimilation is a Big Data problem (and has been so for the past 30 years) and shares many of its technique with machine learning.

The objective of this course is to provide an introduction to the techniques of data assimilation. It consists of a general introduction *from numerical modelling to data assimilation*, a block of 3 lectures to present the basics of the theory of data assimilation, a block of 2 numerical training sessions on PCs, and a double conference with two reknown experts in the use of data assimilation in meteorology and in oceanography.

Syllabus:

1. From numerical modelling to data assimilation
2. Methodological aspects: BLUE
3. Methodological aspects: variational methods
4. Methodological aspects: sequential and ensemble methods
5. Lectures: "Data assimilation in meteorology" & "Data assimilation in oceanography"
6. Computer training session with a "shallow water" model (part I)
7. Computer training session with a "shallow water" model (part II)
8. Oral exam: scientific article synthesis

Marc Bocquet

Senior researcher and Professor at École des Ponts ParisTech, deputy director of CEREAs, joint laboratory with EDF R&D. He is an expert in data assimilation and inverse problems with applications to atmospheric chemistry, air quality and meteorology.

Web page: <http://cerea.enpc.fr/HomePages/bocquet/teaching/>