

# Geological fluid dynamics



Niveau d'étude  
Master 2



ECTS  
6 crédits



Volume horaire  
52h



Période de  
l'année  
Semestre 3

## Présentation

### DESCRIPTION

(1) Elements of continuum mechanics (stress tensor, mechanical equilibrium, pressure)

(2) The equations of fluid mechanics (fluid, time derivative in fluid mechanics: lagrangian vs eulerian

description of a flow, mass conservation, momentum conservation for an inviscid flow)

(3) The Navier-Stokes equation (viscosity, viscous stress tensor, some exact solutions of the Navier-

Stokes equation)

(4) Dimensional analysis and similarity : Reynolds number, laminar vs turbulent flows

(5) Flows in the mantle (Stream function for 2D flows, Post-glacial rebound, subduction zone)

(6) Volcanic flows (Laminar eruption regime : controls on the eruption rate, spreading of lava

domes, Turbulent and compressible eruption regime : choking)

(7) Thermal convection (heat transport in a fluid, Rayleigh-Benard convection, Plumes and thermals).

(8) Surface and subsurface flows (aquifer and rivers).

### OBJECTIFS

Fluids play a major role in numerous geological processes from the core to the Earth surface. The

objective of this class is to introduce the main principles and equations of Fluid mechanics, and to apply them to the description of various geological systems.

### HEURES D'ENSEIGNEMENT

|                           |                 |     |
|---------------------------|-----------------|-----|
| Geological fluid dynamics | Cours Magistral | 28h |
| Geological fluid dynamics | Travaux Dirigés | 24h |

### PRÉ-REQUIS NÉCESSAIRES

The class requires solid bases in mathematics (differential equations) and in continuum mechanics.

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