

Prof. Marco PICASSO

Mathematics Institute of Computational Science and Engineering - MATHICSE

SEMINAR OF NUMERICAL ANALYSIS

➤ **WEDNESDAY 2 MARCH 2016 - ROOM CM09 - 16h15**

Prof. Paolo RICCI (EPFL, Lausanne) will present a seminar entitled:

“How can numerical simulations help to box up a star without melting the box?”

Abstract:

In the edge region of a fusion device the temperature decreases, over only a few centimeters, from a value ten times higher than in the centre of the Sun, to the room temperature of the surrounding solid walls. This extreme gradient, probably the steepest in the Universe, drives highly complex physics phenomena, including strongly nonlinear turbulence, on spatial and temporal scales spanning ten orders of magnitude in complex geometries. Turbulence in the edge region determines the heat load on the device wall, which must remain within the materials limits. Current empirical extrapolations indicate these constraints may be exceeded in future fusion devices. Therefore, understanding edge turbulence and disentangling its complexity become of crucial importance. In fact, this is now recognized as one of the greatest challenges for the successful operation of future fusion reactors. More philosophically, turbulence is one of the most important unsolved problems in classical physics and remains a fascinating mathematical challenge. Given this complexity, the role of numerical simulations is crucial. The goal of this talk is shining some light on the pertinent physics at the edge of a fusion device, deriving the model that we used over the last few years to describe its dynamics and the related mathematical challenges, and, finally, presenting the numerical techniques we used. We will also stress the most important mathematical and numerical open issues.

Lausanne, 28 January 2016/DK/cr