

MATHEMATICS FOR THE PLANET EARTH

A Challenge and an Opportunity to Mathematicians

José Francisco Rodrigues
University of Lisbon

Abstract

The “Mathematics of Planet Earth” initiative (MPE2013) aims to be an important occasion for showing the essential relevance of mathematical sciences in planetary issues at research level for solving some of the greatest challenges of our century. As in the World Mathematical Year 2000, it should also be an opportunity for the non less important Raising Public Awareness of mathematics at the educational and societal levels.

The Planet Earth System is composed of several sub-systems, such as, the atmosphere, the liquid oceans and the icecaps and the biosphere, and in all of them mathematics, enhanced by the supercomputers, has currently a key role in the “universal method” for their study, which, following J.-L. Lions, consists of the mathematical modeling, the analysis with simulation and the control. Much before the advent of computers, the representation of the Earth, the navigation and the cartography have contributed in a decisive form to the mathematical knowledge, as well as the International Geosphere-Biosphere Program, sponsored by the International Council of Scientific Unions, is contributing to stimulate several mathematical research topics.

In this lecture, we present a brief historical introduction to the essential mathematics for understanding the Planet Earth and some of the challenges raised by the current global change, with a special focus on the international competition for modules for a virtual global exhibition promoted by MPE2013, which launching has the UNESCO patronage, and the research initiatives announced for 2013, in particular, in Europe by the ERCOM centers.