Preface: On the need for an open debate on alternative and conventional theories in the Earth sciences

A one-day symposium on new and conventional ideas in plate tectonics and Mediterranean geodynamics was held in Rome on February 19, 2003 at the headquarters of INGV. There were two main reasons for such an initiative. The first was an invitation to Giancarlo Scalera from the "Gabriele D’Annunzio" University of Chieti to present his alternative ideas on global tectonics to final year students of the Regional Geology course. The second was a reciprocal invitation to Giusy Lavecchia and Francesco Stoppa to explain their criticisms of the application of subduction-related models to Italian geology and to present their data on the recently discovered intra-Apennines carbonatite occurrences. It was decided to dedicate an entire day to seminars, involving people with a more conventional approach to geodynamics, especially those involved with seismic tomography.

In the last few years, high-resolution mantle tomographic models have been widely used to unravel the geometry of subduction zones. A turning point in the field, however, was a review paper written by Fukao et al. (Rev. Geophysics, 39, 291-323, 2001) showing that there was no clear evidence for slab subduction down to the core-mantle boundary, thus posing a major problem on the balance between the lithosphere subducted at consuming plate margins and the large amount of oceanic lithosphere accreted at diverging plate margins. This prompted the need to re-evaluate the nature of subduction and plate margin evolution.

Accepting the theory of plate tectonics, many problems remain open, especially those regarding plate driving mechanisms and their possible link with the forces developed at the core-mantle boundary. Might these forces trigger pulsating tectonic and magmatic activity, with mantle upwellings and large-scale emission of CO₂, capable of causing dramatic changes in the composition of the atmosphere and changes at the Earth’s surface? Could these lead to major catastrophic changes in Earth history?

During the one-day symposium, a stimulating discussion took place involving different interpretations of observations, especially those relating to the geodynamics of the Mediterranean region. Although the papers in this collection do not provide unique solutions, they do, however, provide new insights into some problems and in some cases suggest new interpretations. Many questions also arise about the rela-
tionships between the tectonics of the lithosphere and the deep mantle processes. May the denser portions of the inner parts of the Earth transform into shallower, lighter chemical phases, with a possible increase in the Earth’s volume? May the asthenosphere above growing plume heads be capable of dragging the overlying lithosphere? May mantle plumes be wet rather than hot? Some papers consider gravitation to be a driving mechanism for the nucleation of contractional belts and others even doubt the compressional origin of orogens. Finally – as a link to fundamental physics – an original mechanism of energy conversion from gravitons to photons is proposed as a supply of energy for global tectonic processes.

Obviously, because of an often diverse philosophical and scientific background, it is difficult for the ideas presented in this supplement to be shared by all readers and contributors. But we hope that these ideas will help to encourage critical evaluations of some commonly accepted concepts in modern plate tectonic theory. European geoscientists have available to them an exceptional natural laboratory – the Mediterranean and surrounding orogens – complete with all of its paradoxes and contradictions. In this natural laboratory, we hope that new evidence and new solutions to a variety of problems outside of the Mediterranean region will be found!

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