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EUROMARGINS and TOPO-EUROPE: prospects for synergy between ESF EUROCORES in process-oriented Integrated Solid Earth research

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EUROMARGINS with its focus on Europe's continental margins and their analogues has generated substantial new data sets and conceptual inputs pertinent to the understanding of the coupling between the deep Earth and surface processes at continental margins systems. The new TOPO-EUROPE will build on the EUROMARGINS results to study the topography of the continents and their margins. The lithosphere responds to forces exerted by these processes, generating mountain belts (e.g. Alps, Apennines, Carpathians, Caucasus and Scandes), elongated rift zones (e.g. Rhine-Rhone rift system), vast areas of recent volcanism (e.g. Massif Central, Rhenish Massif), explosive volcanoes (e.g. Canaries, Azores, Santorini, Vesuvius, Campi Flegrei) and large sedimentary basins (e.g. North Sea, Pannonian Basin, Black and Baltic Seas, Mediterranean, East European Platform basins). Improved knowledge of the deep mantle and its coupling to the lithosphere and the surface is key to understanding the enormous forces that produce these features. The impact of solid-earth processes on surface topography at plate boundaries has been known for several decades, but their significance for intraplate domains, and particularly the vulnerable coastal regions, has only recently been appreciated. Furthermore, critical feedback mechanisms between solid-earth processes and topography are now recognized. The present state and behaviour of the shallow Earth system is a consequence of processes operating on a wide range of time and spatial scales. Time-varying phenomena include long-term

tectonic controls on subsidence, glaciation, uplift and river systems, residual isostatic effects of the ice ages on crustal movements, stress accumulation and release at intraplate boundaries, natural climatic and environmental changes from the distant past to the present and the powerful short-term anthropogenic impact of the last century. The key spatial dimensions vary from continental-scale mantle convection cells and plumes through regional-scale variations in lithospheric structure and glacial rebound to local-scale coastal erosion and changes to rivers, streams and groundwater. To trace, quantify and forecast topography evolution in response to solid-earth processes and movements of water and air, it is essential that researchers proficient in a wide range of sub-disciplines interact and collaborate. TOPO-EUROPE will link the results of various geomorphological, geological, petrologic, tectonic, geochemical, geochronological, geophysical, hydrological, geodetic, remote sensing and geotechnical investigations both in the field and laboratory. Such an integrated interdisciplinary approach has yet to be achieved on a truly European scale. Researchers in various organisations (e.g. universities, government laboratories, geological surveys) in distinct scientific fields will join forces to implement innovative research strategies that lead to an improved understanding of Europe's dynamic topography and enhanced forecasting capabilities. Activities will be directed to such sensitive areas as onshore and offshore continental margins, densely populated lowlands, including flood-prone coastal areas and subsiding deltas, mountain ranges susceptible to landslides and rockfalls, active volcanoes, tectonic features prone to earthquakes and intra-plate basins that may contain hydrocarbon occurrences. TOPO-EUROPE will be linked via its members to a series of programs that focus on diverse aspects of topographic evolution. An important goal will be to simulate the recent past by "inverting" geodata and forecast the future by connecting the past, present and future evolution of the solid-earth system. Through the close connection between the two EUROCORES programmes and their complementary nature considerable synergy can be expected. This applies in particular to the prospects of an effective integration of onshore and offshore parts of the continental margin system. Such a coupling is crucial for a better understanding of for instance Source-Sink system dynamics in margin areas of high topographic gradients.