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The Deep-Sea and Sub-Seafloor Frontier initiative – a key to link EC research and international scientific ocean drilling

Achim Kopf and the DS3F Steering Committee Team
University Bremen, MARUM, Bremen, Germany (akopf@uni-bremen.de, +49 421 218 65805)

The Deep-Sea and Sub-Seafloor Frontiers project, DS3F, represents the continuation of the DSF roadmap towards the sustainable management of oceanic resources on a European scale. It will develop strategies for sub-seafloor sampling to contribute to a better understanding of deep-sea and sub-seafloor processes by connecting marine research in life and geosciences, climate and environmental change, as well as socio-economic issues and policy building. We propose to establish a long-lived research approach that considers (i) the need for a sustainable management of the ocean, and particularly the deep sea with enhanced activity (fishery, hydrocarbon exploration), (ii) the necessity to unravel deep-seated geological processes that drive seafloor ecosystems, and (iii) the value of seabed archives for the reconstruction of paleo-environmental conditions and the improved prediction of future climate change.
Sub-seafloor drilling and sampling can provide two key components in understanding how deep-sea ecosystems function at present, and how they will respond to global change: (a) an inventory of present subsurface processes and biospheres, and their links to surface ecosystems, including seafloor observation and baseline studies, and (b) a high resolution archive of past variations in environmental conditions and biodiversity. For both components, an international effort is needed to share knowledge, methods and technologies, including mission-specific platforms to increase the efficiency, coverage and accuracy of sub-seafloor sampling and exploration.
The deep biosphere has been discovered only within the past two decades and comprises the last major frontier for biological exploration. We lack fundamental knowledge of composition, diversity, distribution and metabolism in sub-seafloor biological communities at Earth's extremes, and their repercussions on seafloor ecosystems and life in the deep sea. There is equally an emerging need to shed light on geodynamic processes fuelling biological activity, and how such processes tie into the emission of geofuels and the formation of hydrocarbons and other resources. In addition, geodynamic processes may be cause natural hazards such as earthquake slip, submarine landslides, or tsunamis with a profound effect for humans and ecosystems. Their governing principles and potential triggers are poorly understood and often related to the sub-seafloor environment.
In summary, the three main research areas in the Integrated Ocean Drilling Program (IODP; see Initial Science Plan www.iodp.org/isp/), i.e. geodynamics, climate and deep biosphere, as well as the goals of DS3F show a strong overlap and suggest an emerging need to join forces. This will result in the most efficient use of sub-seafloor sampling techniques and existing marine infrastructure to study the geosystem and its effects on biosphere and marine ecosystems, and provide a comprehensive "white paper" for a sustainable use of the oceans and a Maritime Policy. For potential European contributions to the successor program of IODP after 2013, this could mean that in addition to commingled funds by national funding agencies (as currently managed by ECORD), the European Commission in Brussels could assist in co-funding individual, mission-specific research projects by providing the basis for post-cruise studies, third party equipment, monitoring networks, or data management. In essence, this would result in a more substantial European contribution to the program than what is presently the case.