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The EUCOR-URGENT Project

Upper Rhine Graben: evolution and neotectonics

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EUCOR-URGENT is a transnational Environmental Earth System Dynamics Training through Research Project that is centred on the Upper Rhine Graben, the home ground of the EUCOR Universities of Basel, Freiburg im Breisgau, Karlsruhe and Strasbourg. Owing to a vast database, the Upper Rhine Graben offers a natural laboratory for analysing the evolution of a tectonically still active intracontinental rift and for assessing the impact of on-going slow deformation of the Earth's crust on large population and industrial concentrations. These are exposed to elevated seismic hazards and rely for their water supply to a large extent on groundwater contained in the Quaternary fill of the Upper Rhine Graben. These water resources are endangered by anthropogenic pollution.

Innovating aspects of the EUCOR-URGENT Project are the transnational cooperation of all Solid Earth Science disciplines in an effort to: (1) integrate all available data and to acquire new ones applying state-of-the-art technologies and numerical modelling, (2) quantify and model dynamic processes controlling the past and present evolution of the Rhine rift system, (3) quantify on-going deformation and related earthquake hazards, including assessment of the recurrence time of major shocks, (4) quantify the dynamics of the Pliocene-Quaternary groundwater systems and the transfer time of pollutants within them. The EUCOR-URGENT research platform provides a solid base for the training and mobility of young researchers at graduate, post-graduate and post-doctoral levels.

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The URGENT Project was developed during 1997–1998 on the initiative of the Geological-Palaeontological Institute of the University of Basel in close cooperation with its EUCOR partners at Albert-Ludwigs-Universität of Freiburg im Breisgau, Universität Fridericiana Karlsruhe and Université Louis Pasteur of Strasbourg. Following recognition of the URGENT Project as a EUCOR Project by the presidents of the EUCOR Universities, EUCOR-URGENT was launched during a symposium held in Basel in mid-January 1999 for a duration of 5 years, with an option for prolongation into a second phase. Coordination of the EUCOR-URGENT Project was entrusted to the University of Basel, with the Coordinator being supported by a Scientific Steering Committee in which the four EUCOR Universities, as well as ETH Zürich (Switzerland), Vrije Universiteit Amsterdam (The Netherlands), BRGM Orléans (France) and LGRB Baden-Württemberg (Freiburg, Germany), are represented as main contributors to the Project. As EUCOR-URGENT evolved, additional Universities and National Organisations joined the Project, mainly by contributing one or more research or training positions funded by themselves or by their respective National Science Foundations. By mid-2004, the EUCOR-URGENT network embraced about 40 Ph.D. students, 20 Post-Docs and 18 senior researchers, who were based either at one of the four EUCOR Universities or at one of the 21 partner Universities or National Organisations.

During its initial 5-year phase, EUCOR-URGENT was instrumental in attracting for its research and training activities substantial funding from external sources, such as via the EU-5th Framework Program ENTEC (ENvironmental TECtonics: the Northern Alpine Foreland) and SAFE (Slow moving Active Faults in Europe) projects and the EU-INTERREG III “NITRATE” and “Microzonation Greater Basel Area” projects. Moreover, EUCOR-URGENT was recognised in 2000 by the European Science Foundation (ESF) as one of its Life and Environmental Sciences Networks,

and thus was provided with funding of its annual workshops during 2000–2003. These workshops served the coordination of activities of the different project components.

The EUCOR-URGENT Project is structured into four discipline-related Themes, each of which is composed of a number of sub-projects. Theme 1 addresses Neotectonics and Seismic Hazard, and includes the following sub-projects: (1) geodetic quantification of uplift, subsidence and lateral displacement rates, (2) seismicity and seismic hazard zonation, (3) present- and palaeo-stress fields, and (4) geomorphologic record of Plio-Quaternary deformation, surface and subsurface evidence for recent deformation and evaluation of the recurrence time of major earthquakes based on palaeoseismicity records. Theme 2 concerns itself with the hydrosystems of the Upper Rhine Graben, with sub-projects addressing (1) the correlation and sequence stratigraphy of Plio-Quaternary alluvial systems, (2) their hydrological framework, (3) their sedimentology, (4) geochemical and isotopic groundwater characteristics, and (4) the development of hydrogeological models. Theme 3 addresses the structure and evolution of the Upper Rhine Graben, with sub-projects concerned with (1) a reassessment of its structural configuration, neotectonic deformation and related fault re-activation and earthquake activity, (2) the evolution of the crust and lithosphere and their present configuration, (3) the evolution of the sedimentary basin and development of regional palaeogeographic–palaeotectonic maps based on a revised chronostratigraphy of the basin fill, (4) the distribution of magmatic activity in time and space, and processes of magma generation, and (5) analysis of the timing and magnitude of rift shoulder uplifts, based on fission track data. Theme 4 is dedicated to multi-scale dynamic modelling of the past and present deformation of the Upper Rhine Graben, involving (1) its 3D palinspastic pre-rift reconstruction, (2) quantitative 1D, 2D and 3D subsidence and uplift modelling, (3) modelling of

the role of lithospheric and crustal rheology on rift dynamics under changing stress regimes, and (4) modelling of seismic hazard zonation.

Towards the end of the initial 5-year period of the EUCOR-URGENT Project, its progress was reviewed during an open symposium held in September 29 to October 1, 2003, at the University of Basel. This Special Issue of the International Journal of Earth Sciences contains a selection of papers that were presented during this symposium. Papers published here cover parts of all four main research themes of the Project. This way we hope to be able to offer a balanced overview of results, keeping in mind that numerous other research papers on the EUCOR-URGENT related topics have already been published, and additional technical contributions and syntheses are still to appear.

At the end of the 2003 Basel symposium it was agreed that the EUCOR-URGENT Project warrants extension into a second 5-year phase during which training aspects ought to be formalised. To this end, a EUCOR training-through-research Environmental Earth System Dynamics (ESDY) Doctoral School, based on the “co-tutelle de thèses” system, is currently under development.

For further information on EUCOR-URGENT, and a comprehensive Project-related publication list, readers of this special issue of International Journal of Earth Sciences are referred to the Project web site at <http://www.unibas.ch/eucor-urgent>, and to the past and present Coordinators, and Project and Data Base Managers:

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