

# Preface

Although sedimentary basins are visually less impressive than mountain belts, they are mankind's most important archives, not only regarding our understanding of the past but also in terms of economic and ecological aspects. Subsiding over millions of years, they accumulate sediments which allow us to reconstruct long term climatic and tectonic changes that have affected the history of the Earth. During subsidence and consequent burial the deposits are exposed to greater depth, pressure, and temperature. A chemical kitchen develops, reacting as a geo-reactor, generating fluids such as petroleum and natural gas. Beside the fact that basins provide more than 90% of our energy resources, they also provide large reservoirs of drinking water. Other typical resources are sandstones, carbonates, gypsum and different types of salt. The latter not only includes conventional sodium chloride (kitchen salt, halite), but also potassium salts used as fertilizers. Increasingly, sedimentary basins will also act as long term resources for geothermal energy which may partly fill the forthcoming gap in energy resources. Additionally, salt structures and other layers of low permeability in deep sedimentary basins are in the focus for waste disposal, especially radiogenic and toxic agents. Finally, porous and permeable layers overlain by less permeable cap rocks can be used to store liquids or gases, including carbon dioxide, in the attempt to store energy or to construct climate neutral power plants.

Usage of basins is becoming more and more competitive in terms of production of resources and long term storage of waste. In order to achieve compatibility, reliable management will be necessary. Reliable management, however, requires a profound knowledge of the structure to be managed and this knowledge must encompass not only its present state but also, as far as possible, its past and future evolution. For simple basins, straight forward analytic and modeling methods have been developed in various disciplines. There is, however, a class of basins that are either rather large and/or have suffered a complicated geodynamic history over a long time for which classical models fail or are at least insufficient to predict details of the internal structure. We call these basins "complex". One such is the Central European Basin System (CEBS) extending from Norway to Germany and from Great Britain to Poland. The CEBS has experienced various phases of subsidence and uplift during the past 270 million years. This area will be the central focus throughout this book, although other areas of the world will also be discussed.

In 1999, ten years after the fall of the Berlin Wall we took the opportunity to launch a project concerning sedimentary basins, focusing on the Central European Basin System within a future orientated program of the German Research Foundation DFG and the Federal Ministry of Education and Research BMBF, ("GEOTECHNOLOGIEN: The System Earth – From Processes to Management"). At the same time, the German hydrocarbon industry announced that they would provide previously classified data for basic research. Finally, in 2002, it was possible to initiate a special research project SPP 1135: "Dynamics of sedimentary basins", funded by the DFG for six years as a "Priority Programme" (Schwerpunktprogramm) and cosponsored by the DGMK (German Society for Petroleum and Coal Science and Technology) as representative of the German hydro-

carbon industry (DGMK-project 577). For the following six years basic research was performed in about 30 projects and results were presented in a variety of publications, including three peer-reviewed special volumes (Marotta and Bayer, 2005, Littke et al. 2005, Bayer et al. 2008).

The special research project SPP1135 was built on scientific research into the area from the last twenty years. It was first of all the European Geo-Traverse (Blundell et al. 1992) crossing the area in the late 1980s. EUROPROBE served as an umbrella bringing together scientists from eastern and western Europe after the political boundaries became transparent in the 1990s. Sub-programmes like TESZ (Trans-European Suture Zone) and associated programmes like PACE (Paleozoic Amalgamation of Central Europe), DEKORP Basin'96, MonaLisa, Polonaise and Celebration 2000, and Thor need to be mentioned here. All these projects, funded by different sources, provided a sound basis for understanding in particular the deeper crust below the Central European basin system by focussed research.

Having published many results of our research program in scientific journals, we felt the need to present our major findings in a book specifically designed to describe a basin system completely and to elucidate the major processes acting therein. This is the first objective of this book, and the sedimentary system selected is that of the Central European Basin System, which is one of the largest and most complex continental basins on Earth. In order to develop a conclusive concept for the structure and evolution of this outstanding example of a complex basin, it was necessary to integrate the data and to organise the people specialised in dealing with certain data sets into a non-hierarchical scientific system, which was a considerable enterprise given that the databases came from geology, geophysics, geochemistry, hydrogeology and so on.

The contribution by authorities from different fields of geoscientific research also provided the rare opportunity to combine expert knowledge from different disciplines in one book. In the course of our research programme, we could learn a lot about the disciplines of "the others", thereby obtaining a wider view of sedimentary basin dynamics. We want to share this experience with our readers and have encouraged the authors to describe basic processes from their view as a geophysicist, sedimentologist, structural geologist, petroleum geochemist, hydro-geochemist and so on. Thus, the second objective of this book is to provide an advanced understanding of some of the most important interpretation concepts and parameters relevant for understanding processes acting in sedimentary basins. In this sense, this book should be regarded as an advanced teaching book bringing together expertise from different scientific disciplines. This expertise can be applied to sedimentary basins in general, not only the Central European Basin System.

The result we present here is a multi-authored book, whereby the authors of the different chapters are responsible for the content of their chapters.

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