



Preface

Evolution of the Rheic Ocean



The idea for this special issue grew from three international meetings of the IGCP (International Geoscience Programme) Project 497 – ‘*The Rheic Ocean: Origin, Evolution and Correlatives*’, hosted in Portsmouth, UK (5–11th July 2005), in Ankara, Turkey (23–30th June 2006) and in Évora, Portugal (27th September–4th October 2006). These meetings focused, respectively, on the ‘Devono–Carboniferous Evolution of the Northern Margin of the Rheic Ocean’, the ‘Neoproterozoic and Palaeozoic Terranes in Northwest Turkey’ and the ‘Ediacaran to Viséan Crustal Growth Processes in the Ossa–Morena Zone’. A wealth of new data was presented during these meetings, and it was decided to prepare a compilation of contributions dealing with Peri-Gondwanan crustal growth in the Alleghanian–Variscan orogenic system of northern South America, North America, Western and Central Europe, and Northwest Africa. The remnants of Rheic Ocean form discontinuous exposures from Mexico in the west to eastern Europe in the Dobrogea (Romania) and Turkey. This special issue is not merely a compilation of the communications presented during these meetings. Instead, by inviting additional contributions, the two coordinated parts are designed to provide a comprehensive view of our current understanding of Late Neoproterozoic to Early Palaeozoic tectonics in relation to Peri-Gondwanan terranes and the development of the Rheic Ocean.

Although not totally understood, the initiation of the Palaeozoic rifting that culminated in the opening of the Rheic Ocean and correlative basins between the gigantic continent of Gondwana to the south and the continents of Baltica and Avalonia to the north (Fig. 1a, b) began in Early Cambrian time with the break up of a Neoproterozoic continental margin (Murphy et al., 2004, 2006a,b). After Neoproterozoic accretion (Nance et al., 2002), the northern Gondwana margin began to be fragmented giving rise to the development of marine basins with voluminous rift-related magmatism. As Baltica and Laurentia converged during the latest Ordovician to Silurian, the Rheic Ocean developed as a narrow sea between Avalonia and Gondwana (Fig. 1c). The Rheic Ocean continued to open at the expense of the Iapetus Ocean and reached its widest extent during the Silurian (Fig. 1b, c). It is now firmly established that a Late Palaeozoic accretion/subduction process was responsible for the closure and tectonic inversion of these marine/oceanic basins due to the collision of Gondwana and Laurussia (Variscan–Alleghanian orogeny; Matte, 2001) during Carboniferous assembly of the super-continent Pangea (Fig. 1d, e).

Despite this accepted geodynamic scheme, there is no real consensus about the mode and timing of rifting, oceanization, kinematics, subduction, thickening and collapse-related processes that occurred along this margin of Gondwana for a period of more than 250 million years of Earth history. Until now the available information relating to: (1) the extensional structures consequent on crustal thinning, (2) the distribution of anorogenic magmatism and hypothetical oceanic crust remnants, (3) the plausible existence of more than one suture zone and associated high-pressure rocks, (4) the occurrence of orogenic continental arc-related magmatic complexes, (5) the role of transcurrent movements in the deformation of the basement and development of basins and (6) the reconstruction of subduction related thrust tectonics and high-pressure units, was not sufficient to allow the development of well-constrained geodynamic models.

This project contains 27 contributions divided into two parts. The bulk of both volumes deal with detailed aspects of palaeogeography, palaeontology, geochronology, provenance analysis, geochemistry, deformation and tectonics, magmatism and sedimentation, and are concerned with the evolution of Peri-Gondwanan correlatives from European, North and South America areas. The geology is considered in a general chronological order:

Part I: ‘The foundations and birth of the Rheic Ocean: Avalonian–Cadomian orogenic processes and Early Palaeozoic rifting at the northern Gondwana margin’, with 16 papers;

Part II: ‘Evolution and closure of the Rheic Ocean: Palaeozoic drift of peri-Gondwanan terranes and Alleghanian–Variscan orogenic processes’, with 11 contributions.