



Miocene connectivity between the Central and Eastern Paratethys: Constraints from the western Dacian Basin



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ABSTRACT

The Dacian Basin formed an important link between the central and eastern parts of the Paratethys, a chain of late Tertiary inland seas and lakes. This study presents constraints on Miocene sea and lake level fluctuations in the Dacian Basin and on the connectivity between it and other Paratethys basins, based on the interpretation of seismic lines, a micropalaeontological study and lithofacies analysis of a large number of outcrops. It is shown that relative sea level fluctuations in the western part of the Dacian Basin during the Middle Miocene were primarily driven by tectonic activity in the nearby Carpathian Mountains. From the Maeotian (Late Miocene) onwards, however, tectonic activity was minor and relative sea level fluctuations were primarily driven by changes in basin connectivity and climate. The connection between the Central and Eastern Paratethys was broken at the end of the Middle Miocene, leading to the development of an endemic fauna in the former, but new data presented here suggest that isolation was not sustained completely as Central Paratethys species appeared in the Dacian Basin during the Maeotian (Late Miocene). Besides the isolation two falls in water level occurred in the basin during the latest Miocene: Of these, the intra-Pontian sea-level drop is the best known. We show, however, that this drop was preceded by a larger sea or lake-level drop in the late Sarmatian/Maeotian. This latter event may have affected much larger parts of the Paratethys, and we recommend more study of the bordering basins. The hypothesis that the connection between the Dacian and Central Paratethys basins was located in the region where the Danube River presently crosses the Carpathians was tested, but no supporting evidence was found.

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1. Introduction

This study focusses on the Miocene connections between three major Central and Eastern Paratethys basins, the Pannonian Basin, the Dacian Basin and the Black Sea Basin, during the Miocene (Fig. 1). The Paratethys comprised a chain of basins that stretched across Europe from Oligocene times onwards (e.g., Steininger et al., 1988; Rögl, 1999). Although a significant amount of research has been carried out recently (e.g., Çağatay et al., 2006; Harzhauser and Piller, 2007; Krijgsman et al., 2010; Leever et al., 2010, 2011; Karami et al., 2011; Munteanu et al., 2012; Jipa and Olariu, 2013) there is still considerable discussion on the exact nature, cause and impact of relative sea and lake level changes, on basin connectivity and on the locations of gateways between these basins (e.g., Magyar and Sztanó, 2008; Krijgsman et al., 2010; Suc et al., 2011; Bache et al., 2012; Bartol et al., 2012; Csato et al., 2013). Changes in connectivity between semi-enclosed sedimentary basins can have far-reaching effects on the

water and sediment exchange between basins, the salinity, the formation of regional unconformities, the occurrence of flooding events, the development and migration of (endemic) faunas, and on the regional climate (e.g., Rögl, 1999; Steininger and Wessely, 1999; Popov et al., 2004; Krijgsman et al., 2010).

In this study three events during which connections between the Dacian Basin and neighbouring areas of sedimentation may have changed were investigated. The first of these records the separation of the Dacian Basin from the Pannonian Basin towards the end of Middle Miocene times. This was most probably related to uplift of the Carpathian Mountains and corresponded to a major extinction event in the Central Paratethys (Horváth, 1995; Vasiliev et al., 2010; Ter Borgh et al., 2013), but the location of the closure point is not well constrained (Marinescu, 1985; Magyar et al., 1999; Popov et al., 2004; Jipa and Olariu, 2013).

The second event that was investigated is the intra-Pontian event (latest Miocene). It resulted in a sea-level drop that has been estimated at 50–200 m in the Dacian Basin (Krijgsman et al., 2010; Leever et al., 2010; Stoica et al., 2013). In the Black Sea, however, a drop of more than 1 km has been proposed (Hsü and Giovanoli, 1979; Munteanu

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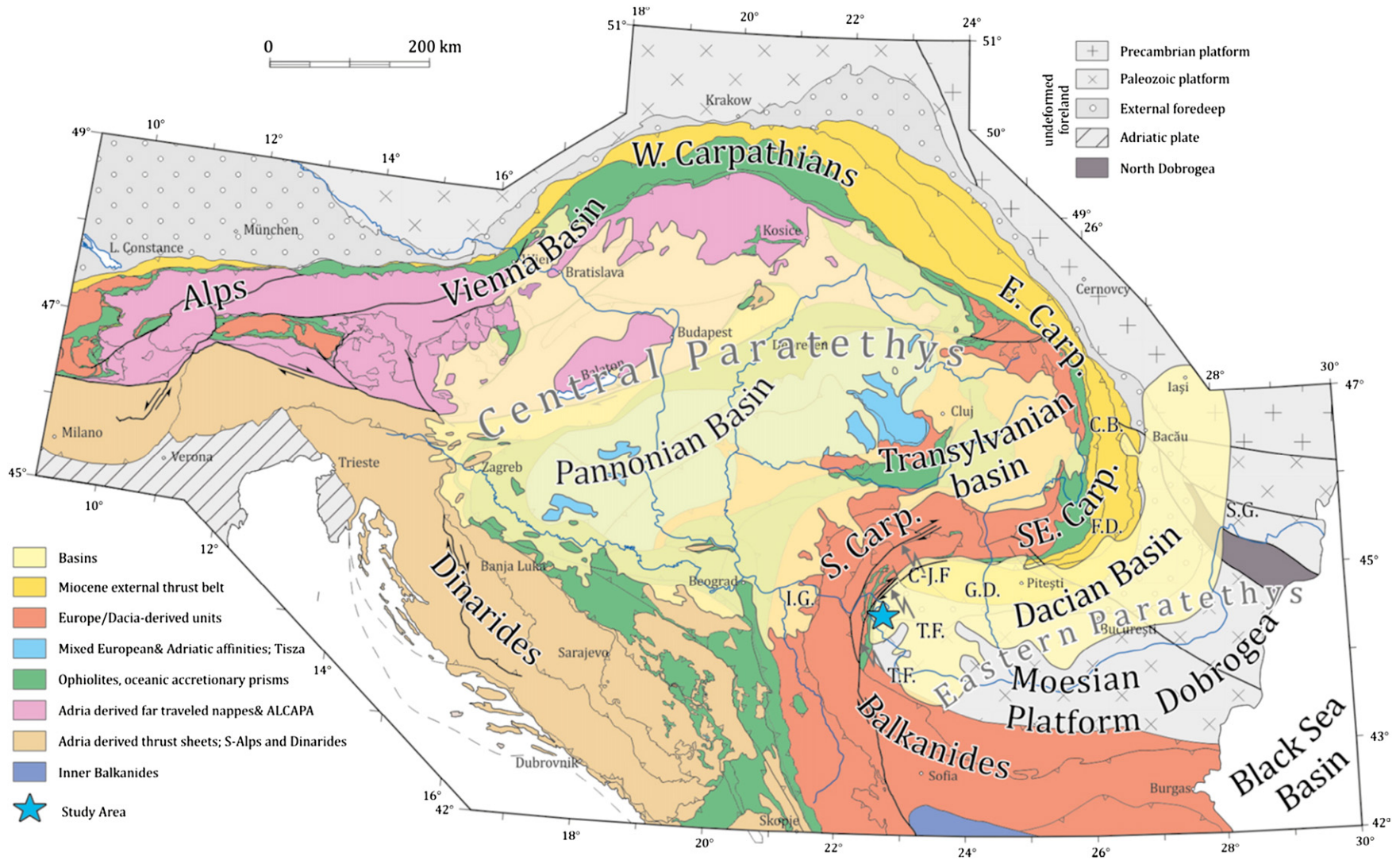


Fig. 1. Map of the western part of the Eastern and the Central Paratethys. Shown are the main tectonic units, the extents of the individual Paratethys basins and the location of the study area. C.B. – Comănești Basin, C-J.F. – Cerna-Jiu Fault, F.D. – Focșani Depression, G.D. – Getic Depression, I.G. – Iron Gates, S.G. – Scythian Gateway, T.F. – Timok Fault. Modified after Schmid et al. (2008).

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