tions in basin shape can be mostly explained in terms of changes in load distribution, but pre-existing differences in initial bathymetry are quite important. The lithospheric strength on the other hand is small and does not vary a lot.

Modes of Polish Trough inversion and its relationship to Alpine collision - from the Baltic Sea to the Carpathians

P. KRZYWIEC

Department of Geophysics, Polish Geological Institute, Warsaw, Poland, krzywiec@pgi.waw.pl

Orogenic processes are often responsible for variations in evolution of sedimentary basins located in the far-field of the evolving orogenic belt. Also, development of various foreland inversion structures within the brittle upper crust is often connected to evolution of orogenic belts. These structures can often be investigated using seismic reflection profiles that show both inverted and rotated basement blocks as well as folded and faulted rocks of sedimentary infill. Polish Trough (PT) has evolved in Permian to Cretaceous times along broadly defined Trans-European Suture Zone. It has already been postulated for a long time that its Late Cretaceous inversion could be correlated with Alpine collision and transmission of compressional stresses into the foreland plate – i.e. European Plate. However, only very limited number of publications has been published so far with seismic examples of inversion-related structures. This was mainly due to fact that bottom part of the basin infill contains thick series of Zechstein evaporites that strongly attenuate seismic energy. Therefore straightforward interpretation of inversion structures was either difficult or impossible.

Completed interpretation of offshore and onshore seismic data from various parts of the PT revealed numerous examples of inversion-related structures. Their identification allowed for spatial and temporal interpretation of various aspects of the PT inversion and its relationship to Alpine collision. A model for development of various upper crustal brittle inversion structures was constructed, taking into account relative role of Zechstein salt deposits for formation of these structures, as well as relationship between inversion processes and salt tectonics.

First group of inversion-related structures related to Late Cretaceous inversion of the PT consists of uplifted basement blocks and large reverse faults that cut both Palaeozoic basement and Mesozoic basin infill. They are generally oriented NW–SE and could be regarded as extensional faults that controlled development of the PT and become inverted in Late Cretaceous. They were identified in the N part of the PT (Baltic and Pomeranian segments), in NW surroundings of the Holy Cross Mts, and in Lublin Trough. Syn-inversion sedimentary features like thickness reductions above fault-related folds hinge, or sediment progradation away from uplifted blocks, accompany some of these faults. In all these areas Zechstein evaporites are either absent or of small thickness. In the central part of the PT, where evaporites are of considerable thickness, presumed inversion of older extensional faults was restricted to pre-Zechstein section. It has resulted in basement block rotation, development of inverted faults and basement highs, and formation of various related salt structures. Such relationship between inversion and thickness of salt deposits suggest that, most probably, PT inversion was to at least some degree controlled by thickness of ductile Zechstein evaporitic deposits. They may have acted as detachment level between brittle Palaeozoic basement and Triassic to Cretaceous sedimentary infill and prevented formation of fully developed Mesozoic inversion structures in areas of thick salt.

Along the NE edge of the PT, in places characterised relatively thin Zechstein cover, series of transpressional (flower) structures and related inverted faults formed in Late Cretaceous that cut high into the Cretaceous section. These structures were described along so-called Koszalin–Chojnice anticline and attributed to PT inversion. Numerous seismic unconformities observed above this anticline combined with well information allowed for precise dating of inversion tectonic activity. Steep reverse faults and flower structures related to strike-slip movements, accompanied by prominent syn-inversion sediment progradation, were also identified in the wide tectonic fault zone between Bornholm island and the Polish coast.

Alpine collision to the south has led to tectonic movements also along faults perpendicular to the

PT, like Grójec fault. Several seismic lines clearly show typical flower structures developed within the Mesozoic section along this fault that prove its strike-slip character. Late Cretaceous inversion of the PT influenced also area located relatively close to present-day Carpathian front. Within the Nida Trough several reverse faults were identified. Thickness variations of Cretaceous deposits across the fault plane prove their Early Cretaceous extensional activity. These faults were inverted during Late Cretaceous inversion of the PT, and reactivated in compressional regime during Miocene Carpathian collision. Remnants of similar faults associated with PT inversion and Małopolska Massif uplift can be observed in E Polish Carpathian foredeep basin. These faults were re-activated as normal faults during Miocene flexural extension of the foreland plate.

Factors controlling progressive deformation of heterogeneous lithosphere: example from Western Capathians

O. LEXA & K. SCHULMANN

Institute of Petrology and Structural Geology, Charles University, Prague

The object of this study is the Cretaceous deformation of continental lithosphere strongly reworked during Variscan orogeny and subsequently modified by Early Mesozoic rifting. The continental crust of the northern part of the studied area is composed of high-grade crystalline complexes marked by presence of voluminous plutonism thrust to the south over medium grade metasediments during Variscan orogeny. In the south occurs low grade to anchimetamorphic early Palaeozoic Gemer basin overlying pre-Cambrian basement. Variscan inversion of this basin is associated with overthrusting of high grade complex to the south, development of inverted metamorphic zonation and southwards vanishing deformation gradient. This complex orogenic structure is rifted during early Mesozoic extensional period that is responsible for opening of Meliata oceanic domain to the south and heterogeneous thinning of continental lithosphere to the north. This mechanisms produced large scale lithospheric Vepor segment separated from main European continental Tatric domain by Mesozoic Fatric basin.

The closing of the Meliata oceanic domain is connected with progressive indentation and heterogeneous deformation of above described lithospheric structure. We first recognise northward Upper Jurassic thrusting of subduction related melange, blue schist metamorphics and low grade meta-sediments of accretionary wedge over underlying basement without its reworking.

Onset of Cretaceous continental collision is marked by southward continental underthrusting of Fatric lithosphere below Vepor lithospheric segment, inversion of Fatric basin and beginning of imbrication of strong Proterozoic crust in front of southern indenter. These processes generated décollement of Mesozoic sequences their transportation to the north and building of complex nappe pile on the European Tatric platform. Southward underthrusting of buoyant Fatric and Lower Fatric domains generates vertical shortening of Vepor Variscan crust manifested by development of greenschist facies mylonitic extensional fabric. Northward imbrication of Proterozoic crust produces positive cleavage fan within low grade meta-sediments of the Gemer basin. The closure of Fatric basin in the north and significant shortening of southern Gemer basin result in effective transmission of stress from northern European platform and southern indenter across intermediate Veporic domain. This stage is manifested by compressional deformation of all lithospheric units marked by development of heterogeneous shear zones within more or less isotropic basement rocks and complex folding of more anisotropic sequences. This deformation is largerly transpressive due to obliquity between movement of southern indenter with respect to the boundary of European platform. This transpression is responsible for development of strain partitioning leading to origin of wrench dominated shear zones parallel to the collisional margin and to important pure shear shortening of rest of the basement.

This evolution is supported by rheological modelling which defines starting mechanical conditions at the onset of collision by means of yields strength envelopes and integrated lithospheric strength profiles. The progressive oblique indentation and deformation pattern in weak Gemer basin are further modelled using modified England's thin viscous sheet model by Ježek et al.