SEISMIC DATA OF THE CARPATHIAN FOREDEEP BASEMENT
(ROMANIA)

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Abstract

The Carpathian foredeep is a molasse-bearing depression that formed in front of the folded eastern and southern Carpathians in the Late Miocene. Deep seismic reflection/refraction profiles as well as gravity and thermal studies carried out in the foredeep area of the southern and eastern Carpathians provide information on the crustal structure of the study region. The variability in the reflectivity pattern and crustal thickness shown by the different sectors of the Carpathian foredeep are due to differences in the structure and lithology as well as differences in crustal age (Klemperer, 1987; Wever et al., 1987).

In western part of the southern Carpathian foredeep reflectivity increases with depth and Moho is delineated by strong reflections at 9-11.5 s two-way travel time (TWT) (30 - 33 km depth). The eastern side of the southern Carpathian foredeep shows a decreasing reflectivity with depth, the crustal base being interpreted at 12-13 s TWT (40-45 km depth) (Raileanu et al., 1994).

The eastern Carpathian foredeep is characterized by an almost transparent upper crust and a layered lower crust down to 13 s TWT (40-45 km depth). The greatest thickness of foredeep rocks is in the eastern Carpathian arc bend (Focsani depression), where Neogene rocks are 8 to 10 km thick.

1. Introduction

The Carpathian foredeep external to the outer southern and eastern Carpathians is considered to be a typical molasse bearing foredeep that formed coeval with thrusting in the adjacent mountain belt (Royden and Karner, 1984). It is a transition zone between the Carpathians and foreland units and formed as a result of the Savian and Styrian tectonic movements (Burchfiel and Royden, 1982).

The Carpathian foredeep contains mostly Neogene sediments largely derived from the Carpathians, but also with significant contributions of detritus from the more external East-European (Moldavian) and Moesian platforms. Rock types within the foredeep include molassic conglomerates, sandstones and shales and local important evaporite deposits. Folds and small thrusts within the Neogene, Pliocene and even Pleistocene rocks are complicated by salt diapirs which have a variety of complex structural forms (Patrut et al., 1973). Many of these folds contain important oil reserves (Paraschiv, 1979; Burchfiel and Royden, 1982). The foredeep ranges in width from only a few kilometers (~10 km) in the northern part of the eastern Carpathians to more than 100 km at the southern Carpathian bend. The greatest thickness of the foredeep sediments is south of the eastern Carpathian bend (Focsani depression), where the Neogene rocks are probably 8 to 10 km thick. Recently this area has been subsiding at a rate of up to 3mm/yr. (Popescu and Dragoescu, 1986).

This paper synthesizes previous seismic studies carried out in this zone (Radulescu et al., 1977; Radulescu, 1981; Raileanu et al., 1994; Diaconescu M. et al., in press) creating an integrative interpretation of the data. The knowledge of the crustal structure of the Carpathian foredeep in Romania is mainly based on seismic (near-vertical reflection profiling and refraction methods) gravity and thermal data (Andreeescu et al., 1989; Andreeescu, 1993; Demetrescu and Andreeescu, 1994; Diaconescu C. et al., in press).

2. Geological setting

Structurally, the Carpathian foredeep forms a wedge of clastic rocks and evaporites that thickens toward the Carpathians. The inner part of the foredeep has been involved in the folding and thrusting of the foreland belt.