forms was established during this tectonic event. Fold plane dips of synforms are generally northward and their b-axes are east-west oriented (Vojtko 1999). Continuous north-south compression induced sinistral transpressional regime at the Muráň line along which carbonate lenticular bodies within the Scythian shales, with klippen tectonic style, have been formed. The fan--fault structures of the first generation were likely generated by sinistral movements along the Muráň line. These all tectonic structures were cut by the NNE-SSW Suché Doly fault at the end of compressional stage (Vojtko 1999).

During the Eocene and Oligocene, compression changed into an extensional regime. This tectonic regime induced a dextral transtension along the Tisovec fault and simultaneously the SW block subsided. The tectonic event is recorded in sedimentary filling of the Brezno depression by block sedimentation during the Priabonian.

Along this extension, the Lower Miocene compression followed, which induced destruction of the Paleogene basin as well as uplift of the surrounding mountains. This compression stage is not sufficiently documented, because of lack of exact data from the tectonic slickensides on the fault planes (Marko 1993b, Vojtko 1999).

The Miocene extensional tectonics is characterized by evolution of the Vepor volcano-plutonic complex, in which five eruption phases with various products of this volcanism were identified. The Miocene extension was E -W directed and it generated a normal fault system, which shaped the Tisovec Karst to asymmetrical graben structure (Vojtko 1999). These normal fault discontinuous zone served as way for migration of groundwaters northerly from the Suché Doly valley shallow holes to the Teplica karst spring in the Furmanec valley (Wiesengangerová 2000).

A very young tectonic activity was identified at the brittle Tisovec fault, which cut all the normal faults together with the Muráň line probably during the Plio-Pleistocene.The neotectonic activity of the Tisovec Karst area is very difficult to be identified, because the rocks younger than the Badenian are not known there. Quaternary alluvial sediments are of small thickness up to 2.5 m, locally, south of Tisovec, to 3.5 m. There are circumstantial evidences in the studied area which point to a neotectonic activity. The most important evidence are "seismites", documented by limestone block debris near the Tisovec fault. These blocks fell down from fault scarp of the fault zone. In the area of this tectonic zone morphological features are present, which proved neotectonic activity. The neotectonic movements influenced the course of the Rimava river and Strieborný potok stream and caused also geomorphological anomalies between Tisovec town and the Zbojská saddle (Vojtko 1999).

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Remarks to Main Tectonic Fenomena along the Northern Part of the Seismic Transect 2T

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The contribution is focused on regional tectonic problems based on re-interpretation of the seismic transect 2T, one of the dominant in the territory of the Slovak Republic presented in the Atlas of deep reflection seismic profiles of the Western Carpathians and their interpretation (Vozár et al. 1998,1999)

The already traditional question concerning the Tatricum unit basement is the Penninicum problem (Leško and Varga 1980) or the problem of unit representing function of the Penninicum here (Vahicum sensu Maheľ, 1981). The Penninicum represents a hypothethic unit in the Western Carpathians. None of the units belonging to the Flysch zone, which according to some ideas might represent Penninicum in the Western Carpathians, does not overlap the lineament of the Klippen Belt. Based on the deep seismic profiles (3T, 8HR, 6HR, 2T, G) it is not possible to interpret continuation of units belonging to the flysch zone toward the inner part of the Pieniny Klippen Belt.

The contact between the Tatricum and Veporicum, which are dominant units in the Inner Western Carpathians, is interpeted as a north-verged overthrust of metamorphic rocks belonging to the northern Veporicum on the prevailingly granitoid basement of the Tatricum in the southern part of the Ďumbier Lower Tatras (e.g., Koutek 1931). The originally defined Čertovica Line (Zoubek 1953 in Maheľ et al. 1964) as a tectonic contact of the Veporicum and Tatricum, was at the same time interpreted as a scar after reduced depositional area of the Krížna Nappe extended above the Veporicum basement (Biely and Fusán 1967).

This thrust line was identified with the Donovaly Line in its western continuation in the Starohorské vrchy Mts. (Jaroš 1971) and according to other interpretation it was redefined as the Čertovice Fault localized in the Hron valley (in Maheľ edit. 1964). In seismic transect 2T the contact of the northern Veporicum and Tatricum is well-defined on the southern slopes of the Ďumbier Tatras being perpendicular or steeply dipping toward south. Faults with almost perpendicular projection in the Hron valley, which we interpret as intra-north-Veporic, are parallel to this tectonic phenomenon. This structural phenomenon affects crystalline rocks, their envelop, Mesozoic rocks of the upper nappe units and Late Cretaceous – Tertiary fill. According to some indications it also affects the Quaternary deposits. Several faults identified on the surface probably have only local and shallow establishment and they were not identified in seismic profile (e.g., Osrblie Line sensu Zoubek in Maheľ edit. 1964).

Structural position of the upper unit, i.e., the Northern Veporicum is documented in the profile 2T/85 by bundles of reflectors dipping slightly toward the south. Zones of metamorphic rocks prevail which have expressive reflectors. Zones of lower reflectivity, characteristic of granitoid massifs, are less abubdant in the transect. In some parts of the northern Veporicum profile it is possible to observe discontinuous reflectors dipping toward the north which are interpreted by Bezák et al. (1995) as relics of the Hercynian structures on crystalline basement. Root zone of the Krížna Nappe (Andrusov 1968; Biely 1961; Biely and Fusán 1967; Jaroš 1971; Maheľ edit. 1964; Maheľ 1964, 1986; Vozár 1965) or the Fatricum (sensu Andrusov et al. 1973) may be localized in the in the northern Veporicum based on geologic, mainly structural and facial evidence. In the northern Veporicum substantial shortening of the space is assumed which is related to displacement of crystalline and Mesozoic nappes but in the seismic transect 2T localization of the rear part of the Krížna Nappe is ambiguous.

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Cenomanian / Turonian Boundary in the Pieniny Klippen Belt-Sedimentological Studies.

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Geology

The Pieniny Klippen Belt (PKB) composed nearly 600 km in length and a few kilometres in width, arch-structure which separates two structural units: the Inner and the Outer Carpathians (Fig. 1).

In late Mesosoic time, the Pieniny Basin belonged to the Eastern branch of the Tethys and consisted of several sub-basins representing different realms, from the outer shelf (the Czorsztyn Succession), to bathyal zones (the Pieniny and Niedzica successions; Birkenmajer 1986; Birkenmajer and Gasiński 1992).

Samples

The studied material is dominated by marls, shales, limestones and flysch-like sediments, dated as Cenomanian-Turonian (Bąk 1998; Birkenmajer and Jednorowska 1987; Gasiński 1998).