It is possible to interpret these facts by combination of several tectonic events:

1. Origin of the old foliation in the Svratka and Polička Units (preserved in the NE limb of the large fold)
2. Origin of the Svratka anticline by combination of the old foliation and the young one during extensional dextral transtensional slipping in the NW part of the units.
3. Movement along the E-W-striking Kadov fault leading to duplication of the anticlinal structure (Melichar 1995). Consequently it was possible to misinterpret two parallel parts of the same NE-dipping limbs as two opposite limbs of the isoclinal large-scale anticlinal structure (Fig. 1).

Preferences:

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Emplacement Mechanisms of the West Carpathian Cover Nappes

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Rauhwackes / rauhwackised tectonic breccias, which occur at the soles of the superficial nappes were investigated at ca. 50 localities in various tectonic positions: under the Silica, Muráň, Drienok, Choč and Krížna nappes. This rock type was considered as a lubricant horizon, accommodating the thrusting of these nappes.

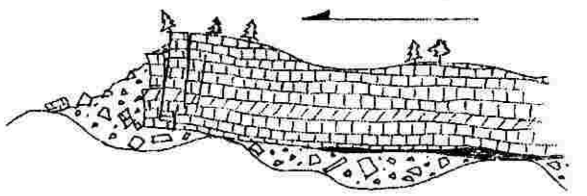

Fig. 1. Formation of the mélange in front of the leftwards advancing nappe body.

Rauhwackes of this origin usually appear as a continuous layer of thickness up to 200 m, separating (or connecting) the overlying nappe from its substrate. The uppermost part is frequently accompanied by the Werfenian shales, that are regarded as the décollement horizon of related nappe. At a certain scale of observation, rauhwacke appears as more or less polymict breccia with a recrystallised calcitic matrix (this need not be obvious from a hand specimen!). Size of rock fragments varies over several orders of magnitude, ranging from silt fraction to boulders of 40 m in diameter. Since this clastic material is derived from various stratigraphic levels of both footwall and hangingwall, it probably accumulated somewhere close to the nappe front in a manner shown on the sketch above. Levelling of the basal relief and erosion of the nappe front produced debris, that was pushed forwards and continuously overridden by the advancing thrust.

Dominant deformation mechanisms operating in the "protorauhwacke" at the time of thrusting was cataclasis and hydraulic fracturation. Cataclasis caused a rapid grain size reduction which resulted in the granular flow. This was very effectively supported by the fluid overpressure, as inferred from rock textures as well as from fluid inclusions. Very soft behaviour of calcitic matrix shows also newly formed idiomorphic quartz, which, at temperature >400°C (measured in fluid inclusions) remained microstructurally intact, without any need to deform internally.

One can consider the rauhwacke horizon as a vast hydrothermal system with well defined chemical and mineral alterations: **Dedolomitisation** occurs when the sulphate-rich fluid attacks the dolomite, leaching-out Mg^{2+} cation, following the overall reaction:

$$CaMg(CO_3)^2 + SO_4^{2-} - MgSO_4 + CaCO_3 + CO_3^{2-}.$$

Dedolomitisation took place in an immense extent, since dolomite seems to have represented a major volume component of rauhwacke. Massive **dissolution of quartz** and subsequent replacement by calcite takes place in a certain phase of rauhwackisation. Sometimes even large blocks of quartz-bearing rock (as e. g. gneiss, arkose, rhyolite) are completely calcitised. **Newly formed euhedral quartz** often grows in the calcitic matrix. Usually it encloses crystals of gypsum, anhydrite, calcite, pyrite, feldspar and clay minerals, fluid inclusions were found as well. Crystal-size distribution appears as negative-exponential, maximum size normally reaches 2 mm, exceptionally 6 mm (along the Z axis). Often the surface of a new quartz is affected by later etching. Euhedral **authigenic feldspar** (mostly albite) is often referred from limestones that have undergone anchizonal metamorphism. In rauhwackes, both albite and K-feldspar was found, often forming the so called Roc Tourné twins. Besides submicroscopical **illite** and **chlorite**, newly formed trioctahedral **K-Mg mica** (?phengite) was found in two samples. They both represent completely dedolomitised tectonic breccia, which might explain the source of Mg. Distortion of euhedral columns along the basal planes or even bending of separate sheets indicates the pre- or rather syntectonic growth of mica. Neogenesis of **pyrite** might have been supplied by Fe^{2+} released from dolomite in a course of dedolomitisation. Authigenic pyrite (now usually hematite pseudomorphs) appears as pyritohedra, sometimes combined with cubes and/or octahedra. Crystal faces show dense striation, which is typical if precipitated from a supersaturated solution.

All the newly formed minerals are occasionally affected by cataclasis and thus must have precipitated synkinematically. In case of quartz and pyrite, their later replacement indicates changing kinetic equilibria, caused by variations in pH and redox potential. Neogenesis of feldspar and mica requires a sufficient supply of alkalies through dedolomitisation which is conditioned by presence of sulphates. Two possible sources are proposed: 1) brines derived from the Permian evaporites, 2) input of the sea water.

All the above described features and processes suggest the principal role of fluid flow in a course of the rauhwacke formation, which confirms the fluid inclusion study. In euhedral quartz, primary CO_2 rich inclusions were found with salinities over 40% and homogenisation temperatures in the range 380 - 420°C. Calculated pressures exceed 2 kbar which oversteps the proposed lithostatic pressure by 1 kbar. This excess is due to the extreme fluid pressure which, at these values, could have supported the weight of the nappe in the course of thrusting. This possibly indicates a way a displacement of many km without any strong deformation of the nappe body occurred.

Petrography of the Zábřeh Crystalline Unit: A Review

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The Zábřeh crystalline unit (ZCU) is a metamorphosed volcano-sedimentary complex situated in the NE margin of the Bohemian Massif. A supposed gradual increase in metamorphic grade from the south to the north in the ZCU was not fully confirmed by recent data. It is possible to distinguish some relatively independent parts of the ZCU from the viewpoint of lithology and character of the metamorphism.

The southern part is formed by phyllites containing abundant intercalations of amphibolites in places with ultramafic rocks. Layers of acid metavolcanites and metadiorites are rare. The amphibolites metamorphosed under conditions of granulite facies (Babůrek and Hanžl 1997) are exposed together with garnet phyllonites in low-grade rocks (metapelites and metagreywackes) in the southernmost part of the ZCU near Pěčíkov. Amphibolites are accompanied by thin layers of strongly mylonitised marbles.

The northern part is composed of quartzite gneisses containing layers of quartzite and metarhyolite, biotite gneisses with garnet and sillimanite, augen gneisses and migmatites with intercalations of amphibolites.

Concordant bodies of tonalites are common mostly in the north part of the ZCU.

Two main described parts are separated along the Moravská Sázava river valley by a narrow, relatively independent, belt of flysch like metasediments with porphyroblasts of biotite. The belt contains a horizon of schists with staurolite north of Hoštejn village which indicates metamorphic conditions of lower amphibolite facies.

New mineral assemblages in gneisses, tonalites (chlorite) and amphibolites (chlorite, epidote) accompanied by brittle - ductile deformation are products of destabilisation during the retrograde metamorphism in the greenschist facies conditions. Indicators of the retrograde metamorphism have not been observed in metasediments from the southern part of the ZCU.

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The Omphacite Exsolutions in Pigeonitic Pyroxene Coexisting with Na-amphibole in Meladiorite Body at Krásná Lípa (Northern Part of Bohemian Massif)

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A sample of pyroxene-amphibole meladiorite with unusual pyroxene exsolution textures and Na-amphibole was collected in a core of the drillhole situated 0.5 km to the north of Krásná Lípa (southern part of the Šluknov area). The recognisable omphacite lamellae in host pigeonite as well as small nyböite and cummingtonite crystals were used to constrain a history of cooling from igneous conditions as well as regional metamorphism ones. The jadeite-rich clinopyroxene and alkali amphibole are characteristic of high-grade metamorphic rocks (blueschists and eclogites) whereas they would be absent in meladiorite. This finding suggests that elastic strain energy may have been affected by metamorphism during deep meladiorite emplacement. The list of Na-amphibole occurrences within basic dykes involves the bluish riebeckite overgrowths on brown amphibole in "lamprophyre" dyke from environs of Dresden by Tröger (1932) and numerous occurrences of the Na-Ca amphiboles (taramite, katoforite) in "lamprophyres" within the Lusatian granitoid pluton by Beger (1913). All places of occurrence correspond to a positive gravity anomaly beneath the Lusatian area (Lindner 1972).