sition Member carbonates which have undergone strong alteration, mainly silicification. Due to their high silica content these altered rocks were called in the mine "quartz rock" (QR). An overview of the major element geochemistry of the different lithologies occurring in the mining area is given in Table 1. The scope of this contribution is to present a mass balance study of the host rock alteration in the Rubiales deposit.

The "Isocon Diagram" method of Grant (1986) requires the concentrations of the least altered rock and of the most altered rock to firstly determine the most immobile and mobile components, and secondly to calculate relative gains and losses.

The rock compositions used in this study are the mean values of least altered carbonate rocks of the Middle Transition Member and, as most altered rocks, the mean QR values (Fig. 1). Geochemical data and petrographic observation were used to assess that the samples included in the QR group were originally carbonate rocks.

Al_2O_3, TiO_2 and the origin are almost colinear. A best fit line (not shown in Fig. 1) between Al_2O_3 and TiO_2 would intersect the x–axis at 0.01. Al_2O_3 and TiO_2 can be considered as immobile components. The slope of 2.25 of this best fit line corresponds to a mass loss of about 56%. The gains and losses calculated for assumed constant Al_2O_3 (Fig. 2) show a strong increase of SiO_2, an increase of FeO(tot), a possible weak increase of K_2O and losses for all other components, the strongest of which is for $CaCO_3$. Figure 3 shows the alteration effects by plotting the most enriched components SiO_2 and FeO(tot) over the least mobile components. The unaltered rock types plot in a narrow area, whereas most of the QR sample plots reflect the strong enrichment in SiO_2 and FeO(tot). Interestingly the host rock with originally shaly lithology (ore–SL) does not show an obvious alteration pattern.

It can be concluded at Rubiales that strong decarbonatization combined with silicification and Fe–input result in a mass loss of about 56% (up to 63 % volume loss taking into account the densities of quartz and calcite). This loss accounts for the apparent increase by a factor of 2.25 of Al_2O_3 and TiO_2, which show an immobile behaviour. The calculated volume loss corresponds with the 60 to 70% thickness reduction of the altered carbonate layers at Rubiales proposed by Arias (1988).

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TECTOGENESIS OF THE MID–EUROPEAN VARISCAN FOLD BELT

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The Mid–European Variscides developed on the granitic layer of the crust of the Laurasian Plate when it collided with the Gondwana Plate. A thin basement crust in the deformed zone may explain its high mobility. The tendencies of the continental drift trending North were connected with the tectogenesis of unconsolidated crust when passing through the mobile circum–equatorial zone.

It is not possible to presuppose a dilatation during initial stages of the basins but only a compression. In the course of Variscan tectogenesis, the bordering Forelands were underthrusted (subducted) below the mobile deformed zone and a Median Mass. A steep geothermal paleogradient caused the melting of the underthrusted crust. The melts migrated under the Median Mass which thus was intruded by large granitoid plutons (e. g. Moldanubicum).

In first stage (early Devonian) developing basins were filled mainly with siliciclastics from the deeply weathered Precambrian crystalline rocks of Forelands.

The second stage (Middle Devonian and Frasnian) is marked by the predominance of reef–limestones. There is an temporal relationship between the maximum of basic volcanic activity and the formation of reefs. Calcium was released from feldspars and passed into the sea water during the spilitisation process. The surplus Ca was used by the reef–building fauna for the construction of huge limestone complexes.This demonstrates a widespread marine transgression: it marked a turning point before the onset of Flysch. Both, the reefs and the basic volcanism have their maximum in this stage. They were associated with the subsidence of the whole basin and its surroundings.

In the third stage (Famennian and Lower Carboniferous), rather quick lifting of many blocks of the Variscan Median Mass was related to ascending granitoid magmas, melted crustal material that had been pressed from the subducted and melted Forelands. Acid volcanoes appeared on the peaks of the newly formed mountains. Their volcanoclastics have been widely dispersed and clastic volcanic material was also transported to the areas of Flysch sedimentation by streams. In the first zones of maximum subsidence (ZMS), situated near the Median Mass (subduction zone) first Flysch sediments were deposited: the fresh material came from quickly rising source areas in the Median Mass. The ZMS were narrow, their axes ran subparallel to the rising source areas. The rate of shifting of the ZMS in the direction from the Median Mass to the Forelands increased distinctly as late as Namurian A, when the tectogenetic processes reached their maximum (e. g. in Moravia and Silesia). It was the time of transition from Flysch to Molasse. The speed of this shifting accelerated towards the end of the Flysch stage, more clastic material was delivered into the migrating basins in a certain time, and thicknesses of individual formations and grain sizes increased. The Flysch formation was accompanied by granitic intrusions and subsequent acid volcanism. Ages of the plutons determined by radiometric methods do not yield the time of intrusion but rather that of cooling.

The fourth (Molasse) stage (Upper Carboniferous) was reached when sedimentation caught up with subsidence. The tectogene was still considerably uplifted. An early Molasse is known from the Drahany Upland (Moravia). About 3000 mm thick coarse conglomerates of Upper Viséan age with rounded granulite boulders reaching 2 m in diameter were transported from a distance of 50 km. Most of the material was delivered from the katazonal metamorphosed Moldanubian of the Bohemian–Moravian Upland.

The regular rytmic subsidence of the Foredeeps (coal–bearing cyclothems) reflects continuous uplift of the tectogene – indicated by the general decrease of marine influence in the paralic basins. Upper Silesian coalfield in Moravia and Silesia started as a paralic coal–bearing Molasse in the Foredeep (3000 m thick – lower half of Namurian A). The 5 m thick coal seam Prokop marks the boundary between the paralic and terrestrial Molasse. The deposition of the Prokop seam happened in upper half of Namurian A and lower half of Namurian B. The time of the coal seam Prokop deposition on the Foreland platform was the end of the main tectogenesis (folding) in Moravia and Silesia.

The oldest intermontane basins are of late Viséan age (accompanied by andesites). They increase in number, surface area, and thickness of deposits during the Upper Carboniferous. From the Westphalian C on, sediment thicknesses there were greater than on the Forelands. The intermontane basins are graben–like dilatational structures developed in the highest parts of the uplifted Median Mass in times of maximum compression of the whole Tectogene.

The occurrence of pebbles ot' Moldanubian rocks on the base of Flysch or Molasse formations of the Drahany Upland is one of the arguments for the Precambrian age of Moldanubian metamorphism and tectonics. There is no great difference between the today level of denudation of Bohemian–Moravian Upland and during Devonian and Carboniferous times. Therefore, already in Devonian time the Moldanubicum cannot be covered by epi– and mesozonal metamorphosed overlying rocks. Denudation of these rocks must have occured during Precambrian or Cambrian times – not later.