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Evolution of lignite seams within the South Moravian Lignite Coalfield based on certain qualitative data

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ABSTRACT

This paper focuses on evolution of lignite seams (the Pannonian) in the South Moravian Lignite Coalfield (SMLC). It is based on data analysis (seam geometry, ash yield, sulfur content, and lithology) from more than 3300 boreholes and many channel samples. The results show that the Vienna Basin in the Pannonian period gradually developed into a freshwater bay. In the Early Pannonian the sedimentary environment was tectonically calm. The salinity of the sedimentary environment was changing as a consequence of recurring transgressions. The studied area was under the influence of rivers flowing into the region from the west, north, and northeast. In the upper part of zone B (Papp's classification of the Pannonian sediments), especially in the northern areas of the SMLC, suitable conditions for coal-bearing sedimentation (the Kyjov seam) occurred. Zones C–F were characterized by simple or incomplete cyclic sedimentation processes. The Vienna Basin opened and the subsidence between the Steinberg fault zone and Lužice–Lanžhot fault zone (interconnected with the Polešovice fault zone) took place in the SMLC. At the beginning of zone F the swamp areas suitable for Dubňany seam formation developed in the SMLC. The coal-forming conditions were repeatedly restored. The sedimentary cycles with the coal-bearing deposits occurred also in zone G, however only in the central and southern parts of the SMLC. The increasing thickness of the deposits in zone G and the increasing number of cycles with lignitic layers in the southern part of the SMLC indicate a shift of the suitable conditions for swamps towards the south and into the overlying rocks. A distinct tectonic deformation of the lignite seam in the SMLC started only in the Pliocene, when due to the change of the stress field in the Vienna Basin the rejuvenation of the tectonic zones of the pull-apart system took place towards the NE–SW and NW–SE to NNW–SSE.

1. Introduction

For more than 160 years the Vienna Basin (VB) and its northern part, the so-called South Moravian Lignite Coalfield (SMLC), have been subjects of intensive studies, focusing on structural geology, tectonic structure, sedimentology, lithofacial analysis, sequential stratigraphy and paleography of the area (Decker and Peresson, 1996; Fodor, 1995; Harzhauser et al., 2003, 2004; Kováč et al., 1997, 1998, 2004; Lankreijer et al., 1995; Linzer et al., 2002; Royden, 1985; Seifert, 1992; Strauss et al., 2006; Wessely, 1986). However, the majority of these studies has not dealt with the development of the northern part of the VB (in the SMLC) in the Late Miocene thoroughly.

The SMLC is located in the southeastern part of the Czech Republic (Fig. 1). It has been reported that coal first appeared in the SMLC during the Badenian era. However, only the lignite seams in the Pannonian strata have brought economic benefits and have been mined for decades. In total more than 70 lignite mines have been opened. Currently, only two mines remain active (Fig. 1). The first one is an underground mine called Mír, situated in the area of Mikulčice–Hodonín in the Czech part of the VB. This mine produced 400,000 t of lignite in 2009. The second active mine is the underground mine Gbely Baňa Záhorié, situated in the Slovakian part of the basin. Its maximal annual production of lignite was 500,000 t in 2005. At present the annual production is about 155,000 t of lignite per year. Today, lignite is no longer seen as an interesting fuel alternative, but, conversely, it is increasingly used as a raw material for agriculture and in the chemical industry.

In this paper we present a study of the SMLC based on tens of thousands analyses from more than 3300 boreholes and many channel samples. With such a high number of data this study is able to capture the geological evolution of the area and the qualitative parameters of lignite which is present here. Our first aim is to reconstruct the development of the coal seam in the Late Miocene (the Pannonian) in the SMLC on the basis of selected technological parameters. Our second aim is to assess the mutual relationship between tectonic faulting and sedimentary development of the seam coal.

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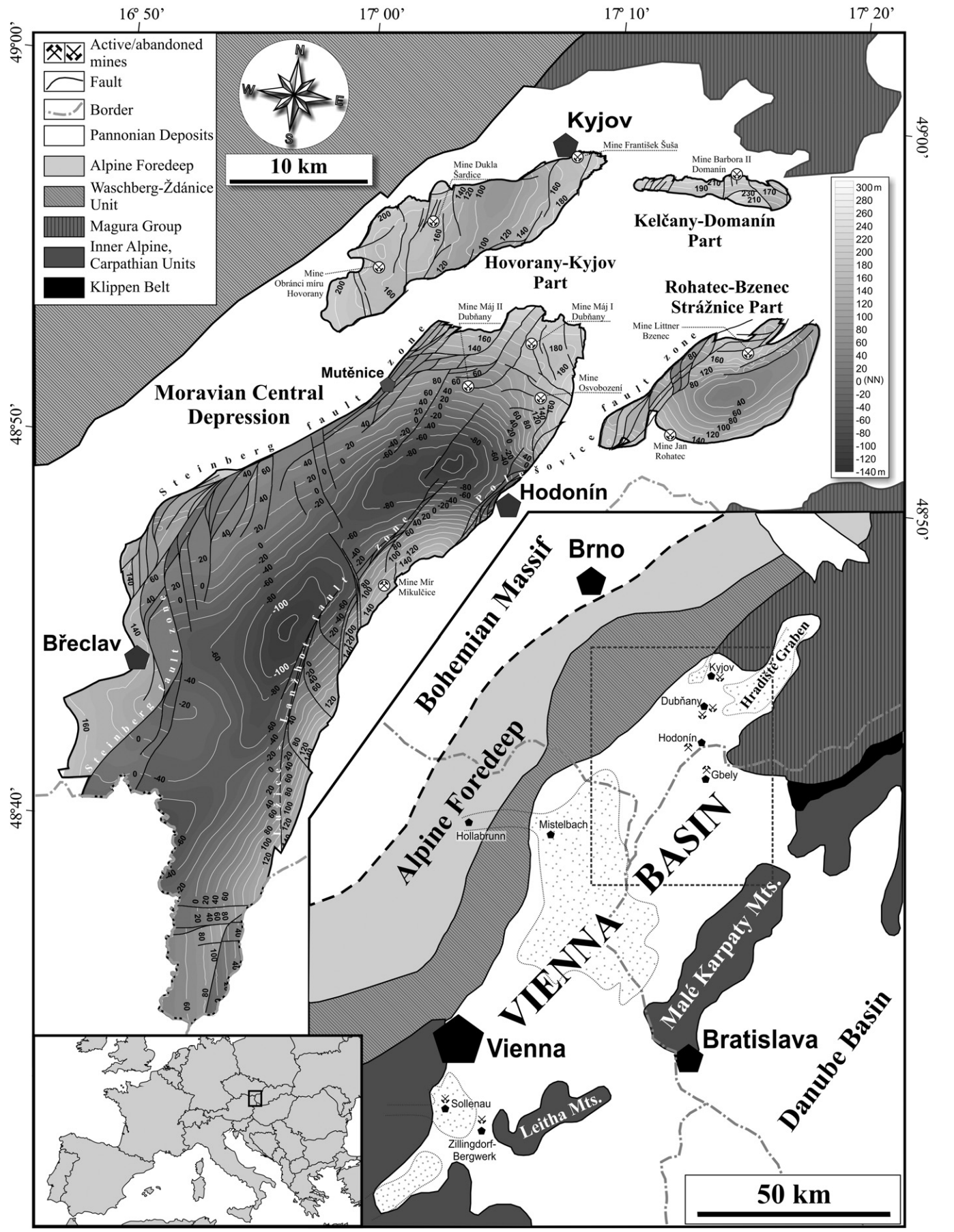
16° 50'
17° 00'
17° 10'
17° 20'
49°00'
48°50'
48°40'
Active/abandoned mines
Fault
Border
Pannonian Deposits
Alpine Foredeep
Waschberg-Ždánice Unit
Magura Group
Inner Alpine, Carpathian Units
Klippen Belt
N
W
E
S
10 km
Kyjov
Mine František Šuša
Mine Dukla Šardice
Mine Barbora II Domanín
Kelčany-Domanín Part
Hovorany-Kyjov Part
Mine Obránci míru Hovorany
Rohatec-Bzenec Strážnice Part
Mine Máj II Dubňany
Mine Máj I Dubňany
Mine Littner Bzenec
Mutěnice
Mine Osvobození
Moravian Central Depression
Steinberg fault zone
Rohatec fault zone
Hodonín
Mine Jan Rohatec
Mine Mír Mikulčice
Břeclav
Lanžhot fault
Brno
Bohemian Massif
Alpine Foredeep
Kyjov
Hradiště Graben
Dubňany
Hodonín
Gbely
Mistelbach
Hollabrunn
VIENNA BASIN
Malé Karpaty Mts.
Vienna
Bratislava
Danube Basin
Sollenau
Leitha Mts.
Zillingdorf-Bergwerk
50 km
300 m
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0 (NN)
-20
-40
-60
-80
-100
-120
-140 m