English Summary

Hydrological history of the mire of the Prokop Seam (Lower Pennsylvanian), in the Upper Silesian Coal Basin, Czech Republic

The Prokop Seam (early Lower Pennsylvanian, formerly Namurian B) is the thickest and economically the most important coal seam of the Ostra-Karviná Coalfield and of the whole Upper Silesian Coal Basin as well. Continuous, 11 m thick section of this seam (No. 40) merged with the overlying seam No. 39 from eastern part of the Ostrava-Karviná Coalfield (SW part of the Upper Silesian Coal Basin) was studied using petrographical and some analytical methods. The section was obtained from core of the mining borehole No 6277/02 located in the Darkov Coal Mine. The main aim of the study is to characterize changes in petrographical composition and consequently to reconstruct genesis of coal seam in term of its hydrological history.

The drill core was makropetrographicaly described and the section was divided into 129 samples. Samples, the thickness of which varies from 4 to 16 cm (8 cm on the average), were homogenised and divided into two parts, one for polished grain samples and the second one for ash and total sulphur content analyses. Maceral analysis was performed on polished samples.

Coal of the Prokop Seam represents dull and dull banded medium volatile bituminous coals (orto- and metatypes). Coal is unusually rich in inertinit at the expense of the vitrinite content which makes the Prokop Seam and other seams of the Saddle Beds appareantly different from seams of the Ostrava Formation and younger seams of the Karviná Formation dominating in vitrinite. The ash content is rather low, its average is only 5,2 percentages by weight.

Results of the maceral analysis show the existence of the cyclic changes of the contents of individual maceral groups, subgroups and some macerals. Apparent is fluctuation of vitrinite which negativelly correlates with similar alternation in inertinite content. The thickness of the cycles varies from 0,5 m to 2 m. Cycles are of both types, either with positive or negative trends of petrographical changes.

Inertinite rich part of cycles probably formed during the periods of less stable (fluctuating) water table which probably dropped often below the mire surface and enhanced peat oxidation. This is indicated by partly humified and consequently oxidised plant tissues preserved as semifusinite and oxidised gels (macrinite). By contrast, inertinite-poor (vitrinite-

rich) part of cycles probably formed during periods of much stable water table stabilised around the mire surface. However low ash content shows, that there was not probably any reverse into rhetrophical hydrology and the mire was still domed.

In accordance with this is the decrease of ash content and of collotelinit which corresponds with increasing of collodetrinit. Mineral matter content generally decreases up the section. and clastic clay minerals as well. The latter disappear at the level of sample P1/42. Diagenetic sulfides and carboantes are, however, present through the whole seam section.

The values of the Tissue Preservation Index (TPI, Diessel 1992) are very low and there are no any cyclic changes (repetition) at all. However the values of the Gelification Index (GI, Diessel 1992) shows cyclic fluctuation of values which corresponds with vitrinite/inertinite cycles described above. The decreasing in TPI up the section indicates that the most prominent floristic change took place near above the base when the mire start to dvelop from rheotrophic hydrology to ombrotrophic one. This transition was probably accompanied by retreat of lycospora (tenuisporinite) producing tree lycopsids (lepidodendrids) and subsequent collonization of the mire by subtree lycopsids producing densospores (crassisporinite) probably belonging to the genus *Omphalophloios*.

Estimated duration of the mire based on published data (Taylor et al. 1998) for peat accretion (1 - 2 mm/year) and compaction (peat/coal compaction 1:10) varies between 55 000 and 110 000 years. However, high inertinite content indicates increased necromass/peat oxidation which could resulted in lower peat accumulation rate. Therefore, the longevity of mire of the Prokop and No. 39 seams was also calculated for peat accretion rate of only 0,5 mm per year. Under such condition, the formation of the Prokop Seam may took place about 220 000 years. Similarly, the duration of cycles was estimated, too. These cycles could be accumulated during the interval of 500 to 1 000 years. However, in the case of slower accumulation rate of peat due to increased oxidation of organic matter, duration of the cycles could reached up to 2 000 years. The formation of these cycles is not known but may be related to climatic changes of sub-Millankovitch periodicities or to tectonic pulses.

Data obtained from all the analyses show that the mire of the Prokop Seam was at the begining of the reotrophic type with planar surface. However, quite soon it graded into the mire with ombrotrophic hydrology. In agreement with this assumption are trends of maceral and ash contents and character of mineral matter as well as generally high content of inertinit in most parts of the section. During the ombrotrophic stage of the mire development, the mire was supplied only by rainfall water which resulted in extremely low ash content. The cyclic

changes described above probably copy alternations of periods stable and fluctuating water tables. However, the reason of this fluctuation remains poorly understood but may reflect alternation of periods of „wetter“ and „drier“ climate.

The seam is topped by mudstone layer which indicates that peat acretion was terminated by lake transgretion and drowning of peat and peat-forming vegetation. The reason is not clear, probably it can relate with increase subsidence of the area.