Studie transportu štěrku v říčním toku s využitím metalurgické strusky jako stopovače: přínos pro poznání fluviální redistribuce vltavínů

A study of gravel transport paths in a stream using metallurgical slag as a tracer: a contribution to the understanding of fluvial moldavite redistribution

KAREL ŽÁK

Geologický ústav AV ČR, v. v. i., Rozvojová 269,165 00 Praha 6

ŽÁK K. (2009): Studie transportu štěrku v říčním toku s využitím metalurgické strusky jako stopovače: přínos pro poznání fluviální redistribuce vltavínů. - *Bull. mineral.-petrolog. Odd. Nár. Muz. (Praha)* **17/1**, 79-90. ISSN: 1211-0329.

Abstract

Fluvial transport of gravel was studied using pebble size analysis and pebble lithology in the channel of the Berounka River, Czech Republic. Fluvial transport of pebbles of metallurgical slag in the gravels is discussed as a possible indirect analog to the redistribution of moldavites from their original strewn fields by fluvial processes.

A 70 km long river reach, between 74.2 and 4.5 km above the confluence of the Berounka River with the Vltava River, was studied using 5 gravel samples collected from fresh gravel bars formed in the river channel after the major 2002 flood. The studied river reach is characterized by a moderate gradient (0.8 m · km^{-1}), average flow of 36.6 m^3 · s^{-1} (Beroun gauge) and peak recorded flow close to 3,000 m^3 · s^{-1}, during the 1872 flood. Typical size of the largest pebbles forming the gravel bars in the channel is slightly above 100 mm (the pebble longest axis). Samples (weight 55.41 to 60.02 kg) contained 675 to 1187 pebbles above 16 mm in size, of which 100 largest pebbles in each sample were determined petrographically. Pebbles of metallurgical slag were separated and studied from the whole fraction above 16 mm.

Pebble lithology largely reflects local rock sources in the river basin. The longest transport of pebbles on the order of tens of kilometers was found for several types of SiO_2-rich rocks, like vein quartz, Neoproterozoic silicites, Ordovician quartzites, and Cambrian quartz conglomerates. With respect to numerous steep-sloped inflows into the Berounka River, no obvious downstream gravel size fining was observed along the river path.

Metallurgical slag was introduced in the river especially after the major flood of 1872, when iron works located near the river were destroyed. After 137 years of fluvial redistribution (with several subsequent major floods) the metallurgical slag represents 8.78 wt. % of the > 16 mm pebble fraction at a site located 1 km below the former iron works, while samples collected 17 and 34 km downstream contained 1.12 and 0.11 wt. % of the slag.

Based on these data, and on discussion of other observations and data from literature, fluvial transport of moldavites along river bottoms is interpreted as improbable for distances longer than several tens of kilometers. Nevertheless, individual moldavites can be transported over longer distances, either incorporated in floating ice, or with floating trees during flood events.

***Key words**: fluvial transport, gravel, Berounka River, moldavite, central Bohemia*