Evaluating the fate of chlorinated ethene (TCE) around the near-stream zone

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The fate of chloroninated ethens in a near stream zone was evaluated using concentration of each component, hydrogeochemical data, microbial data and carbon isotope data. Temporal and spatial monitoring investigation show that a trichloroehylene (TCE) plume was originated from a small source zone in an industrial complex and is discharging to a stream. Groundwater geochemical data around the stream showed a region of depleted dissolved oxygen. Mass discharge of contaminants computed across transect lines showed that TCE mass discharge decreases along the groundwater flow path, whereas *cis*-DCE and VC mass discharge increases across the transect line located near the stream. TCE molar fraction is high ranging from 83 to 90% of total VOCs at a well located near the source zone. However, in the region downgradient of the source zone, molar fractions of *cis*-DCE and VC increase indicating biodegradation of TCE. The degree of chlorinated ethene transformation varies spatially due to local conditions. Reductive dechlorination likely dominated in the anaerobic region of the aquifer where TCE level was observed to decrease with simulaneous increase in *cis*-1,2-dichloroethene (*cis*-DCE) and vinyl chloride (VC). Groundwater along the transect nearest to the stream has concentrations of *cis*-DCE and VC decreased below detection limits, presumably due to anaerobic biotransformation processes at the near-stream zone. The increase in ferrous iron and manganese and decrease in TCE around the stream zone also are related with the biotransformation. Microbial community around the near-stream zone was analyzed to identify organisms which are responsible for the biodegradation. Carbon isotope ($\delta^{13}C$ of TCE, *cis*-DCE and VC) data were used to estimate the origin of contaminants source and the evidence of biodegration around the near-stream zone. TCE isotope values (from -19.21‰ to -17.78‰) around the near-steram zone are more enriched in $\delta^{13}C$ than the $\delta^{13}C$ around the source zone (-24.45‰). These isotope results also showed the evidence of biodegradation around the stream zone. Those data and analyses indicate the contaminant plume around the stream zone have been naturally attenuated by active anaerobic biotransformation processes.

Late Ordovician volcanic rocks in South Korea: Speculation on the cause of Paleozoic regional unconformity in Sino-Korean craton

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One of the distinct geologic features that distinguishing Sino-Korean block (SKB) from other east Asian blocks (e.g., South China block (SCB), Tarim block etc.) is a regional unconformity between Upper Ordovician and Middle-Upper Carboniferous on the SKB [1, 2]. The Korean Paleozoic, as a part of Sino-Korean sedimentary system, are mostly distributed in two relatively large sedimentary basins, the Taebaeksan and Pyeongnam basins, and consist of lower and upper Paleozoic strata with a great unconformity between them. The unconformity period is conventionally thought to be of non-deposition, but the cause of the unconformity is still ambiguous.

The Oknyobong Formation (OFm), consisting of volcanoclastics, tuffs, basalt and rhyolite, overlies Cambro-Ordovician strata in Taebaeksan basin [3]. It was considered to be Late Jurassic-Early Cretaceous stratum, based on incorrect age data [3]. In this study we reported SHRIMP U-Pb zircon ages and geochemical data for the volcanic rocks from the OFm. SHRIMP U-Pb zircon ages of 452.5 ± 3.2 (2σ) Ma and 445.0 ± 3.7 (2σ) Ma were obtained from two felsic volcanics, indicating that the OFm is of Upper Ordovician in age. Petrological and geochemical features suggest that the OFm extruded at the within-plate tectonic environment.

The Upper Ordovician within-plate volcanic activity, confirmed by the OFm, is coeval well with the Ordovician (~470 Ma) kimberlite volcanism in SKB, suggestive of regional lithosphereic uplift at that time [4]. Therefore epeirogenic uplift from mantle plumes (or hotspot epeirogeny) is suggested as a possible cause of the regional development of middle Paleozoic unconformity in SKB.

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