REDOX CHARACTERISTICS AND WATER QUALITY IN SELECTED PRINCIPAL AQUIFERS: IMPLICATIONS FOR GROUND-WATER MONITORING

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ABSTRACT

Redox characteristics of ground water in 15 Principal Aquifer systems across the United States, and their influence on the occurrence of selected natural and anthropogenic contaminants, were assessed from a large data base collected by the National Water-Quality Assessment (NAWQA) Program of the U.S. Geological Survey. Redox characteristics were classified according to successive depletion of aqueous-phase electron acceptors such as dissolved oxygen, nitrate, and sulfate and the dissolution of solid-phase electron acceptors such as Mn(IV) and Fe(III) minerals as indicated by the production of dissolved manganese and iron. Applying this framework to water samples from a number of Principal Aquifers across the United States suggests that the occurrence and distribution of different redox species in ground water is largely controlled by climate, geology, hydrology, and anthropogenic factors that, in combination, influence ground-water residence time and the availability of electron acceptors and donors. For the natural and anthropogenic contaminants assessed in this study, it appears that considering redox characteristics as defined by the framework explains many of the observed water-quality trends at the regional scale of this analysis. Given the interpretative power of the redox framework and the fact that the chemical constituents used to define redox conditions in aquifers are relatively inexpensive and easy to measure, those parameters should be included in routine ground-water monitoring programs whenever possible.

KEYWORDS

Monitoring, ground water, redox framework, principal aquifers,

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