

Carlin-type fluid interaction with Permian coal, southwest Guizhou Province, China

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Southwest Guizhou Province is underlain by an extensive thickness of upper Paleozoic and lower Mesozoic sediments. The Permian, although areally much less extensive, contains coal-bearing argillaceous sediments (Longtan Formation) that crop out related to fault or fold structures. Southwest Guizhou Province also is the site of extensive, albeit small-scale, gold mining from discontinuous sediment-hosted (Carlin-type) gold deposits. The gold deposits in some areas tend to be fault controlled and in other localities the gold deposits are associated with an unconformity at the base of the coal-bearing Longtan Formation. The coal in some parts of this region is extraordinarily enriched (whole coal basis) in As (up to 3.5 wt%), Sb (up to 360 ppm), Au (up to 570 ppb), Hg (up to 50 ppm), and W (up to 1200 ppm). U.S. coals [1], typical of world coal element abundances, have mean values of 24 ppm As, 1.2 ppm Sb, < 5 ppb Au, 0.17 ppm Hg, and 1 ppm W. The economic gold deposits in Guizhou Province are sited mainly in carbonate or organic-rich pelite, suggesting that the coal-Carlin-type fluid interaction was not as an efficient scavenger as other host rocks. The use of high-arsenic (>1,000 ppm; some > 3 wt.%) coals for domestic heating and cooking have caused in excess of 3000 cases of arsenic poisoning [2] in several villages. The structural complexity of the area and mineralized coal association suggests that coal zones containing high element enrichments are probably as irregular and discontinuous as the gold deposits. The local health officials have instituted a program of testing the coal being mined for high concentration of As. This is a very important aspect of public health but the discontinuous and varied nature of the As-rich coal zones suggests that this program will require constant monitoring.

[1] Finkelman (1993) in *Organic Geochemistry*, Engel & Macko, eds., 593-607 [2] Belkin *et al* (2008) in *Environmental Geochemistry*, De Vivo, Belkin, & Lima, eds., 401-420