Acid mine drainage and responsible mining

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One of the most challenging environmental problems to mitigate or remediate is acid mine drainage (AMD) from metal and coal mining. Until relatively recently, planning for a new mine did not consider the production of AMD or even an accounting of the water cycle (recharge, flowpaths, and discharge). Environmental managers were not considered part of the mining work force and hydrogeologists, geochemists, land use planners, and socio-economic planners were mocked for being irrelevant. Fortunately, this situation has been reversed for many companies and today there are several industry consortiums whose goal is to prevent or mitigate AMD**.** Professionals in the hydrologic, geochemical, geological, and microbiological sciences are being asked more frequently to investigate and advise on water-quality issues and remediation scenarios related to mining and mineral processing. Unfortunately we still have a long ways to go. I suggest that even more fundamental changes are needed: (a) support environmental scientists in hydrology, environmental geology, and geochemistry and involve them in the initial planning stages, in background studies, and in testing of waste materials and modeling their environmental effects. (b) The word mine 'wastes' should be dropped from common usage. An attitude needs to be developed that every bit of earth removed but not economic for ore processing is economic and utilizable for something. (c) Contaminant water pathways can be anticipated beforehand with hydrogeochemical expertise and after waterways have been polluted, careful investigations through synoptic sampling and tracer-injection test can establish sources and sinks of AMD, simulate potential remediation scenarios, and determine the reasons for successes and failures of remediation from properly monitored sites.

Geochemical and physical characteriation of palaeo and contemporary redox interfaces within Late Palaeozoic sediment sequences in South Australia

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The record of Late Carboniferous to Permian glacial erosion and deposition in South Australia is part of the Late Palaeozoic Gondwanan glaciation. Although there have been many different sedimentological and palaeogeographical studies of these sediments, they have not been mutli-element, geochemically characterised. This study identifies and briefly characterises some of the redox interfaces within these sediments that have important attributes in accounting for the multi-element characteristics of these sediments from ICP-MS and XRF.

Lodgement tills, fluvial-glacial, lacustine-glacial and glacial-marine sediments are abundant within these sequences, with some of the larger and deeper depositional areas (e.g. Arckaringa Basin) also containing fluvial and coal swamp deposits. Some of the most extensive redox interfaces are associated with the interfaces between geochemically reduced lignite beds and geochemically oxidised sandstone beds. These interfaces are major repositories for a range of redox-sensitive elements, in particular U. Another important setting for redox interfaces is within the predominantly geochemically reduced clays and interbedded oxidised fine sands within the glacial marine sediments. These interfaces typically feature tabular sheets of calcareous and silicified sandstones, as well as silica-indurated, discoidal reduction spots and in some sites irregular masses of alunite concretions. The third major type of redox interface identified contains variably ferruginised and minor manganiferrous induration. This may be constrained by the hydromorphic attrubites of particular sediment lithologies (e.g. preferentially confined to sandstone or clay beds) or fractures sets within the sequence. Alternatively ferruginisation is associated with redox and weathering profiles associated with palaeosurfaces, with oxidation typically extending vertically downwards into otherwise geochemically reduced sediment.