SIGNIFICANCE OF ANDEAN DEFORMATION IN CONTROLLING METAL-ORGANIC FLUID INTERACTIONS, SOUTH AMERICA

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Close associations occur between migrated organic matter (bitumen) and metalliferous minerals in several Andean regions, including western Argentina (uranium/copper), Chile (copper) and Peru/Columbia (vanadium). These associations represent diverse styles of mineralization, some of which may have been enhanced by fluid migration controlled by compressional deformation.A strong enrichment of vanadium in bitumens from Argentina to Venezuela could relate to a regional crustal vanadium anomaly, but is most likely to reflect common derivation from a regionally important source rock in the Cretaceous. The concentration of vanadium to economic levels in bitumen at Minas Ragra, Peru, is associated with excessive availability of organically-bound sulphur in the bitumen, which allowed vanadium sulphide precipitation. The sulphur in turn may have been derived from evaporite beds. Sulphate reduction in the presence of organic matter probably also influenced other types of sulphide mineralization in central Peru.In two sandstone-hosted deposits in the Neuquen Basin, Argentina, paragenetic relationships of bitumen with copper minerals (Fortuna IV mine) and uranium/copper minerals (Cerro Huemul mine) indicate that metal precipitation occurred after bitumen emplacement. At Fortuna IV, veins of solid bitumen appear to have been forcefully injected into the host sandstones, a phenomenon attributed to high pore fluid pressure. Thrusting overlapped and followed bitumen emplacement and was enhanced by bituminous surfaces. Thus metal migration and thrusting occurred at a broadly similar time (Oligocene-Miocene). It is less easy to constrain the timing of fluid movements in Peru, but similar relationships between organic and metalliferous fluids and compressional deformation may exist.