Paper Number: 5130

Deep Seismic Reflections and Mineral Deposits

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Although reflection seismic techniques have found significant, thought limited, application in the direct exploration and development of mineral deposits, the systematic exploration of the continental crust using multichannel seismic methods has revealed both individual and categories of structures which are likely linked to processes of mineral transport and concentration in the crust. The most straightforward of such features are faults that have, or may have, served as conduits for migration of ore bearing fluids, or structures that expose ore bodies formed at greater depth. Of particular interest here are reflection images that are related to magmatic processes in the crust which are likely heat sources for mineral transport. These include prominent subhorizontal reflections associated with solid sills in many Precambrian terranes, layered reflection sequences in both the upper and lower crust that mark major magmatic accumulations (both intrusive and extrusive), and seismic bright spots that likely mark fluids in the deep crust in tectonically active areas. Here we review examples of such reflection features and their relevance to both magmatism and ore genesis in the crust, with special attention to those from central Asia.