Seismic triggers of the development of ore-forming systems of hydrothermal gold deposits

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Functioning and transformation regimes of the ore forming systems of four hydrothermal gold deposits were studied in the state space of of the phases of paleoseismodynamic and fluid systems (FSs). Variable parameters of the stress-strain state (SSS) of the medium were reconstructed from conjugate quartz-gold veinlets and the phase portraits of strain-stress vector orientation variations. Stress field variability was determined from tensor–deviator determinant value variations, and the degree of instability, from k1, k2, and k3 tensor asymmetry estimates. Variables of FS thermobaric geochemical parameters (pressure, density, temperature, salinity, chemical composition, $\delta^{13}C/\delta^{12}C$ for CO2gas) were obtained by studying fluid inclusions (FI) in auriferous quartz, captured during mineral formation, on THMSG-600 "Linkam"device. Methods [1, 2, 3, 4] were applied for parameter estimation. Ore-forming gas-hydrate FSs have relatively similar phase and chemical compositions but different pressures and temperatures. Fluid migration from generation area to ore concentration sphere took place at different SSS of the medium. Fluid transport within Dogaldynskaya and Verninskaya FSs took place in $\sigma3 \leftrightarrow \sigma2$ inversion setting, which induced returns "pendulum"deformations with BC plane swinging around A($\sigma1$) in oblique-slip thrust plane. Paleodeformation mechanism is similar to seismic mechanism caused by stress redistribution between $\sigma1$ and $\sigma3$ through $\sigma2$ in a DC-type (double couple) earthquake focus. It can provide pump like pulsating fluid injection at 2-3 kbar in directions controlled by deformation axis B orientations. Fluids of Uryakhskaya and Irokindinskaya FSs supplied under high pressures (P>3-4 kbar) into faults of the shear zone changed SSS of medium and induced strike slip attenuation and phase transition of DC-type linear seismodynamic system into a NDC- type (non-double couple) centroid system with a new deformation symmetry axis (H). Fluid transport here was supported by uniaxial vortex field, and migration directions in ore accumulation sphere were controlled by the orientation of symmetry axis H. It is assumed that the phase transition of the seismodynamic system into a new regime induced FS transformations revealed during FI studies: pH variations; acidic to alkaline (Uryakhskaya FS) and alkaline to acidic (Irokindinskaya FS) regime inversion; carbon isotope fractionation in the gas phase of CO2 with a tendency to achieve a heavier $\delta^{13}C/\delta^{12}C$ isotope ratio.

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