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Thermal history of Carlin-type gold deposits in Yukon (Canada) as revealed by organic matter geothermometry, clumped isotope data, fluid inclusion microthermometry, and apatite fission-track analyses

ESM2: Geological constraints and model parameters used during modeling of apatite fission track data.

Geological constraints

- 1- Models start at 250 Ma > oldest AFT grain age
- 2- Regional temperature maximum > 150°C based on Rock-Eval and HAWKS data
- 3- Maximum temperature = 230 °C based on pyrobitumen reflectance data.
- 4- Maximum temperature is reached between 105 Ma and 70 Ma, which include regional scenarios (maximum burial at 105-95 Ma based on post-Jurassic, but pre-95 Ma ductile fabrics associated with the Tombstone Thrust, west of Carlin-type deposits; Murphy, 1997) and hydrothermal scenarios.
- 5- Temperature at 74 ± 4 Ma must be less than the lower clumped isotope temperatures of late-ore calcite veins (91°C).
- 6- Present-day temperature = $5 \pm 5^\circ\text{C}$

Model parameters

Software = HeFTy (Ketcham, 2013; modified from Ketcham, 2005)

Annealing model: Ketcham et al., 2007 / Initial fission track length = equation from Carlson et al. (1999) / Standard length reduction = 0.893

Kinetic parameter = Rmr0 (Carlson, 1999)

Complexity of time-temperature paths = 3 halves (8 changes in slope between constraints), monotonic variable, episodic (sudden changes are allowed) and maximum heating/cooling rates of 5°C/Ma.

The goodness of the fit assessed using Kuiper's Statistic. Good fit and acceptable fit paths have goodness-of-fit values of > 0.75 and 0.05, respectively. Number of tT paths: continuous modelling until 50 good fit paths are generated

References

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