MAGMA EVOLUTION IN THE HALLS CREEK OROGEN; INSIGHT FROM GEODYNAMIC NUMERICAL MODELLING AND GEOCHEMICAL ANALYSIS

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Abstract: The two plausible tectonic scenarios of the Halls Creek Orogen are examined through 2D thermo-mechanical-petrological numerical experiments based on I2VIS code. The initial constraints for model setup are appropriate to the inferred tectonic environment for the protoliths to the Tickalara Metamorphics in an intra-ocean subduction or ocean-continent subduction/collision. These numerical models allowed us to examine the conceptual models of geodynamic setting scenarios of the Halls Creek Orogen through time. With this approach, we determined experiments with specific physical parameters that are compatible with the geology observed in the Halls Creek Orogen. Finding the model most compatible with the geology can reveal geological processes which are not observable without the aid of geodynamic simulation. The results indicate that the geology of the Halls Creek Orogen is best represented by the ensialic marginal basin scenario. A further aspect of the numerical models is the degree to which they reveal magmatic activities which lead in the generation of key lithological units during the tectonic evolution of the Halls Creek Orogen. Development and closure of a marginal basin and the role of collisional magmatism are important parts of tectono-thermal evolution of the Halls Creek Orogen. The numerical models predict magma sources through time, linked to the tectonothermal evolution of the region. Whole rock and isotope geochemistry from the region has been used to verify and improve the models.