Geophysical Research Abstracts
Vol. 20, EGU2018-8933, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

The newly recognized Dunite Peak intra-oceanic arc and its implications for Paleozoic-Mesozoic plate tectonic models of the Northern Cordillera

Andrew Parsons (1), Alex Zagorevski (2), Jim Ryan (3), Bill McClelland (4), Cees van Staal (3), Mark Coleman (5), and Martyn Golding (3)

(1) Department of Earth Sciences, University of Oxford, United Kingdom (andrew.parsons@earth.ox.ac.uk), (2) Geological Survey of Canada, Ottawa, ON, Canada, (3) Geological Survey of Canada, Vancouver, BC, Canada, (4) Department of Earth and Environmental Sciences, University of Iowa, Iowa City, IA, USA, (5) Department of Earth and Environmental Sciences, University of Ottawa, Ottawa, ON, Canada

The distinction of upper and lower plate processes in paleosubduction zones is critical for identification and interpretation of terrane sutures, subduction zone geometries and mechanisms of accretionary orogenesis. We utilize geochemical and geochronological analyses to challenge existing Paleozoic-Mesozoic tectonic models for the Northern Cordillera, with focus on the tectonic interactions of the allochthonous Yukon-Tanana terrane (YTT) with the western margin of Laurentia and the Slide Mountain Ocean. In current tectonic models for the Northern Cordillera, YTT separated from Laurentia during Devonian-Mississippian back-arc rifting, which formed the intervening Slide Mountain Ocean. Eastward subduction of Panthalassa along the western margin of YTT was maintained until the Middle Permian at which point a polarity reversal resulted in westward subduction of the Slide Mountain Ocean beneath the east margin of YTT. Westward subduction of Slide Mountain Ocean led to the collision and re-accretion of YTT to Laurentia during the Middle Permian to Early Triassic Klondike orogeny.

In our study, we synthesize new and previously published geochemical and geochronometric data from Middle Permian suprasubduction zone (SSZ) ophilolites of the Slide Mountain Ocean including the newly studied Dunite Peak ophiolite in south-central Yukon. Together we propose that these SSZ ophilolites formed in the upper plate of an as yet unrecognized ca. 280-260 Ma intra-oceanic arc between YTT and Laurentia. We name this arc, the Dunite Peak intra-oceanic arc. Regional variations in the geochemical signatures of these SSZ ophilolites suggest that the Dunite Peak intra-oceanic arc comprised localized zones of upper plate extension and extensional magmatism coeval with and adjacent to areas of constructive volcanism.

Identification of the Dunite Peak intra-oceanic arc, is incompatible with current tectonic models of the North Cordillera. Instead, we propose that during the Middle Permian Klondike orogeny, deformation and eclogite facies metamorphism of YTT occurred in response to eastward subduction of YTT continental basement beneath the Dunite Peak intra-oceanic arc. Coeval SSZ ophiolite generation and eclogitization of YYT continental basement suggest that arc-continent collision was diachronous, possibly due to the presence of promontories and re-entrants along the Dunite Peak intra-oceanic arc active margin. Subduction of YTT continental basement ceased between $\sim$265-260 Ma. This was followed by orogenic collapse, subduction zone flip and associated magmatism (the Klondike magmatic cycle) between $\sim$265-252 Ma. Accretion of the composite terrane comprising YTT and the Dunite Peak intra-oceanic arc to Laurentia must have occurred after the Permian and probably after the Middle Triassic. We suggest that all upper plate assemblages of the Dunite Peak intra-oceanic arc should be formally recognised as a separate terrane, distinct from the Slide Mountain terrane and YTT. Our new hypothesis suggests that current plate reconstructions of the Slide Mountain Ocean and the Paleozoic-Early Mesozoic subduction history of the Northern Cordillera are oversimplified and require further investigation.