

⁴⁰AR-³⁹AR AND U-PB AGE CONSTRAINTS ON THE TRIASSIC-JURASSIC AND NORIAN-RHAETIAN BOUNDARIES, NORTHERN VANCOUVER ISLAND, CANADA

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⁴⁰Ar-³⁹Ar and U-Pb dating of Late Triassic-Early Jurassic sedimentary and intrusive rocks in the Wrangellia Terrane, northern Vancouver Island, has placed constraints on the absolute age of the Triassic-Jurassic (Tr-J) and Norian-Rhaetian (N-R) boundaries. Classic Wrangellian stratigraphy (Jones et al., 1977) is represented on Vancouver Island by mid- to Late Triassic rocks of the Vancouver Group, comprising Karmutsen flood basalts (Ladinian-Carnian) and platform Quatsino limestone (Carnian-Early Norian), succeeded by latest Triassic (Carnian-Rhaetian) volcanic-sedimentary sequences of the Parson Bay Formation at the base of the Late Triassic-Middle Jurassic Bonanza Group (Nixon and Orr, 2006). A stratigraphic section (327 m) through strata of the Parson Bay Formation was measured west of Kathleen Lake (92L/6) where the succession is affected by localized, distal skarn alteration associated with nearby intrusions of the Early to Middle Jurassic Island Plutonic Suite (Nixon et al., 2006). Parson Bay strata in the measured section comprise thin to medium bedded, impure limestone, calcareous mudstone, siltstone and minor shale interbedded with hornblende- and augite-bearing feldspathic wacke, crystal-lithic tuff and reworked equivalents, and minor volcanoclastic debris-flow deposits. The top of the section is overlain by a thick sequence (>1 km) of poorly bedded, waterlain volcanic breccias, lithic wackes and subaerial basaltic to andesitic flows; the latter represent the main phase of Bonanza arc volcanism.

Bivalves and conodont faunas collected from Parson Bay sedimentary lithologies indicate an age range of (late) Early Norian to Late Norian-Rhaetian. Hornblende phenocrysts in a porphyritic andesite cobble from a debris-flow deposit located 12m below silty limestone beds containing *Monotis subcircularis* Gabb in the Late Norian part of the section yield a ⁴⁰Ar-³⁹Ar plateau age of 199.4 ± 3.4 (2 σ) Ma (for 50% of the ³⁹Ar released). Limestone beds ~50 m above the *Monotis* locality yield latest Norian-Rhaetian conodont faunas (*Epigondolella* ex. gr. *bidentata* Mosher 1968). Thus, according to the ⁴⁰Ar-³⁹Ar systematics, the maximum age of the Norian-Rhaetian stage boundary is 202.8 Ma at the 2 σ level of confidence, which is slightly younger than the age of 203.6 ± 1.5 Ma given by Gradstein et al. (2004).

The composite Merry Widow pluton, which intrudes the Triassic-Jurassic stratigraphy, yields concordant U-Pb zircon ages of 197.1 ± 0.5 (2 σ) and 196.7 ± 0.7 (2 σ) Ma from gabbro pegmatite and monzonitic phases of the intrusion, respectively. A crystal of metasomatic phlogopite in calc-silicate skarn gives a ⁴⁰Ar-³⁹Ar plateau age of 197.9 ± 1.3 (2 σ) Ma, in good agreement (within error) with the U-Pb dates. The mean U-Pb age of 196.9 Ma for the Merry Widow pluton and the ⁴⁰Ar-³⁹Ar date from the Late Triassic stratigraphy constrain the absolute age of the Tr-J boundary to approximately 200 ± 3 Ma, consistent with the more precise age of 199.6 ± 0.4 Ma proposed for this boundary by Palfy et al. (2000). Further U-Pb geochronology is presently being conducted on detrital zircons recovered from tuffaceous wackes in the measured section in an attempt to refine the latest Triassic time scale.

REFERENCES

- Jones, D.L., Silberling, N.J., and Hillhouse, J., 1977, Wrangellia – a displaced terrane in northwestern North America: Canadian Journal of Earth Sciences, Volume 14, p. 2565-2577.
- Nixon, G.T., and Orr, A.J., 2007, Recent revisions to the Early Mesozoic stratigraphy of northern Vancouver Island (NTS 102I; 92L) and metallogenic implications, British Columbia: B. C. Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork 2006, Paper 2007-1, p. 163-177.
- Nixon, G.T., Snyder, L.D., Payie, G.J., Long, S., Finnie, A., Friedman, R.M., Archibald, D.A., Orchard, M.J., Tozer, T., Poulton, T.P., and Haggart, J.W., 2006, Geology of the Alice Lake area, northern Vancouver Island: B. C. Ministry of Energy, Mines and Petroleum Resources, Geoscience Map 2006-1, scale 1:50,000.
- Palfy, J., Smith, P.L., and Mortensen, J.K., 2000: U-Pb and ⁴⁰Ar-³⁹Ar time scale for the Jurassic: Canadian Journal of Earth Sciences, Volume 37, p. 923-944.