

Cambrian tectonostratigraphy: Implications for stratigraphic correlations in the WCSB and beyond

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Summary

U-Pb dates from basal Cambrian rocks constrain the timing and mechanisms of rifting and the formation of Neoproterozoic and early Paleozoic basins of western North America. These recent age results have delineated a complex evolution of the western (present coordinates) Laurentian margin proceeding and during the early Paleozoic flooding of the craton. The first rift episode was followed by the establishment a late Neoproterozoic passive in Canadian Cordillera. The second rift episode, from the latest Ediacaran into the Cambrian, occurred along the extent of the study area from central British Columbia to the southwestern United States and was followed the establishment of the Paleozoic passive margin. This age-refined view of Cambrian strata in the WCSB and the western United States highlights the tectonic controls on sedimentation rates and lateral extent of basal sandstone units.

Theory / Method / Workflow

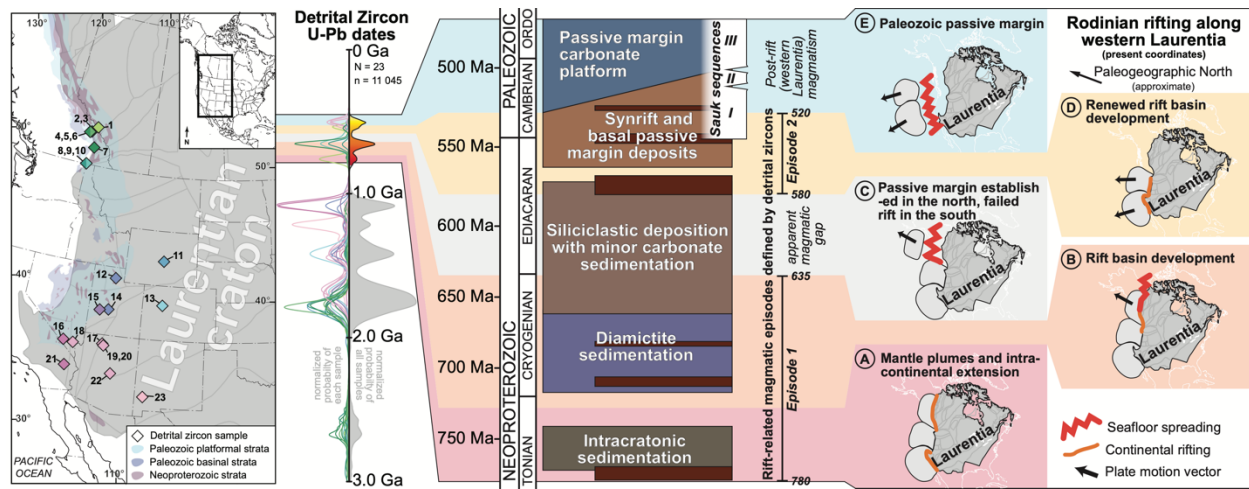
U-Pb dating by LA-ICP-MS was completed on 23 detrital zircon samples of basal Sauk sequence sandstones and volcanoclastic rocks from central British Columbia, Canada to New Mexico, USA. These analyses provide new maximum depositional ages and are used to supplement the igneous record of magmatism.

Results, Observations, Conclusions

When integrated with the extensive early Paleozoic stratigraphic literature for western North America, these latest U-Pb dates substantiate a comprehensive tectonic model for the formation of the ancestral margin of western North America. Two discrete episodes of rift magmatism are defined by U-Pb ages from 780-650 Ma and 580-520 Ma are associated with tectonically-driven subsidence and sedimentation. These episodes are separated by a period of apparent magmatic quiescence during Windermere Supergroup passive margin sedimentation in the southern Canadian Cordillera and failed rifting in the southwestern United States. Final continental breakup and the subsequent initiation of the lower Paleozoic passive margin occurred ca. 520 Ma.

Novel/Additive Information

New maximum depositional ages further refine the Cambrian timescale, for which more work remains to integrate these recent radiometric dates with the biostratigraphic record of the WCSB. Furthermore, the diachroneity captured in this comprehensive tectonic model for basal Cambrian deposition highlights the importance of a detailed architectural understanding for developing subsurface reservoirs (CCS, He).



Acknowledgements

Much of the data collection herein was part of my MSc thesis work at the University of Calgary in collaboration with Dr. William Matthews. Some samples were collected under sampling permits courtesy of Dr. Karl Karlstrom. This work has benefited from fruitful discussions, encouragement, and/or review from Drs. Phil Simony, Mark Holland, Charles Henderson, James Hagadorn, Thomas Hadlari, Margot McMechan, and Kevin Root. I would also like to thank my employer, Geofirma Engineering, for their support in my continued work on Cambrian sandstones across North America.

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