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Constraining patterns of Northwest Hawaiian Ridge volcanism before, during and after the 25 Ma major Pacific Plate reorganization

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Prior to spending his entire career at MIT, Fred Frey obtained three degrees from the University of Wisconsin-Madison from 1960-1967. Even though Fred didn't work on Hawaiian rocks while in Madison, we carry on his legacy of Badgers studying Hawaiian volcanism. The Northwest Hawaiian Ridge (NWHR) has several kinks along its ~2900 km long alignment of volcanoes. The most notable is between Manawai and Kapou atolls and involves a change in orientation and almost doubling of the propagation rate of the NWHR [1]. $^{40}Ar/^{39}Ar$ data constrains the offset to 25.3 ± 0.5 Ma [1]. Seamounts on either side of the prominent kink were mapped and sampled using the NOAA's ROV Deep Discoverer during expeditions in 2015 and 2016 to help distinguish between NWHR and Cretaceous seamounts and allow us to better understand the patterns of NWHR volcanism before, during and after the major Pacific Plate reorganization. Geochemical data and thirteen new $^{40}Ar/^{39}Ar$ ages from both shield and post-shield stage lavas spanning ~1400 km of the NWHR suggest that the mid-Cenozoic Pacific Plate motion and propagation rate change was likely more complex than previously envisioned and may have involved multiple jumps to the south. Moreover, the new data expand the duration of shield and post shield stage volcanism at several NWHR volcanoes and provide new clues as to how edifice construction may have progressed in rift zones vs summit eruptions.

[1] Jicha, B.R., Garcia, M.O., Wessel, P., 2018. Geology 46, 939-942.