

Plant community and climatic response to middle Miocene environmental change in the Pacific Northwest (USA)

Lowe, A. ; Strömberg, C. ; Rember, W. ; Dillhoff, T. ; Dillhoff, R. ; Steinhorsdottir, M. ; Schmitz, M. D.

The US Pacific Northwest (PNW), including Washington, Oregon, and Idaho, hosts an extensive suite of Oligocene-Miocene fossil plant sites, spanning in time across several pronounced environmental perturbations. The Middle Miocene Climatic Optimum (MMCO) was a period of elevated global temperatures, from ca. 17 to 14 Ma, terminated by a cooling trend, termed the Middle Miocene Climatic Transition (MMCT). In addition, Earth's most recent continental flood basalts, the Columbia River Basalts (CRBs), erupted ~95% of its volume in the Pacific Northwest from 16.7 to 15.9 Ma. This collaborative study focuses on 18 PNW fossil sites spanning ca. 32 to 10 Ma, many of which have extensive pre-existing macrofossil collections. We will radiometrically date interbedded ashes at these sites to establish a high-resolution temporal framework, using U-Pb CA-IDTIMS methods which can produce ± 20 ka resolution. Within this framework, we plan to: 1) better document the regional manifestation of climate change in the PNW during the MMCO and MMCT using paleobotany-based paleoclimate proxies, 2) provide an integrated perspective on the response of plant communities to these middle Miocene environmental changes by combining macrofossil, palynomorph, and phytolith evidence, and 3) shed light on the CRBs' potential role in MMCO warming by producing CO₂ estimates from fossil leaf cuticle. As of yet, we have sampled volcanic ash from eight sites, made macrofossil census collections from four sites, and revisited prior museum collections for four sites. This project will provide a comprehensive and vital example of long-term regional responses to global climatic change and regional volcanism.

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