

GSA Connects 2024 Meeting in Anaheim, California

Paper No. 101-2

Presentation Time: 8:00 AM-5:30 PM

UNVEILING THE GEOLOGIC HISTORY OF MARIE BYRD LAND, WEST ANTARCTICA: INSIGHTS FROM THERMO-KINEMATIC MODELING AND LOW-TEMPERATURE THERMOCHRONOLOGY

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Marie Byrd Land (MBL), West Antarctica, is poorly studied geologically due to its ice cover and remoteness. As a result, the timing and magnitude of tectonic and erosional events, such as the tectonic uplift of the Marie Byrd Land dome and the incision of the DeVicq Glacial Trough, are debated. When faced with problems difficult to study and solve through in-person field work, it becomes necessary to turn to modeling. Pecube is a thermo-kinematic modeling program that uses topographic and crustal thermal data to calculate thermochronologic ages across a landscape. Thermochronology uses radiometric dating of mineral systems that are sensitive to specific temperatures and can be used to track cooling related to the tectonic and exhumation history of a region. Model predictions can be compared to observed ages to test the viability of tectonic or geomorphic scenarios. Observed ages used here include dates derived from apatite fission track analysis (AFT; closure temperature ~ 110 °C) and apatite (U-Th)/He dating (AHe; closure temperature ~ 60 °C) of detrital material recovered from offshore MBL that presumably originated from the DeVicq Trough region of MBL. Ongoing modeling efforts will determine how closely calculated bedrock ages compare to new detrital AHe ages, ranging from 23.5-82.8 Ma, and AFT ages, ranging from 49.7-83.6 Ma. These ages broadly correspond to late breakup of Gondwana (~100-85Ma), erosion during and after the uplift of the Marie Byrd Land dome (~30Ma), and glacial incision (beginning at 34 or 20Ma). In light of these new data, alterations were made to existing Pecube models for the DeVicq Trough region to rule out and narrow down the timings and rates possible for both glacial incision at the DeVicq Glacial Trough and exhumation of the Marie Byrd Land dome. Preliminary results suggest that varying glacial incision start time between 34 and 20 Ma, dates proposed for the initiation of the West Antarctic Ice Sheet, does not change resulting bedrock ages significantly. However, varying background exhumation rates results in ages that are broadly consistent with observed ages. Ongoing modeling efforts seek to refine this range further to give insight on the exhumation history and tectonic processes of this region.

Session No. 101--Booth# 28

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Monday, 23 September 2024: 8:00 AM-5:30 PM

Hall D (Anaheim Convention Center)

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[<< Previous Abstract](#) | [Next Abstract >>](#)