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Timing of the Eocene plate motion change in the southwest Pacific: The magnetostratigraphic record of New Caledonia and New Zealand

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The early–middle Eocene was a time of complex reorganization in the kinematics of the Pacific plate circuit, related with the onset of the western Pacific subduction zone. As the geological history of the northwest Pacific active margin is relatively well known, the timing of the southwest Pacific evolution is still not fully resolved. Available seismic reflection data reveals the presence of widespread middle Eocene convergent deformation, reverse faulting, and uplift across the Tasman area and the Zealandia continent, east of Australia. This is the time when a major change occurred in the sedimentation pattern of marine sections exposed in New Caledonia and New Zealand, the only emerged portions of Zealandia.

The Eocene sediment succession in New Caledonia is characterized by a shift from pelagic micrite deposited on a stable sub-marine plateau to high-energy, terrigenous-rich calciturbidite, indicating uplift and development of a slope. We present a new high-resolution paleo- and rock-magnetic study of a 260 m-thick section cropping out in the Koumac area of northern New Caledonia. The obtained robust magnetic polarity-based chronology pins in time the inception of the calciturbidite sedimentation at 45 Ma, in agreement to recent data from southern New Caledonia (1).

These data are integrated with recent magnetostratigraphic data from the south island of New Zealand (2, 3). Here, coeval dramatic variations in the terrigenous input are related to opening of new basins capturing the drainage system, as result of newly activated regional tectonic.

We put forward a tectonic frame, based on robust magnetic polarity age models and applicable to the whole northern Zealandia continent, where the eastward motion of the Pacific Plate results in a middle Eocene (46–45 Ma) regional reorganization. This is manifested by uplift and convergent deformation in the north (New Caledonia). To the south (New Zealand) the proximity of the Pacific-Australian rotational pole causes a more complex response, with opening of new basins accompanied by quick changes of variations of the sediment accumulation rates.

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