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South Pacific – the tectonic evolution movie

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Accurate tectonic reconstructions provide an essential framework for evaluating and modelling long-term palaeoenvironmental data. Reconstructions of large parts of the Pacific Ocean for mid-Cenozoic and earlier times are particularly difficult to constrain because it is almost encircled by subduction zones. However, in the southernmost Pacific the conjugate passive margins offshore from New Zealand and Marie Byrd Land provide an opportunity to produce well-constrained reconstructions from the Late Cretaceous onwards (Larter et al., 2002). In addition to providing a framework for studying palaeoenvironmental evolution of the Southern Ocean, reconstructions of this region are also the key link in the global plate circuit tying plate motions in the Pacific Ocean basin to the rest of the world (Cande et al., 1995). Until recently, however, the scarcity of marine geophysical data from the remote area off Marie Byrd Land has placed a severe limitation on the reliability of such reconstructions.

We present a new animated reconstruction showing South Pacific plate kinematics since 90 Ma (Eagles et al., 2004). In this reconstruction sections of the modern marine free-air gravity field are rotated with the tectonic plates. Reconstruction of gridded data limits the problem of subjective interpretation of features used in reconstructions to identification of plate boundaries. Animation of reconstructions is a useful way of illustrating kinematic evolution, and of exposing inconsistencies in tectonic scenarios depicted by static reconstructions. The combination of these two techniques provides a powerful new tool for considering the spatial and temporal context of palaeoenvironmental data. Future work will include integration of this reconstruction with reconstructions of the Tasman and Drake Passage gateways that flank the studied region, and production of gridded palaeobathymetric reconstructions for use in palaeoclimate modelling.

0.1 References

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