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**Integrated (U-Th)/He Dating, AFTA and Vitrinite Reflectance Results in Seven Otway Basin Wells Confirm Regional Late Miocene Exhumation and Validate Helium Diffusion Systematics**

Apatite (U-Th)/He thermochronology is based on progressive resetting of (U-Th)/He ages by heating, with total loss of helium occurring at temperatures around 80 to 90°C (over geological timescales). Using this technique, Thermal History Reconstructions derived from AFTA and vitrinite reflectance can be further refined, allowing improved precision on the timing information of paleo-thermal events at relatively low temperatures (<80°C).

Published apatite (U-Th)/He ages from Otway Basin wells have been interpreted by other workers as suggesting inconsistencies between measured data and thermal histories derived from AFTA. However, the thermal histories used in those studies were not sufficiently well-defined to provide a meaningful comparison. In this study, detailed thermal history reconstructions in seven wells, based on new AFTA data combined with vitrinite reflectance data, provide a more rigorous framework. Results show excellent agreement between predicted and measured ages. As well as demonstrating that helium diffusion behaviour in laboratory conditions can be extrapolated to geological conditions with confidence, these results confirm that many parts of the Otway Basin have undergone Late Tertiary exhumation, beginning at ~ 10 Ma. This is highly consistent with the recognition of a major Late Miocene unconformity across SE Australia, with a recent synthesis of geological evidence suggesting that this represents a major erosional episode.

The improved definition of the timing and magnitude of paleo-thermal episodes provided by this integrated approach results in enhanced definition of areas where timing of oil generation post-dates formation of structures, resulting in more efficient exploration. Results from the Otway Basin illustrate this point well.