The Impact of Recalibrating Palynological Zones to the Chronometric Timescale: Revised Stratigraphic Relationships in Australian Permian and Triassic Hydrocarbon-Bearing Basins

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ABSTRACT

High-precision radioisotopic dating using Chemical Abrasion-Isotope Dilution Thermal Ionisation Mass Spectrometry (CA-IDTIMS) has been undertaken to allow the recalibration of the numerical ages of Permian and Triassic spore-pollen palynozones. These changes have been significant, with some zonal boundaries in the Permian changing by as much as 6 million years, and some in the Triassic changing by more than twice as much. Most of the samples analysed have come from Eastern Australian coal basins (Sydney, Gunnedah, Bowen) where abundant ash beds are scattered through the coal-bearing successions. The recalibrations of these widely used palynozones have implications for the timing of stratigraphic events far beyond the basins whence the samples came. Our revised dates for the Permian and Triassic palynozones can now be applied to all Permian and Triassic basins across Australia, from the Perth, Carnarvon, Roebuck, Canning, and Bonaparte basins along the western and northern continental margins, the Cooper and Galilee basins in central Australia, and the Bowen, Gunnedah and Sydney basins in eastern Australia. Revised regional stratigraphic frameworks presented here include the Perth, Bonaparte, Cooper, Galilee and Sydney basins. The impact of an improved calibration of biostratigraphic zones to the numerical timescale is broad and far-reaching. For example, accurate stratigraphic ages are required for reliable burial history modelling, impacting on the prediction of kerogen maturation, hydrocarbon expulsion and migration. Basin models that utilise these improved age interpretations will more closely approximate the true basin history. These improvements can in turn be expected to translate in to better exploration outcomes. So far, we have focused on the Permian and Triassic, but plan to expand recalibrations to include the Jurassic and Cretaceous successions. Preliminary data indicates that significant changes to these calibrations are also likely.