

Paleomagnetic dating of Pleistocene cave sediments at Buchan, southeastern Australia

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Abstract

The Dukes cave system at Buchan consists of three horizontal epiphreatic levels, which can be correlated with terraces in the adjacent river valley. The lowermost contains extensive stream-deposited sands, gravels and minor clays, whereas the uppermost has deposits of red silty clay. Paleomagnetic samples from both levels are dominated by magnetite of multidomain size ($>10\ \mu\text{m}$), which has been subject to viscous remagnetisation so a normally-polarised remanence, in the direction of the present field, has replaced any depositional magnetisation. The main depositional magnetic carrier was probably very fine-grained (superparamagnetic) haematite; this is still present in one sample admixed with the magnetite. The coarser magnetite which now dominates the remanence may have grown in-situ, possibly due to bacterial reduction of the sediments. Hysteresis parameters of a few samples from both cave levels indicate an admixture of slightly finer-grained, pseudo-single-domain sized magnetite, which preserves a primary reversed polarity magnetisation. This remanence was presumably acquired some time after sedimentation, during authigenic growth of magnetite in the sediments. Although short intervals of reversed or mixed polarity are known from the Brunhes Chron, these represent only a very small fraction of its duration. Thus cave sedimentation most probably

occurred prior to the Brunhes Chron, i.e. before 780 ka. This accords with uranium series dates of $>300\ \text{ka}$ on speleothems from the upper cave level. The lower epiphreatic level, $>0.73\ \text{Ma}$ old, is only 2-3 m above the nearby surface stream-bed, indicating that river incision rates have been very slow ($<5\ \text{m/Ma}$), and that the sea level and climate fluctuations of the Late Pleistocene left little discernible trace in the Buchan area. The red clays and silts in the upper level are probably aeolian in origin, and represent the onset of aridity in central Australia, dated elsewhere as prior to 0.9 Ma.

This paper was published in 2003 after a presentation at a cave sediments meeting at the Karst Waters Institute.

Reference

R. J. Musgrave & J.A. Webb 2003, Palaeomagnetic Analysis of sediments in the Buchan Caves, Southeastern Australia, provides a pre-Late Pleistocene date for landscape and climate evolution. In Sakowsky, I.D. & Mylroie, J.E. (eds), *Studies in Cave Sediments*, 47- 70. Kluwer.



*Joe Sydney negotiating a
SpeleoSports obstacle. Photo D. Carr*