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First palaeomagnetic results from Lake Ohau, New Zealand

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Early in 2016, the Lake Ohau Climate History Project cored two sites at Lake Ohau, South Island, New Zealand (44°10′S, 169°49′E, 500 m asl), retrieving four cores with a total length of ∼230 m and an estimated maximum age of around 17 ka. Magnetic analysis of these cores offers the potential both to improve the age model of the Lake Ohau palaeoclimatic record, and to contribute a new high-resolution palaeomagnetic data set for a region with few existing records of late Quaternary palaeosecular variation and relative palaeointensity (RPI).

We have u-channelled two of the Lake Ohau cores for palaeomagnetic analysis. We applied stepwise alternating-field (AF) demagnetization to recover the natural remanent magnetization, then imparted an anhysteretic remanent magnetization and performed another sequence of stepwise AF demagnetization to determine RPI.

We present the results of these initial palaeomagnetic studies. The demagnetization data reveal a range of behaviours including frequent multi-component magnetizations. There are indications of greigite mineralogy (as revealed by acquisition of gyroremanent magnetizations at high field strengths) in some sections of the core. The magnetic mineralogy creates challenges in the construction of both inclination and RPI records, requiring careful interpretation informed by additional rock magnetic analyses. Further challenges are posed by variations in sediment deposition, in particular by intervals where flooding events interrupt the regular varved depositional pattern. Interpretation of this complex record has required us to develop new software tools to aid in its analysis, and will need careful corroboration.

We show preliminary palaeomagnetic inclination and RPI records from the two analysed cores from Lake Ohau, discuss their magnetic behaviours, and compare our results with existing records and models for the New Zealand region. We also discuss how our ongoing rock magnetic studies of the same cores are helping to refine our interpretation of the palaeomagnetic data, and demonstrate their potential for enviromagnetic studies of the cores.