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OceanMAG — The Application of Magnetic Gradient Tensor Measurements to Exploration in the Marine Environment

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Magnetic field surveys of the deep ocean are hampered by navigational and other difficulties, making them extremely time consuming and expensive. However, similar information can be acquired in a shorter time by measuring the magnetic gradient tensor, which is much richer in information than a simple field measurement. The OceanMAG Project, part of CSIRO's Wealth from Oceans Flagship, has been examining how best to capture the advantages of making tensor measurements as opposed to field measurements in seabed exploration. Seabed minerals – For 20 years, CSIRO Exploration & Mining has studied hydrothermal deposits on the sea-floor as juvenile analogues of on-shore mineral deposits. In the last year or so, the mining industry has begun a multi-national effort to extract sea-floor minerals. Typically each deposit is the size of a few football fields and may have a depth extent of only 10 m. However, each deposit may also be worth up to $1B. OceanMAG has the potential to pin-point these targets without the expense and effort of extensive magnetic surveys. Hydrocarbon exploration – The controlled source-electromagnetic (CSEM) method has been reported to greatly reduce the drilling of dry-wells. With deep ocean wells costing $US50M each, CSEM significantly reduces exploration costs. However, currently it is only used in deep water, with shallow water exploration a topic of ongoing research. Used in conjunction with seismic and CSEM methods, OceanMAG aims to allow shallow water exploration by providing reduced noise, reduced inversion ambiguity and improved modelling.