



Modelling ocean circulation, climate and oxygen isotopes in the ocean over the last 120,000 years

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A new Earth System Model of Intermediate Complexity, GENIE-1, is used to simulate the most recent glacial-interglacial (G-IG) cycle by prescribing orbital forcing, time evolution of ice sheet extent and orography (based on latest reconstructions), and atmospheric CO₂ concentration (from ice cores). The model features a 3-D ocean component in realistic geometry and topography, a 2-D Energy Moisture Balance atmosphere, thermodynamic sea ice, and a simple land scheme with fixed vegetation. A series of experiments are designed to investigate both model sensitivity and uncertainty in the amplitude, frequency and location of prescribed melt water pulses (MWP) attributed to Heinrich Events. Associated with each MWP is a flux into the ocean of glacial oxygen isotope ratio that serves as a tracer of the melt water. Modelling forward from 120,000 years before present, benthic oxygen isotope records are simulated that can be directly compared with measurements taken from sediment cores at key locations. The experiments are a first step towards more complete modelling of climate and biogeochemical cycles over G-IG cycles.