



Abstract ID : 141

Dansgaard-Oeschger events in climate models: Review and baseline MIS3 protocol

Content

Frequent well documented Dansgaard-Oeschger (D-O) events occurred throughout the Marine Isotope Stage 3 (MIS3; approximately 25 – 60 ka) period. The climate modelling community up to now has not been able to answer the question: Are our climate models too stable to simulate D-O events? To address this, this study lays the ground-work for a MIS3 D-O protocol for CMIP-class models. We review: necessary D-O definitions; current progress on simulating D-O events in IPCC-class models (processes and published examples); and consider evidence of boundary conditions under which D-O events occur. We find that no model exhibits D-O like behaviour under pre-industrial conditions. Some, but not all, models exhibit D-O like oscillations under MIS3 and/or Last Glacial Maximum (21 ka) conditions. Greenhouse gases and ice-sheet configurations are crucial. However most modelling groups have not run simulations of long enough duration to be sure which models do capture D-O like behaviour, under either MIS3 or LGM states. We propose a MIS3 baseline protocol at 38 ky (38 to 32 ky) period, which (1) shows a regular sequence of D-O events, and (2) features the intermediate ice-sheet configuration and central-to-low MIS3 greenhouse gas values which our review suggests are most conducive to D-O like behaviour in models. The protocol also covers insolation, and freshwater forcing. Alongside this baseline, previous work suggests that a kicked Heinrich meltwater baseline variant may also be helpful in preconditioning a state in models which is conducive to D-O events. This review and protocol help unify the work of model groups when investigating MIS3 D-O oscillations under a common framework.

Primary authors: Dr MALMIERCA-VALLET, Irene (British Antarctic Survey (BAS), UK); Dr LOUISE C., Sime (British Antarctic Survey (BAS), UK)

Co-authors: Prof. ABE-OUCHI, Ayako (The University of Tokyo, Japan); Dr BOUTTES, Nathaëlle (Laboratoire des sciences du climat et de l'environnement, France); Prof. DITLEVSEN, Peter (Niels Bohr Institute, University of Copenhagen, Denmark); Dr GOWAN, Evan (Department of Earth and Environmental Sciences, Kumamoto University, Japan); Dr GREGOIRE, Lauren (University of Leeds, UK); Dr GUO, Chuncheng (University of Bergen, Norway); Prof. HARRISON, Sandy P. (University of Reading, UK); KAGEYAMA, Masa (Laboratoire des sciences du climat et de l'environnement, France); Dr KLOCKMANN, Marlene (Helmholtz-Zentrum Hereon, Germany); Prof. LAMBERT, Fabrice (Pontifical Catholic University of Chile, Chile); Prof. NISANCIOGLU, Kerim H. (University of Bergen, Norway); Dr OLIVER, Kevin (University of Southampton, UK); Dr P. ERB, Michael (Northern Arizona University, USA); Prof. PELTIER, Dick (University of Toronto, Canada); Prof. REHFELD, Kira (Department of Geoscience and Department of Physics, Tübingen University and Institute of Environmental Physics, Heidelberg University, Germany); Dr ROBINSON, Alexander J. (Complutense University, Madrid, Spain); Prof. TARASOV, Lev (Memorial University of Newfoundland and Labrador, Canada); Prof. VALDES, Paul J. (University of Bristol, UK); Dr VETTORETTI, Guido (Niels Bohr Institute, University of Copenhagen, Denmark); Dr WEITZEL, Nils (Department of Geoscience and Department of Physics, Tübingen University and Institute of Environmental Physics, Heidelberg University, Germany); Prof. ZHANG, Xu (State Key Laboratory of Tibetan Plateau Earth System, Resources and Environment (TPESRE), Chinese Academy of Sciences (CAS), Beijing China)

Presenters: Dr LOUISE C., Sime (British Antarctic Survey (BAS), UK); Dr MALMIERCA-VALLET, Irene (British Antarctic Survey (BAS), UK)

Track Classification: Glacial / interglacial dynamics, interglacials, and sea level