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Heinrich Stadials: Globa Climate Impacts and the "Bipolar Seesaw" Phase Relationsip

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With the recent demonstration that millennial timescale Dansgaard-Oeschger oscillations of MIS 3 are predictable in a modern coupled climate model following a Heinrich event-like reduction of AMOC strength (eg. Peltier and Vettoretti, 2014), the stage was set for a renewed attack upon the physics of H-events themselves (see Velay-Vitow et al, 2019, JGR-Oceans). This predicts that the freshwater forcing of the AMOC by individual H-events will be on the order of 0.1 Sv and to be maintained for a period between 500 years and 1500 years in accord with data-based inferences (Hemming, 2004). Whereas in the original analysis of H-event induced D-O oscillations the D-O initiating H-event appeared simply as a sharp reduction in AMOC strength in the spin-up of the coupled model, in the work to be reported we transform the pseudo H-event into one that involves explicit freshwater forcing applied at a strength and over a range of times in accord with observational constraints. This has enabled a detailed analysis of the global climate impacts of these events as represented in the coupled climate model that we continue to employ. A critical focus of this analysis is upon the phase relationship between events recorded in the oxygen isotopic records from Greenland and Antarctic ice cores, analyses which demonstrate that this phase relationship is set by the D-O initiating Heinrich event. We also address the expected global climate impacts of stadial-interstadial transitions and provide an initial discussion of these impacts with those recorded in speliothems and other archives.