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The Nonlinear Dansgaard-Oeschger Relaxation Oscillation:successfully reproduced in a comprehensive model of glacial climate

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We describe a recently completed detailed diagnostic analysis of the simulation of D-O dynamics based upon the University of Toronto version of CCSM4 (Vettoretti and Peltier,JClim,in press, 2018). The original simulation upon which this diagnostic analysis is based is that of Peltier and Vettoretti(GRL,2014). This has previously been shown to reproduce this millenium timescale oscillatory behavior as a consequence of the action of a "kicked" salt oscillation that spontaneously appears in the North Atlantic Ocean following a Heinrich event related sharp decrease in the strength of the Atlantic MOC. Here we discuss the important coupling of the ocean and sea ice dynamics of the North Atlantic salt oscillator to the Arctic Ocean, which we demonstrate to be the source of the sea ice, the continuous delivery of which into the Atlantic by the East Greenland Current supports the slow physics of the transition from warm interstadial to cold stadial conditions. The fast physics of the transition from cold stadial to warm interstadial conditions in the relaxation oscillation is governed by the opening of an extensive polynya in the sea ice that covers the Irminger Sea under stadial conditions (Vettoretti and Peltier, GRL, 2017) . The boundary conditions employed in this successful simulation of D-O physics is based upon the ICE-6G_C (VM5a) model of Peltier et al (2015), a model that has recently been further tested for ice dynamical consistency in Stuhne and Peltier (2015, 2018 JGR Earth Surface in press).