



Natural and non-natural end of Holocene

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Here, we study the questions why we still live in an interglacial world and when we should expect the end of the Holocene under natural conditions (no anthropogenic influence) or under anthropogenic perturbations (also referred to as “Anthropocene”), questions which attracted considerable interest in recent years. It was argued that without earlier anthropogenic activity we would live already in glacial world (Ruddiman’s hypothesis). Tzedakis et al. (Nature Geoscience, 2012), using MIS 19 as the best analogy in terms of the orbital parameters for the Holocene, suggested that the new glacial inception would start within the next 1500 years, assuming natural CO₂ level of 240 ppm. However, 240 ppm is much lower than preindustrial CO₂ level and CO₂ concentrations during several most recent interglacials (starting from MIS 11). Here, using the comprehensive Earth system model of intermediate complexity CLIMBER-2, carefully calibrated for the simulations of the past eight glacial cycles, we show that (i) although climate conditions during late Holocene were very close to the bifurcation transition to the glacial climate state (Calov and Ganopolski, Geophys. Res. Lett., 2005), it is very unlikely that under pre-industrial CO₂ level (280 ppm) glacial inception would occur within the next several thousand years; (ii) it is likely that the current interglacial, even without anthropogenic CO₂ emission, would be the longest interglacial during the past million years; (iii) current CO₂ level makes new glacial inception virtually impossible within the next 50,000 years; (iv) in agreement with earlier result of Archer and Ganopolski (Geochem. Geophys. Geosyst., 2007) based on a conceptual model of glacial cycles, we found that consumption of a large portion of available fossil fuel could postpone the next glacial inception by hundreds of thousand years.