

# Impacts of precession on the periodicity of climate and AMOC variabilities

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Over the glacial period, climate varied on centennial to millennial time scale between the warm interstadial and the cold stadial. Recent ice core and modelling studies have shown that changes in CO<sub>2</sub> and the glacial ice sheet played a critical role in controlling the periodicity of the climate variability through affecting the Atlantic Meridional Overturning Circulation (AMOC). Here, by analysing simulation data from a climate model GFDL, it is shown that changes in insolation pattern due to changes in precession also exert a substantial impact on the periodicity of the climate and AMOC variability. Model results show that a change from a Northern Hemisphere summer solstice perihelion to winter solstice perihelion causes an increase in the periodicity of the AMOC variability from decadal to millennial. Analysis reveals that an increase of sea ice over the Northern Hemisphere and a decrease in sea ice over the Southern Ocean due to insolation changes play a role in increasing the periodicity through stabilising both the vigorous AMOC and weak AMOC. These results may have some implications in interpreting the ice core data.

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