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Investigation of the response of water isotope records to the changes in orbital forcing with the isotope-enabled AGCM MIROC5-iso

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It has been well demonstrated that the variations of orbital parameters, known as Milankovitch theory, are one of the most important drivers of the Earth's climate system. However, the way how the changes in orbital forcing imprint the glacial-interglacial cycles recorded in paleo-proxies, such as stable water isotopes in ice cores and speleothems, is still unclear. One way to progress in this question is to make direct comparisons of isotopic data with simulation results from isotope-enabled General Circulation Models (GCMs). We use here such a model, the Japanese atmospheric GCM MIROC5-iso[1], to perform simulations under different idealized paleoclimate conditions. For that, corresponding orbital parameters and greenhouse gases concentrations are set. Prescribed sea surface temperature and sea ice coverage boundary conditions from the fully coupled atmosphere-ocean GCM MIROC (MIROC-AOGCM) experiments are used, after an adaptation to the MIROC5-iso grid. Because earlier version of MIROC-AOGCM has been widely used for paleoclimate modeling purposes, the climatological mean states of MIROC5-iso under preindustrial conditions are evaluated against simulation results from different versions of MIROC-AOGCM (MIROC4m, which is a slightly updated version of MIROC3.2(med), and MIROC5 [2]). In addition, several interglacial periods and idealized paleoclimate experiments will be investigated and implications for the interpretation of water isotope response to the changes in orbital forcing will be discussed.

[1] Okazaki and Yoshimura, J. Geophys. Res. Atmos, **124**, 8972–8993, 2019.

[2] Watanabe et al., J. Climate, **23**, 6312–6335, 2010.