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The Mid-Pleistocene Transition: A delayed response to an increasing positive feedback?

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Glacial-interglacial cycles constitute large natural variations in Earth's climate. The Mid-Pleistocene Transition (MPT) marks a shift of the dominant periodicity of these climate cycles from ~40 to ~100 kyr. Ramping with frequency locking is a promising mechanism to explain the MPT, combining an increase in the internal period with lockings to an external forcing. We identify the strength of positive feedbacks as a key parameter to induce increases in the internal period and allow ramping with frequency locking. Using the calcifier-alkalinity model, we simulate changes in periodicity similar to the Mid-Pleistocene Transition through this mechanism. However, the periodicity shift occurs up to 10 Million years after the change in the feedback strength. This result puts into question the assumption that the cause for the MPT must have operated around the same time as the observed periodicity shift.