



On the stability asymmetry of the glacial-interglacial cycle

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An idealized model of Atlantic Meridional Overturning Circulation (AMOC) is used to study the stability of the ocean circulation along the 100 kyr period glacial-interglacial cycle. It results to the appearance of chaotic burst, with a significant millennial time scale signature, but only during glacial period. There is no variability during interglacial period. The main hypothesis of this work is that the latitudinal changes of the ice cover edge during the glacial-interglacial cycle push back and forward the AMOC in the Atlantic basin. This leads to a brand new theory which is sufficient to explain the stability of the Holocene climate compared to the variability of the glacial period: the displacement hypothesis. The non-autonomous attractor of the system is determined and shows an important asymmetry between the glacial and inter-glacial period in term of initial condition uncertainty. It is shown that this latter diagnostic could be used as prediction of the AMOC collapse as well as for probabilistic prediction. This latter analysis also provides new approach/method to understand the stability and behavior of a non-autonomous system (such as the climate under global warming).