



Could Ruddiman's hypothesis be undecidable ?

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In 2003 Bill Ruddiman formulated the hypothesis that the civilisations of antiquity exerted a perturbation significant enough to modify the natural trajectory of climate evolution. Instead of lowering of CO₂ and glacial inception — he said — climate trajectory turned out to follow a long interglacial.

Ruddiman's hypothesis is partly founded on an analogy principle. It is based on the observation that glacial inception occurred in the past when the circumstances of insolation and ice volume were similar to today. On the other hand, the absence of a visible signature of the supposed anthropogenic forcing on the carbon isotopic record shows that the direct human influence on the net atmospheric carbon balance must have been fairly small. How can these two observations be reconciled ?

Ruddiman argued that the effects of the human perturbation may have been amplified by natural feedbacks. This is plausible. After all, most theories of glacial-interglacial cycles admit the existence of bifurcations and internal instabilities in the climate system; nothing allows us to reject the idea that the Holocene was close enough to instability to allow a human perturbation to tip the scales towards a long interglacial. On the other hand, the argument is risky. A dynamical system that amplifies a small perturbation is unpredictable. Therefore, the analogy principle may no longer be a valid argument.

In this context, we consider adequate to address Ruddiman's hypothesis from a probabilistic (Bayesian) prospective. What was the probability of entering glacial inception during the Holocene, given prior information ? Did the human perturbation modify this probability ?

This question is the subject of a new research project and only a methodological outline and preliminary results will be given at this presentation.