



Emissions corridors reducing the risk of reorganizations of the Atlantic meridional overturning circulation

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In this paper, we derive emissions corridors that are compatible with the policy goal of reducing the risk of Atlantic meridional overturning circulation (AMOC) changes while taking into account expectations about the socio-economically acceptable pace of CO₂ emissions reductions. The analytical framework consists of an integrated assessment model (IAM) comprising a globally aggregated multi gas climate model and a model of the world economy for assessing the monetary costs of climate protection. For the scope of this paper, the IAM was improved over previous versions to be able to process information provided in probabilistic terms, such as probability density functions (PDFs) for climate sensitivity. The risk of an AMOC break-down is taken into account via subjective probability distributions relating the probability of AMOC collapse (p^{col}) to the change in global mean temperature (ΔT) in 2100. These distributions were elicited in face-to-face interviews from leading experts in oceanography. Our results indicate that for medium distributions for p^{col} (i.e., $p^{col} = 0.1$ for $\Delta T = 3K$, $p^{col} = 0.2$ for $\Delta T = 5K$, $p^{col} = 0.3$ for $\Delta T \geq 8K$) and climate sensitivity (lognormal PDF with a median of 2.7K), effective emissions reductions relative to business-as-usual are required within this century if the risk of AMOC collapse is to be contained to 0.1 or less or the costs of climate protection are to be kept at a tolerable level. If the admissible risk of AMOC collapse is restricted or more pessimistic assumptions about the distributions for climate sensitivity and p^{col} are made, the timing of required emissions reductions is shifted towards the early decades of this century.