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# Reducing uncertainty in Climate Response Time Scale by Bayesian Analysis of the 8.2 ka event

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We analyze the possibility of uncertainty reduction in Climate Response Time Scale by utilizing Greenland ice-core data that contain the 8.2 ka event within a Bayesian model-data intercomparison with the Earth system model of intermediate complexity, CLIMBER-2.3.

Within a stochastic version of the model it has been possible to mimic the 8.2 ka event within a plausible experimental setting and with relatively good accuracy considering the timing of the event in comparison to other modeling exercises [1]. The simulation of the centennial cold event is effectively determined by the oceanic cooling rate which depends largely on the ocean diffusivity described by diffusion coefficients of relatively wide uncertainty ranges. The idea now is to discriminate between the different values of diffusivities according to their likelihood to rightly represent the duration of the 8.2 ka event and thus to exploit the paleo data to constrain uncertainty in model parameters in analogue to [2]. Implementing this inverse Bayesian Analysis with this model the technical difficulty arises to establish the related likelihood numerically in addition to the uncertain model parameters: While mainstream uncertainty analyses can assume a quasi-Gaussian shape of likelihood, with weather fluctuating around a long term mean, the 8.2 ka event as a highly nonlinear effect precludes such an a priori assumption. As a result of this study [3] the Bayesian Analysis showed a reduction of uncertainty in vertical ocean diffusivity parameters of factor 2 compared to prior knowledge. This learning effect on the model parameters is propagated to other model outputs of interest; e.g. the inverse ocean heat capacity, which is important for the dominant time scale of climate response to anthropogenic forcing which, in combination with climate sensitivity, strongly influences the climate systems reaction for the near- and medium-term future.

## 1 References

[1] E. Bauer, A. Ganopolski, M. Montoya: Simulation of the cold climate event 8200 years ago by meltwater outburst from lake Agassiz. *Paleoceanography* **19**:PA3014, (2004)

[2] T. Schneider von Deimling, H. Held, A. Ganopolski, S. Rahmstorf, *Climate sensitivity estimated from ensemble simulations of glacial climates*, Climate Dynamics **27**, 149-163, DOI 10.1007/s00382-006-0126-8 (2006).

[3] A. Lorenz, Diploma Thesis, U Potsdam (2007).