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Linking Physical Climate Research and Economic Assessments of Mitigation Policies

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Evaluating climate change policies requires economic assessments which balance the costs and benefits of climate action. A certain class of Integrated Assessment Models (IAMS) are widely used for this type of analysis; DICE, PAGE and FUND are three of the most influential. In the economics community there has been much discussion and debate about the economic assumptions implemented within these models. Two aspects in particular have gained much attention: i) the costs of damages resulting from climate change – the so-called damage function, and ii) the choice of discount rate applied to future costs and benefits. There has, however, been rather little attention given to the consequences of the choices made in the physical climate models within these IAMS.

Here we discuss the practical aspects of the implementation of the physical models in these IAMS, as well as the implications of choices made in these physical science components for economic assessments[1]. We present a simple breakdown of how these IAMS differently represent the climate system as a consequence of differing underlying physical models, different parametric assumptions (for parameters representing, for instance, feedbacks and ocean heat uptake) and different numerical approaches to solving the models. We present the physical and economic consequences of these differences and reflect on how we might better incorporate the latest physical science understanding in economic models of this type.

[1] Calel, R. and Stainforth D.A., “On the Physics of Three Integrated Assessment Models”, Bulletin of the American Meteorological Society, in press.