Correction to: A theoretical basis for the equivalence between physical and economic climate metrics and implications for the choice of Global Warming Potential time horizon

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The original article has been corrected. The figures in this article were updated.

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Fig. 1 Comparison between theoretical and numerical approaches for estimating the relationship between the global damage potential (GDP) and the global warming potential (GWP) and associated parameters. Results highlighted for the two simplest versions of the numerical model: Version 1—shown as “GWP RE constant and GDP RE constant” and indicated by red markers—assumes constant background concentrations for CH₄ and CO₂ resulting in a constant radiative efficiency (RE) ratio for both metrics. Version 2—shown as “GWP RE constant and GDP RE varying” and indicated by green markers—assumes varying REs for the GDP based on concentrations achieved under RCP4.5 but constant REs for the GWP following the definition in Section of 8.SM.11 of IPCC AR5 (Myhre et al. 2013b). For completeness, a third case—shown as “GWP varying and GDP varying” and indicated by blue markers—assumes varying REs for both the GDP and GWP based on concentrations achieved under RCP4.5. Other assumptions in the numerical model (held fixed across these three cases) are described in Table 1. a) Numerically estimated GWP versus GDP, where the GWP time horizon (TH) is consistent with the corresponding GDP parameters. Consistency is determined from Eq. 14, assuming an average economic growth rate of 2.2% per year. Each solid circle represents a different choice of discount rate used in the numerical GDP calculation. The solid gray ($y = x$) line represents the theoretical relationship between the GDP and GWP when consistent parameters are used, while the shaded area indicates 10% deviation from the theoretical relationship. b) TH that equates the GWP and GDP for a variety of discount rates used to numerically evaluate the GDP (solid circles). The solid gray curve is the theoretical relationship in Eq. 14, assuming an average economic growth rate of 2.2% per year

Fig. 2 Impact of RCP and state-dependent climate-carbon cycle feedbacks on the numerical relationship between the time horizon (TH) in the global warming potential (GWP) and the discount rate in the global damage potential (GDP). The circles show the TH that equates the GWP and GDP for a variety of discount rates used to numerically evaluate the GDP (solid circles). With the exception of background emissions (RCP) and state dependent climate-carbon cycle feedbacks, all other assumptions in the numerical model are consistent with those for the simplest version of the numerical model in Table 1 that assumes constant RE for GWP and varying RE for GDP based on RCP4.5. Green circles in panel a) are identical to those in Fig. 1. The solid gray curve is the theoretical relationship in Eq. 14, assuming an average economic growth rate of 2.2% per year. a) State dependent climate-carbon cycle feedbacks turned off in the numerical model. b) State-dependent climate-carbon cycle feedbacks turned on in the numerical model

Fig. 3 Impact of damage function representation and economic growth on the numerical relationship between the time horizon (TH) in the global warming potential (GWP) and the discount rate in the global damage potential (GDP). The circles show the TH that equates the GWP and GDP for a variety of discount rates used to numerically evaluate the GDP. Shaded areas represent variation in numerical model outputs due to inclusion and exclusion of state-dependent climate-carbon cycle feedbacks, with the top of the shaded areas representing values with such feedbacks turned on, and the bottom of the shaded areas (also shown by solid circles) representing values with such feedbacks turned off. With the exception of damage exponents (a), the economic growth rate (b), and state-dependent climate-carbon cycle feedbacks, all other assumptions in the numerical model are consistent with those for the simplest version of the numerical model in Table 1 that assumes constant RE for GWP and varying RE for GDP based on RCP4.5. Green circles in both panels are identical to those in Fig. 1. The solid gray curve is the theoretical relationship in Eq. 14, assuming an average economic growth rate of 2.2% per year. a) Effect of varying damage function exponent (1.5, 2, 3). b) Effect of varying economic growth assumptions (constant or variable)