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# Most robust estimate of the Transient Climate Response yet?

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Estimates of the Transient Climate Response often lack a coherent hemispheric or otherwise spatio-temporal representation. In the light of recent work that highlights the importance of inhomogeneous forcing considerations (Shindell et al 2014; Marvel et al 2015) and tas/tos-related inaccuracies (Richardson et al. 2016), here we present results from a well-tested two-box response model that takes these effects carefully into account. All external forcing data are updated based on latest emission estimates as well as recent TSI and volcanic AOD estimates. So are observed GMST data which include data for the entire year of 2016. Hence we also provide one of the first TCR estimates taking the latest El Nino into account. We demonstrate that short-term climate variability is not going to change the TCR estimate beyond very minor fluctuations. The method is therefore shown to be robust within surprisingly small uncertainty estimates.

Using PMIP3 and an extended ensemble of HadCM3 simulations (Euro500; Schurer et al. 2014) GCM simulations for the pre-industrial period, we test the fast and slow response time constants that are tailored for observational data (Ripdal 2012). We also test the hemispheric response as well as the response over land and ocean separately. The TCR/ECS ratio is taken from a selected sub-set of CMIP5 simulations. The selection criteria is the best spatiotemporal match over 4 different time periods between 1860 and 2010. We will argue that this procedure should also be standard procedure to estimate ECS from observations, rather than relying on OHC estimates only. Finally, the demonstrate that PMIP3-type simulations that are initialised at least a century before 1850 (as is the standard initialisation for CMIP5-type simulations) are to be preferred. Remaining long-term radiative imbalance due to strong volcanic eruptions (e.g. Gleckler et al. 2006) tend to make CMIP5-type simulations slightly more sensitive to forcing, which leads to detectable stronger warming up until recent day.