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Discussions

Interactive comment on "Ideas: a simple proposal to improve the contribution of IPCC WG1 to the assessment and communication of climate change risks" *by* Rowan T. Sutton

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Physically Plausible High Impact Scenarios (PPHIS) for use by IPCC WG1: practical implementation and examples

This comment is an elaboration of my response to the helpful comments by S. Hallegatte, and others, and provides a more detailed explanation of how the proposal could be implemented within the framework of the existing IPCC uncertainty guidelines and associated calibrated language. Several examples are given.

PPHIS Proposed Definition for WG1: An assessed physically based storyline for spe-

cific aspects of future climate change that is consistent with all available evidence and would result in impacts that are substantially greater than those implied by the relevant likely range.

This information is policy relevant because policy makers are concerned with the management of risk.

It is proposed that the characterisation of each PPHIS should include: 1) an assessment of likelihood, and 2) an assessment of impact explicitly framed in conditional terms (i.e. conditional on the PPHIS being realised in the real world), with separate assessed confidence levels for each of these two components. This approach is in line with the IPCC uncertainty guidelines (Mastrandrea et al, 2010) which state: "For findings (effects) that are conditional on other findings (causes) . . . [author teams should] consider independently evaluating the degrees of certainty in both causes and effects, with the understanding that the degree of certainty in the causes may be low".

With regard to likelihood, it is proposed that WG1 should typically base PPHIS on scenarios that are assessed to be very unlikely (0-10%) rather than extremely unlikely (0-5%) or exceptionally unlikely (0-1%). In the context of deep uncertainty attempts to quantify the likelihood of a PPHIS more precisely are unlikely to be fruitful, and are not necessary to provide information that is useful for risk assessment (see e.g. www.deepuncertainty.org). Information provided about impact should be limited in WG1 to physical climate variables but should be quantitative where possible and include an assessed confidence level. WG2 could make use of the WG1 PPHIS to provide further information about impacts; this would help coordination between the working group reports and the production of the Synthesis Report.

Potential abrupt changes have long been recognised as an important risk-relevant issue for IPCC WG1 to assess (e.g. Section 12.5.5 in Collins et al, 2013). However, abrupt changes are only a subset - and not obviously the most important subset - of PPHIS. It is notable that hardly any information about abrupt changes was included in

the AR5 WG1 Summary for Policymakers, and where information was included (e.g. for the AMOC, Section E.4 in IPCC, 2013), it addressed likelihood only with little or no information provided about impact.

Below are three examples of how PPHIS could be used, adapted from the WG1 AR5 Summary for Policymakers. In these examples all the information used can be found somewhere within the AR5 report, but the synthesis and communication (including framing) of this information is different.

1. Equilibrium Climate Sensitivity (ECS). It is very unlikely that ECS is greater than 6oC (medium confidence) but this value may be considered a Physically Plausible High Impact Scenario (PPHIS). If realised, such a value for ECS would very likely result in an increase in global mean temperature by 2100 well above 2oC relative to 1850-1900 under all RCP scenarios except RCP2.6 (high confidence).

2. Sea level. A partial collapse of the marine-based sectors of the Antarctic ice sheet is considered unlikely during the 21st century (medium confidence). However, if realised this PPHIS could cause an additional contribution to sea level rise of up to several tenths of a meter during the 21st century (medium confidence).

3. Atlantic Meridional Overturning Circulation (AMOC). It is very unlikely that the AMOC will undergo an abrupt transition or collapse in the 21st century for the scenarios considered (medium confidence). However, if it did occur such a transition would have very large rapid (decadal timescale) impacts on the regional climate of the North Atlantic and surrounding continents (high confidence) and substantial impacts on the climate of regions further afield (medium confidence). [More quantitative information on impacts could and should be provided.]

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