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“Agreement” in the IPCC Confidence measure

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ABSTRACT

The Intergovernmental Panel on Climate Change (IPCC) has, in its most recent Assessment Report (AR5), articulated guidelines for evaluating and communicating uncertainty that include a qualitative scale of confidence. We examine one factor included in that scale: the “degree of agreement.” Some discussions of the degree of agreement in AR5 suggest that the IPCC is employing a consensus-oriented social epistemology. We consider the application of the degree of agreement factor in practice in AR5. Our findings, though based on a limited examination, suggest that agreement attributions do not so much track the overall consensus among investigators as the degree to which relevant research findings substantively converge in offering support for IPCC claims. We articulate a principle guiding confidence attributions in AR5 that centers not on consensus but on the notion of support. In concluding, we tentatively suggest a pluralist approach to the notion of support.

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1. Introduction

In its most recent Fifth Assessment Report (AR5), the Intergovernmental Panel on Climate Change (IPCC) takes pains to clarify its methods of estimating the uncertainty of its various claims about climate change and its impacts on ecosystems and society. The IPCC distinguishes two methods for estimating uncertainty: a quantitative likelihood scale, and a qualitative confidence scale, which authors were to use when they could not provide a quantitative estimate. In fact, the confidence scale is all encompassing, inasmuch as likelihood estimates presuppose at least a high level of confidence, unless stipulated otherwise.¹ In assigning a level of confidence IPCC authors consider both the evidence (specifically, its amount, type, quality, and consistency) and the “degree of agreement.” High or very high confidence generally requires a high level of agreement and “robust” evidence.

To date, philosophical treatments of climate science have focused heavily on the evaluation and evidential status of models

that simulate climate systems.² But climate models make up only one source of evidence for IPCC reports, which also rely on other sorts of evidence, in particular observational evidence.³ In any case, the IPCC qualitative confidence scale has not received much philosophical attention.⁴ Though the evidence dimension of confidence raises interesting questions in its own right,⁵ in this essay we focus in particular on the agreement dimension of confidence. The IPCC seems to attribute an epistemic role to agreement, which in turn has implications for the meaning of confidence. What makes agreement especially interesting is its association with a consensus-based social epistemology of science. Though IPCC

² E.g., Parker (2010); Lloyd (2010); Winsberg (2010, chap. 6); for a critical overview of different approaches, see Katzav (2014).

³ To be sure, observational evidence also depends on computer modeling in various ways; indeed, physicists have long employed simulations as part of their efforts to “observe” high-energy particles (Galison, 1997, chap. 8; Morrison, 2015; regarding climate science, see Edwards 2010 and Parker 2009), so the distinction between these sorts of evidence may be more a matter of degree than kind.

⁴ For a detailed analysis of the uncertainties in climate modeling that make a qualitative approach necessary, see Stainforth, Allen, Tredger, & Smith (2007); Katzav (2014) treats the IPCC notion of confidence briefly, again in relation to climate simulations.

⁵ In particular, there are questions regarding the IPCC understanding of robust evidence, but that is matter for another study. Note that the IPCC notion of robust evidence appears to differ from the use of that term in the philosophy of science literature (e.g. Wimsatt, 1981).

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¹ AR5, Working Group II Report, Summary for Policymakers (SPM), p. 6, Background Box SPM 3 (IPCC 2014a; hereafter AR5-II, 6). Note that all three working groups use the same uncertainty measures.

statements about agreement are far from precise, and not wholly uniform, multiple statements suggest an epistemology of science in which the consensus of investigators plays a central role. We will call this the “consensus version” of the agreement measure: “agreement” refers to consensus in the relevant community of investigators on the IPCC finding at issue.

The IPCC’s apparent allusions to a consensus measure provide occasion for making philosophical analysis relevant for practicing scientists, or more accurately, for scientists on expert committees, of which the IPCC is the most ambitious to date. More precisely, we should like to know if the IPCC use of agreement as a partial basis for confidence can be supported by a plausible social epistemology. To answer that question, we must first understand exactly how the IPCC links its agreement attributions with its confidence estimates. As it turns out on closer inspection, however, the consensus version of agreement in AR5 squares neither with the entirety of IPCC explanations of agreement, nor with the actual practice of attributing degrees of agreement in the chapters that assess relevant literature. We find that the actual practice diverges from the consensus version in interesting ways, which do not match what we should expect to find in a consensus epistemology. Agreement attributions do not so much track the overall consensus among investigators as the degree to which relevant research findings substantively converge in offering support for IPCC claims.

We start by examining the explanations of agreement put forth by the statements on uncertainty in each working group report.⁶ We also take into account the 2010 IPCC “Guidance Note” (GN) on the treatment of uncertainty and an associated article by the authors of the GN (Section 2). After clarifying the structure of the “traceable accounts” with which AR5 authors support their confidence judgments (Section 3), we examine in detail the actual practice of agreement attributions in two examples, the first regarding past warming trends, the second concerned with phenology: though one might defend a consensus interpretation of the first case, the second case is clearly at odds with the consensus version of agreement (Sections 4, 5). We then approach the matter from the philosophical side, asking whether a consensus-based epistemology of science could capture the sense of IPCC agreement attributions. We find that neither Peirce’s veritistic model of consensus, nor a more recent justification-based model, fits IPCC practice as represented by the traceable accounts we have considered (Section 6). Rather, agreement in actual IPCC practice has more to do with convergence of research than opinion. We conclude by formulating a general confidence principle that captures IPCC practice. That principle, we suggest, provides a starting point for posing further questions regarding the epistemic force of IPCC confidence attributions (Section 7).

2. IPCC statements about agreement

In response to criticisms of the Fourth Assessment Report, AR5 authors took pains to employ a uniform method of treating uncertainty across the three working groups.⁷ Thus each of the three Working Group Reports in AR5 affirms the same confidence chart, whose outcomes depend on both evidence and agreement. And each working group, in its section on the treatment of uncertainty, at some point explicitly links agreement with expert consensus (although other understandings of agreement appear alongside these links).

In the section of its report devoted to the treatment of uncertainty, Working Group I, without explicitly invoking the term ‘agreement,’ states that its aim is to provide “a consistent, calibrated set of words through which to communicate the uncertainty, confidence, and degree of consensus prevailing in the scientific literature” (AR5-I, 142). As part of its articulation of the rationale for its contribution to the Assessment Report, Working Group I states that the “IPCC process is aimed at assessing the literature as it stands and attempts to reflect the level of *reasonable scientific consensus* as well as disagreement” (AR5-I, 123, emphasis added). Both of these statements are compatible with multiple understandings of the term ‘agreement’ as employed in IPCC statements about the treatment of uncertainty, including a consensus version of agreement. The first quotation, however, referring to consensus “in the scientific literature,” suggests an alternative view of agreement in terms of concurrence amongst findings published in the relevant scientific literature. As we document below, this *concurrence* version of agreement is suggested also in an important Guidance Note regarding the treatment of uncertainties aimed at AR5 lead authors (Mastrandrea et al., 2010, Annex A, p. 1).

The Working Group II Report explicitly contrasts agreement with evidential consistency: “Beyond consistency of evidence, the degree of agreement indicates the consensus within the scientific community on a topic and the degree to which established, competing, or speculative scientific explanations exist” (AR5-II, 177). This statement uses language similar to that in another paper written by authors of the AR5 Guidance Note (Mastrandrea et al., 2011). We will consider this construction more closely below.

Working Group III again draws upon the Guidance Note (GN), but appears to regard it as employing a consensus version of agreement: “The GN recommends reporting the degree of certainty and/or uncertainty of a given topic as a measure of consensus or *agreement* across the scientific community. *Confidence* expresses the extent to which the IPCC authors do in fact support a key finding” (AR5-III, 157).

The mixture of consensus and concurrence understandings that we find in the Working Group Reports reflect the heterogeneity in the Guidance Notes prepared for IPCC authors in 2005 and revised in 2010. The earlier document explains that the confidence measure “considers both the amount of evidence available in support of findings and the *degree of consensus among experts* on its interpretation” (IPCC, 2005, 3, emphasis added). The main body of the 2010 Guidance Note uses the term ‘agreement’ without explanation. However, the authors present in Annex A to that document a comparison between the approaches to uncertainty of AR4 and AR5. The AR5 Guidance Note authors interpret the AR4 notion of agreement as “the *level of concurrence in the literature* on a particular finding” (Mastrandrea et al., 2010, Annex A, 1, emphasis added), and treat this as the operative understanding of agreement for AR5. In different places, then, AR5 invokes both the notion of “concurrence in the literature on a particular finding” and “consensus among experts.”⁸

Finally, consider the treatment of agreement in a 2011 paper by the authors of the 2010 Guidance Note. This may be the most developed statement by IPCC authors regarding agreement, though it retains the mixture of distinct understandings found in our previous examples:

The degree of agreement is a measure of the consensus across the scientific community on a given topic and not just across an author team. It indicates, for example, the degree to which a

⁶ IPCC assessments are composed of three main reports, each written by a different “working group” (IPCC, 2013, 2014a, 2014b, resp.; hereafter cited as AR5-I, AR5-II, and AR5-III): Working Group I (WGI) treats the physical science basis of climate change, WGII, its environmental and social impacts, and WGIII, mitigation.

⁷ For the criticisms, see the InterAcademy Council report (2010).

⁸ Consider also this interpretation from AR5-I, in a discussion of the evaluation of climate models: “The degree of agreement measures whether different studies come to the same conclusions or not” (AR5-I, 822).

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