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1 Tension between scientific certainty and meaning complicates communication of IPCC
2 reports

3

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5

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10

11 **Here we demonstrate that speakers at the press conference for the publication of the**
12 **IPCC’s Assessment Report 5 (Working Group 1)¹ attempted to make the documented**
13 **broad certainty of anthropogenic global warming (AGW) more meaningful to the**
14 **public. Speakers sought such meaning through reference to short-term temperature**
15 **increases. However, when journalists inquired about the similarly short-lengthed**
16 **‘pause’² in global temperature increase, the speakers dismissed the relevance of such**
17 **timescales, thus becoming incoherent as to ‘what counts’ as scientific evidence for**
18 **AGW. We call this the ‘IPCC’s certainty trap’. Speakers’ incoherence led to confusion**
19 **within the press conference and subsequent condemnation in the media³. While the**
20 **speakers were well intentioned in their attempts to communicate the public implications**
21 **of the report, these attempts threatened to erode their scientific credibility. In this**
22 **instance, the certainty trap was the result of the speakers’ failure to acknowledge the**
23 **tensions between scientific and public meanings. Avoiding the certainty trap in the**
24 **future will require a nuanced accommodation of ongoing uncertainties and a**
25 **recognition that rightful demands for scientific credibility need to be balanced with**

26 **public and political dialogue about the things we value and the actions we take to**
27 **protect those things⁴⁻⁶.**

28

29 In this paper, we assess the relationship between two fundamentals of science
30 communication: uncertainty and meaning. Uncertainties are everyday matters of concern for
31 scientists. The majority can be called ‘local’ uncertainties⁷ as they reflect an uncertainty
32 manifest within a single phenomenon. Climate science is replete with such local
33 uncertainties⁸. Here, we focus on temporally local uncertainties which were the subject of a
34 number of questions and answers in the press conference under consideration. Examples of
35 temporally local uncertainties in climate science include the variable effects of volcanoes,
36 solar cycles, climate sensitivity, El Niño, and the impact of the financial crisis on emissions.
37 While some of these phenomena are spatially huge, they are temporally local in the sense that
38 they are hypothesised to have short-term effects and require resolution within broader
39 theoretical frameworks^{7,8}. And yet these problematic, temporally local, uncertainties are
40 inevitably encountered by climate scientists seeking to produce broader certainties; namely
41 the concrete, theoretical explanation and detection of Anthropogenic Global Warming
42 (AGW).

43

44 A second crucial issue, for those concerned with science communication, is that of meaning.
45 Meaning arises from personal experiences embedded in the local contexts within which
46 people create and value their lives^{4,9}. Acknowledging the importance of local contexts
47 highlights how different spheres of meaning become relevant in making science public. For
48 example, a comparison of professional and popular science writing¹⁰ has shown that the
49 characteristics of scientific claims shift as knowledge is translated from scholarly journals
50 into more widely read publications. Journal articles largely restrict themselves to answering

51 questions of scientific meaning: ‘what happened?’ and ‘what was the reason for the event?’
52 Wider audiences, however, are concerned with questions of public meaning related to their
53 own local contexts: ‘what value should be placed on the event?’ and ‘what action should now
54 be taken?’

55

56 Negotiating the boundary between ‘scientific meaning’ and ‘public meaning’ is a particular
57 concern for the IPCC for two reasons. First, while the IPCC is committed to providing
58 policy-neutral advice¹¹, it also seeks to facilitate greater understanding of its work amongst
59 non-specialist audiences¹², and there are calls for such objectives to be achieved not only
60 through an increased supply of scientific knowledge but also through such knowledge being
61 made more publicly meaningful^{4,5}. Second, representatives of the IPCC are requested to give
62 press conferences, events which sit at the boundary between science and the media¹³ wherein
63 officials can make meaning beyond the text and demonstrate authority while still exerting a
64 degree of control¹⁴. Here we examine this boundary, building on previous literature on the
65 communication of climate science uncertainties^{15,16} with a qualitative analysis of a novel and
66 important data source: the press conference transcript.

67

68 We argue here that a relationship exists between certainty and meaning in climate science,
69 that a framework for understanding this relationship can be formed, and that this framework
70 can be explored using the IPCC as a test case. We do not claim that understanding meaning,
71 certainty, or the relationship between them is straightforward. Following others^{5,17,18} we do,
72 however, believe that it is reasonable to treat the two concepts as independent of one another,
73 although further empirical research into the question will be valuable. Investigating the
74 relationship between certainty and meaning is also useful in helping to understand

75 interactions during the press conference under consideration and the activities of the IPCC
76 more broadly.

77

78 The degree of certainty regarding AGW has increased since the IPCC's Fourth Assessment
79 Report in 2007¹. Indeed, various calls for action on AGW have been premised upon this
80 increasing certainty¹⁹. Simultaneously, however, there is a widely-held belief, following
81 criticisms⁴, that increased certainty has yet to manifest into public meanings powerful enough
82 to prompt significant personal, political and policy responses (see Fig. 1). That is not to say
83 that no public meanings about climate change have developed during the lifetime of the
84 IPCC^{20,21}, rather that the certainty of climate change knowledge continues to have greater
85 scientific than public meaning.

86

87 During the press conference, the IPCC speakers attempted to make climate knowledge more
88 publicly meaningful by repeated reference to temporally local phenomena such as short-term
89 temperature change. However, as described above, there are more uncertainties around the
90 causes of these phenomena and whether they are indeed attributable to AGW. Furthermore,
91 these phenomena are of a kind with other uncertain, temporally local phenomena such as 'the
92 pause'² which do not incontrovertibly support the AGW hypothesis. Thus, attempts to
93 increase public meaning through a discussion of temporally local phenomena in this way are
94 coupled with an erosion of certainty. In this press conference, the IPCC speakers failed to
95 acknowledge this diminishing certainty, dismissing journalists' questions about 'the pause'
96 precisely because the phenomenon is uncertain. The simultaneous reliance upon some
97 temporally local events in order to increase public meaning, and dismissal of other similar
98 events because they are uncertain, led to confusion, incoherence and negative press coverage

99 following the press conference. This is the certainty trap which the IPCC must avoid in
100 future.

101

102 During the press conference in Stockholm, and in the terms outlined above, there were
103 frequent considerations of ‘the value which should be placed on AGW’ and considerations of
104 ‘what should be done’. In a particularly passionate passage, the World Meteorological
105 Organization’s Michel Jarraud (see Methods for further information on speakers’
106 organisational roles) argued that “[The] report demonstrates that we must greatly reduce
107 global emissions in order to avoid the worst effects of climate change” (Jarraud L90-92,
108 emphasis added). The information, delivered in WG1’s report, “can be use, that should be
109 used to produce actionable climate information” (L94-96; see Supplementary Information A
110 for full transcript). There are two observations to be made about these extracts. First, there
111 seems little doubt that Jarraud attached a great deal of meaning to AGW and believed
112 particular actions – most notably a significant reduction in global emissions – should be
113 undertaken. What is also clear, in the repeated use of terms such as “our time” (IPCC’s
114 Thomas Stocker, L345-346), “our planet” (United Nations Environment Programme’s Achim
115 Steiner L129), “our only home” (Stocker L507), “our activities” (Jarraud L69), and “we must
116 greatly reduce global emissions” (Jarraud L90-91) is that the speakers believed AGW to be
117 meaningful for a collective which is broader than the scientific community, although
118 ultimately this collective remains unspecified. Second, Jarraud sought to give climate change
119 meaning *through* certainty. It is ‘the report’ which ‘can be used, should be used’ and which
120 ‘demonstrates’ the need for action. Within the press conference, the speakers attempt to
121 leverage scientific certainty to procure public meaning (Fig. 2).

122

123 The problem for the press conference speakers was that, while they clearly thought that the
124 certainty of AGW demonstrated the need for public action, it is not entirely clear why that
125 argument should have been publicly persuasive given that literature in the social sciences
126 strongly suggests that little public meaning has been successfully attached to this aggregated,
127 abstract notion of climate^{4,5}. Perhaps acknowledging this, speakers attempted to make AGW
128 meaningful by temporally localising the terms of reference, focusing particularly upon recent
129 and short-term climate changes. For example, Jarraud (L84-85), Stocker (L418-420) and the
130 IPCC's Rajenda Pachauri emphasised the fact that "the decade 2001 onwards having been the
131 hottest, the warmest that we have seen" (Pachauri L261-262). Focusing upon these recent
132 decades, we suggest, began to give AGW meaning by situating it within the "normal horizons
133 of time" rather than the epic timescales which are the usual currency of climate science⁴ (for
134 an extended version of this analysis, see Supplementary Information B).

135

136 However, while a focus on the decadal scale may have helped to make climate change more
137 meaningful it also brought considerable difficulties, in large part because press conference
138 speakers asserted that "periods of less than around thirty years... are less relevant" (Stocker,
139 L582-583). Thus, publicly meaningful phenomena were actually incorporated at the expense
140 of certainty (Fig. 3).

141

142 What became apparent throughout the press conference is that increasing public meaning at
143 the expense of certainty was particularly problematic, not least because of journalists'
144 extended focus upon the 'hiatus' or 'pause'² in the rate of increase in global mean surface
145 temperature since the late 1990s. The pause was brought into play once timeframes of less
146 than thirty years were considered relevant for assessment by the press conference speakers.
147 Thus, by temporally localising AGW in order to give the debate meaning, the spotlight also

148 fell upon sources of scientific uncertainty. This did not escape the attention of journalists at
149 the press conference, who were particularly interested in this temporally meaningful pause
150 (for an extended version of this analysis, see Supplementary Information C), with six out of
151 eighteen journalists asking whether the pause undermined the IPCC's findings. David Rose
152 of the UK's Mail on Sunday tackled the topic forcefully, asking "how much longer will the
153 so-called pause or hiatus have to continue before you would begin to reflect that there is
154 something fundamentally wrong with the models?" (L772-774).

155

156 Various attempts were made by the IPCC speakers to downplay the importance of the pause.
157 Stocker repeatedly pinpointed a lack of published literature as a problem (L436-437, L568-
158 571) and claimed that temperature trends that last for less than thirty years should be treated
159 as significantly less important than trends that last over thirty years (L580-584, L793-795).
160 This 'temporal segmentation'⁷ enabled the pause to be dismissed as scientifically irrelevant,
161 suggesting that journalists' questions on the matter could be ignored. Jarraud offered just
162 such a dismissal to Rose's question, which he claimed was "from a scientific point of view...
163 what we would call an ill-posed question" (L827-828), essentially dismissing Rose as
164 scientifically illiterate. The terms of this dismissal, however, appear inconsistent with the
165 temporally localised claims made by speakers during the press conference. The speakers
166 oscillated between two positions: one of broad certainty but little public meaning, the other of
167 public meaning but little broad certainty (fig. 4). This striking incoherence was noted by Alex
168 Morales of Bloomberg News who asked why fifteen year periods are considered by the
169 speakers if they hold no scientific value (L965-969).

170

171 When Rose³ published his article the following day, the quote "your question is ill-posed!"
172 was given headline status, and derided as a misjudged response to "a simple question". We

173 do not wish to claim here that Rose was particularly sympathetic to the IPCC prior to the
174 press conference^{22,23}, but in this instance his question was well-founded. It exposed how
175 attempts during the press conference to increase public meaning undermined the very
176 scientific certainty that representatives were trying to communicate, and then leverage, in
177 order to procure public meaning.

178

179 Climate change is a science/policy arena where consistent attempts are made to communicate
180 the certainty of AGW theory, and the broad level of consensus over certain facets of that
181 theory in the literature^{24,25}. Within this context, a spotlight on scientific uncertainties may be
182 regarded as unwelcome, as the pause proved to be in the press conference. However, we
183 argue that this spotlight is an unavoidable byproduct of attempts to make scientific certainty
184 publicly meaningful by emphasising the temporally local.

185

186 This insight implies that seeking to persuade citizens of the case for climate action solely
187 through expositions of the certainty of AGW, and the scientific consensus on the topic, may
188 be a moribund strategy. For while the IPCC has been able to establish greater certainty
189 around AGW (Figure 1) the attempts by IPCC speakers at the press conference to ground
190 their conclusions with reference to temporally local, publicly meaningful events (Figure 2)
191 threatened the credibility of the certainty they wished to convey (Figure 3). This was not lost
192 on the assembled media, whose questions prompted an incoherently oscillating position
193 regarding the appropriate timescales to be considered within climate science (Figure 4). If
194 IPCC speakers are to avoid this certainty trap in the future, they must be better availed of the
195 competing tensions between scientific certainty and public meaning, and the particular
196 difficulties faced by scientists when trying to communicate their findings in a meaningful
197 fashion. In particular, public dialogue has a key role to play in making climate science

198 knowledge meaningful. We should strive for an approach to climate change which breaks
199 free of the certainty trap to better include public dialogue, values, visions and
200 beliefs^{4,6,17,20,26,27}.

201

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267

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275 ours alone.

276

277 **Author Contributions**

278 Both GH and WP contributed fully to all aspects of this submission and acknowledge joint
279 first-authorship.

280

281 **Conflicting Interests**

282 Neither GH nor WP has any conflict of interest with regard to this paper.

283

284 **Figure Legends**

285

286 **Fig. 1:** Since the last IPCC report, certainty has increased concerning AGW. Speakers at the
287 press conference stressed this increase:

288 “the evidence for human influence has grown since AR4, it is now deemed
289 extremely likely that human influence has been the dominant cause of the observed
290 warming.” (Steiner L153-155).

291 However, social scientific research has argued⁴ that the issue of AGW is yet to attain enough
292 public meaning to prompt significant personal, political and policy responses. Figure 1 thus
293 shows an upward shift along the y-axis, representing increased broad certainty, but no
294 movement on the x-axis, representing the continued dominance of scientific meaning.

295

296 **Fig. 2:** Within the press conference, speakers attempted to leverage the certainty
297 demonstrated in the AR5 report – a report which is explicitly not concerned with public or
298 society – in order to procure public meaning and policy change:

299 “[The] report demonstrates that we must greatly reduce global emissions in order to
300 avoid the worst effects of climate change.” (Jarraud L90-92)

301 In Figure 2 we represent this move with a horizontal shift along the x-axis (to position 3); a
302 utilization of certainty in order to procure public meaning.

303

304 **Fig. 3:** The speakers drew upon temporally local events in order to give AGW public
305 meaning during the press conference:

306 “the decade 2001 onwards having been the hottest, the warmest that we have seen”
307 (Pachauri L261-263).

308 The speakers understood these temporally local phenomena to be less certain than the overall
309 theory of AGW:

310 “periods of less than around thirty years... are less relevant” (Stocker, L582-583).

311 Thus, publically meaningful phenomena were actually incorporated at the expense of
312 certainty. Therefore, the intended move to the top-right quadrant (position three) was not
313 achieved. Instead the move was to the bottom-right quadrant (position four).

314

315 **Fig. 4:** Drawing upon temporally local, publically meaningful information ('the hottest
316 decade') proved problematic, as it lent legitimacy to the discussion of other local
317 uncertainties, such as the 15-year 'pause'. Speakers were repeatedly challenged on the
318 uncertainties connected to this phenomenon:

319 "Your climate change models did not predict there was a slowdown in the warming.

320 How can we be sure about your predicted projections for future warming?"

321 (Harrabin L560-562)

322 Faced with these challenges, speakers retreated from temporally local, publicly meaningful
323 data (position 4) to reaffirm AGW's broad certainty (position 2):

324 "we are very clear in our report that it is inappropriate to compare a short term
325 period of observations with model performance" (Stocker L794-796).

326 This retreat led to confusion, incoherence, and criticism within the press conference.

1 **Methods**

2

3 Publication in journals cannot be relied upon as a means of communicating research outputs
4 beyond the scientific community; less than 0.005% of scientific papers outside of health and
5 medicine were reported in the mass media between 1990 and 2001²⁸. Press conferences,
6 therefore, are a means for scientists to reach non-specialist audiences and provide an
7 important location for the study of science communication. Where the issue under
8 consideration is of political importance, such as climate change, press conferences take on
9 greater significance as they offer a demarcation line between the relatively closed processes
10 of scientific assessment, during which the publication of provisional findings are likely to be
11 discouraged, and the point at which a peer-reviewed scientific publication can be made public
12 via the media¹³. Thus, the press conference represents a “constitutional stage” upon which
13 officials can impart meaning beyond the text and demonstrate authority, while still exerting a
14 degree of control over proceedings¹⁴. The press conference also, however, marks the point at
15 which the authors of a report begin to lose control of meaning, the inescapable moment at
16 which the report begins to take on a life of its own following publication.

17

18 Despite the importance and unique features of a scientific press conference, there are no
19 detailed analyses of these events in the literature, although they are acknowledged as a part of
20 the difficult boundary between science and the media^{13,29,30}. This paper begins to address this
21 empirical gap by examining the IPCC press conference held in Stockholm, Sweden on
22 September 27, 2013 to present the Summary for Policymakers for Working Group 1 of the
23 Fifth Assessment Report¹.

24

25 The press conference began with a sequence of presentations by six speakers:

26 Ban Ki-Moon (United Nations)

27 Michel Jarraud (Secretary General, World Meteorological Organization)

28 Achim Steiner (Executive Director, United Nations Environment Programme)

29 Rajenda K. Pachauri (Chair, IPCC)

30 Qin Dahe (Co-Chair, IPCC WG1)

31 Thomas Stocker (Co-Chair, IPCC WG1)

32 The presentations were followed by questions from a total of 18 journalists, all but one of
33 which were answered by Jarraud, Pachauri or Stocker. We viewed the press conference as it
34 was aired live on BBC News 24 and subsequently transcribed a recording. The transcript is
35 12,400 words in length and is presented in full in Supplementary Information A. The
36 transcript is produced verbatim from the words uttered during the press conference and
37 apparent errors of speech have not been corrected. Quotes taken from the transcript are
38 supplied with line numbers, to ease cross-referencing with the full transcript.

39

40 The transcript was coded for language related to the two categories being studied: meaning
41 and certainty. Our understanding of meaning arises from work conducted by Fahnestock, who
42 provides a simple taxonomy of four questions which account for the development of issues in
43 the public sphere; ‘what happened?’, ‘what is the reason for the event?’, ‘what value should be
44 placed upon the event?’, and ‘what action should be taken now?’¹⁰. In her comparison of
45 professional and popular science writing, Fahnestock shows how the characteristics of claims
46 shift as knowledge is translated from scholarly journals into more widely read publications.
47 In particular, Fahnestock shows that journal articles largely restrict themselves to answering
48 the question ‘what happened?’, allocating considerable space to validating the answer to the
49 question through a description of research methods. Wider audiences, however, are
50 concerned with larger public issues than the deliberately restricted claims served up for a

51 narrow audience of specialist scientists. Such concerns lead on to questions concerned with
52 the causality, value and implications of an event. Following Fahnestock, therefore, we were
53 able to code statements relating to meaning into one of four categories and determine whether
54 utterances had more in common with the statements most frequently found in scientific
55 publications ('scientific meaning') or the public sphere ('public meaning').

56

57 Similarly, we searched for utterances concerned with the certainty of scientific findings. We
58 used Star's^{7,31} division between 'local' and 'global' (here renamed local and broad), as well
59 as specific literatures relating to climate change^{4,8,9} to determine whether certainty-statements
60 referred to large or small scale (temporally and spatially) events. When explanations for
61 uncertainty were proffered, we again referred to literature from sociology and science and
62 technology studies, which has considered this question in depth, in order to classify the nature
63 of those responses^{7,15,16,31-35}.

64

65 Finally, we identified patterns in the data which were suggestive of a relationship between
66 these two categories of certainty and meaning, and employed principles of narrative analysis
67 to ensure, firstly, the veracity and faithfulness of our data interpretation³⁶ and, secondly, that
68 the data presented provide a robust representation of how the IPCC speakers communicated
69 during the press conference.

70

71 **Additional References**

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