IPCC communicative practices: A linguistic comparison of the *Summary for Policymakers* 2007 and 2013

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Abstract

The present paper undertakes an analysis of language use in two so-called Summaries for policymakers (SPMs), published as part of the IPCC (Intergovernmental Panel on Climate Change) Assessment Reports 4 (AR4, 2007) and 5 (AR5, 2013). Through a comparative analysis, we investigate how scientific claims are conveyed through expressions indicating various levels of (un)certainty, through scalar systems established by the IPCC to indicate levels of likelihood, confidence and evidence, as well as through non-predefined linguistic means. We also consider to what extent contrasted claims may indicate a difference in argumentative emphasis in the two summaries, without diverging from the overall purpose of the IPCC: to present a consensual view on current climate knowledge. Further, the analysis assumes a textual perspective, investigating to what extent the summaries have a narrative structure with a clear storyline. The results show that, generally, the two SPMs adhere to the expressed purpose of the IPCC. However, there are differences indicating a strengthened basis for scientific certainty in the AR5-SPM. The narrative analysis discusses the lack of explicit reactions to the stated complications. The findings also point towards the need for further analyses to assess the reception of text layout and language use by policymakers.

1 Introduction

In September 2013, the Intergovernmental Panel on Climate Change (IPCC) published the first component of the 5th Assessment Report (AR5)[1], namely Working Group I's report on the physical scientific basis (WGI). Since 2007, when the previous report, AR4,[2] was published, there has been much discussion of the IPCC texts, notably on the issue of how to convey (un)certainty (e.g. Bowman et al. 2009; Budescu et al. 2009; Budescu et al. 2014; Harris et al. 2013; Hulme 2013; Jonassen and Pielke 2011). In 2010, an international scientific body, the InterAcademy Council (IAC), undertook a comprehensive review of IPCC procedures, structure and governance, including the issue of communicating at the interface between science and policy. Their assessment (InterAcademy Council 2010)[3] contributed to putting IPCC discourse on the public agenda. With those discussions as a backdrop, the current paper undertakes a comparative analysis of a selection of phenomena related to language use in the AR4 and AR5 summaries for policymakers (SPMs)[4],[5], published as part of the WGI reports[6],[7],[8]. Our main purpose is to explore both similarities and differences between the two documents and to investigate to what extent AR5-WGI-SPM has adhered to or neglected the recommendations proposed in the IAC review. We believe such an investigation is important due to the vital role played by the IPCC in constructing and communicating a consensus about the current state of climate knowledge to non-scientists, notably policymakers, but also other interested stakeholders.

Our intention is to broaden the current discussion of language use in the IPCC assessment reports from the calibrated language for handling uncertainties set out in the document 'Guidance Note for Lead Authors' (2010)[9] to also considering other language devices that may contribute to fulfil the communicative goals of the IPCC. By means of a comparative linguistic analysis, we therefore investigate how scientific claims are conveyed through expressions indicating various levels of (un)certainty, through the scalar systems such as those established by the IPCC to indicate levels of likelihood, confidence and evidence, as well as through non-predefined linguistic means. We further investigate to what extent the recommendations from the IAC on how to evaluate evidence and deal with uncertainty are reflected in AR5-WGI-SPM. We in addition consider in both SPMs to what extent contrasted statements referring to different claims may indicate different argumentative emphasis, without diverging from the overall purpose of the IPCC: to present a consensual view on current climate knowledge. Finally, inspired by the fact that the authors of AR5-WGI-SPM

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[1] http://www.ipcc.ch/report/ar5/

[2] http://www.ipcc.ch/report/ar4/

[3] http://reviewipcc.interacademycouncil.net/report/Climate%20Change%20Assessments,%20Review%20of%20the%20Processes%20&%20Procedures%20of%20the%20IPCC.pdf

[4] http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf

[5] http://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_SPM_FINAL.pdf

[6] http://www.ipcc.ch/report/ar4/wg1/

[7] http://www.ipcc.ch/report/ar5/wg1/

[8] Note that all the Assessment Reports (AR) comprise 3 Working Group (WG) Reports as well as a Synthesis Report. Each of the part-reports contains a Summary for Policymakers (SPM). The two SPMs analysed here are the ones from WGI of AR4 and AR5, respectively. The labels AR4-WGI-SPM and AR5-WGI-SPM are used in the running text and the tables to refer to the summaries in question. In the cited examples, the simplified labels AR4-SPM and AR5-SPM are used to denote the same two texts.

[9] http://www.ipcc.ch/pdf/supporting-material/uncertainty-guidance-note.pdf

call their text a "narrative" (p. 2), we examine to what extent the text corresponds to the typical narrative structure, with specific content components and actors. Recent research on the concept of narrative in the policy process (Jones 2010, 2013) has found that the use of "heroes" is "particularly powerful in shaping opinion about climate change" (Shanahan et al., 2013: 456).

Our findings will show that, as expected after the IAC review, there are observable differences between the two SPMs with regard to the issues we focus on. However, we also find that the IAC recommendations are only partially adhered to in AR5-WGI-SPM. Finally, we will claim that AR5-WGI-SPM does not represent a full narrative. These findings provide a basis for discussing possible implications for the potential impact of texts such as the SPMs on target audiences.

The structure of the paper is as follows: After a brief description of our material and theoretical foundation (section 2), we analyse how claims are conveyed through expressions for different levels of (un)certainty, and present some quantitative data relating to the two SPMs (section 3). We proceed to consider the issue of argumentative force of contrasted claims (section 4). Section 5 considers AR5-WGI-SPM from a text structure perspective, while we in section 6 discuss findings related to differences between the two SPMs as well as some paths for further studies.

2 Material and theoretical foundation

As already stated, this paper investigates two part-documents[10] from the IPCC, the SPM of WGI of AR4 and AR5. The IPCC on its website states that their work is "policy-relevant and yet policy-neutral, never policy-prescriptive".[11] To be policy-relevant and at the same time policy-neutral may represent a challenge (Fløttum and Dahl 2011). The SPMs are targeted at policymakers and based on the full WGI report's chapters, which represent the outcome of the assessment of numerous scientific papers. Given the context in which the summaries are produced – through specific approval procedures between scientific experts and government officials – they may be characterised as a scientific and political co-construction of knowledge and situated somewhere between scientific and political discourse.

The discipline of linguistics allows for a detailed analysis of language aspects ranging from macrostructure (the genre or text type perspective) to the study of micro-level elements (words and sentences). Meaning can be expressed in numerous ways, and the chosen expression or grammatical structure depends on a range of textual and contextual factors (Nerlich et al. 2010). The rhetorical function of a text, i.e. how the text 'interacts' with its readers (e.g. Hyland 2000), is influenced by language choices made at different text levels. In the current paper, we consider features linked to the micro-level, notably to discuss (un)certainty, as well as features related to the macro-level, in our consideration of AR5-WGI-SPM as a narrative text.

A basic theoretical assumption for our work is that all texts are inherently polyphonic, or multivoiced, so that a given text may present different points of view to which the author(s)

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[10] Our analysis is based on the running text only, excluding figures, tables and boxes.
[11] http://www.ipcc.ch/organization/organization.shtml

relate(s) in different ways (Fløttum 2010; Nølke et al. 2004). The most typical example of linguistic polyphony is reported speech ('NN stated that there is…') or quotations from external voices ('NN stated as follows: "…"'). However, for texts like the SPMs, where such instances of external voice are not found, it is interesting to study linguistic devices indicating implicit and *internal* polyphony (points of view existing within one authorial community). In a sentence like "The sea level on the west coast is now stable, but it will rise during the next decade", the connective *but* links two points of view in contrast, which may correspond to different, potentially divergent, scientific claims. The author(s) can agree with both; however, by inserting *but*, the second claim is emphasised as argumentatively stronger than the first one. This type of construction contributes in a subtle way to implicit argumentation.

Another theoretical assumption is that even if texts clearly are written by a specific author (authors), they are not (typically) unidirectional, from writer to readers. Rather, the writer takes the readers into account (Roulet et al. 2001). Objections that readers may be expected to have are countered, allowances are made for doubts and uncertainties in the information, evaluative (often promotional) expressions are used, e.g. to draw attention to *new* findings and *improved* methods. The features selected for investigation in sections 3 and 4 rest on these two basic assumptions of texts. For reasons of space, we will primarily present text examples from AR5-WGI-SPM. However, two tables (Table 1 and 2) in section 3 provide quantitative data from both SPMs.

3 Levels of (un)certainty in consensual claims

The aim of the IPCC in a general sense is "to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts".[12] This is commonly understood as a purpose of providing a consensus view on existing knowledge (see e.g. Corner and Hahn 2009). Obviously, "a clear scientific view" does not in itself imply a consensual view. However, in the context of the IPCC and the three Working Groups' SPMs, the line-by-line approval process undertaken by the participating members is intended to result in a document presenting a consensual view, through language that is comprehensible to policymakers. We hypothesise that in addition to the IPCC scalar expressions (see 3.1), (un)certainty will also manifest itself through other non-predefined linguistic expressions. These expressions may have different meanings and rhetorical effects (3.2).

3.1 IPCC expressions characterising likelihood, confidence and evidence

One important aspect dealt with in the IAC review (InterAcademy Council 2010) involves the scalar systems developed by the IPCC to communicate observations and findings related to likelihood, levels of confidence and degrees of evidential agreement, supporting claims and statements in the reports. These systems may be regarded as examples of the principle of writer-reader interaction: they have been consciously developed with a target group in mind. Table 1 presents the quantitative results for the use of pre-defined terms established by the IPCC to represent these various dimensions in the two SPMs:

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[12] http://www.ipcc.ch/organization/organization.shtml#.Ujqw2_M4Vdg

IPCC labels	AR4-WGI-SPM 5916 words		AR5-WGI-SPM 9708 words		
	N	Relative per 1000 words	N	Relative per 1000 words	Non-technical qualifications
LIKELIHOOD					
Virtually certain	0	0	6	0.618	
Extremely likely	0	0	3	0.309	
Very likely	13	2.197	22	2.266	
Likely	18	3.042	53	5.459	
More likely than not	1	0.169	2	0.206	
About as likely as not	0	0	2	0.206	
Unlikely	0	0	2	0.206	
Very unlikely	3	0.507	2	0.206	
Exceptionally unlikely	0	0	0	0	
Extremely unlikely	1	0.169	2	0.206	
CONFIDENCE					
Very high confidence	1	0.169	8	0.824	
High confidence	1	0.169	40	4.120	
Medium confidence	0	0	36	3.708	
Low confidence	0	0	15	1.545	
Very low confidence	0	0	0	0	
Non-technical use of confidence (not italicised)	6	1.014	8	0.824	<u>AR4:</u> increased, strengthening, higher, less <u>AR5:</u> greater, no, less, increased
EVIDENCE AND AGREEMENT					
Robust evidence	0	0	1	0.103	
Medium evidence	0	0	0	0	
Limited evidence	0	0	1	0.103	
Non-technical use of evidence	3	0.507	13	1.339	<u>AR4:</u> observational, insufficient, stronger <u>AR5:</u> new, indirect, observational, strong, strengthening, modelling, insufficient
High agreement	0	0	0		
Medium	0	0	0		

agreement					
Low agreement	0	0	0		
Non-technical use of agreement	1	0,169	1	0,103	<u>AR5</u>: improved

Table 1 Frequency of IPCC labels

We observe that there have been notable changes in the way different predefined levels of (un)certainty are expressed. In AR4-WGI-SPM, a quantitative scale of likelihood dominates. Here is an example:

(1) Average Northern Hemisphere temperatures during the second half of the 20th century were *very likely* higher than during any other 50-year period in the last 500 years and *likely* the highest in at least the past 1,300 years. (AR4-SPM, 9)

At times a confidence scale is used, but this scale is much more frequently used in the AR5-SPM (see Table 1), a trend also revealed by a word frequency analysis of the SPMs of AR4 and AR5 by Grundmann (reported in Pielke 2013). The IAC review criticises the use of both scales together and suggests that "the confidence scale is redundant when the likelihood scale is used" (InterAcademy Council 2010: 31). The review also raises the issue of differences in interpretation of probabilities by expert and non-expert audiences (e.g. Budescu et al. 2009; Patt and Schrag 2003). Later studies (e.g. Budescu et al 2014; Harris et al. 2013) have pointed to cultural and translation issues complicating the use of probability expressions. However, in AR5-WGI-SPM, we see that in addition there is abundant use of the likelihood scale. One may ask why both scales are used simultaneously, thus contravening the IAC recommendations.

The IAC recommends that all WGs should use a qualitative level-of-understanding scale in their SPM, "supplemented by a quantitative probability scale, if appropriate" (InterAcademy Council 2010: 39). This advice is also reflected in the Guidance Note accompanying AR5. The amount of *evidence* should be described as 'limited', 'medium' or 'robust', and the degree of *agreement* as 'low', 'medium' or 'high'. In contrast to the terms denoting likelihood and confidence, these new summary labels are not rendered in italics, which may make them less visible to readers.

Comparing AR4 and AR5, it is not surprising that we do not find any instances of these labels in AR4-WGI-SPM (except for some instances of non-technical use with various qualifications; see Table 1). In AR5, just a few instances are found. For combinations of a summary term and the word *evidence*, there is one occurrence with *limited* as well as one instance of *robust* (example 2).

(2) There is robust evidence that the downward trend in Arctic summer sea ice extent since 1979 is now reproduced by more models than at the time of the AR4 […]. (AR5-SPM, 11)

There are no occurrences of findings characterised by a summary term and the word *agreement*. However, there are some instances of the words *evidence* and *agreement* appearing either alone or in combination with another qualifier (see Table 1), as in (3)–(4).

(3) There is evidence for human influence in some individual ocean basins. {3.2, 10.4} (AR5-SPM, 13)

(4) Confidence in projections of global mean sea level rise has increased since the AR4 because of the improved physical understanding of the components of sea level, the improved agreement of process-based models with observations, and the inclusion of ice-sheet dynamical changes. (AR5-SPM, 18)

One may question to what extent the use/mix of both predefined and non-predefined qualifications of evidence and agreement provides the intended assistance in non-experts' interpretation of the SPM message.

Two of the IPCC scalar expressions not used in AR4-WGI-SPM are *virtually certain* and *extremely likely*. In AR5-WGI-SPM, there are six occurrences of *virtually certain* and three of *extremely likely*. We also note that there are eight occurrences of *very high confidence* (see examples (5)–(6)). The numerical value given for the first expression is '> 99% probability', for the second, '95–100%' and for the third, 'at least a 9 out of 10 chance of being correct'. With the conception of scientific knowledge as always containing a certain level of uncertainty, all three values seem to indicate the highest certainty levels any finding may achieve. The use of these expressions in AR5 indicates a strengthened basis for scientific certainty in the period between AR4 and AR5.

(5) It is virtually certain that there will be more frequent hot and fewer cold temperature extremes over most land areas on daily and seasonal timescales as global mean temperatures increase. (AR5-SPM, 15)

(6) The mean rates of increase in atmospheric concentrations over the past century are, with very high confidence, unprecedented in the last 22,000 years. (AR5-SPM, 7)

3.2 Non-technical linguistic devices for expressing different levels of (un)certainty
In addition to the scalar expressions technically defined by the IPCC, the texts make use of linguistic devices which are also used in everyday language, and which to varying degrees express certainty. The most important ones are discussed here, and their frequency is presented in Table 2.

Non-technical linguistic devices	AR4-WGI-SPM 5916 words		AR5-WGI-SPM 9708 words	
	N	Relative per 1000 words	N	Relative per 1000 words
Impersonal constructions:				
there is/are	11	1.859	43	4.429
Epistemic expressions:				
May	2	0.338	5	0.515
Could	5	0.845	2	0.206

Conditional expressions:				
if + would. could or other verb	7	1.183	4	0.412
Imprecise qualifiers:				
Mainly	4	0.676	1	0.103
Many	6	1.014	13	1.339
Generally	2	0.338	1	0.103
Booster words:				
improvement(s)/improved	11	1.859	9	0.927
Better	3	0.507	2	0.206
New	9	1.521	5	0.515
Contrasting expressions:				
But	14	2.366	14	1.442
However	4	0.676	6	0.618
even if	3	0.507	1	0.103
Not	17	2.873	19	1.957

Table 2 Frequency of non-technical linguistic devices

3.2.1 The impersonal construction There is/are

This is a traditional 'objective' device for not specifying the author(s) in scientific writing, as in the following examples:

(7) There is no clear trend in the annual numbers of tropical cyclones. (AR4-SPM, 9)

(8) There has been further strengthening of the evidence for human influence on temperature extremes since the SREX. (AR5-SPM, 13)

The relevance of this construction is that it implicitly expresses high certainty (in contrast to for example 'there may be'). It can be understood as a reduced version of the construction "We have found that there is …" where *we* (i.e. the authors) would represent the 'real subject' (in a grammatical sense) of the claim. From Table 2 we see that AR5 uses this construction more frequently than AR4 (43 versus 11).

3.2.2 Passive constructions with no expressed agent

Another device typical of scientific writing is the passive voice (e.g. Sager et al. 1980), as in "Sea-level rise has been observed by satellites during the last decades". It is a useful tool for topicalisation, enabling the theme of the claim (here: sea-level rise) to be presented first in the sentence. However, these constructions are often found without an expressed agent (human or non-human), as in the following example:

(9) The strongest ocean warming is projected for the surface in tropical and Northern Hemisphere subtropical regions. (AR5-SPM, 17)

These passive constructions are typically used with research verbs such as *estimate, observe, project* and *show*. When presented through the passive voice without an agent, the claim in question gives the impression of being certain, but without any acknowledged source or actor.

3.2.3 Epistemic and conditional expressions

There are numerous linguistic devices which contribute to modifying the truth value of statements. Some of the most common ones are modal verbs like *may, might, can* and *could*.

These have a complex semantic potential (Lyons 1977), but of interest in the present paper is their use as epistemic modifiers, adding nuances to categorical statements (Hyland 1998b). The distribution of the items we have considered is given in Table 2, and some examples are discussed below.

> (10) The Greenland Ice Sheet and other arctic ice fields likely contributed no more than 4m of the observed sea level rise. There may also have been a contribution from Antarctica. (AR4-SPM, 9)

In the perspective of (un)certainty or truth value, the modification from *there also have been...* to *there may also have been* is important. The modal *may* adds some uncertainty to the underlying statement. The message becomes less categorical, but at the same time we understand that the status of the reported research makes the modification necessary.

The modal *could* adds the same kind of uncertainty as *may* to the presented observations:

> (11) There is insufficient knowledge to quantify how much CO2 emissions could be partially offset by CDR on a century timescale. (AR5-SPM, 21)

In this context, the following passage from an editorial in *Nature* (2010) is worth quoting. The editorial is an attack on the media (blaming news reporters for not being sufficiently interested in the continuously accumulating scientific knowledge), including a "lecture" to climate scientists:

> This does not leave researchers who deal with the media impotent when they want to communicate uncertainty. They should learn from Kent [a previous CIA intelligence analyst] and the IPCC, and use more precise language. Kent identified 'weasel words', such as 'could', 'suggest' and 'may', that were best avoided because they were "expressions with sound but upon reflection almost without meaning". These are not words of science, but of the news media. The world is an uncertain place, but scientific findings can be virtually certain, likely, improbable or highly doubtful. Take your pick. (Nature, Editorial, 21 October 2010, 467: 883)

It seems odd to claim that the cited words are "weasel words" and not "words of science, but of the news media". There are numerous studies on the use of these types of hedging devices in scientific discourse (e.g. Hyland 1998b; Fløttum et al. 2006). As illustrated by Table 2 and examples (10)-(11) above, the IPCC also uses such modal expressions, albeit to a modest extent in the SPMs originating from the physical science-based WGI report.

Another construction of a similar kind is the conditional construction introduced by *if* and the subjunctive verb form *were,* followed by the modal *would* in the subsequent proposition:

> (12) (…) if this contribution were to grow linearly with global average temperature change, the upper ranges of sea level rise for SRES scenarios shown in Table SPM.3 would increase by 0.1 to 0.2 m. (AR4-SPM, 14)

The conjunction *if* introduces a hypothesis, which is followed by a nuance of uncertainty added to the scenario presented.

These expressions may all affect the perception of (un)certainty, and contribute to less definite messages. This may annoy policymakers, who tend to prefer messages which are 'certain' and can be transformed directly into measures and action, as expressed by former Danish Prime Minister Anders Fogh Rasmussen at a conference for climate researchers in 2009 (see Hope 2010):

> "I would give you the piece of advice, not to provide us with too many moving targets, because it is already a very, very complicated process. And I need your assistance to push this process in the right direction, and in that respect, I need fixed targets and certain figures, and not too many considerations on uncertainty and risk and things like that."

However, a balance must be struck between a sound scientific foundation and the needs of policymakers, and these expressions from everyday language ensure that the politicians are alerted to the current status of the claims. The modal devices presented above constitute useful tools for this purpose. The question is how easily these non-predefined expressions are interpreted in comparison with the IPCC predefined expressions of uncertainty, which in addition in many cases are typographically visible through the use of italics.

3.2.4 Imprecise modifiers

Some adverbs will through their meaning impose a tone of certainty on statements in which they occur, without expressing any absolute truth. However, it should be noted that there will always be limitations to the capacity of language to express precision in the way the IPCC is striving for. Typical examples of this phenomenon are *generally* and *mainly*. They may also be characterised as implying imprecision, but it is a kind of imprecision which is 'positively' oriented. Table 2 shows the number of occurrences in each SPM for these two adverbs as well as for the quantifier *many*, which has a similar effect. It may be discussed whether *mainly* conveys a higher degree of precision than the other two, but a definite answer would require an in-depth linguistic investigation of the word in a variety of linguistic contexts. Here are some examples:

(13) Simulated global-mean trends in the frequency of extreme warm and cold days and nights over the second half of the 20th century are generally consistent with observations. (AR5-SPM, 10)

(14) There is *very high confidence* that these losses are **mainly** from the northern Antarctic Peninsula and the Amundsen Sea sector of West Antarctica. (AR5-SPM, 5)

In situations where it is not possible to state absolute numbers, but where it still is relevant to express a comprehensive and general existence of some fact, the modifier *many* can be used:

(15) Surface temperatures will remain approximately constant at elevated levels for many centuries after a complete cessation of net anthropogenic CO2 emissions. (AR5-SPM,20)

Even if these expressions are used at the expense of precision, they may seem to contribute to orienting the discourse towards certainty. In fact, what they do is only to demonstrate that science is making progress.

3.2.5 Booster words

General language devices are important in the framing of statements and may have a clear impact on interpretation. In the following, we will look at some non-technical words which serve to enhance the 'quality' of a claim, viz. *improvement/improved, better* and *new*. The words are heterogeneous in terms of grammatical status, representing nouns, verbs and adjectives. We discuss them here under the common heading of *boosters* (see e.g. Hyland 1998a), as they are used to draw attention to what may be described as the increased 'value' of a finding, a method, a model etc. In this way they may also be seen as contributing to the certainty of the phenomenon in question. Table 2 above provides the figures for the two texts, and examples (16)–(20) illustrate how they are used.

> (16) The understanding of anthropogenic warming and cooling influences on climate has **improved** since the TAR, […]. (AR4-SPM, 3)

> (17) There has been some **improvement** in the simulation of continental-scale patterns of precipitation since the AR4. (AR5-SPM, 11)

A further comment is pertinent here. The words *improve(d)* and *improvement* contain a positive feature, but this can be modified in different directions according to any accompanying qualifications. In (17), the pronoun *some* which qualifies *improvement* is very vague, and this particular combination cannot be interpreted as contributing to certainty in a significant way.

> (18) However, there is *high confidence* that regional-scale surface temperature is **better** simulated than at the time of the AR4. (AR5-SPM, 10)

The comparative adjective form *better* is in itself adding more certainty to the processes it describes. In (19)-(20) we observe that 'newness' in these cases is related to data, set of scenarios and climate model simulations which by themselves say nothing about certainty, but contribute to an understanding of science reported by the IPCC as increasing in quality:

> (19) **New** data since the TAR now show that losses from the ice sheets of Greenland and Antarctica have *very likely* contributed to sea level rise over 1993 to 2003 (see Table SPM.1). (AR4-SPM, 5)

> (20) A **new** set of scenarios, the Representative Concentration Pathways (RCPs), was used for the **new** climate model simulations carried out under the framework of the Coupled Model Intercomparison Project Phase 5 (CMIP5) of the World Climate Research Programme. (AR5-SPM, 14)

To sum up the analysis of the use of these non-predefined linguistic devices, we claim that they contribute to expressing various meaning nuances which may influence the overall understanding of certainty and uncertainty conveyed by the two SPMs. We note that there are no significant differences in the frequency of these expressions in the two SPMs, except for the use of *there is/are*.

3.3 "The scientific community"

We would like to draw attention to an expression found in AR5, viz. *the scientific community*. It is used twice in AR5-WGI-SPM but is not found in AR4-WGI-SPM. Here is one of the examples:

(21) Many semi-empirical model projections of global mean sea level rise are higher than process-based model projections (up to about twice as large), but there is no consensus in the scientific community about their reliability […].(AR5-SPM, 18)

This *scientific community* is a general expression with no precise reference. It probably comprises both the IPCC authors and scholars outside this community. However, it is a way of bringing in a human sender of the message, which may add a hint of a 'personal flair' to the otherwise objective and technical text. In this context, it may also be mentioned that there are no occurrences of the personal pronoun WE in the two SPMs studied here. The documents represent the collective voice of the IPCC, and the most obvious device for representing this voice would in a general language text have been WE, in its inclusive meaning ('we, the science community'). The fact that it is not used fits with the traditional view of scientific discourse as neutral and non-personal (Fløttum et al. 2006). It is interesting to note that the WGI-SPM of the First Assessment Report (1990)[13] started as follows: "We are certain of the following:…". In the WGI-SPM of the Second Assesment Report (1995)[14], however, this approach had changed to the impersonal one also seen in the subsequent reports. It may be noted that psychological experiments have shown that the level of engagement in climate change discourse increases when the discourse is founded in a WE-perspective (Haddad et al. 2012).

4 Traces of argumentation in contrasted claims

We know that the climate debate in general − due to the comprehensive impact of climate change and the high number of stakeholders involved − is particularly multi-voiced or polyphonic. There are many important questions related to the voices participating in this debate: Which voices are present, explicitly or implicitly, which ones are the dominant ones and which voices are absent (Fløttum 2010; Fløttum and Dahl 2011; Fløttum and Gjerstad 2013)? The IAC review recommended that IPCC "Lead Authors should explicitly document that a range of scientific viewpoints has been considered" (InterAcademy Council 2010: 20). However, we do not find any clearly divergent viewpoints in the SPMs under study here. There are nevertheless traces of what we may call *internal polyphony* (presence of several viewpoints; see section 2). One obvious example of this is the connective *but*, linking two points of view in contrast, which may correspond to different claims. In this construction − p BUT q − there is no disagreement, but an implicit argumentation is presented, where the q statement is considered the most important (according to the linguistic instructions embedded in *but*). We observe in Table 2 that especially *but* and the similar connective *however* are relatively frequent in both SPMs (14 occurrences of *but* in both; 4 and 6 respectively of *however*). In addition, there are some instances of *even if* (3 in AR4, 1 in AR5)*,* with a concessive meaning. Here is an example with *however*:

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[13] http://www.ipcc.ch/ipccreports/far/wg_I/ipcc_far_wg_I_spm.pdf
[14] http://www.ipcc.ch/ipccreports/sar/wg_I/ipcc_sar_wg_I_full_report.pdf

(22) Current global model studies project that the Antarctic Ice Sheet will remain too cold for widespread surface melting and is expected to gain in mass due to increased snowfall. However, net loss of ice mass could occur if dynamical ice discharge dominates the ice sheet mass balance. (AR4-SPM, 17)

In everyday language, the interpretation of (22) could be rendered as follows: The authors accept that 'the Antarctic Ice Sheet will remain too cold for widespread surface melting'. Then, by the connective *however*, it is emphasised that what counts here and now is that 'net loss of ice mass could occur'. The connective *however* indicates that the last claim is the strongest argument, in a sense overriding the fact that the verb form *could* indicates a lower level of certainty than the verb form *will* in the p statement. These viewpoints seem to refer to specific claims about which there is consensus, but where the second one is presented as a stronger argument (implicitly for doing something) than the first.

In the next example, the argumentation concerning different findings is conveyed through a construction with *even if* (expressing a concession), and where the emphasis is on the claim in the following clause – *a further warming …*, also conveying contrast:

(23) Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected. (AR4-SPM, 12)

Constructions of negation realised through *not* can also convey different meanings. In its polemic use, it is clearly polyphonic, integrating an underlying and opposing point of view, as in the last part of the following statement:

(24) […] it is *extremely unlikely* that global climate change of the past 50 years can be explained without external forcing, and *very likely* that it is **not** due to known natural causes alone. (AR4-SPM, 10)

Here we see that an implicit point of view – 'it is due to known natural causes alone' – is refuted through the construction with *not.* The contrast is further emphasised by the former part of the statement, including the IPCC expressions *extremely unlikely* and *very likely.* It seems reasonable to interpret this as an implicit and consensual 'response' to the climate change critics opposing IPCC statements on anthropogenic climate change. However, of all the negation occurrences in AR4-SPM, this is the only one with a polemic meaning. The others are of the descriptive type, implying no polemic, thus fitting well into the consensus frame.

There is always a potential for some degree of subjectivity in the interpretation in this kind of analysis, but in AR5-SPM, the proportion of polemic negations seems to be higher. The following example may be seen as refuting an underlying viewpoint:

(25) There is *high confidence* that changes in total solar irradiance have **not** contributed to the increase in global mean surface temperature over the period 1986 to 2008, (AR5-SPM, 13)

However, again the SPM expresses a consensus on this refusal of solar irradiance contribution to surface temperature.

5 AR5-WGI-SPM from a text structure perspective
Both SPMs have a format which to some extent mirrors a classical scientific paper, with the exception of an explicit Discussion section. However, in the Introduction section of AR5-WGI-SPM, we find the following statement:

(26) This Summary for Policymakers (SPM) follows the structure of the Working Group I report. The **narrative** is supported by a series of overarching highlighted conclusions which, taken together, provide a concise summary. (AR5-SPM, 2)

It is interesting that the IPCC uses the word *narrative* to refer to its own text. The notion of narrative has been used in a somewhat loose sense to describe a variety of texts genres. However, some research has also been done on applying the notion in a more rigorous way in order to understand to what extent there may be a 'storyline' in non-fiction texts related to climate change (Fløttum 2013; Fløttum and Dahl 2012; Fløttum and Gjerstad 2013). With a basis in our previous studies on UN documents and White Papers related to climate change, we argue that such documents can be considered to be part of what could be called *climate change narratives*. By this term we refer to text and talk presenting climate change as a certain type of complication, with implicit or explicit recommendations or imperatives for action(s) taking place or that should be taking place to achieve some particular effect(s). In other words, narratives have a plot. In addition, different characters or actors are involved, such as nature, humans, society and countries, in the roles of hero, victim or villain. The classical structure of a narrative comprises typically (Adam 2008) five components – Introduction, Complication, Reaction, Resolution and Final situation. Among these, the Complication component is mandatory. The Reaction component may include suggestions of action (or non-action) which could or should take place to achieve some particular effect(s).

Now the question is: to what extent does AR5-WG1-SPM have a structure of this kind? The answer is not straightforward. However, it is clear that the text emphasises the Complication component, and thus the starting point for a plot is in place. Through the projected scenarios included in the report –in the shape of four Representative Concentration Pathways – potential future or Final situations are also integrated. However, there is one component that is missing in order to fulfil a 'real' story: the Reaction component. Thus, there is no clear storyline in the Summary. Even though there are indications of a temporal development, e.g. "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia." (p.3), there is no line from Complication via Reaction to a Final situation. Thus, the IPCC's use of the term *narrative* in its traditional sense is not borne out by the structure of the SPM. This is not surprising, as the SPM of WGI is a summary of the physical science basis. Also, by not including a Reaction component, which would contain recommendations and imperatives for action, the IPCC is loyal to the requirement of being policy neutral. However, we may see implicit 'scientific reactions' through the claims which are presented as relatively uncertain, thus requiring more research. Further, it may also be argued that numerous IPCC claims clearly indicate pertinent political reactions (such as measures to reduce emissions of CO2), but this is not explicitly stated.

The issue of storyline will, however, be an important one when the full AR5 report including the Synthesis Report becomes available during 2014. As it turns out, the SPM of WGIII (but not of WGII) also uses the word *narrative*. When all the part-reports are finalised, it will also be more relevant to examine to what extent we can identify different characters assuming narrative roles such as hero, victim and villain. Our hypothesis is that there will be no clear heroes in any of the part-reports, but victims and villains are likely to be identifiable. Already in the SPM under study here, we can perceive implicit villains (humanity as a whole) as well as victims (both nature and humans).

In the introduction to AR5-WGI-SPM, the IPCC refers to the important "series of overarching highlighted conclusions" for policymakers. From a content perspective, when taken together, these highlights provide a concise summary of the text. But there is no textual coherence between the highlight statements, which would be needed for this to constitute a coherent story, a narrative. Thus, no full 'story' is being told, neither in a narrative sense nor through the highlighted conclusions. However, what the highlights do contribute to is an increased understanding of the extremely complex phenomenon of climate change, or more specifically, the observed changes, drivers and future global and regional developments.

6 Discussion

In this paper we have shown that the IPCC Assessment Reports (AR) 4 and 5 display notable differences in terms of how they represent certainty in their Working Group I Summary for policymakers (WGI-SPM). AR5 makes extensive use of both the likelihood and confidence scales, while the confidence scale is almost absent in AR4. This raises the question of what the implications are of using both or only one of these scales for the understanding of the documents. This is an issue that requires further research. It is also somewhat surprising that the AR5 authors have not followed the IAC's advice of not to use the confidence scale when the likelihood scale is used. Along the same lines, we also wonder why the new summary terms (e.g. 'medium evidence', 'high agreement') proposed by the IAC were not used in AR5-WGI-SPM. What we found was that the word *evidence* is used fairly extensively, but – except for two instances − not in combination with the recommended qualitative labels. This is all the more surprising since extensive discussions have taken place in the past couple of years regarding the language used in the IPCC reports.

Another difference between the two summaries is the use of *virtually certain* and *very high confidence* in AR5-WGI-SPM, two expressions which were not seen in AR4-WGI-SPM. The use of these in AR5 indicates an increased level of certainty in the period between the two reports. Thus, the findings characterised by these expressions do not necessarily concern new phenomena; rather, the expressions add more certainty to previously investigated phenomena. This may also contribute to strengthening the impact of the reports, something which non-technical booster words like *better* and *improved* also contribute to. Other non-technical linguistic constructions studied contribute to various meaning nuances which may influence the overall understanding of certainty and uncertainty conveyed by the two SPMs, but with no significant quantitative differences in occurrences between the two SPMs.

Further, we have drawn attention to constructions bringing in contrasted statements referring to different claims. When linguistic devices (such as *but* and *however*) indicate one claim as more important than another, this contributes to an argumentative tone – typical of scientific papers (Fløttum et al. 2006) – which otherwise seems to be absent from the IPCC summaries.

Thus, the two SPMs – through well-known linguistic devices, both IPCC-defined and everyday language devices – adhere to the expressed purpose of the IPCC, namely to present a consensual message to be used by policymakers; a message which is publicly recognised with genuine controversies not included. Thus the ongoing debates manifesting themselves outside the context of the IPCC work do not have a place in the IPCC SPMs. One may wonder if this consensus dominance is contributing to the overall understanding of the multifaceted climate change phenomenon, or whether more emphasis on divergent perspectives would facilitate or improve the understanding (Hulme 2013).

This has not been a text reception analysis, and it is therefore difficult to assess the impact of the new layout presented in AR5, mainly in the shape of highlights extracted from all chapters and presented in high-visibility locations. However, from a cognitive and linguistic point of view, it has been established (e.g. van Dijk 1980) that presenting readers with the essence of a text (i.e. a summary of the main points), enhances the understanding of the message. In this way, the new format is likely to serve policymakers better than previous reports.

Regarding the text structure, introduced as a *narrative* in the AR5-WGI-SPM introduction, there are components which clearly match a storyline interpretation. However, the Reaction component is lacking, even though it may be seen as implicit in the numerous observed climate changes and drivers. We expect an overarching storyline to become more prominent when all three Working Group reports are considered together in the Synthesis Report, a storyline which should represent the complete story that the IPCC can report. Finally, we may ask whether a more human face of climate change through linking powerful human stories to the scientific basis would have a more significant impact on target audiences for initiating appropriate reactions.

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