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IEEE GRSS WELCOMES CONTRIBUTIONS OF THE SOCIETY MEMBERS TO THE PREPARATION OF THE IPCC FIFTH ASSESSMENT REPORT

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I. Scope of the IPCC Fifth Assessment Report on Climate Change

The Intergovernmental Panel on Climate Change (IPCC [1]) is currently preparing its Fifth Assessment Report on Climate Change (AR5). More than 800 authors, selected from around 3000 nominations, are involved in writing the reports, including members of the IEEE GRSS [2]. The AR5 will consist of three Working Group (WG) Reports and a Synthesis Report that will be approved in 2013/2014 [3]:

- WG I: The Physical Science Basis – mid September 2013
- WG II: Impacts, Adaptation and Vulnerability – mid March 2014
- WG III: Mitigation of Climate Change – early April 2014
- AR5 Synthesis Report (SYR) – end October 2014

Earth observations are a central component of the WG I contribution to the AR5 that will assess observed changes, process understanding, and climate change projections in 14 chapters. Three of the chapters focus specifically on Earth observations of the atmosphere and surface, of the ocean, and of the cryosphere, respectively. Observations, in particular long-term and global remote sensing data, will also play an essential role in subsequent chapters on process understanding, for example to verify physical and biogeochemical processes in Earth system models, which are necessary to understand and project climate change. New elements of the AR5 WG I Report will include an end-to-end assessment of sea level change and the carbon cycle, and for the first time in a separate chapter an assessment of the understanding on clouds and aerosols. Greater emphasis will be put on regional

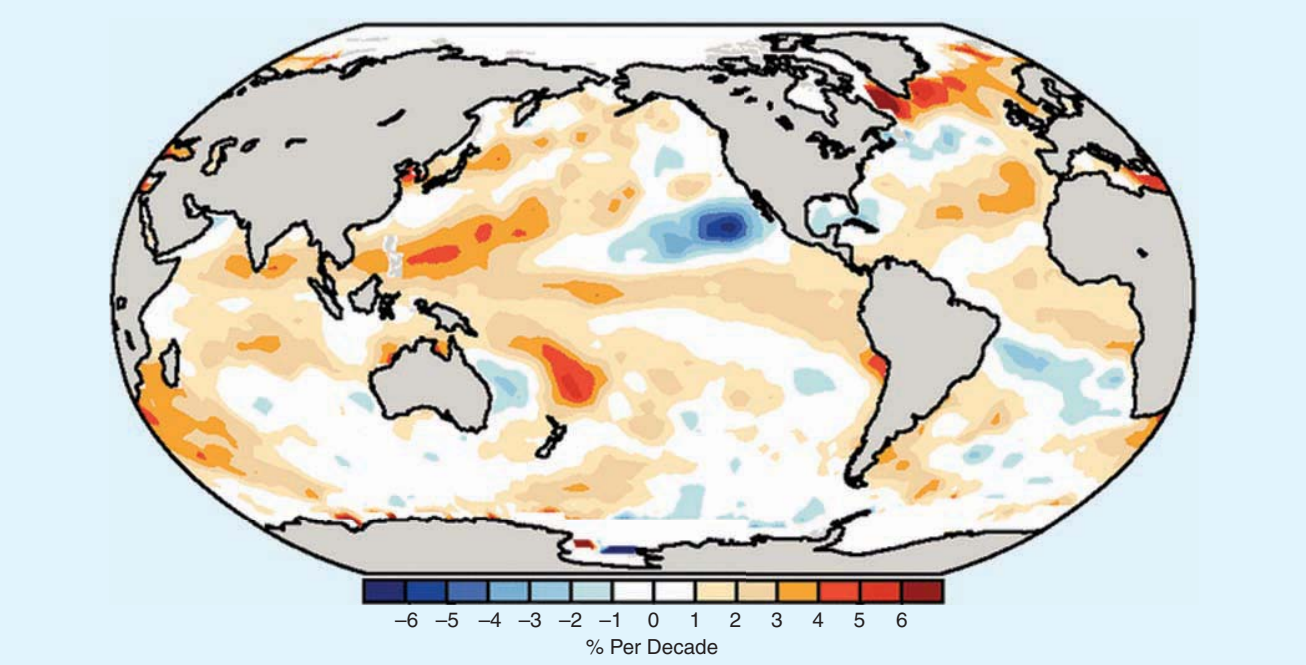

Figure 1. Water vapour in the atmosphere is increasing as a result of warming, and at the same time constitutes one of the major feedbacks that amplify the initial warming caused by the emission of anthropogenic greenhouse gases. The figure shows linear trends in precipitable water (total column water vapour) over the period 1988 to 2004 (% per decade) Figure TS.8. of [4].

information by specifically assessing key climate phenomena (monsoon, El Niño, etc.) and their relevance for future regional climate change. In addition, the coverage of climate change projections will be extended in WGI AR5 by assessing near- and long-term projections including stabilisation of greenhouse gas concentrations for the first time in two separate chapters.

The WG II report will contain two parts, one on global and sectoral aspects, and one on regional aspects. A broad range of impacts, including impacts on ocean systems will be assessed. Information on the impacts and costs of climate change will be considered for different sectors and regions. Special sections will be devoted to natural and managed resources and systems, and their uses, human settlements, industry, and infrastructure, as well as human health, well-being, and security. AR5 will provide a detailed analysis of risk management, the impact of multiple stresses, an expanded treatment of adaptation, and will consider the interaction between adaptation, mitigation and sustainable development.

WG III will assess the risks, economics and ethics and will treat socio-economic aspects of climate change and its implications for sustainable development. Global climate protection goals will be assessed with respect to concepts, costs and implications. Pathways for mitigating climate change will be evaluated for different sectors including energy, transport, buildings, industry and human settlement infrastructure. WG III will also address climate change response policies on the global, regional, national and sub-national level, as well as investment and finance issues.

Compared to the IPCC Fourth Assessment Report [4], more emphasis is put on an integrated assessment of interactions between climate change impacts, adaptation and mitigation across the three WGs, also at the regional level. The goal is to improve consistency throughout the WGs by addressing a number of cross-cutting issues. These include water and the Earth system, carbon cycle including ocean acidification, ice sheets and sea-level rise, as well as mitigation, adaptation and sustainable development. In addition, consistent methodologies will be applied including evaluation of uncertainties and risks, costing and economic analysis, regional aspects as well as treatment of scenarios and greenhouse gas metrics. Where possible integrative analyses will be performed, addressing inter- and intra-regional impacts as well as multi-sector synthesis.

Policy relevant scientific knowledge will be provided by all three WGs, for example information regarding Article 2 of the UNFCCC (referring to the "…stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system").

The IPCC assessment report is based as far as possible on peer-reviewed literature. To be included in AR5, papers have to be published or accepted for publication before the following indicative cut-off dates:

• WG I: submitted by 31.07.2012, accepted by 15.03.2013
• WG II: submitted by 31.01.2013; accepted by 31.08.2013
• WG III: submitted by 11.03.2013; accepted by 28.10.2013

The preparation of IPCC reports [5] is based on the voluntary contributions of many authors, contributors, review editors and reviewers. The composition of the lead author teams for each chapter reflects a range of views, expertise and geographical representation. IPCC reports undergo a comprehensive review of three stages. The first draft is reviewed by experts, the second draft simultaneously by both governments and experts. The summaries for policymakers, overview chapters and synthesis reports are subject to a government review, and are adopted or approved by consensus of governments in Panel sessions. The purpose of this review process is to ensure that the IPCC reports present a comprehensive, objective, and balanced view of the areas they cover.

II. Activities in Preparation of IPCC AR5

In support of AR5, the integrated assessment and climate modelling communities have been preparing a set of new coherent scenarios of future climates with information on radiative forcings, emissions and socio-economic development [6]. Consistent definitions of baseline and mitigation scenarios are critical to ensure comparability across WG contributions. Trajectories have been developed for future climate forcing through greenhouse gases. These so called Representative Concentration Pathways (RCPs) and the related emission trajectories are the new standard used in climate modelling for AR5. Each RCP could result from alternative sets of assumptions (socioeconomic scenarios) about future socioeconomic development, technology, and policy. This flexibility is an intentional and innovative feature of the RCP process. A framework is currently being established that will contain a new set of socioeconomic scenarios allowing for consistent assessments of climate change impacts and options for adaptation and mitigation.

In addition, the Working Group on Coupled Modelling (WGCM) of the World Climate Research Programme (WCRP) has agreed on a new set of coordinated climate model experiments in support of AR5 [7, 8]. This set of climate model simulations forms phase five of the Coupled Model Intercomparison Project (CMIP5). Its purpose is to address outstanding scientific questions that arose as part of the IPCC Fourth Assessment Report (AR4), to improve understanding of climate, and to provide estimates of future climate change. CMIP5 is a very ambitious coordinated model intercomparison exercise involving most of the climate modelling groups worldwide. This set of coordinated climate model experiments is expected to form a unique opportunity to undertake high-impact multi-model research on the fundamental physics of climate and its expected changes that can be assessed in IPCC AR5 [8]. Output from the CMIP5 model simulations is made publicly available for the community at the Earth System Grid web page [9].

Similarly, coordinated efforts are underway that actively support the model evaluation and analysis of CMIP5 data with satellite observations. Examples include the NASA initiative on Satellite Observations for CMIP5 Simulations and the ESA Climate Change Initiative (CCI). The goals of the NASA initiative are to provide the community with access to satellite observational data that are analogous to CMIP5 data in terms of variables, temporal and spatial frequency, and periods, and to provide a strategy for accessing them that closely parallels the model data archive [10]. The goal of the ESA CCI initiative is to produce consistent, error-characterized long-term data sets for selected essential climate variables (ECVs) from multiple instruments and satellite platforms to monitor and understand climate [11].

Within the scope of the IPCC work programme, a number of specific workshops and Expert meetings have been held in support of the IPCC assessment process, with reports and Good Practice Guidance Papers (GPGP) available online [1]. For example, the GPGP on Assessing and Combining Multi-Model Climate Projections provides recommendations for good practice in using multi-model ensembles for detection and attribution, model evaluation and global climate projections as well as regional projections relevant for impact and adaptation studies [12], and the GPGP on Detection and Attribution Related to Anthropogenic Climate Change provides recommendations for good practice in detection and attribution studies, including outlines on data requirements [13].

III. IPCC Special Reports

In addition to climate assessment reports, the IPCC is publishing Special Reports on specific topics. Recently, the Special Report on Renewable Energy Sources and Climate Change Mitigation was published [14]. This report assesses six Renewable Energy sources (bioenergy, direct solar energy, geothermal energy, hydropower, ocean energy, and wind energy). Renewable Energy technologies offer large potentials to contribute to climate change mitigation. The technical potentials of Renewable Energy sources exceed the current and projected global energy requirements substantially. The cost of Renewable Energy is falling and is in some cases already today comparable to current energy costs. Policy measures, investments and further research are needed at regional, national and local levels to further enable the technical potential of Renewable Energy. Another IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation will be published early 2012 [15].

IV. IPCC Reform Process

The procedures and processes of the IPCC have been enhanced [16]. This concerns the establishment of reports, e.g. clearer guidance for the consideration of sources of knowledge and protocols on how to handle scientific uncertainties across all three WGs, as well as for addressing possible errors in previous assessment reports. IPCC has also adopted a framework for its communications strategy. The operational management has been strengthened through the establishment of an Executive Committee. The terms of office of IPCC-leadership have been limited to one term with possible extension for one further term. A conflict of interest (CoI) policy has been adopted by the IPCC Panel that will protect the integrity, trust, and credibility of the IPCC and its reports through enhanced transparency. This policy applies to senior IPCC leadership, lead authors with responsibilities for report content, Review Editors, and the members of the Technical Support Units.

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