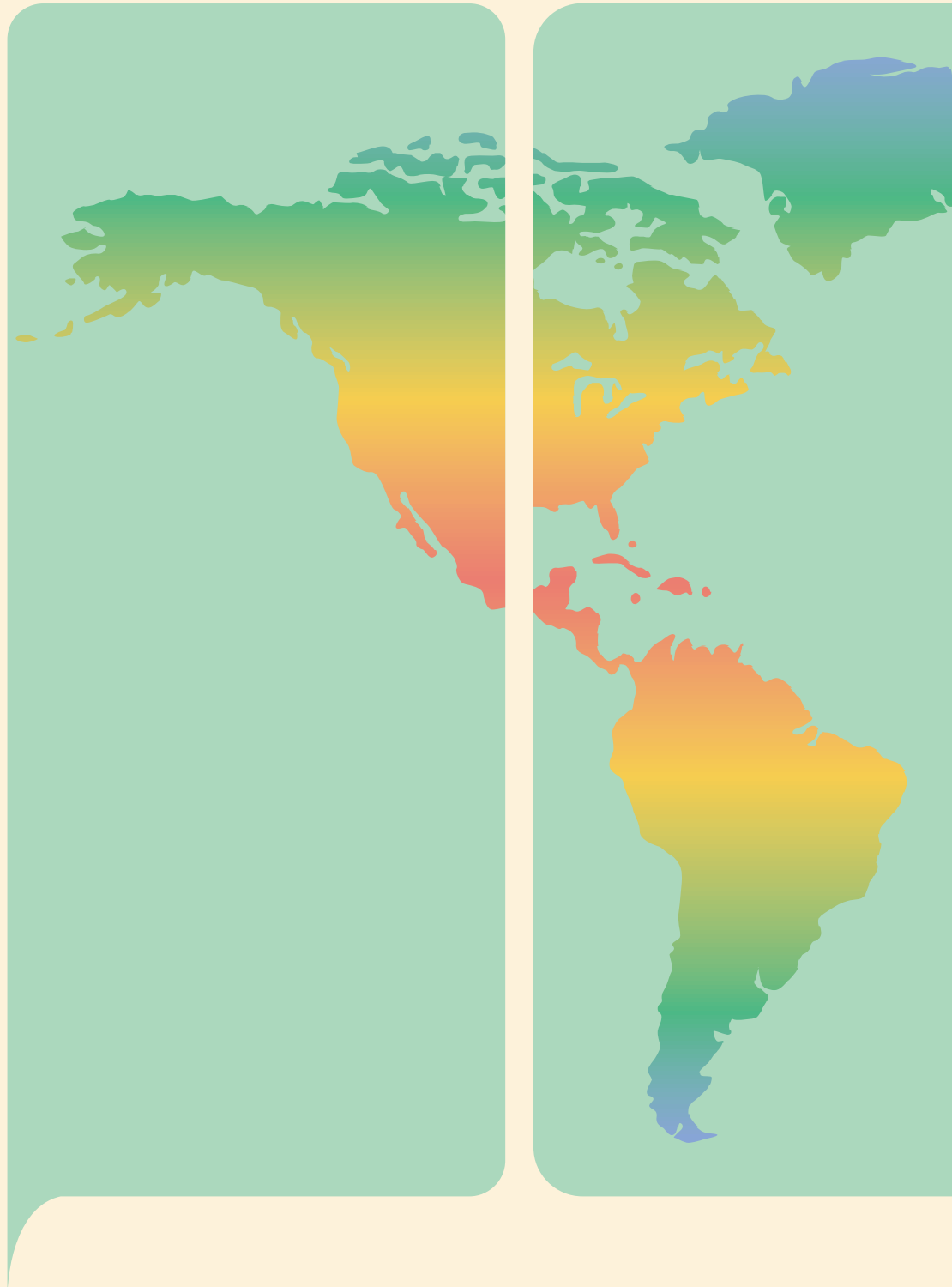
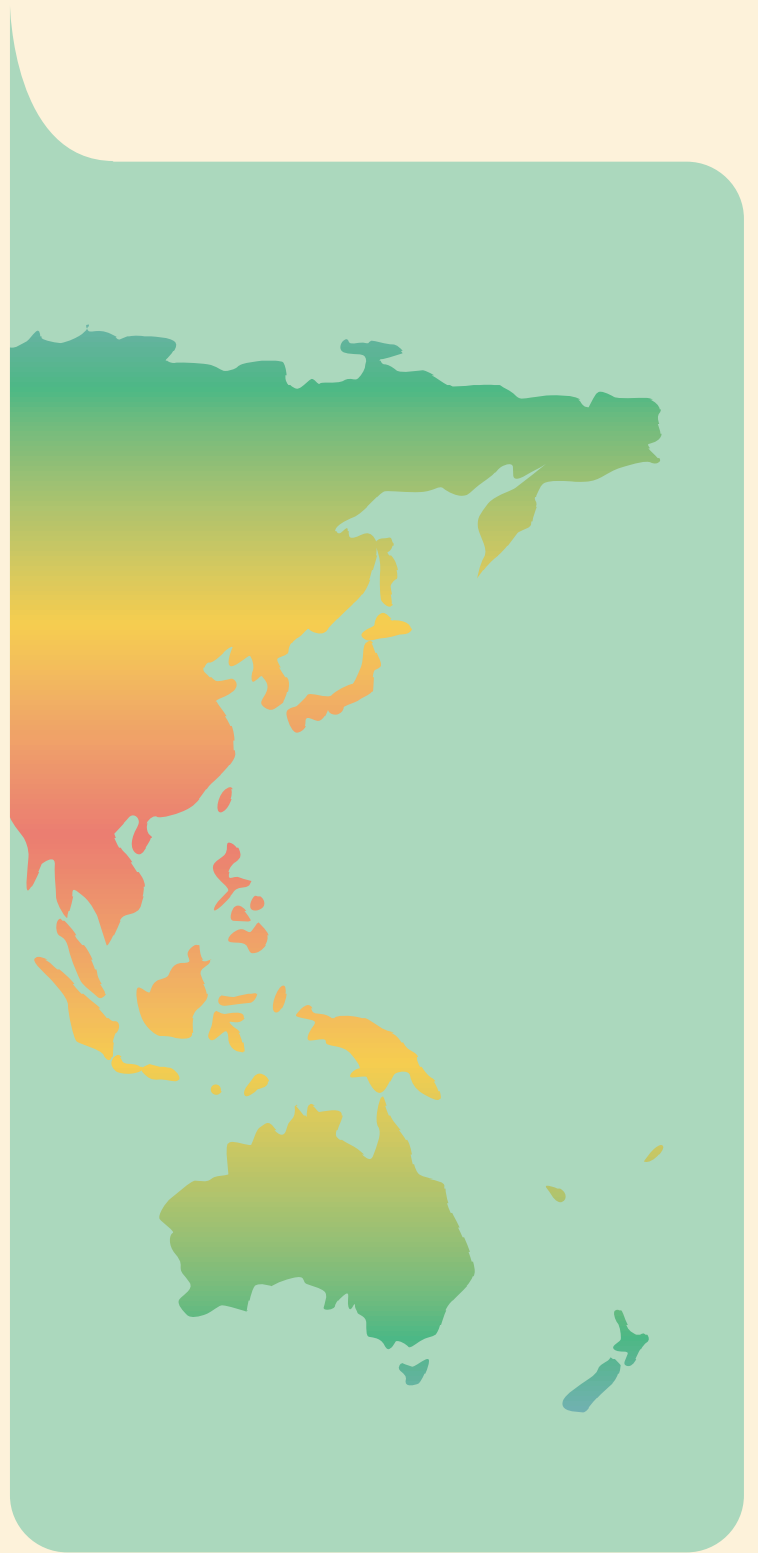
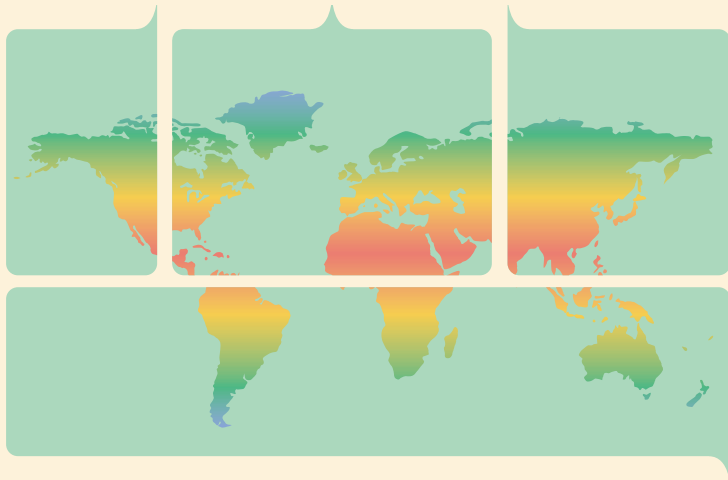

CLIMATE SYMPOSIUM 2014: Round-up

In the wake of the Climate Symposium 2014, which united international experts in climate observations, research, analysis and modelling, Director of the Joint Global Change Research Institute **Ghassem Asrar** shares his highlights of the event, while EUMETSAT Director General **Alain Ratier** discusses his contribution to the proceedings







Can you give an insight into the Climate Symposium, which took place 13-17 October in Darmstadt, Germany?

The Symposium was a major success by all accounts. Around 500 participants from 50 countries, including more than 100 early career scientists and students, attended. A combination of plenary and posters presentations, panel discussions and informal networking receptions and social events provided ample time for deliberation on major climate science challenges and opportunities, and the required observations.

For example, the invited speakers during the first day of the Symposium helped in framing the major observational capabilities required to address the World Climate Research Program (WCRP) and grand science challenges, and they put them in perspective of the political and societal benefits they offer. This also set the stage for detailed discussions in grand challenges theme orientated sessions in the subsequent days.

A dialogue with users and providers of science-based climate information for decision making highlighted the need for codesign, development, evaluation and use of such information, and the importance of better characterising and communicating the associated uncertainties of such information. The private sector participants who represented re-insurance, energy, commercial real estate and development organisations clearly articulated the type of information they need, and their willingness to accept the uncertainties associated with them as long as they are properly characterised and communicated. They were quite complimentary of the science community's efforts to provide the best scientific understanding and information about high impact weather/climate events that affect people and major infrastructure at the national and international level; the risks associated with sea-level variability and change, and impacts on populations and coastal systems; availability and distribution of fresh water resources, especially in mountain regions that are affected by snow and glaciers; and the interplay between water, energy, food and climate in developed and developing regions of the world. The presence of members of news and communication media, together with social media, made the Symposium and its deliberations accessible to those who could not be present in person in Darmstadt.

Can you highlight some of the major points raised around the event's six key themes?

A major and common theme for all sessions was a greater focus on understanding key underlying climate processes, such as the role of clouds, oceans and cryosphere in circulation of energy, water and carbon in the Earth System. This fundamental understanding is key for identifying and addressing the sources of uncertainty in our knowledge of Earth's climate system, hence the projection and prediction of future changes.

A focus on such complex Earth System processes requires coordinated observations of the Earth System domains (ie. atmosphere, ocean, cryosphere, land, etc.) and therefore a need for focusing on multi-parameter observations. This, in turn, requires a shift from individual climate/environment variables, which is currently practised, to a family of such variables that contribute to understanding these complex

processes. To achieve this objective, a greater focus on coordinated field experiments, together with a constellation approach to obtaining surface-based, sub-orbital and space-based observations needed for such purpose were identified to be high priority for the coming decades.

There was a general recognition of declining *in situ* observing networks for regions with limited scientific understanding and significant uncertainty, eg. Africa, Southeast Asia, Southern Oceans, etc. There was also a concrete proposal for routine and sustained economic analyses to quantify and communicate the value of observations and derived scientific information as a service to society, and for use by private sector and all decision makers. This should help with making the case for continued and sustained investments in observing networks globally.

There was considerable debate and discussion on the role that scientists can and should play in transfer and use of science-based information for decision makers. In this context, the role of boundary organisations and social and behavioural sciences were identified as key to success. There was a general recognition that the scope of these challenges and opportunities transcend individual nations, let alone single organisations, thus international cooperation is key to success.

The Symposium comprised large Executive and Science Committees. What are the key goals of the committees regarding the organisation of the event and what did you set out to achieve when planning began?

GA: The Executive Committee helped shape part of the Symposium agenda that framed the broad and encompassing topics in the first day, and facilitated the discussion and deliberations among the space agencies, scientists, private sector and NGO participants throughout the Symposium. The Science Committee shaped the agenda for the Symposium daily thematic sessions, invited and organised oral and poster presentations/speakers. Together, the two committees coordinated daily summary and distillation of the scientific findings and recommendations for reporting to the Symposium participants in the final day, and for inclusion in the Symposium statement. In this context, the early career scientists who were present at the Symposium played a major role in these daily activities. We believe this was a critical role for them, both in gaining experience by working with well-established senior scientists and for being the stewards of overall recommendations and findings in the future. Some of the early career scientists' poster presentations were selected and awarded the best prizes at the end of the Symposium. As such, it successfully accomplished its education and capacity development focus for early career scientists and students.

AR: The idea of the Symposium was first discussed between Ghassem and myself, and we converged rapidly on a concept structured around the grand scientific challenges of the WCRP, as opposed to a more common approach addressing each component of the Earth System and the relevant space-based observations. These challenges are the main priorities of the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) perspective, but in retrospect this was also key to the success and high profile of the event. This was indeed essential to convince Dame Professor Julia Slingo to accept chairing the Science Committee, to attract other leading researchers on the Committee and, ultimately, for all of them as a group to take ownership of the Symposium.

Conversely, it was initially a challenge for EUMETSAT to sell the concept to its partner space agencies expected to co-sponsor the event, for which it was more intuitive to think first in terms of satellite programmes and observations of the atmosphere, ocean, land and cryosphere. This was achieved through our chairmanship of the Executive Committee and an important factor was undoubtedly the involvement of a cross section of the Science Committee. The Executive Committee then kept the oversight and provided guidance toward achieving the agreed objectives of the Symposium, while the Science Committee could concentrate on the definition of the scientific programme, and on the networking required to attract high profile speakers. It was quite a task to put together such a comprehensive, well-balanced and high-profile science programme!

The last, but certainly not the least element was the Organising Committee led by a highly committed EUMETSAT team in charge of all organisation and logistic aspects, from the setup of the website to the post-Symposium survey. The organisation of the Symposium was as challenging as its success is rewarding.

As panel leaders, were there duties you fulfilled at the event itself?

GA: As a co-chair and convener, I contributed to the development of the Symposium agenda, engagement of speakers and panellist, chairing sessions/panels, and assisting with daily synthesis and summary of discussions. I worked very closely with other Committees' chairs and members to ensure Symposium's overall success. I also assisted the Symposium organisers with resources mobilisation that enabled active participation of early career scientists, students and some of senior scientists in the Symposium.

AR: As the Director-General of EUMETSAT, I had the obligations of the local host and main organiser of the Climate Symposium, which meant welcoming VIPs and ensuring, with my team, that everything worked as planned and that we were responsive to the unforeseen. One area of special attention was the roundtable on 'climate information for decision makers' involving high-level representatives from industry that I had organised with Ghassem.

In addition, although I would certainly not call it a duty, I personally attended the two full-day session, as well as the evening briefing from the EUMETSAT Chief Scientist, Dr Johannes Schmetz. Then, I participated in the closing Panel discussion on 'Future directions and next steps – response by the Earth Observation community', in my capacity of EUMETSAT Director-General, but also as the Chairman of the Committee on Earth Observation Satellites (CEOS). This was very exciting as we had to react 'live' to the findings and recommendations of all grand scientific challenge sessions of the Symposium presented by the rapporteurs and to answer well-informed questions from the leading scientists in the audience.

To what can the Symposium's success be attributed?

I believe the entire roster of speakers and presenters at the Symposium contributed significantly to its overall success by their high quality presentations and participation in lively discussions. The Symposium format was based mainly on plenary sessions and dedicated time for poster viewing and one-on-one exchanges among scientists were all acknowledged broadly by the participants as unique features of the Symposium. A major theme 'follow the water in the Earth System' became very popular and the focus of many sessions and side discussions. I observed many informal discussions and networking arrangements among the participants during the lunch and coffee breaks and evening receptions. I believe the true science impact of the Symposium will be realised through these teaming arrangements and cooperation, especially among the early career scientists for the years to come.

How did the Climate Symposium ensure effective communication between relevant stakeholders?

The Symposium used a variety of means to facilitate discussion among the stakeholders and participants prior to, during and following its successful completion. Prior to the Symposium, major stakeholders were invited to share their perspective and views on expectations and outcomes, and how they are contributing to the Symposium and its agenda. During the Symposium, in addition to regular plenary and poster sessions, the social media and traditional communication and outreach means such as reporters and news media members were used to share Symposium results as broadly as possible.

Daily news releases and articles appeared in the local, national and international news outlets based on interviews with the speakers and participants. Evening panel discussions and informal networking receptions were other popular venues for communication and discussion among stakeholders and participants. Some participants were interviewed and recorded on video for broadcast through a variety of venues. NASA

provided a large video-wall called 'Hyperwall' that helped demonstrate the power of space-based observations for understanding every aspects of Earth System in the form of video loops similar to high-definition short feature films, for the entire planet. Some of the Symposium participants were invited to present their talks to the rest of the participants using this unique capability.

SYMPOSIUM OUTPUTS

- A need for continued dialogue and greater interaction between Earth System research and modelling scientists, Earth observations experts and programmes and stakeholders for science-based climate information
- Greater focus on obtaining multiple climate observation records that are required to understand Earth System processes that are contributing to the uncertainties associated with current climate information used and future information required by decision making
- Mainstreaming the analyses of economic value of climate observations and information in risk management and decision making processes
- Design and evaluation of efficacy and adequacy of climate observing networks in the context of scientific challenges and opportunities (eg. WCRP Grand Science Challenges)
- Training and development of the next generation of Earth System scientists and experts, and their active engagement in planning and implementation of Symposium outcomes
- Sustained focus on co design, development and communication of climate information and knowledge with decision makers
- Enabling global climate services for regions and sectors

Are certain themes likely to be high on the next Symposium's agenda?

The answer to this question will probably differ based on perspectives of scientists and experts whose research focus on different aspects of the Earth System. The major themes that emerged repeatedly were global and regional fresh water availability and distribution; extreme events and their impact on people, infrastructure and natural systems; sea-level change and storm surge impacts on coastal communities; and fundamental understanding and characterising of processes that contribute to uncertainties in climate information used in decision making, and how to communicate such uncertainties to decision makers. Progress on these themes requires sustained focus on development of Earth System observations and models, and attracting the best minds to pursue these efforts. These are very complex and challenging tasks that cannot be addressed by individual nations, let alone single organisations or disciplines. They require international collaboration and coordination.



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