distribution, and new scenario simulations with improved models, such as those for glaciers, lake ice, and marine food webs, have become available. In many cases, uncertainties can now be better estimated than before because more models were included in the ensembles, especially for the Baltic Sea. With the help of coupled models, feedbacks between several components of the Earth system have been studied, and multiple driver studies were performed, e.g., projections of the food web that include fisheries, eutrophication, and climate change. New data sets and projections have led to a revised understanding of changes in some variables such as salinity. Furthermore, it has become evident that natural variability, in particular for the ocean on multidecadal timescales, is greater than previously estimated, challenging our ability to detect observed and projected changes in climate.

Prospects for the Future

In addition to assessment reports on the various Baltic Earth grand challenges and topics, Baltic Earth organizes conferences, workshops, and educational events like summer and winter schools. As of the 4th Baltic Earth Conference in Jastarnia, Poland, in June 2022, the first phase of Baltic Earth is slowly coming to a close and will be terminated after 11 years with the 5th Baltic Earth Conference in June 2024 in Latvia. The two years between the two conferences will be used to analyze the research gaps specified by the BEAR reports and to elaborate an updated Baltic Earth Science Plan with the goal of a pragmatic way forward: research goals that are timely and feasible. The discussions are just beginning, and the outcomes will define a new Baltic Earth phase.

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Meeting/Workshop Reports

Understanding and Modeling Atmospheric Processes: 3rd Pan-GASS Meeting

Monterey, CA, USA
25–29 July 2022

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Atmospheric processes from the micro- to meso-scale shape the world we live in by influencing the global water and energy exchanges. The 3rd Pan-Global Atmospheric System Studies (GASS) Meeting (https://www.gewexevents.org/meetings/3rd-pan-gass-meetingunderstanding-and-modeling-atmospheric-processes/) was held to review progress in the understanding and modeling of atmospheric processes, identify pressing issues and opportunities, and organize activities in the international research community to advance this understanding. The meeting was supported financially and through local organization by the U.S. Department of Energy's Lawrence Livermore National Laboratory.

After scientific discussions had largely retreated to the virtual world over the past two years, the community was eager to exchange again with colleagues in person. For some of the early career scientists, it was the first time they met some of their colleagues face-to-face and experienced the international collaboration that is so important to the field.

The conference was organized along four themes, which reflected current and future directions of activities in the GEWEX GASS Panel. Those themes were (i) organization of shallow and deep convection, including the underlying processes, their dependence on environmental conditions, their representation in numerical models, and their role in extreme events, large-scale circulation, and cloud feedbacks; (ii) surface–atmosphere interactions and the boundary layer, including the role of mesoscale processes in air–sea coupling, the role of land–atmosphere coupling in predictive skill, surface and orographic drag, and atmospheric boundary layer over land, ocean, and ice; (iii) cloud systems and associated processes (microphysics, physics, dynamics, radiation): convective systems, including shallow/deep transition, precipitation intensity and variability, scale-awareness and transition from parameterized to resolved convection, mixed-phase clouds, cirrus, and fog, polar clouds and planetary boundary layer processes, and radiative transfer; and (iv) towards global km-scale modeling of the Earth System: strengths and challenges; innovative approaches for high-performance comput-

ing, data analysis, and visualization; and science in support of the World Climate Research Programme (WCRP)'s Lighthouse Activity on Digital Earths. Around 200 participants from the international community participated through oral presentations, posters, and vivid discussions during breakout groups. For more information, including conference presentations, posters, and discussion summaries, see *https://www.gewexevents.org/meetings/3rd-pan-gass-meetingunderstanding-and-modeling-atmospheric-processes/*.

An important part of Pan-GASS meetings are breakout groups to discuss the progress of ongoing projects or the launch of potential new initiatives. Current GASS projects and activities, whose members met during the conference to discuss results and next steps, were the GEWEX Upper Tropospheric Clouds and Convection Process Evaluation Study (UTCC PROES), the Impact of Initialized Land Temperature and Snowpack on Sub-Seasonal to Seasonal Prediction (LS4P) project, the Diurnal Cycle of Precipitation (DCP) project, and the GEWEX Aerosol Precipitation (GAP) initiative. New activities of the community were discussed, such as one based on the EUREC4A field campaign (with a modeling intercomparison on the representation of the mesoscale organization of convection with an additional focus on air-sea fluxes), one based on shallow convective momentum transport, and another on global km-scale models. Similarly, an activity on the Cold-Air Outbreaks in the Marine Boundary Layer Experiment (COMBLE) field campaign is planned, with a focus on convective clouds during arctic cold-air outbreaks using nudged climate model runs to be able to compare directly with observations. the Lagrangian large eddy simulation (LES)/single column model (SCM) approach.

Other relevant community activities discussed during the meeting include 1) the WCRP Global Precipitation Experiment (GPEX) project, which will be a multi-year project targeting the improvement of precipitation prediction using an integrated observation and modeling strategy; and 2) the World Meteorological Organization's Year of Polar Prediction (YOPP) site intercomparison project, which is a coordinated, international process-based model evaluation project based on high-frequency, multi-variate observations at select Arctic and Antarctic supersites during the YOPP. Nudged climate simulations that could make the comparison between simulations and observations easier were also discussed.

In order to guide future GASS activities, three overarching questions were formulated from the meeting's discussions:

1. How do the micro- to meso-scale atmospheric processes control global water and energy exchanges?
2. What controls cloud phase and precipitation?
3. What controls the mesoscale organization of convection?

Implementation plans for the discussed topics are being prepared to help answer the above-listed questions, and interested scientists are invited to get involved and contribute to the activities.

Highlights of the GEWEX SSG-34

Monterey, CA, USA
26–27 July 2022

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GEWEX held the 34th session of its Scientific Steering Group (SSG) through two in-person meetings: SSG-34A from 3–5 May 2022 in Paris, and SSG-34B from 26–27 July 2022 in Monterey, California. This was the first in-person session since January 2020 (for SSG-32) due to COVID-19. While SSG-34A focused more on the discussions about the new GEWEX Science Plan and other strategy documents to align with WCRP's new priorities in anticipation of Phase IV (2023–2032) of GEWEX, SSG-34B emphasized the interaction with funding agencies and other programs. As the full report will be prepared later as a WCRP Publication (e.g., see last year's report at *https://www.gewexevents.org/wp-content/uploads/GEWEX-SSG33-report_V2.pdf*), here we provide a few highlights only.

GEWEX Panels are all proactive in organizing or planning exciting new activities, with a few examples provided here.

- The Global Land-Atmosphere System Studies (GLASS) Panel has launched a project on the modeling of solar-induced chlorophyll fluorescence (SIF) in land models (SIFMIP) as a bridge to better understand the coupling of energy and water cycles to the carbon cycle, and initiated another project on the Coupling of Land and Atmospheric Subgrid Parameterizations (CLASP).
- The GEWEX Hydroclimatology Panel (GHP) has engaged heavily with scientists in different continents to explore and develop regional hydroclimatological projects, and has proposed a Crosscutting Project on flooding, which has not received much attention in Earth system modeling.
- The Global Atmospheric System Studies (GASS) Panel has been efficient in completing, continuing, and initiating projects, and is expected to launch new initiatives soon that are related to shallow and deep convection and their organization/aggregation, as well as other topics.
- The GEWEX Data and Analysis Panel (GDAP) is in the process of developing a new strategy in helping the data and user community: instead of labeling "GEWEX data sets", GDAP will try to develop the GEWEX criteria for satellite data sets (related to the energy and water cycles) to meet through data assessment and analysis.

GEWEX has made good progress in integrating Process Evaluation Studies (PROES) into the existing Panel structure. These PROES are intended to integrate observation-based metrics to understand key physical processes in climate and to improve weather and climate models at their fundamental process levels. Now two such PROES, the GEWEX Aerosol Precipitation (GAP) initiative and the PROcess Evaluation Study on Upper Tropospheric Clouds and Convection (UTCC-PROES), will join the GASS