

45th Session of the WCRP Joint Scientific Committee (JSC)

27-30 May 2024

Report to the WCRP Joint Scientific Committee

APARC

1. Highlights for Joint Scientific Committee (including high-level publications, new achievements/products, and capacity building activities – in particular anything you feel should go into a WCRP annual achievement report or brochure)

- APARC has successfully completed its **rebranding from SPARC to APARC**. We have an updated website, have adopted the new logo from the WCRP rebranding, and have published an APARC Newsletter article about the rebranding.
- The APARC IPO has successfully transitioned from DLR, Germany to **FZ Jülich, Germany**.
- APARC welcomes 3 new scientific **Activities**:
 - Impact of chlorinated very-short-lived substances on stratospheric ozone (VSLS-MIP1)
 - Hunga Tonga-Hunga Ha'apai stratospheric impacts (HTHH)
 - Large Ensembles for Attribution of Dynamically-driven ExtRemes (LEADER)All of them are 3-year Limited-term cross-activity focused projects.
- An APARC **Training School** for Early Career Scientists (ECS) on "Climate Data Analysis and Artificial Intelligence in the Global South (AI4Climate)" was held at the University of Rwanda from 29-31 October 2023. The Training School was scheduled to follow the WCRP Open Science Conference in Kigali and was organized by Mohamadou A. Diallo, Michaela I. Hegglin, Amadou T. Gaye, and Theodore G. Shepherd, in collaboration with the University of Rwanda. It was attended by 30 researchers from Global South and North countries, selected based on their scientific background. APARC is planning a follow-on Training School in Dakar in 2025.
- APARC activities held several **meetings** (non-exhaustive):
 - FISAPS Workshop on Research Using High Vertical-Resolution Radiosonde Data (30 August-1 September 2023, Boulder, Colorado, USA)
 - Dynvar & SNAP Workshop: The Role of Atmospheric Dynamics for Climate and Extremes (9-13 October 2023, Munich, Germany)
 - HTHH workshop from 22-24 April 2024 in Paris, France.The following workshops received additional supported by ISSI and were held in Bern, Switzerland:
 - OCTAV-UTLS: Understanding Satellite, Aircraft, Balloon, and Ground-Based Composition Trends: Using Dynamical Coordinates for Consistent Analysis of UTLS Composition
 - SSiRC: Perspectives on stratospheric aerosol observations
- APARC activities published many **publications** in various journals (see appendix), including **special issues** led by APARC activities:
 - Towards Unified Error Reporting (TUNER):
AMT: https://amt.copernicus.org/articles/special_issue921.html
15 papers (April 2024)

- Atmospheric ozone and related species in the early 2020s: latest results and trends (ACP/AMT inter-journal SI): https://acp.copernicus.org/articles/special_issue1194.html
37 published papers (April 2024)
- The SPARC Reanalysis Intercomparison Project (S-RIP) Phase 2 (ACP/WCD inter-journal SI): https://acp.copernicus.org/articles/special_issue1242.html
6 published papers (April 2024)
- Chemistry and Climate Impacts of the Asian Summer Monsoon (ACAM; GRL/JGR-Atmos): <https://agupubs.onlinelibrary.wiley.com/hub/journal/19448007/homepage/call-for-papers/si-2023-001027>
- CMIP7 solar forcing roadmap **review paper**:
 - Funke, B., Dudok de Wit, T., Ermolli, I., Haberreiter, M., Kinnison, D., Marsh, D., Nesse, H., Seppälä, A., Sinnhuber, M., and Usoskin, I.: Towards the definition of a solar forcing dataset for CMIP7, *Geosci. Model Dev.*, 17, 1217–1227, <https://doi.org/10.5194/gmd-17-1217-2024>, 2024.
- ACAM-related **high-level publication**:
 - Laura Pan et al.: East Asian summer monsoon delivers large abundances of very short-lived organic chlorine substances to the lower stratosphere, *PNAS* 121, 2024; <https://doi.org/10.1073/pnas.2318716121>
 - Vogel, B., C. M. Volk, J. Wintel, V. Lauther, R. Müller, P. K. Patra, M. Riese, Y. Terao, and F. Stroh (2023) Reconstructing high-resolution in-situ vertical carbon dioxide profiles in the sparsely monitored Asian monsoon region, *Comm. Earth & Environ.*, 4, 72, <https://doi.org/10.1038/s43247-023-00725-5>.
- Coordinated new modelling experiments to contribute to the work of the CCMi, QBOi, and SNAP activities.

2. Planned science initiatives and major events (over next 1- 5 years)

- The APARC Strategic Plan 2022-2030 has been approved by the SSG and presented to the APARC community at the General Assembly. We are now in the implementation phase which will be a strong focus for APARC in 2024, establishing the new project structure. As part of its new Strategic Plan, APARC is continuing its efforts to include more tropospheric science. All current activities will be asked to submit refreshed science plans and objectives for the next 4 years that will be approved by the SSG.
- Planning is beginning for the APARC General Assembly in 2026. Specifically, we will survey the community to decide whether the event is re-run as a multi-hub event or a single site. It will include a hybrid option. Once this is decided we will solicit recommendations for a host(s).
- A Joint APARC/WCRP Workshop and Training School in the Global South. The APARC Outreach Advisory Panel is leading plans for a proposed capacity building activity which is intended to take place in Dakar, Senegal, in early 2025. The theme of the proposed workshop is “Data Science for Weather and Climate Research in the Global South” and will include discussions on actionable strategies for climate resilience and a long-term training program for early career researchers. A week-long training school is intended to follow the workshop on the topic of “Climate Data Analysis and AI in the Global South”. If funding for the workshop is approved by the JSC, APARC will lead the design, planning and promotion of the workshop and provide resources and content to the workshop and training school.
- APARC is supporting the International workshop on Stratosphere-Troposphere Interactions and Prediction of Monsoon weather EXtremes (STIPMEX) to be held in the Asian monsoon region in Pune, India, 2-7 June 2024 (<https://sparc-extreme.tropmet.res.in/>). ACAM and SSiRC members will attend the STIPMEX workshop. This conference includes a one-day pre-workshop training session for students and ECRs, particularly from India/Asia to give hands-on training on the latest global model outputs and different data analysis techniques about Stratosphere-Troposphere Interactions,

Atmospheric Chemistry and Transports, Extreme Weather Events, probabilistic forecasts etc. APARC is providing financial support for both the workshop and the training school.

- SSiRC will help in the organization of a VollImpact Meeting in Greifswald, Germany, 23-25 April 2025. VollImpact ('Revisiting the volcanic impact on atmosphere and climate – preparations for the next big volcanic eruption', <https://physik.uni-greifswald.de/ag-von-savigny/projects/dfg-research-unit-volimpact-for-2820/>) is a research unit funded by the Deutsche Forschungsgemeinschaft and consisting of several German universities and research institutes. The project's science goals are perfectly aligned with science goals and activities of SSiRC, and SSiRC will co-organize a workshop in Greifswald to foster and expand the international collaboration of VollImpact.
- If financial support is approved by the JSC, APARC is planning to launch an IPO Internship Scheme to provide experience for ECRs in scientific coordination and project management. This recognises that ECRs pursue a diverse range of career paths and many do not remain in a research environment.
- If financial support is approved by the JSC, APARC is planning to establish a series of skills training for APARC ECRs focusing on transferable and soft skills. The sessions will be facilitated by external trainers and will target ECRs from low and middle income countries who may have less access to similar training in their home institutions.

3. Planned Products, high-level assessments or other key outputs/publications

- The HTHH activity has the objective of publishing an APARC Special Report on the HTHH eruption ahead of the 2026 WMO/UNEP Ozone Assessment Report. The activity will focus an international effort to synthesise studies in the published literature for the broader community and to coordinate multi-model assessments.
- The VSLs-MIP1 activity aims at publishing an APARC Special Report in 2026. The activity will assess the impact of industry-related emissions of chlorinated VSLs on stratospheric ozone with new metrics for evaluating the impact of VSLs on ozone depletion and long-term trends.
- CCMi is working with the CMIP7 Forcing Task Force to produce an ozone forcing dataset for CMIP7.
- SOLARIS-HEPPA is working with the CMIP7 Forcing Task Force to produce the solar forcing dataset for CMIP7.
- LOTUS will contribute to the 2026 WMO/UNEP Ozone Assessment Report by updating observed vertically-resolved ozone trends.

4. Linkages with other Core Projects, Lighthouse Activities, Academy etc.

Synergies with other CPs and LHAs

- The HTHH Activity is strongly aligned with VolMIP from CMIP as it is conducting coordinated climate model experiments of the January 2022 Hunga Tonga eruption.
- LEADER is a new APARC Activity that will directly contribute to the EPESC LHA Working Group 2 on Integrated Attribution, Prediction and Projection.
- CMIP, Safe Landing Climates, ESMO, and My Climate Risk have expressed support for the APARC Training School in Dakar. Additional funding has been requested from International Commission on the Middle Atmosphere (ICMA). We will work with the Academy to promote the workshop.
- SSiRC have contacted the relatively new LHA "Research on Climate Intervention" (Daniele Visioni is co-lead) and will be happy to contribute our expertise on the topic of stratospheric aerosols to the SRM/SAI (for the models it does not matter whether the sulphate particles come from volcanoes or from targeted release). APARC co-chair Karen Rosenlof is part of the steering committee for the Climate Intervention LHA.
- SOLARIS-HEPPA activity lead Bernd Funke and Michaela Hegglin (CCMi) are members of the WCRP Climate forcing Task Team. They are developing the CMIP7 solar forcing and ozone datasets, respectively.

- *APARC is continuing efforts to connect to the GEWEX/CLIVAR Monsoon Panel. ACAM has appointed new activity leads in 2023 which provides an opportunity to forge new links. Both sides are very interested in establishing closer relationships but this is still emerging.*
- *Gravity Waves has some interaction with GEWEX, on the role of gravity waves relative to clouds. Contacts with the UTCC PROES activity, coordinated by Claudia Stubenrauch and Graeme Stephens have been made, with participation in some of their meetings.*
- *There are many synergies between APARC and ESMO through our modelling activities: QBOi aims to improve QBO modelling; SNAP through continued S2S activities; Masatomo Fujiwara is A-RIP liaison with the WCRP TIRA, which is now within ESMO.*
- *Hella Garny is the APARC representative on the Digital Earth's steering committee. APARC is particularly interested in gravity waves in high resolution models.*
- *ATC contributed to the WCRP-GCOS Task Team on Earth's Energy and Budget Cycles Task Force and Workshops.*

Added value (or concerns) on synergies with other CPs

- *SNAP continues to address matters of predictability. Following the ending of the joint WWRP/WCRP S2S project, SNAP is aligned with ESMO as the home for WGSIP. APARC would like to strengthen these links to build on the success of the S2S project.*
- *As part of the JSC review of CliC we discussed how the joint APARC-CliC Polar Climate Predictability Initiative (PCPI) has not been active for some time. It should be discussed whether this activity will be retired or revitalised.*

5. Partnerships with entities outside of WCRP

- *As part of its new Strategic Plan, APARC is in the process of establishing a new Partnerships Panel as a dedicated forum to review and plan APARC's engagement with other WCRP groups (CPs, LHAs) and with projects external to WCRP. The proposed IPO internship would support this initiative by conducting a mapping exercise and identifying 1-2 key partnerships to prioritise in the next 3 years.*
- *APARC activities continue close collaborations with IGAC:*
 - *ACAM collaboration with IGAC activities including MANGO and MAP-AQ*
 - *CCMi collaborate with the ROSTEES working group under the Tropospheric Ozone Assessment Report (TOAR) activity of IGAC*
 - *LOTUS collaborates with the IGAC TOAR activity to interpret changes in tropospheric ozone that contribute to the total ozone changes.*
 - *An OCTAV UTLS representative attends the IGAC TOAR-2 meetings.*
- *ACAM: collaboration with ACCLIP on the regional and global impact of the Asian summer monsoon*
- *ACAM: collaboration with the NASA ASIA-AQ field experiment in 2026*
- *LOTUS & OCTAV UTLS activities collaborate with the WMO GAW and NDACC by using the ground-based ozone (and other) records for trend analyses. Some PIs of ground-based records are members of the LOTUS activity. LOTUS also collaborates with the satellite community including NASA, ESA, NOAA, and EUMETSAT that provide combined long-term ozone records.*
- *SOLARIS HEPPA is strongly interacting with SCOSTEP within its PRESTO Science Programme.*
- *With respect to research on the tropospheric OCS budget, SSiRC collaborates with COSANOVA, a community of researchers that use atmospheric measurements of carbonyl sulfide and other emerging methods in ecosystem science.*
- *The Hunga Tonga activity will inform the 2026 WMO/UNEP Ozone Assessment.*
- *APARC continues to cooperate well with CEDA for long-term storage of data from various APARC activities. A next step is to publicise datasets to a wider user base.*

6. Suggestions, issues or challenges:

- *With each new Scientific Outreach Panel, APARC intends to strengthen each existing partnership with institutions and academies in the Global South by promoting capacity building through training of ECRs tailored to their current and future interest, and partnership between institutions and academies in the Global South and North. The Global Fellowship is an excellent opportunity that will enable APARC to make a significant impact by improving leadership diversity, equity, integrity and open access to climate science. When the call for applications for the Global Fellowship opens, APARC will aim to host 2-3 ERCs to train them in machine learning and AI for climate and weather research; observational instrument development; scientific coordination and project management as part of the IPO internship program, as well as transferable skills and soft skills. A set of host institutions and academies in the Global South and North will be identified, with strong involvement of APARC's SSG through APARC's Science Outreach Coordination Panel to foster partnerships between early-career, mid-career and established scientists in the Global South and North.*

Appendix: List of Publications from APARC activities within the reporting period (non-exhaustive)

- Bramberger, M., Goetz, D., Alexander, M. J., Kalnajs, L., Hertzog, A., & Podglajen, A. (2023). Tropical wave observations from the reel-down atmospheric temperature sensor (RATS) in the lowermost stratosphere during Strateole-2. *Geophysical Research Letters*, 50, e2023GL104711. <https://doi.org/insu.bib.cnrs.fr/10.1029/2023GL104711>
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- Clemens, J., Vogel, B., Hoffmann, L., Griessbach, S., Thomas, N., Fadnavis, S., Müller, R., Peter, T., and Ploeger, F.: A multi-scenario Lagrangian trajectory analysis to identify source regions of the Asian tropopause aerosol layer on the Indian subcontinent in August 2016, *Atmos. Chem. Phys.*, 24, 763–787, <https://doi.org/10.5194/acp-24-763-2024>, 2024. Ern, M., Diallo, M. A., Khordakova, D., Krisch, I., Preusse, P., Reitebuch, O., Ungermann, J., and Riese, M.: The quasi-biennial oscillation (QBO) and global-scale tropical waves in Aeolus wind observations, radiosonde data, and reanalyses, *Atmos. Chem. Phys.*, 23, 9549–9583, <https://doi.org/10.5194/acp-23-9549-2023>, 2023.
- Fujiwara, M., Martineau, P., Wright, J. S., Abalos, M., Šácha, P., Kawatani, Y., Davis, S. M., Birner, T., and Monge-Sanz, B. M.: Climatology of the terms and variables of transformed Eulerian-mean (TEM) equations from multiple reanalyses: MERRA-2, JRA-55, ERA-Interim, and CFSR, *EGUsphere* [preprint], <https://doi.org/10.5194/egusphere-2023-2917>, 2023. Funke, B., Dudok de Wit, T., Ermolli, I., Haberreiter, M., Kinnison, D., Marsh, D., Nesse, H., Seppälä, A., Sinnhuber, M., and Usoskin, I.: Towards the definition of a solar forcing dataset for CMIP7, *Geosci. Model Dev.*, 17, 1217–1227, <https://doi.org/10.5194/gmd-17-1217-2024>, 2024.
- Kiefer, M., D Hurst, G Stiller, S Lossow, H Vömel, J Anderson, F Azam, J-L Bertaux, L Blanot, K Bramstedt, J. P. Burrows, R. Damadeo, B. M. Dinelli, P. Eriksson, M. García-Comas, J.C. Gille, M. Hervig, Y. Kasai, F. Khosrawi, D. Murtagh, G. E. Nedoluha, S. Noël, P. Raspollini, W. G. Read, K. H. Rosenlof, A. Rozanov, C. E. Sioris, T. Sugita, T. von Clarmann, K. A. Walker, and K. Weigel: The SPARC water vapour assessment II: biases and drifts of water vapour satellite data records with respect to frost point hygrometer records, *Atmos. Meas. Tech.*, 16, 4589–4642, <https://doi.org/10.5194/amt-16-4589-2023>, 2023
- Kloss, C., Bossolasco, A., Thomason, L., Legras, B., Berthet, G., Jégou, F., et al.: Reconsidering the existence of a trend in the Asian tropopause aerosol layer (ATAL) from 1979 to 2017. *J. Geophys. Res.: Atmospheres*, 129, e2023JD039784. <https://doi.org/10.1029/2023JD039784>, 2024.
- Ko, H.-C., H.-Y. Chun, R. Sharman, and J.-H. Kim, 2023: Comparison of eddy dissipation rate estimated from operational radiosonde and commercial aircraft observations in the United States, *J. Geophys. Res. Atmos.* 128(20).
- Lee, Y.-S., H.-Y. Chun, and H.-C. Ko, 2023: Lower tropospheric states revealed in high vertical-resolution radiosonde data in Korea and synoptic patterns for instability based on a self-organizing map. *Atmos. Res.* 295, 107037.
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