Final report 2024 for Flagship Pilot Study Convection-Permitting Third Pole (CPTP)

Describe status on fulfilment of the objectives of the project, major outcomes/scientific highlights, what were the main challenges or (if applicable) reasons why you didn't achieve some goals or why some goals were changed, lessons learned, what can be transferred to other domains/projects/activities, how did you engage users/stakeholders and work with the end-to-end perspective during the project period. Include some illustrative photos and graphics of results.

Status on fulfilment of the objectives of the project

The CPTP flagship pilot study has produced multi-model, multi-physics ensembles of convection-permitting simulations, firstly for three case study periods covering different meteorological conditions/phenomena (MCS case, monsoon) and secondly for the water year 2020 (October 2019 – September 2020). The water year 2020 was selected because of the high number of extreme precipitation and flooding events that occurred in the Third Pole region in summer 2020 and the availability of observational data. The project's modelling strategy, experimental design, and a first evaluation of the case study simulations (36 ensemble members) are published in Prein et al., 2023 (https://link.springer.com/article/10.1007/s00382-022-06543-3). The ensemble for the water year 2020 consists of 13 simulations from 10 research groups. An evaluation of the ensemble's performance compared to observations and added value compared to the driving reanalysis ERA 5 has been published by Collier et al., 2024 (https://doi.org/10.1007/s00382-024-07291-2).

So far two research groups have performed decadal runs (University of Innsbruck, Austria and IAP Beijing, China). More groups are determined and planning to do so but need to find the resources (human, computational, storage) to do so. Some groups also want to perform more tests and analysis of the shorter runs before running computationally expensive decadal simulations.

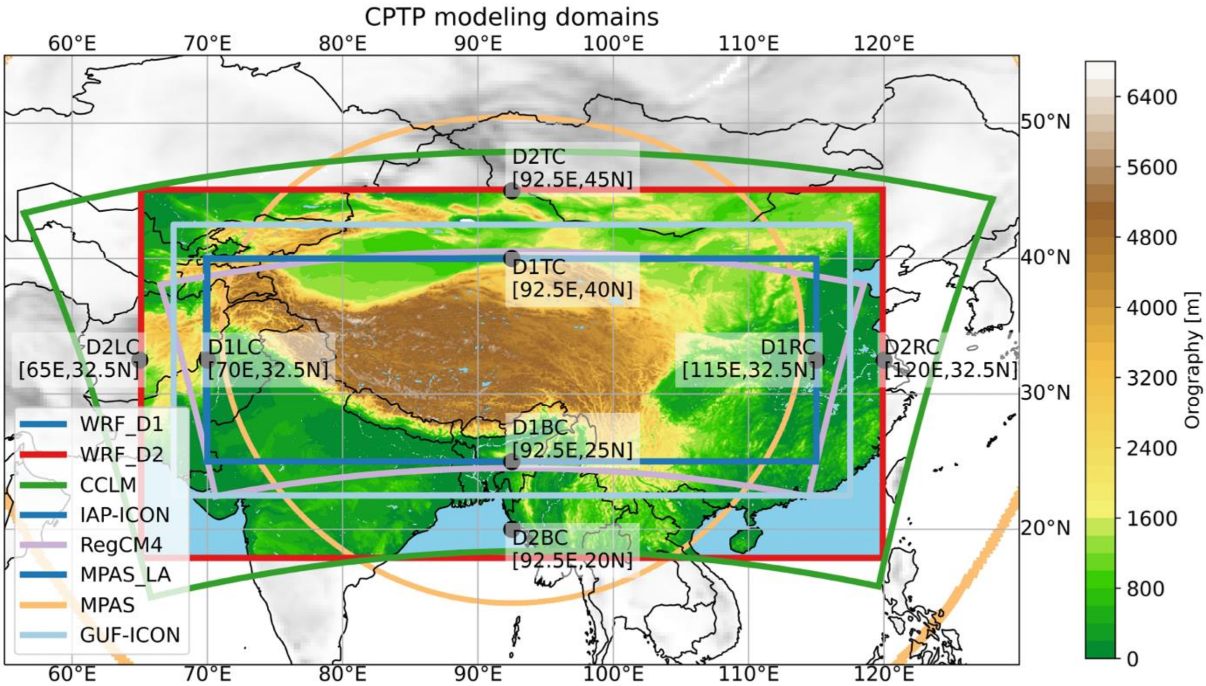

Fig. 1 *Topography and computational domains used in the CPTP project. The minimum domain sizes for domain D1 and D2 are shown according to their top-center (TC), rigth-center (RC), bottom-center (BC), and left-center (LC) points (Fig. 1 in Prein et al., 2023).*

Major outcomes/scientific highlights

1) The CPTP project overview paper introduces the experimental design and first results from multi-model, multi-physics ensemble simulations of three case studies. The five modeling systems show high performance across a range of meteorological situations (a monsoon case, a MCS case, and a snowfall event) and are close to having "observational quality" in simulating precipitation (Fig. 2) and near-surface temperature. This is partly due to the large differences between observational datasets in this region, which are the leading source of uncertainty in model evaluations. However, a

systematic cold bias above 2000 m exists in most modeling systems. Model physics sensitivity tests performed with the Weather Research and Forecasting (WRF) model show that planetary boundary layer (PBL) physics and microphysics contribute equally to model uncertainties. Additionally, larger domains result in better model performance. Therefore, the CPTP WRF modeling community has adapted their modeling strategy and performed future simulations on the larger model domain (D2). This work has been published in *Climate Dynamics* (*Towards Ensemble-Based Kilometer-Scale Climate Simulations over the Third Pole Region*, DOI: 10.1007/s00382-022-06543-3) and led by Andreas Prein (NCAR) and Nicolina Ban (University of Innsbruck) with contributions from all project members.

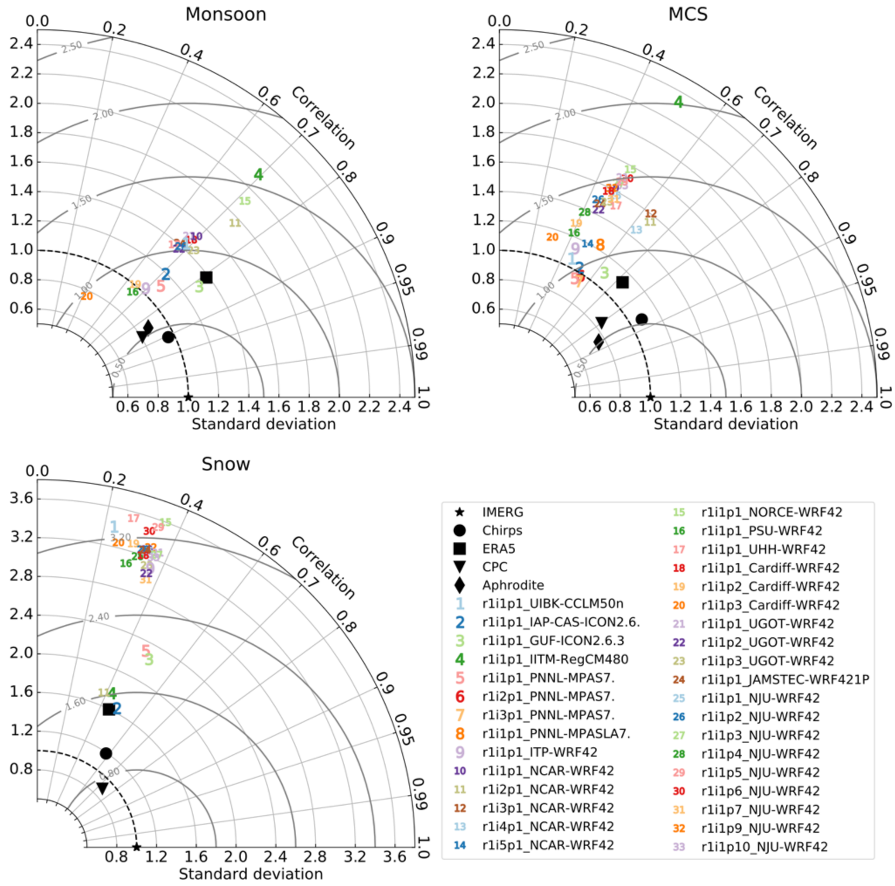

Fig. 2 *Taylor diagrams showing the case average precipitation pattern correlation, spatial standard deviation, and centred root mean square error comparing observational (black symbols; non-bias corrected) and modeled precipitation (colored numbers) with IMERG observations (Fig. 5 in Prein et al., 2023)*

2) <u>MCS case</u>: An in-depth analysis of the mesoscale convective system (MCS) case of the CPTP project was conducted to investigate the key processes for MCS formation and associated precipitation (Fig. 3) and assess the capability of kilometer-scale regional modeling systems in reproducing these processes. Results show that the observed MCS case can be seen as a further development of a vortex moving off the Tibetan Plateau (TP). The preceding vortex evolution over the TP and water vapor fluxes (Fig. 4) into the Sichuan basin were identified as key processes that need to be correctly simulated to reproduce the MCS precipitation center at the right location. A realistic representation of the westerly jet stream is necessary to simulate the vortex and subsequent downstream precipitation correctly. The statistics of MCS are further examined in a 1-year simulation, in which the general statistics of storm systems around the TP are reasonably well captured, even if most of the models struggle to capture the selected storm case. This work has been published in ***Journal of Climate*** (Kilometer-scale multi-model and multi-physics ensemble simulations of a mesoscale convective system in the lee of the Tibetan Plateau: Implications for climate simulations. DOI: 10.1175/JCLI-D-22-0240.1) and led by **Julia Kukulies** (University of Gothenburg).

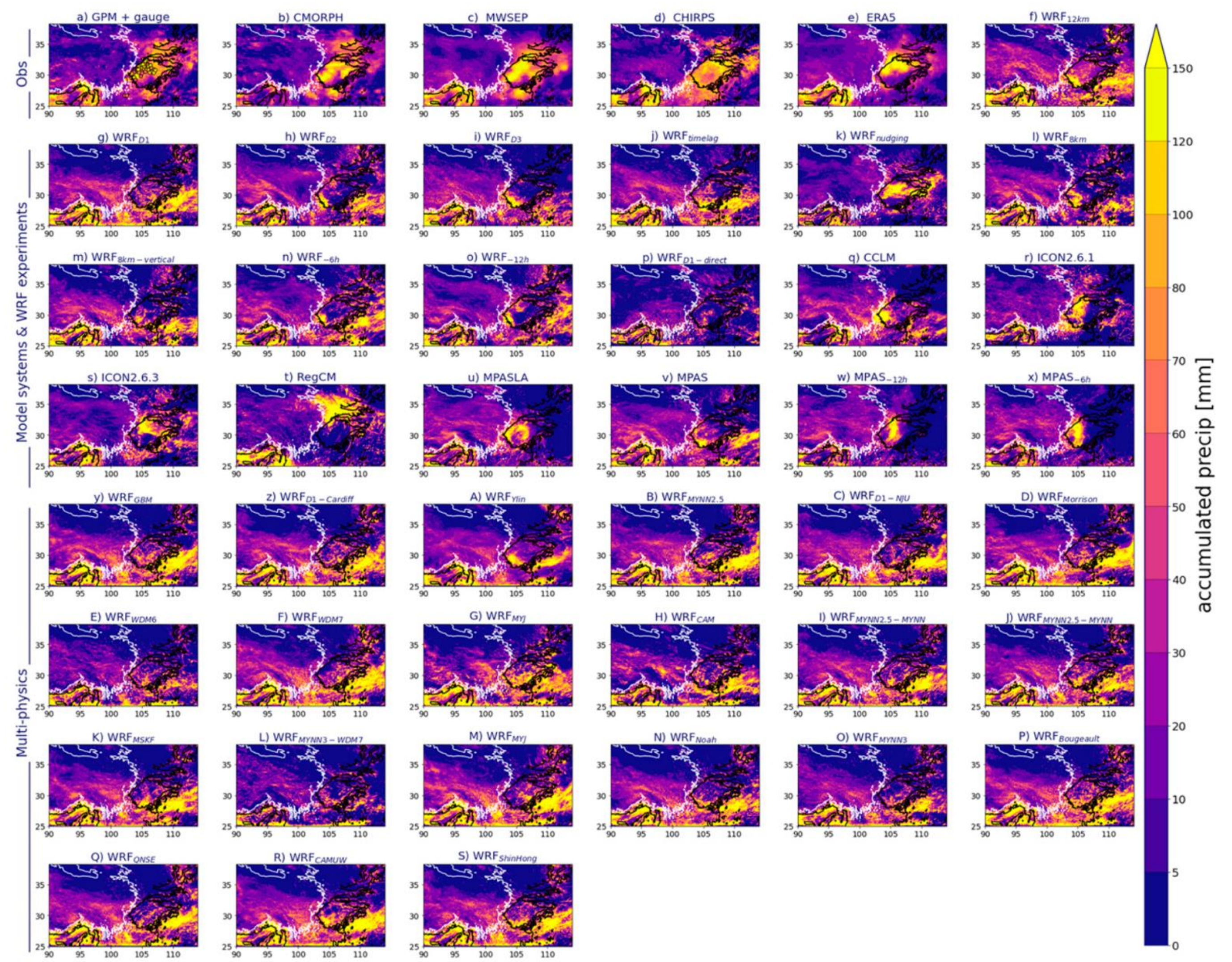

Fig. 3 *Accumulated precipitation during 19–21 Jul 2008 for observations and simulations. (a)–(f) Observations from gauge stations (with accumulations > 50 mm), GPM IMERG, CMORPH, CHIRPS, MWSEP, and ERA5, as well as the 12-km nest for WRF. (g)–(x) Simulated precipitation for experiments with varying model systems, domain sizes, initialization times, and nudging. (y)–(S) WRF ensemble members with varying physics options. The white line marks the 3000-m contour of the TP, and the black line marks the 1000-m contour. (Fig. 3 in Kukulies et al. 2023)*

3) Long-term changes of MCSs in the East Asian rainband are investigated based on a high spatiotemporal resolution satellite precipitation product and a novel MCS tracking method. Results show that both the frequency and intensity of MCSs over the East Asian rainband have increased by 21.8% and 9.8% respectively over the past two decades (2000–2021). The more frequent and intense MCSs contribute nearly three-quarters to the total precipitation increase. The changes in MCSs are caused by more frequent favorable large-scale water vapor-rich environments that are likely to increase under global warming. The increased frequency and intensity of MCSs have profound impacts on the hydroclimate of East Asia, including producing extreme events such as severe flooding. This work has been published in *Geophysical Research Letters* (Intensification of Mesoscale Convective Systems in the East Asian Rainband Over the Past Two Decades. DOI: 10.1029/2023GL103595) and led by Puxi Li (China Meteorological Administration).
4) The sensitivity of MCSs simulated by a global high resolution (~ 10 km), atmosphere-only climate model to different treatments of convection (with and without parametrized convection, and a hybrid representation of convection) have been investigated using the MetOffice Unified Model. The results show that explicit convection (i.e., non-parameterized) can better reproduce the observed pattern of MCS precipitation over the East Asian Summer Monsoon region. In general, explicit convection better simulates the diurnal variability of MCSs over the eastern China, and is able to represent the distinctive diurnal variations of MCS precipitation over complex terrain particularly

well, such as the eastern TP and the complex terrain of central-northern China. It is shown that explicit convection is better at simulating the timing of initiation and subsequent propagating features of the MCS, resulting in better diurnal variations and further a better spatial pattern of summer mean MCS precipitation. This work has been published in ***Climate Dynamics*** (Sensitivity of simulated mesoscale convective systems over East Asia to the treatment of convection in a high-resolution GCM*,* DOI: 10.1007/s00382-022-06471-2) and led by **Puxi Li** (State Key Laboratory of Severe Weather, Chinese Academy of Meteorological Sciences).

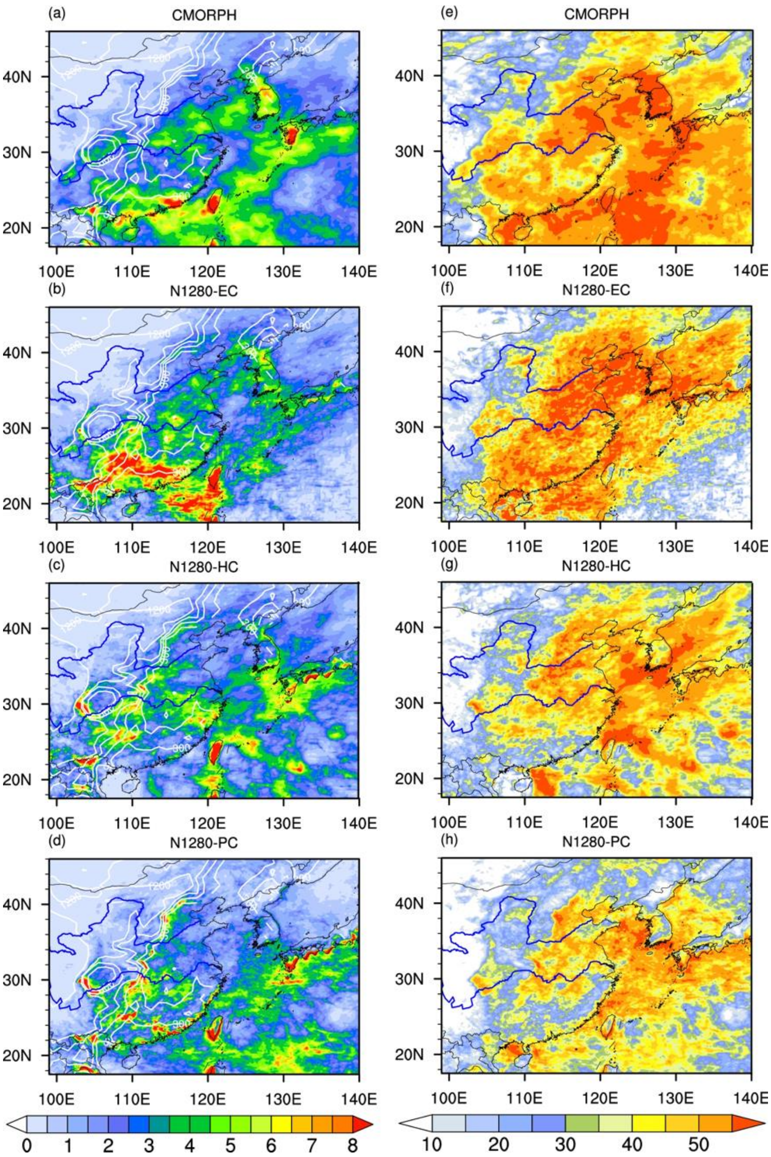

Fig. 4 *Spatial distributions of MCS precipitation (**a**–**d**; unit: mm day*$^{-1}$*) from 2005 to 2008 and MCS contribution to total precipitation (**e**–**h**; unit: %) in observation and simulation: (**a**, **d**) CMORPH, (**b**, **f**) N1280-EC (fully explicit convection), (**c**, **g**) N1280-HC (hybrid convection), and (**d**, **h**) N1280-PC (fully parametrized convection). Here blue lines indicate the Yellow River and Yangtze River, respectively. The white contours in **a**–**d** represent surface elevation (unit: m), where 300, 600, 900, 1200, 2700 m contours are drawn. (Fig. 3 in Li et al., 2022)*

5) <u>Monsoon case</u>: A 4-km-resolution convection-permitting model simulation (CPM) and a 28-km-resolution dynamical downscaling model simulation (DDM) using WRF were performed for one summer season (from 1st June to 31st August 2014, which covers the CPTP monsoon case study period) with the goal to better capture and reproduce the spatial and temporal distribution of precipitation over the TP. The simulations and four other gridded datasets (APHRODITE, GPM, ERA-Interim and ERA5) were evaluated against station observations, in terms of monthly and seasonal mean precipitation amount, frequency, intensity and diurnal cycle. The six datasets show considerable differences in precipitation amount, which are mainly caused by differences in precipitation frequency. DDM shows substantial advantages over the reanalysis, which significantly overestimates precipitation and shows an overly early diurnal peak. However, the excessive daytime convective precipitation and stronger nocturnal precipitation still exist in DDM. The CPM simulation reduces the overestimation of precipitation over the northern and eastern TP and better captures the observed diurnal cycle compared to the DDM simulation, adding value especially by capturing the late afternoon precipitation maximum in June. This work has been published in Climate Dynamics

(How well can a convection-permitting-modelling improve the simulation of summer precipitation diurnal cycle over the Tibetan Plateau? DOI: 10.1007/s00382-021-06090-3) and led by Zhaoyang Liu (Fudan University)

6) Snow event: The performance of the Weather Research Forecasting (WRF) model at 4 km horizontal grid spacing with different physical parameterization schemes (PPSs) in simulating precipitation, 2 m air temperature (T2), snowfall, and lake-effect snow (for the CPTP snow case during October 4–8, 2018) over the TP is investigated. Results show that all simulations of the WRF model can reasonably capture the spatial distributions of precipitation, T2, and snow-related variables. The Milbrandt scheme slightly outperforms the other PPSs in simulating the magnitudes of the snow-related variables. However, none of the PPSs reproduce the characteristics of lake-effect snow well due to their inaccurate temperature and airflow modeling. Continuous improvement in both large-scale circulation and lake dynamics is needed for better capture of the lake-effect snow over the TP. This work has been published in ***Journal of Geophysical Research: Atmospheres*** (Performance of the WRF model at the convection-permitting scale in simulating snowfall and lake-effect snow over the Tibetan Plateau. DOI: 10.1029/2022JD038433) and led by **Qian Lin** (Wuhan University).

7) Water year 2020 simulations: The first multi-model and multi-physics ensemble of kilometre-scale simulations of the hydrological year 2020 over the Third Pole region has been generated. The ensemble consists of 13 simulations with a horizontal grid spacing ranging from 2.2. to 4 km driven by ERA5 reanalysis. The simulations were compared to available gridded and in-situ observations and remote sensing data to assess the performance and spread of the model ensemble compared to ERA5 for the cold and warm seasons. The model evaluation was made difficult due to large differences between the gridded precipitation datasets that serve as reference over this region. Despite this issue the results from the ensemble evaluation show that the ensemble improves on many warm-season precipitation metrics compared with ERA5, including most wet-day and hour statistics, and adds value in the representation of wet spells in both seasons. This work has been published in ***Climate Dynamics*** under the title "The First Ensemble of Kilometre-Scale Simulations of a Hydrological Year over the Third Pole" (DOI: 10.1007/s00382-024-07291-2) and was led by **Emily Collier** from the University of Innsbruck.

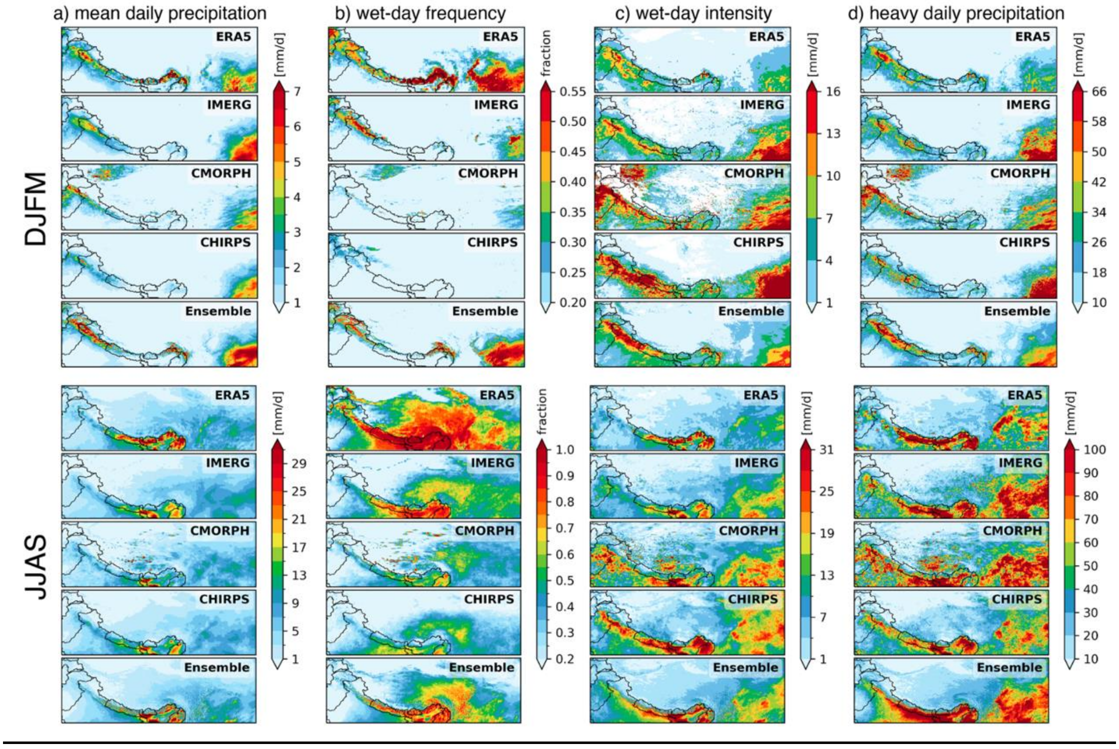

Fig. 5 *Spatial representation of the daily precipitation statistics presented in Table 3 for the DJFM (top row) and JJAS (bottom row) seasons: a mean; wet-day b frequency and c intensity; and, d heavy precipitation. The panel labelled 'Ensemble' displays the mean of all km-scale simulations. (Fig. 2 in Collier et al., 2024)*

8) Decadal simulations: The research group in Beijing performed two 12-year convection permitting simulations with a resolution of 3.3 km using the ICON model for the Tibetan Plateau region. The simulations consist of a retrospective simulation (2008–2020) with initial and boundary conditions from ERA5 reanalysis and a pseudo-global warming projection for the same period driven by modified reanalysis-derived initial and boundary conditions by adding the monthly CMIP6 ensemble-mean climate change under the SSP5-8.5 scenario. The experimental design and a preliminary analysis of the evaluation and projection of seasonal mean precipitation and surface temperature has been published in ***Advances in Atmospheric Sciences*** under the title "Convection-Permitting Simulations of Current and Future Climates over the Tibetan Plateau" led by **Liwei Zou** from LASG, Institute of Atmospheric Physics, Beijing. The retrospective simulation shows overall good performance in capturing the seasonal precipitation and surface air temperature. Over the central and eastern TP, the average biases in precipitation (temperature) are less than −0.34 mm d^{-1} (−1.1°C) throughout the year compared to data from 81 meteorological stations. The simulated biases over the TP are season and height dependent. Cold (wet) biases are found in summer (winter) above 5500 m. The future climate simulation suggests that the TP will be wetter and warmer under the SSP5-8.5 scenario. The general features of projected changes in ICON are comparable to the CMIP6 ensemble projection, but the added value from kilometer-scale modeling is evident in both precipitation and temperature projections over complex topographic regions.

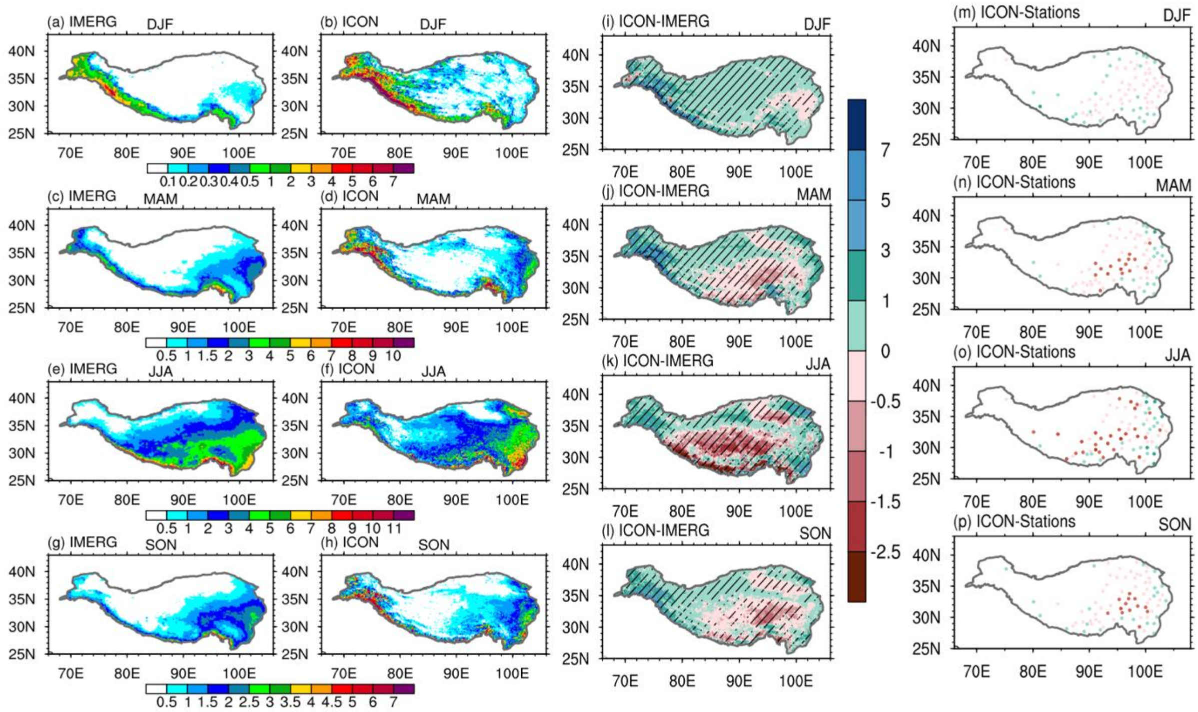

Fig. 6 *Spatial distributions of 11-year seasonal mean precipitation (units: mm d−1) for (a, b) DJF, (c, d) MAM, (e, f) JJA, and (g, h) SON derived from IMERG (first column) and ICON (second column). The third column shows the differences in the seasonal mean precipitation between IMERG and the ICON control simulation. The fourth column shows the differences (units: mm d−1) in the seasonal mean precipitation between the station data and the ICON control simulation. (Fig. 6 in Zou et al., 2024)*

9) A 9 km resolution downscaling, using the Weather Research and Forecasting (WRF) model driven by ERA5, was conducted with a large domain (8°–50° N, 65°–125° E) for the period 1979–2019 (WRF9km). Precipitation values from WRF9km and ERA5 were evaluated against satellite observations. The results show that, compared with ERA5, WRF9km captured the climatological summer precipitation over the northwestern Tibetan Plateau (NWTP, 33°-36° N, 80°–90° E) with a much-reduced wet bias. Further analysis shows that the ERA5 overestimation is mainly caused by excessive convective precipitation, likely linked to strong vertical motions over the NWTP induced by an overestimated lower-level southerly wind. This work has been accepted for publication in Climate Dynamics (Wet bias of summer precipitation in the northwestern Tibetan Plateau in ERA5 is linked to

overestimated lower-level southerly wind over the plateau. DOI: 10.1007/s00382-023-06672-3) and led by Tinghai Ou (University of Gothenburg). The downscaling products, WRF9km, can be downloaded from the project site (http://biggeo.gvc.gu.se/TPReanalysis/).

10) A group of CPTP members wrote a review paper on Mesoscale Convective Sytems (MCSs) in the Third Pole region. The authors review observational and model studies of MCSs in the TP region within a common framework to elucidate their main characteristics, underlying mechanisms, and impact on seasonal and extreme precipitation. We also identify major knowledge gaps and provide suggestions on how these can be addressed using recently published high-resolution model datasets. Three important identified knowledge gaps are 1) the feedback of MCSs to other components of the TP climate system, 2) the impact of the changing climate on future MCS characteristics, and 3) the basin-scale assessment of flood and drought risks associated with changes in MCS frequency and intensity. A particularly promising tool to address these knowledge gaps are convection-permitting climate simulations. Therefore, the systematic evaluation of existing historical convection-permitting climate simulations over the TP is an urgent requirement for reliable future climate change assessments. Kukulies, J, H. Lai, J. Curio, Z. Feng, C. Lin, P. Li, S. Sugimoto, T. Ou, D. Chen, 2023. Mesoscale convective systems in the Third Pole region: Characteristics, Mechanisms and Impact on precipitation. ***Frontiers in Earth Science***. DOI: 10.3389/feart.2023.1143380.

For a complete list of publications from the project please see the list at the end of this document or visit the project website (http://rcg.gvc.gu.se/cordex_fps_cptp/)

What were the main challenges or (if applicable) reasons why you didn't achieve some goals or why some goals were changed

The main challenges in the project were finding the resources to perform the computationally expensive high-resolution simulations, store the large model output, and establish fast and reliable data sharing. Another challenge is the availability or rather lack of reliable high-resolution and long-term observations in the Tibetan Plateau region. There is a huge spread between the existing data which complicates model evaluation.

One objective we have not completely achieved so far is the production of decadal current and future climate simulations. Reasons for this are on one hand limited resources, both computing time and storage capacity, as well as the need to further analyse our existing simulations (case studies and 1-year simulations) and perform additional experiments regarding optimal domain size and position and other model settings to carefully select and identify the best set-up before performing (computational-expensive) kilometre-scale decadal simulations for the Third Pole region.

Additionally, some of the key persons in the project changed positions and moved countries in recent years. Andreas Prein who leads the modelling working group in this FPS is no longer working at NCAR. He was appointed professor at ETH Zurich last year which of course came with a lot of new duties. Lead investigator Deliang Chen is currently on leave from the University of Gothenburg to establish a new research institute at Tsinghua University in Beijing.

Lessons learned

During the sensitivity test for different case studies and the analysis of the multi-model multi-physics ensemble for the WY2020 the importance of choosing the domain size and location became apparent. We need to find a trade-off between computational resources and domain size. An increase in domain size improved the WRF simulation of a MCS case as the smaller domain was cutting through the position of the subtropical westerly jet (Fig. 7) which caused issues at the domain boundary. The simulations that were not able to reproduce the strength and position of the Subtropical Westerly jet are also the ones that are not good at capturing the precipitation event. On the other hand, the ICON simulations still performed better using a smaller domain but a higher frequency of updating the boundary conditions. This showed that we need to perform more test regarding the domain size/position relative to the subtropical westerly jet position and the updating of lateral boundary conditions.

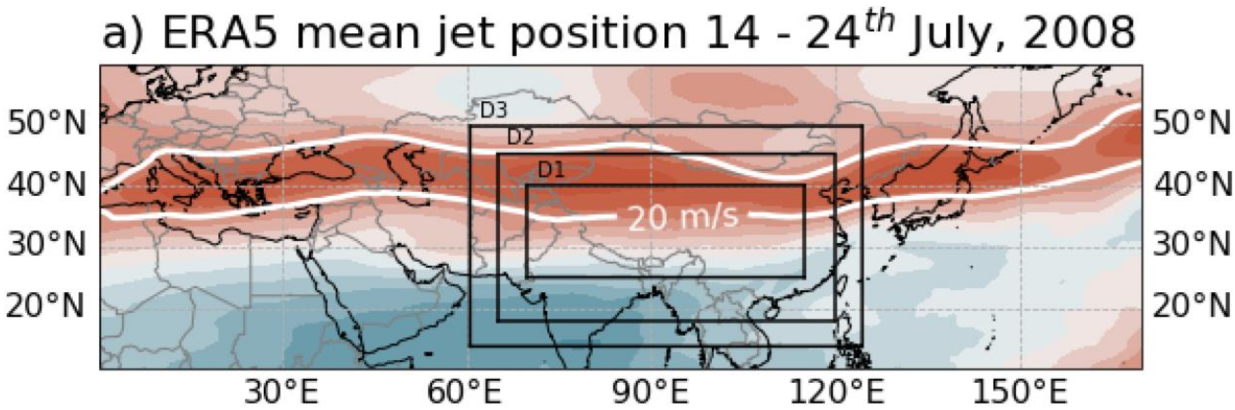

Fig. 7 *The domain sizes are shown in relation to the mean jet stream position in ERA5 for context in. (Fig 8 a) in Kukulies et al. 2023)*

There might not be the one perfect model set-up for all objectives and research questions. The modelling strategy/set-up might have to depend on the research question (process understanding, bias reduction) and the temporal scale of interest (event-based studies, sub-daily features or monthly mean conditions).

What can be transferred to other domains/projects/activities

The experience gained in this project can be transferred to other high mountain regions and other projects performing kilometre-scale simulations over complex terrain. It will also inform future project proposals by the project participants. Working together on new projects will be made easier as we have already established a sense of community.

Multi-model multi-physics ensemble provides a great basis to gain a better understanding of the key processes involved in different types of weather events. Use of case studies at the beginning is a good way to assess if and why models perform similar or not for different cases.

The project benefitted from the close collaboration between modellers and the group focussing on observations. The model evaluation against different observations showed that there is a huge spread between observations and therefore the added value of kilometre-scale models depends on the chosen reference data set. This highlights the need to consider multiple observational datasets for comparison as there is a huge spread between the observations for the Third Pole region which will likely be the case for other regions of complex topography and lack of in-situ observations.

Setting up a publication strategy for the project and share with each other who wants to analyse what and what data are needed for the planned analysis helped to avoid performing the same analysis twice and data sharing more feasible.

How did you engage users/stakeholders and work with the end-to-end perspective during the project period?

The project in general and recent results were presented at key international meetings of the regional high-resolution modelling community, e.g. the VII Convection Permitting Modelling (CPM) Workshop 2023 in Bergen, Norway and the International conference on regional climate modelling (CORDEX conference) 2023 in Trieste, Italy and other international conferences (e.g. EGU, AGU). We also invited interested participants of the VII CPM workshop to join our project meeting following the workshop. Members of the project established a session at EGU focusing on mesoscale and severe convection over land, bringing together scientist working in the Tibetan Plateau region and other mountain regions (e.g. South Amerika, Alps, etc.) fostering knowledge exchange. This session has now been running since 2021. During the project several students used data from the project for their master theses and presented results at conferences.

We had regular meetings within and between the two working groups. We established a seminar series to share results internally but also hear from invited speakers from outside the project team about their research relevant for CPTP.
At the beginning of the project a modelling strategy and framework was established and everyone agreed on list of experiments including minimum domain size and resolution requirements. The experimental design can be found on the CPTP website (http://rcg.gvc.gu.se/cordex_fps_cptp/).
We also agreed on a publication strategy and kept each other up to date by using a shared document of analysis plans and the data needed to perform them. Doing so helped to establish a common set of variables to upload to our data sharing platform. We set up two separate email lists for the modelling and observation group to allow for easy communication within and between the groups.

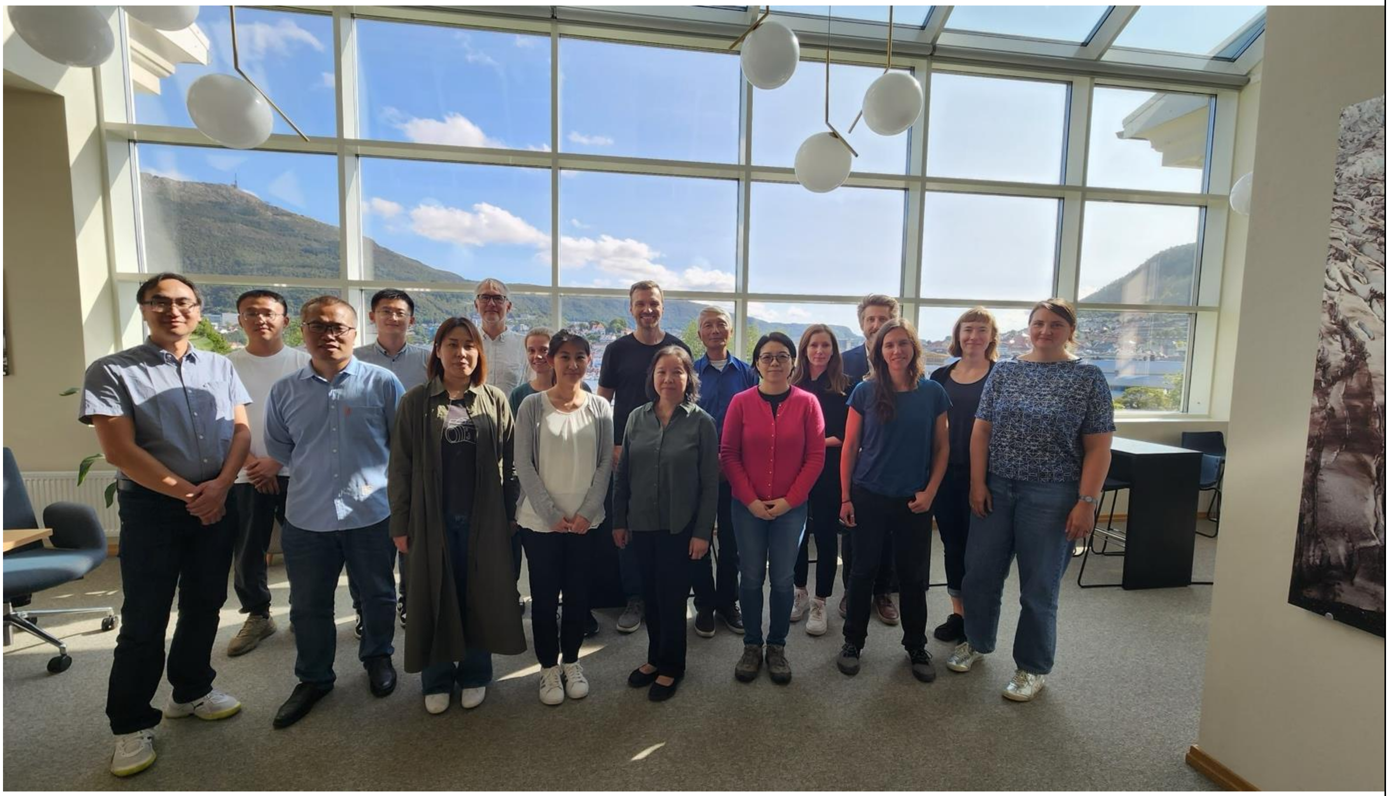

Fig. 7 *CPTP group picture during the project meeting on 1 September 2023 in Bergen organised by University of Gothenburg, hosted by University of Bergen and NORCE.*

Planned follow-up activities/projects

- Continue analysis of WY2020 simulations
- Run decadal hindcast simulations and projections
- Field excursion and a project meeting in the Tibet Plateau
- Work on new proposals associated with the project framework
- Develop stakeholder outreach activities

Final conclusions of the project

Utilizing high-resolution convection-permitting models (CPMs) has led to improved simulations of mesoscale convective systems and associated precipitation over the Third Pole region. Sensitivity tests have helped us to identify the key processes involved in the formation of MCS related extreme precipitation events.
The project highlighted the challenges posed by sparse observational data in the Tibetan Plateau region, e.g. difficult model evaluation due large spread between observational data sets. Added value of kilometre-scale models depends on domain size and chosen observational reference. This shows that more high-quality observations are urgently needed in the Tibetan Plateau region.
The project highlights the importance of assembling an international team with expertise in regional climate modeling, observational analysis, and statistical methods to effectively study complex climate phenomena in data-scarce regions.

Example of societal use of project results

The results from this project lead to an improved understanding of the processes involved in convective precipitation. This will help us and the community to improve forecasting extreme events and increase lead times for warnings. An accurate description and prediction of local climate information is crucial to flooding/drought management, adaptation of local communities, as well as hydropower and agriculture sectors. The project results will also help modelling groups with the decision which models and settings to use for future studies in this and other high-mountain regions.

Summary of major workshops/activities performed during the project time

Title, date, short description, location, website, links	Responsible person/-s	Funder
Participation in various conferences: - participation in EGU and AGU by various members of the project each year - participation in The International Conference on Regional Climate-CORDEX 2023 (ICRC-CORDEX 2023), which was held 25-29 of September 2023 in Trieste, Italy. Julia Curio presented the project and recent results.	Various participants	Grants of various participants

- Paticipation in The VII Convection Permitting Modelling Workshop, which was held 28-31 of August 2023 in Bergen, Norway. Several project members presented results from the project.		
CORDEX-MAIRS-Future Earth workshop was held in Beijing, China, from 17-18 October 2024. Deliang Chen, Julia Curio and Tinghai Ou were involved in the planning of the workshop.	Participation in workshop: Kun Yang (in person), Tinghai Ou (online), Ali Shaukat (Online)	
Project meetings - 1 September 2023, in person at Geophysical Institute, University of Bergen, Norway and online: Andreas Prein gave an overview talk on the analysis of the case study simulations. Emily Collier showed results from the water year 2020 ensemble simulations for winter and summer for temperature and precipitation. The convection-permitting simulations improve all wet spell statistics compared to ERA5. In general the added value depends on the chosen reference dataset as there is a huge spread between observational products. Tinghai Ou presented an analysis of the representation of the jet stream in WRF simulations. Andreas Prein led the discussion about plans for further simulations, analyses and publications. - 22 January 2021, online: In the first annual meeting, Deliang Chen gave a general update of the project and plan for 2021. Andreas Prein gave an update on the coordinated experiments of modeling WG and results from some case studies. Yanhong Gao and Puxi Li presented their Convection-Permitting Modeling work over the TP. Hans Christian Steen-Larsen presented their work related to Water isotopes.	Julia Curio and Deliang Chen	TPE
Modeling Working Group meetings - 5th Modeling Working Group meeting, May 12, 2022, online - 4th Modeling Working Group meeting, November 3, 2021, online - 3rd Modeling Working Group meeting, June 28, 2021, online - 2nd Modeling Working Group meeting, June 29, 2020, online - 1st Modeling Working Group meeting, January 10, 2020, online Please see the annual CPTP project reports for further details.	Andreas F. Prein and Nikolina Ban	TPE STINT
Data Working Group meetings - 1st Data Working Group meeting, January 29, 2020, online	Hans Christian Steen-Larsen and Tandong Yao	TPE STINT
CPTP online seminar series	Julia Curio	TPE STINT

- Changgui Lin (University of Gothenburg/SMHI) "Summer afternoon precipitation associated with wind convergence near the Himalayan glacier fronts", 5 October 2021. - Reinhard Schiemann from the National Centre for Atmospheric Sciences at the University of Reading, UK, presented results from the COSMIC project, COnvective-Scale Modelling in China, 8 June 2021 - Xu Zhou from Institute of Tibetan Plateau Research, Chinese Academy of Sciences, China, gave a talk about one of his newly published works: "Added value of kilometer-scale modeling over the third pole region: A pilot study", 4 May 2021 - Rasmus Benestad from the Norwegian Meteorological Institute, Norway, gave a talk about a recent study on "Testing a simple formula for calculating approximate intensity-duration-frequency curves". The method presented could be used for the analysis of rainfall over the Tibetan Plateau, both from rain-gauges and high-resolution convective-permitting RCMs, 2 March 2021 - Prof Xin Li from the Institute of Tibetan Plateau Research in Beijing talked about the National Tibetan Plateau/Third Pole Environment Data Center (TPDC) he has been leading, 9 February 2021		
1st project meeting (kick-off meeting), November 22, 2019, online meeting In the kick-off meeting, the overall aims and plans of this project were discussed. Two WGs, modeling WG and data WG, were suggested to better coordinate and conduct the overall aims of this project. Co-leaders for each WG are selected. Overall experiment design for the first year was also discussed. A dedicated web page (http://rcg.gvc.gu.se/cordex_fps_cptp/) has been created afterwards based on the design of this project.	Deliang Chen	TPE STINT

Related publications during the project time

Title, journal and link to publication	Author/-s	Date
How does regional convection-permitting modeling improve the simulation of the atmospheric water cycle in spring over the Tibetan Plateau? ***Journal of Geophysical Research: Atmospheres***, 129, e2024JD040964. https://doi.org/10.1029/2024JD040964	Zou, L., Zhou, T.,& Zhao, Y.	2024-08-06
The First Ensemble of Kilometre-Scale Simulations of a Hydrological Year over the Third Pole. ***Climate Dynamics***, **62**, 7501–7518 (2024), https://doi.org/10.1007/s00382-024-07291-2	Collier, E., N. Ban, N. Richter, B. Ahrens, D. Chen, X. Chen, H.-W. Lai, R. Leung, L. Li, A. Medvedova, T. Ou,	2024-05-31

	P. K. Pothapakula, E. Potter, A. F. Prein, K. Sakaguchi, M. Schroeder, P. Singh, S. Sobolowski, S. Sugimoto, J. Tang, H. Yu, C. Ziska	
Discrepancies of kilometer-scale dynamic downscaling over the Tibetan Plateau: underestimation of nocturnal precipitation in summer. ***Climate Dynamics*, 62**, 5909–5925 (2024). https://doi.org/10.1007/s00382-024-07183-5	Jiang, H., Gao, Y. & Wang, G.	2024-04-02
Convection-Permitting Simulations of Current and Future Climates over the Tibetan Plateau. ***Adv. Atmos. Sci.*, 41**, 1901–1916 (2024). https://doi.org/10.1007/s00376-024-3277-9	Zou, L., Zhou, T.	2024-03-26
Decomposition and reduction of WRF-modeled wintertime cold biases over the Tibetan Plateau. ***Climate Dynamics***, **62**, 4189–4203 (2024). https://doi.org/10.1007/s00382-024-07126-0	Li, Y., Gao, Y., Chen, G., Wang, G., Zhang, M.	2024-02-29
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- Co-leaders for WGII (data): Tandong Yao (Institute of Tibetan Plateau Research, ChineseAcademy of Sciences, China) and Hans Christian Steen-Larsen (University of Bergen, Norway)

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