Usage Report of DKRZ Resources

Project: bb1152 ClimXtreme

Project title: ClimXtreme: Climate Change and Extremes (ClimXtreme)

Project leader: A. Hense, C. Kottmeier, J Pinto, U. Ulbrich, F. Kaspar

Project Funding: BMBF

Reporting period: 11/2022 – 04/2023

Used Resources at DKRZ (by end of April 2023)

Resource bb152	Granted	Utilization	Remaining
Levante CPU nodes (Node hours)	36158	9149	27009
Levante GPU nodes (Node hours)	0	2	-2
Levante Storage (TiB)	146	69	77
Archive project (TiB)	408	314	94
Archive long term (TiB)	7	-	7
Resource bm1159	Granted	Utilization	Remaining
Levante CPU nodes (Node hours)	20590	5309	15281
Levante GPU nodes (Node hours)	2460	612	1848
Levante Storage (TiB)	389	380	9
Archive project (TiB)	203	-	203
Archive long term (TiB)	-	-	-

Scientific activities conducted during the report time

1. Module A – A1 SEVERE

Project: bb1152 ClimXtreme – A1 SEVERE
Subproject: Scale Dependent Process Representation and Sensitivity Analysis for Most Extreme Events
Subproject leader: Hendrik Feldmann, Armenia Franco Diaz, Joaquim G. Pinto, Christoph Kottmeier
Reporting period: 11/2022 – 04/2023

1.1 Usage report November 2022 – April 2023

There are two main tasks for A1 SEVERE in 2023, which are still the same as stated in the proposal from October 2022:

1. The transfer of the MiKlip/LAERTES-EU data to the long-term archive
2. The analysis and event-based downscaling of the MPI-ESM Grand Ensemble

Topic 1: LTA

Progress has been made regarding the long term archive (LTA): A large block of the data is already accessible in the LTA. Since procedures, metadata are already established and the HSM system at DKRZ is more stable, it can be expected that the transfer can be finished by the end of the year.

Topic 2: Event-based downscaling of the MPI-ESM Grand-Ensemble

SEVERE investigates the representation of Central Europe's most extreme precipitation events with return periods of 100 years (MEPEs) in climate models over a wide range of resolutions, using large ensembles combined with episodic downscaling.

In this project, we process climate model outputs and reanalysis data relevant to the project SEVERE, such as the MPI-ESM-LR Grand ensemble (Maher et al., 2019) and the ECMWF ERA-5 reanalysis (Hersbach et al., 2020). We identify high precipitation events (HPEs) in summer and winter, separately, for a model chain from global model output prepared for CMIP5 and CMIP6 historical simulations (200 km resolution) and in actual convection permitting FPS Convection simulations using CCLM regional climate simulations (12 km and 3 km grid resolution), with forcing derived from MPI-ESM-LR.

We have performed statistics, such as the Precipitation Severity Index (PSI; Caldas-Alvarez et al., 2022a, b), for characterizing and selecting simulated HPEs in Central Europe. The PSI involves quantifying the intensity, coverage, and persistence of daily precipitation. SEVERE is currently detecting HPEs with return periods of 100 years or more from coarse simulations, from the MPI-ESM-LR Grand ensemble, using the PSI index and other indicators. Currently, we analyze variability in projected mean and extreme precipitation trends in Central Europe, for the 21st Century. In the following months, episodic downscaling to 3 km of such events will be performed and analyzed. This task was delayed, partly due to limitation of the workspace for ClimXtreme.

1.2 Project related publications:

SEVERE contributed to several publications during the reporting periods

Caldas-Alvarez, A., Augenstein, M., Ayzel, G., Barfus, K., Cherian, R., Dillenardt, L., Fauer, F., **Feldmann, H.**, Heistermann, M., Karwat, A., Kaspar, F., Kreibich, H., Lucio-Eceiza, E., Meredith, E.P., Mohr, S., Niermann, D., Pfahl, S., Ruff, F., Rust, H.W., Schoppa, L., Schwitalla. T., Steidl, S., Thieken, A.H., Tradowsky, J.S., Wulfmeyer, V., and Quaas, J. (2022a): Meteorological, Impact and Climate perspectives of the 29 June 2017 Heavy Precipitation Event in the Berlin Metropolitan Area. NHESS, https://doi.org/10.5194/nhess-2022-96.

Caldas-Alvarez, A., Feldmann, H., Lucio-Eceiza, E., **Pinto, J.G.** (2022b): Scale-dependency of extreme precipitation processes in regional climate simulations of the greater Alpine region. Submitted to: WCD Discuss., https://doi.org/10.5194/wcd-2022-11, in review.

Diez-Sierra, J. et al. (among them **Feldmann, H**.), 2022: The Worldwide C3S CORDEX Grand Ensemble: A Major Contribution to Assess Regional Climate Change in the IPCC AR6 Atlas. Bulletin of the American Meteorological Society, 103 (12), E2804–E2826. doi:10.1175/BAMS-D-22-0111.1

Ehmele, F. Kautz, L.-A., **Feldmann, H**., He, Y., Kadlec, M., Kelemen, F. D., Lentink, H. S., Ludwig, P., Manful, D., **Pinto, J. G**., 2022: Adaptation and application of the large LAERTES-EU regional climate model ensemble for modeling hydrological extremes: a pilot study for the Rhine basin Natural Hazards and Earth System Sciences, 22 (2), 677–692. doi:10.5194/nhess-22-677-2022.

Khodayar, S., **Caldas-Alvarez, A**., 2022: Seasonal heavy precipitation sensitivity to moisture corrections in the western Mediterranean across resolutions. Atmospheric Research, 280, Art.-Nr.: 106429. doi:10.1016/j.atmosres.2022.106429

Ludwig, P., Ehmele, F., Franca, M. J., Mohr, S., **Caldas-Alvarez, A.,** Daniell, J. E., Ehret, U., **Feldmann, H.**, Hundhausen, M., Knippertz, P., Küpfer, K., Kunz, M., Mühr, B., **Pinto, J. G.**, Quinting, J., Schäfer, A. M., Seidel, F., Wisotzky, C., 2023: A multi-disciplinary analysis of the exceptional flood event of

July 2021 in central Europe. Part 2: Historical context and relation to climate change Nat Hazards Earth Syst Sci, doi:10.5194/nhess-2022-225

Moemken, J., Koerner, B., Ehmele, **F., Feldmann, H., Pinto, J. G.**, 2022: Recurrence of Drought Events Over Iberia. Part II: Future Changes Using Regional Climate ProjectionsTellus A: Dynamic Meteorology and Oceanography, 74, 262–279. doi:10.16993/tellusa.52

Mohr, M., Ehret, M., Kunz, M., Ludwig, P., **Caldas-Alvarez, A**., Daniell, J.E., Ehmele, F., **Feldmann, H.**, Franca, M.J., Gattke, C., Hundhausen, M., Knippertz, P., Küpfer, K., Mühr, B., **Pinto, J.G.**, Quinting, J., Schäfer, A.M., Scheibel, M., Seidel, F. and Wisotzky, C., 2023: A multi-disciplinary analysis of the exceptional flood event of July 2021 in central Europe – Part 1: Event description and analysis. Nat. Hazards Earth Syst. Sci., 23, 525–551, https://doi.org/10.5194/nhess-23-525-2023.

Müller, S. K., Caillaud, C., Chan, S., de Vries, H., Bastin, S., Berthou, S., Brisson, E., Demory, M.-E., **Feldmann, H.**, Goergen, K., Kartsios, S., Lind, P., Keuler, K., Pichelli, E., Raffa, M., Tölle, M. H., Warrach-Sagi, K., 2022a: Evaluation of Alpine-Mediterranean precipitation events in convection-permitting regional climate models using a set of tracking algorithms. Climate Dynamics. doi:10.1007/s00382-022-06555-z

Müller, S.K., Pichelli, E., Coppola, E., Berthou, S., Briennen, S., Callaud, C., Demory, M.-E., Doble, A., **Feldmann, H.**, Mercogliano, P., Tölle, M., 2022b: The Climate Change Response of Alpine-Mediterranean Heavy Precipitation Events, Climate Dynamics, under revision.

Sangelantoni, L., Sobolowski, S., Lorenz, T. et al. (among them **Feldmann, H.**), 2023: Investigating the representation of heatwaves from an ensemble of km-scale regional climate simulations within CORDEX-FPS convection. Clim Dyn. https://doi.org/10.1007/s00382-023-06769-9

2. Module A – A3 ArcClimEx

Project:	bb1152 ClimXtreme – A3 ArcClimEx
Subproject:	Linkage between Arctic Climate Change and Weather and Climate Extremes over Central Europe
Subproject leader:	Dörthe Handorf (Alfred Wegener Institut), Uwe Ulbrich, Henning W. Rust (FUB)
Reporting period:	11/2022 – 04/2023

2.1 Usage report November 2022 – April 2023

ArcClimEx does not require significant additional computing time in 2023. However, they are doing further analysis work and the data are needed for pending publication. ArcClimEx has submitted a publication about their analyses within ClimXtreme (Riebold et al., 2022), which is still under revision. Until the paper is published, it is necessary to keep the relevant data (~6.5 TiB) on the workspace.

2.2 Project related publications:

Riebold, J., Richling, A., Ulbrich, U., Rust, H., Semmler, T., and Handorf, D.: On the linkage between future Arctic sea ice retreat, Euro-Atlantic circulation regimes and temperature extremes over Europe, EGUsphere [preprint], https://doi.org/10.5194/egusphere-2022-953, 2022, submitted to Weather and Climate Dynamics

3. Module A – A5 DynProHeat

Project:	bb1152 ClimXtreme – A5 DynProHeat
Subproject:	The role of multi-scale dynamical processes in shaping recent and future extreme heat waves over Germany
Subproject leader:	Florian Becker, Andreas Fink, Joaquim G. Pinto, KIT, Karlsruhe, Stephan Pfahl (FU Berlin)
Reporting period:	11/2022 – 04/2023

3.1 Usage report November 2022 – April 2023

In the allocation period starting from July 1, 2022, the project carried out further investigations of dynamical and thermodynamical processes that cause extreme heat waves in past and future climate. The analyses were expanded to the CESM Large Ensemble in the time slices 1991-2000 and 2091-2100 (35 members, 6-hourly, 1°x1° horizontal resolution, 30 vertical levels, Kay et al., 2015) and especially the meteorological variables on heat wave days like maximum temperature, zonal and meridional wind, Rossby wave packet (RWP) amplitude, group and phase velocity. These add to the heat wave event lists for past and future periods in terms of intensity, duration, spatial extent (Becker et al., 2022) and information about their properties and evolution that previously have been compiled. Next, the percentage of temperature extremes at 850 hPa (T850) and 2m (T2m) occurring when RWP amplitude (E) is above the 80th percentile has been assessed for the ensemble as described in Fragkoulidis et al. (2018). We found a decrease of the link between T850(T2m) and E by around 10 % for the ensemble mean in the future compared to the past (not shown). This points towards an increasing role of thermodynamics and boundary layer processes, also as a result of the strongest dynamical forcing shifting further to the North and additionally enhanced by drying soils. The new algorithm of Sousa et al. (2021) which distinguishes between different types of ridges and blocking proved useful for the assessment of dynamics and future heat wave events. Figure 1 shows the CESM ensemble mean occurrence frequency of subtropical ridges (1c), omega blocking (1e), hybrid-Rex (1g) and pure-Rex type blocking (1i) and all types (1a) for all 2091-2100 summer days (left) and the change compared to the 1991-2000 summer days (1b,d,f,h,j). The changes clearly depend on blocking type. Subtropical ridge occurrence increases in western North America and in a latitude band from the western North Atlantic to Eastern Europe. A strong increase of omega blocking is apparent in western North America and a slight increase over Europe into Western Asia. Both can increase the likelihood of heat waves and even stronger if other pre-conditioning factors are present (e.g. dry soils, high SSTs). The hybrid blocking is not very frequent, thus not changing by a large percentage in the future. The rex blocking, which is centered on the polar latitudes, shows slight decreases around Alaska and Greenland, and slight increase around Siberia.

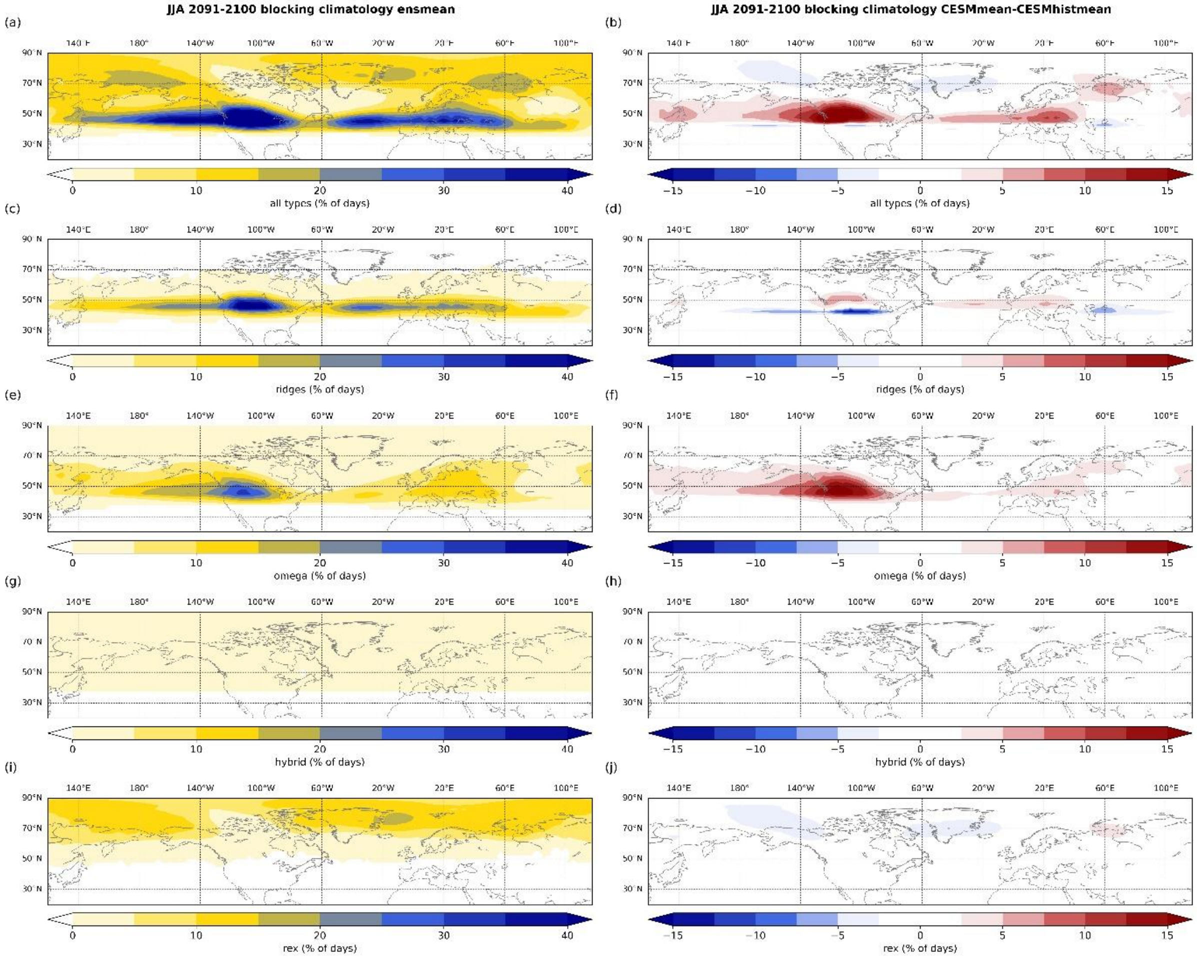

Figure 1: CESM ensemble mean occurrence frequency of subtropical ridges (1c), omega blocking (1e), hybrid-Rex (1g) and pure-Rex type blocking (1i) and all types (1a) for all 2091-2100 summer days and the change compared to the 1991-2000 summers (1b,d,f,h,j), Methodology: Sousa et al. (2021).

The described analyses have been repeated for archived data sets at DKRZ like the ECMWF Reanalysis v5 (ERA5; Hersbach et al., 2020) and data sets from the Coupled Model Intercomparison Project CMIP6 (Eyring et al., 2016) with high-resolution model runs like MPI-ESM-1-2-HR (Müller et al., 2018, short MPI, scenario SSP5-8.5) and EC-Earth-3P (Haarsma et al., 2020, experiment highres-future), Europe, 6-hourly to daily, 0.25° x 0.25° to 2° x 2° resolutions, periods after 1961 until 2100. The work space has been further used for caching data and storing results like multiple climate variables, the diagnostics of Fragkoulidis and Wirth (2020), Sousa et al. (2021) and LAGRANTO trajectories of heat wave days (Sprenger and Wernli, 2015). These are further investigated, especially for heat waves with highly amplified circulation patterns (onset ± additional days) like the 2018 heat wave (Rousi et al., 2022) at the end of this and in the beginning of the next allocation period. The more intense warming of heat waves in Central Europe compared to seasonal and global averages cannot be explained by advection of warmer air only. Analyses and further investigations might complement the published findings of project partners at FU Berlin (Schielicke and Pfahl, 2022) that suggest enhanced decent, stronger diabatic heating, adiabatic warming and sensible heat fluxes from the surface along the trajectories.

3.2 Project related publications:

DynProHeat contributed to several publications during the reporting periods

Becker, F. N., Fink, A. H., Bissolli, P., & Pinto, J. G. (2022): Towards a more comprehensive assessment of the intensity of historical European Heat Waves 1979-2019, Atmospheric Science Letters, 23(11), e1120.

Rousi, E., Fink, A. H., Andersen, L. S., Becker, F. N., Beobide-Arsuaga, G., Breil, M., Cozzi, G., Heinke, J., Jach, L., Niermann, D., Petrovic, D., Richling, A., Riebold, J., Steidl, S., Suarez-Gutierrez, L., Tradowsky, J., Coumou, D., Düsterhus, A., Ellsäßer, F., Fragkoulidis, G., Gliksman, D., Handorf, D., Haustein, K., Kornhuber, K., Kunstmann, H., Pinto, J. G., Warrach-Sagi, K., & Xoplaki, E. (2022): The extremely hot and dry 2018 summer in central and northern Europe from a multi-faceted weather and climate perspective, EGUsphere, 1-37.

4. Module A – A6 CyclEx

Project: bb1152 ClimXtreme – A6 CyclEx
Subproject: Intensity and structural changes of extreme mid-latitude cyclones change in a warming climate
Subproject leader: Ting-Chen Chen, Christoph Braun, Aiko Voigt, Joaquim G. Pinto (KIT, Karlsruhe)
Reporting period: 11/2022 – 04/2023

4.1 Usage report November 2022 – April 2023

We have utilized the resources on DKRZ for multiple tasks under the content of the A6CyclEx project.

First, we tested the time resolution and different parameter setups for the cyclone tracking algorithm ZYKPAK (implemented on Freva) to improve the cyclone track results. Due to existing bugs in the algorithm, many test runs for the cyclone tracking have been carried out based on reanalysis datasets (ERA5 and ERAinterim) for an extended historical period (~60 years) and several CMIP6 climate models for the historical period and future projections. One such result has been further utilized for serial cyclone clustering analysis, contributing to a publication (Hauser et al., 2023). Another application of our ERA5 cyclone track analysis is to contribute to collaborative work led by a research group at Justus Liebig University Giessen on the wind-precipitation compound events (manuscript in preparation).

Second, we modified the code for the surface pressure tendency equation (PTE) analysis to improve the accuracy and applied it to all our idealized baroclinic life cycle simulations (80km and 2.5km) using the ICON model. The changes in the cyclone structure and impacts (in terms of precipitation, wind speed, pressure, eddy kinetic energy, etc.) under different warmer-climate patterns have been analyzed. The PTE results facilitated a quantitative physical interpolation. More analysis is currently in progress, and a manuscript is planned for summer 2023.

4.2 Project related publications:

Hauser, S., Mueller, S., Chen, X., Chen, T.-C., Pinto, J. G., & Grams, C. M. (2023). The linkage of serial cyclone clustering in Western Europe and weather regimes in the North Atlantic-European region in boreal winter. Geophys. Res. Lett., 50, e2022GL101900. https://doi.org/10.1029/2022GL101900

5. Module A – A9 ECCES

Project: bb1152 ClimXtreme – A9 ECCES
Subproject: Climate Change Impacts on Storm Surges in the North Sea
Subproject leader: Moritz Mathis, Thomas Pohlmann, (Uni Hamburg)
Reporting period: 11/2022 – 04/2023

5.1 Usage report November 2022 – April 2023

ECCES does not require significant additional computing time in 2023. However the datasets currently stored in the workspace are still needed, since it is still used by several ClimXtreme projects. Therefore, they should be kept there. It stems from the regional atmosphere/ocean coupling ensemble (Mayer et al., 2022) from the project **A9 ECCES** (~60 TiB workspace, 395 TiB archive). Part of the data have been put to the CERA database:

Mayer, Bernhard, Mathis, Moritz, Pohlmann, Thomas, 2022: Effects of climate change on extreme sea levels in the North Sea (ECCES): regionalized MPIOM-REMO climate ensemble. World Data Center for Climate (WDCC) at DKRZ. https://doi.org/10.26050/WDCC/ECCES_MPIOM-REMO

5.2 Project related publications:

Mayer, B., Mathis, M., Mikolajewicz, U., Pohlmann, T., 2022: RCP8.5-projected changes in German Bight storm surge characteristics from regionalized ensemble simulations for the end of the twenty-first century. Frontiers in Climate, 4, 1-18, 25 November 2022, Sec. Predictions and Projections, https://doi.org/10.3389/fclim.2022.992119.

6. Module D – CoSoDaX

Project: bb1159/bb1152 ClimXtreme
Subproject: Coordination of software and data management for ClimXtreme (D1/D2 CoSoDaX)
Subproject leader: Etor Lucio-Eceiza, Deborah Niermann
Reporting period: 11/2022 – 04/2023

6.1 Usage report November 2022 – April 2023

6.1.1 Planned work, performed simulations, summary of (preliminary) results

Module D is a supporting module of the ClimXtreme research project and is responsible for the coordination of software and data management (CoSoDaX). In addition to the general coordination activities, this includes the following main contributions: (a) the development and operation of a central evaluation system for climate extremes (XCES [1]), (b) the provision and analysis of basic data sets for the evaluation of climate extremes, (c) the support of software developments for the investigation of extreme events and the maintenance of existing software.

XCES is based on Freva (Kadow et al., 2021), a scientific software framework for high performance computing, equipped with a standardized model database, a programming interface and a history of evaluations. Originally developed at the Freie Universität Berlin (FUB) [2], Freva is maintained and updated by the Climate Informatics and Technologies (CLINT [3]) group at DKRZ. Freva is used by other sister projects within DKRZ (Regiklim [4] and NEXTGEMS [5]) as well as by other institutions (e.g., Mavis [6] at the DWD).

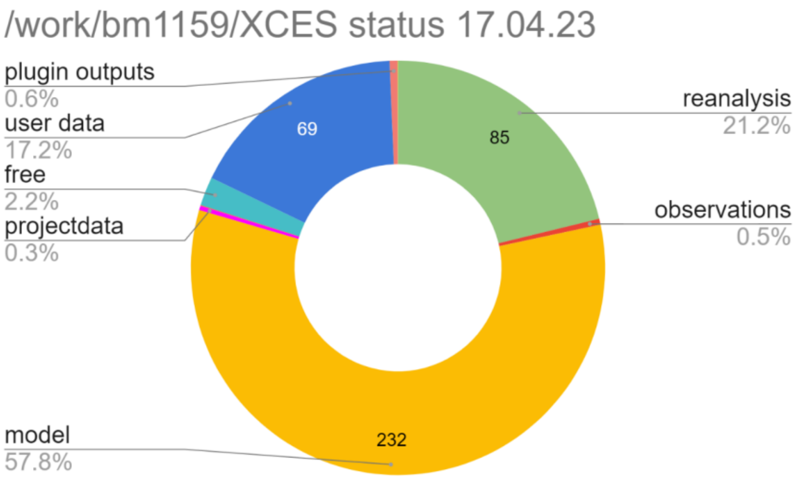

Figure 2: Storage demand (TiB) of different data types under /work/bm1159/XCES/, hosted in the ClimXtreme project bb1152 and percentage of data according to their type.

One of the primary goals of Module D is to build up a reasonable database for the joint project, accessible through XCES. Based on the data from the former MiKlip project [7], this data collection has been progressively expanded during the current report period (10.22/04.23) by the following relevant datasets:

- RADKLIM: raster data for Germany of 5-minute precipitation data in 1km resolution for 2001-2022
- EOBS: raster data for Europe of daily precipitation, temperature, humidity, surface pressure, radiation and wind speed in 0.1° resolution for 1950-2022
- HYRAS-DE: raster data for Germany of daily precipitation, temperature, humidity, and radiation in 1/5km resolution for 1931/1950-2022
- ERA5: global reanalysis with hourly/daily/monthly data in 30km resolution for multiple variables and back extension to 1940-1978 and current extension until 04.2023.

Currently more than 9 million files totaling more than 3 PB of data can be accessed through XCES. Although the vast majority of the data is linked from the /pool/data, a significant amount of it is hosted under the joint project bm1159 (more than 300 TiB). An overview of the data types integrated in the system and hosted with resources of bm1159 (joint project of main bb1152) is given in Figure 2.

XCES grants a flexible incorporation of verification routines (plugins). These analysis tools are being developed by modules A-C with the assistance of Module D, or by Module D itself to fulfill the needs of the project and be used by any member of the Consortium. Within the project 6 plugins have been developed, 5 of them being recent additions (for an overview see Table 1), and 6 more are under different stages of development. Additionally, 14 plugins were inherited from the former MiKlip project.

Table 1: Overview of new and updated Plugins, the developing ClimXtreme project and a short description of their functionality.

Plugin	Module	Short description
COOC	C1	Co-occurrence of extreme events
CLIMPACT_SCI	C1	Successor of climdexcalc
IDF	B2.5	Intensity Duration Frequency Curves
Realistic	D1	Quality-check – data comparison
getCDCstation	D1	Retrieve station observations from DWD/CDC

The goals of the plugins are very diverse, from the quality assessment of the data sets (e.g. Figure 1Figure 3), to calculation of Intensity-Duration-Frequency curves at certain stations (e.g. Figure 4) or the calculation of co occurrence probabilities for extreme events of different nature (e.g. Figure 5).

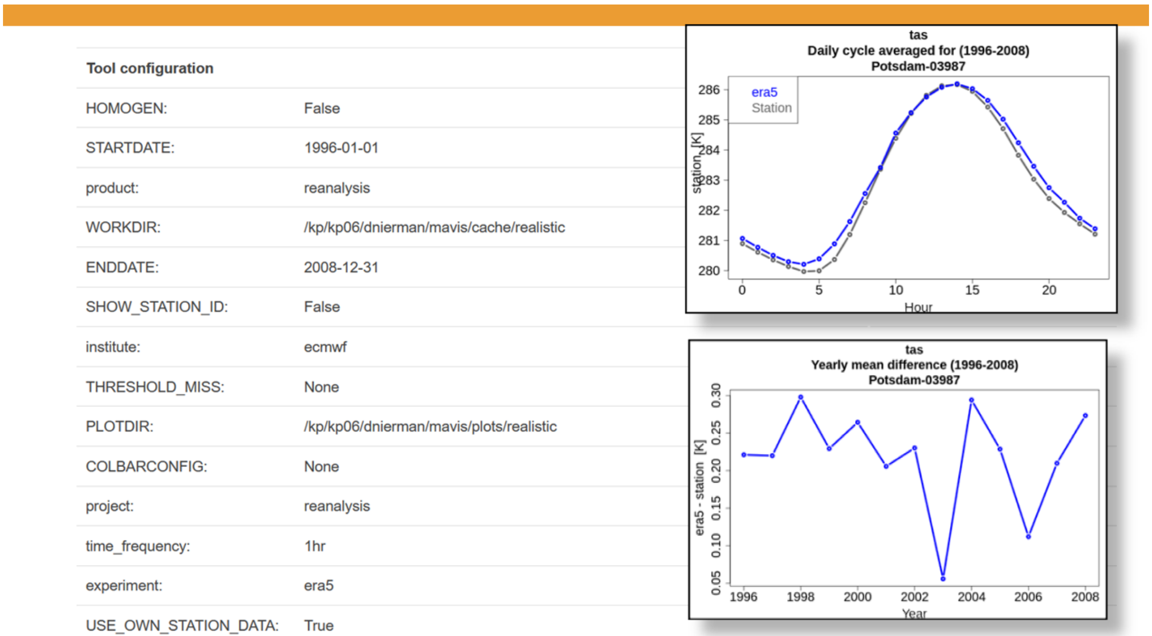

Figure 3: Evaluation of ERA5 2m-temperature against hourly DWD-station observation at location Potsdam with REALISTIC, a plugin developed by Module D at Mavis (DWD), that has been adapted to XCES.

Figure 4: Evaluation of Intensity-Duration-Frequency curves at Aachen, Bad-Lippspringe and Düsseldorf stations for the 1961-1990 interval via IDF plugin, developed at XCES by Module B2.5.

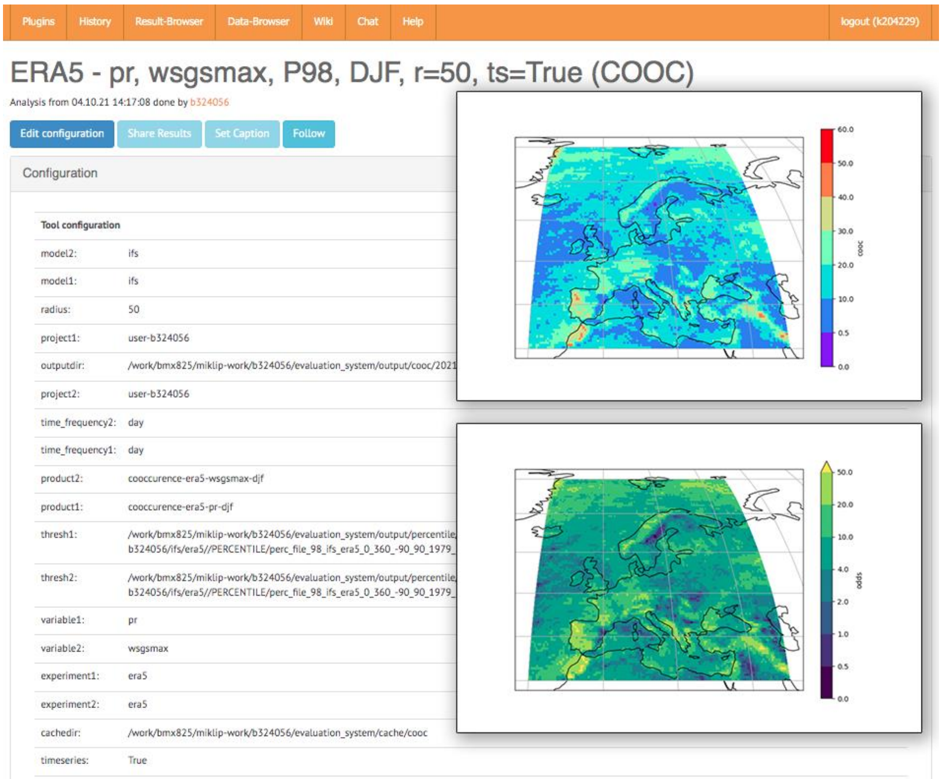

Figure 5: Co occurrence probabilities for precipitation and wind gust extreme events for a selected region, time period and gridded precipitation dataset via COOC plugin, in development at XCES by Module C1.

These plugins are hosted and run through XCES and are available to the whole ClimXtreme community. During the 2022.01-2023.04 period more than 11,400 plugin calls have been done (more than 5,000 from 2022.10 alone), and the storage preserved to outputs has grown continuously.

An adjacent line of research of CLINT is focused on the application of AI/ML methods (Kadow et al., 2020) to tackle a variety of climate science related topics, with a direct usability through XCES (i.e., data and plugins) in mind. The research group has been further developing that methodology under HLRE 4's GPU cores.

6.2 Project related publications:

Caldas-Alvarez, A., Augenstein, M., Ayzel, G., Barfus, K., Cherian, R., Dillenardt, L., Fauer, F., Feldmann, H., Heistermann, M., Karwat, A., Kaspar, F.,Kreibich, H., Lucio-Eceiza, E., Meredith, E.P., Mohr, S., Niermann, D., Pfahl, S., Ruff, F., Rust, H.W., Schoppa, L., Schwitalla, T., Steidl, S., Thieken, A.H., Tradowsky, J.S., Wulfmeyer, V. and Quaas, J. (2022). Meteorological, impact and climate perspectives of the 29 June 2017 heavy precipitation event in the Berlin metropolitan area. *Natural Hazards and Earth System Sciences Discussions*, 1-39. https://doi.org/10.5194/nhess-22-3701-2022

Gliksman, D., Averbeck, P., Becker, N., Gardiner, B., Goldberg, V., Grieger, J., Handorf, D., Haustein, K., Karwat, A., Knutzen, F., Lentink, H.S., Lorenz, R., Niermann, D., Pinto, J.G., Queck, R., Ziemann, A. and C. L. E. Franzke (2022). Wind and storm damage: From Meteorology to Impacts. *Natural Hazards and Earth System Sciences Discussions*, 1-47. Under review. https://doi.org/10.5194/nhess-2022-159

Rousi, E., Fink, A. H., Andersen, L. S., Becker, F. N., Beobide-Arsuaga, G., Breil, M., Heinke, J., Jach, L., Niermann, D., Petrovic, D., Richling, A., Riebold, J., Steidl, Suarez-Gutierrez, L., Tradowsky, J., Coumou, D., Düsterhus, A., Ellsäßer, F., Fragkoulidis, G., Gliksman, D., Handorf, D., Haustein, K.,

Kornhuber, K., Kunstmann, H., Pinto, J.G., Warrach-Sagi, K. and Elena Xoplaki (2022). The extremely hot and dry 2018 summer in central and northern Europe from a multi-faceted weather and climate perspective. *EGUsphere*, 1-37. Under review.
https://doi.org/10.5194/egusphere-2022-813

6.3 Used Resources at DKRZ in 10/2022 – 04/2023 for project bm1159

In January of 2022, project bm1159 (ClimXtreme - CoSoDax Data and Software Management on ClimXtreme Server, former joint project under bmx825 of MiKlip) was joined under project bb1152, transferring to it some computing and storage resources for the exclusive use of Module D.

The work storage resources granted in December 2022 were cut by 30% compared to the amount requested. As a result, serious measures had to be taken with respect to what was planned for this year: in order to keep the existing datasets available in the XCES, the planned extensions of the database had to be reduced and suspended, and the users had to compress their workspace and preliminary results. Currently, almost all available storage capacity is being used (380 of 389 TiB).

The computing resources requested in October 2022 (computing time for data processing and operation of the XCES) have not been fully used, so only new storage resources are required, but no further computing time.

7. References

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Fragkoulidis, G., & Wirth, V. (2020). Local Rossby wave packet amplitude, phase speed, and group velocity: Seasonal variability and their role in temperature extremes. Journal of Climate, 33(20), 8767-8787.

Haarsma, R., Acosta, M., Bakhshi, R., Bretonnière, P. A., Caron, L. P., Castrillo, M., ... & Wyser, K. (2020). HighResMIP versions of EC-Earth: EC-Earth3P and EC-Earth3P-HR–description, model computational performance and basic validation. Geoscientific Model Development, 13(8), 3507-3527.

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