Newsletter 1 / 2021

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Save the date

vEGU on 19-30 April 2021 (abstract submission deadline on 13 January 2021, 13:00 CET)

The abstract submission deadline for this year's virtual EGU General Assembly **vEGU21: Gather Online** taking place from **19-30 April 2021** is approaching very quickly. For ESiWACE2, we are going to participate with the following sessions and are welcoming submissions:

- **AS4.2: High resolution modelling of weather and climate** (Co-organized by CL5.2/ESSI1/OS4)
  Convener: Peter Düben (ECMWF) | Co-conveners: Daniel Klocke, Florian Ziemen (DKRZ)
  https://meetingorganizer.copernicus.org/EGU21/session/40829
- **TS4.4/AS4.1 EDI: Machine learning for Earth system modelling (**Co-organized by CL5.2/ESSI1/NP4)
  Convener: Julien Brajard | Co-conveners: Peter Düben (ECMWF), Redouane Lguensat, Francine Schevenhoven, Maike Sonnewald
  https://meetingorganizer.copernicus.org/EGU21/session/40110
- **ESSI4.1: State of the Art in Earth Science Data Visualization**
  Convener: Michael Böttinger (DKRZ) | Co-convener: Marc Rautenhaus
  https://meetingorganizer.copernicus.org/EGU21/session/40123

Joint IS-ENES3/ESiWACE2 virtual workshop on New Opportunities for Machine Learning & Artificial Intelligence in weather and climate modelling on 16-18 March 2021

Organised jointly by the H2020 projects IS-ENES3 and ESiWACE2, the workshop will be virtual, on **16-18 March 2021** (3.5h per day).
The aim of this workshop is to bring together climate scientists and experts from academia and industry to share knowledge and experience and to identify new opportunities in the areas of machine learning, artificial intelligence and big data techniques for weather and climate modelling.

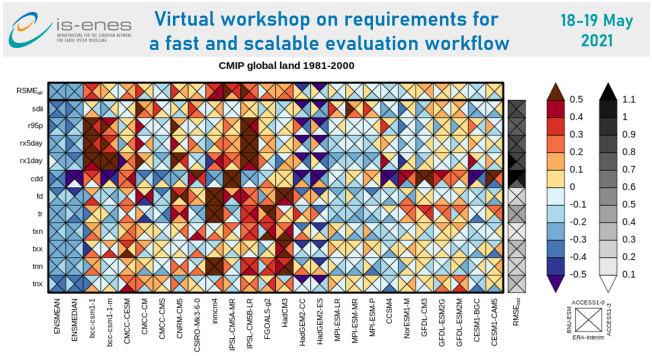
More information about the program and the registration will be provided early in 2021 on the event page.

Spread the word

IS-ENES3 Virtual Workshop on Requirements for a Fast and Scalable Evaluation Workflow on 18-19 May 2021

The "**IS-ENES3 Virtual workshop on requirements for a fast and scalable evaluation workflow**" is a web meeting organised in the context of the EU H2020 IS-ENES3 project in close collaboration with the **ESMValTool development team**, on **18-19 May 2021**.

The workshop aims to bring together leading researchers and software engineers in the field of **evaluation frameworks for Earth System Models to discuss users' requirements, current solutions and to identify gaps and challenges about the next evaluation workflows**.



In this workshop, current and future requirements (such as input data size, memory footprint, reproducibility and computation time, among others) will be gathered, producing a complete set of specifications. This will include feedback from the users obtained from the survey performed by Assimila.

Information on the agenda and registration will be provided early in 2021.

Events that ESiWACE will participate in or has participated in

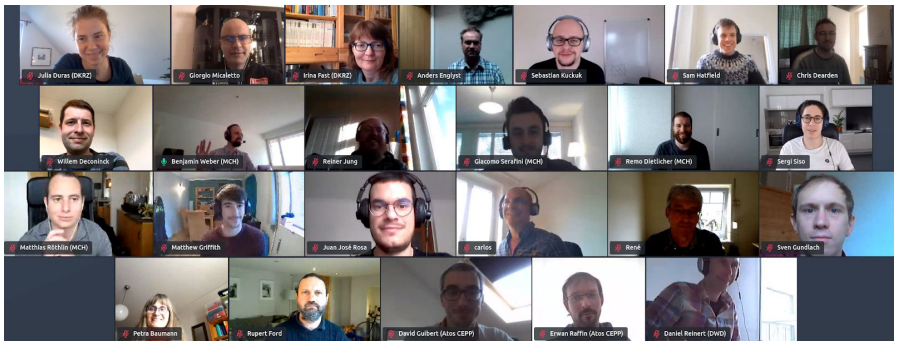
- EGU General Assembly vEGU: Gather Online, online, 19-30 April, 2021
- Joint IS-ENES3/ESiWACE2 virtual workshop on New Opportunities for Machine Learning & Artificial Intelligence in weather and climate modelling, online, 16-18 March, 2021
- HiPEAC Conference, online, 18-20 January, 2021
- ESiWACE2 Domain Specific Language (DSL) training, online, 23-27 November, 2020
- Training on High Performance Data Analytics and Visualisation, online, 6, 13, 22 October & 3 November, 2020

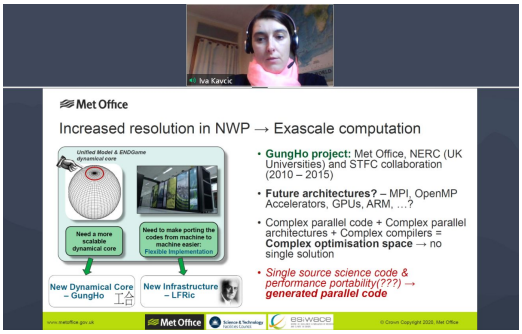
News & updates

ESiWACE2 Domain Specific Language (DSL) training

The ESiWACE2 Domain Specific Language Training was a week-long event that started on Monday the 23rd of November 2020. It concentrated on the two Domain-Specific Languages that are being supported and investigated in the ESiWACE2 project: PSyclone and DAWN (with its DUSK front-end). Due to the COVID19 pandemic, the event was held virtually using the GoToMeeting conferencing software. Whilst it was a virtual event we tried to keep it as hands-on as possible by providing tutorials that attendees could work through, and dedicated Slack channels for them to ask live questions and interact with the trainers. Therefore the event comprised a mixture of presentations and hands-on tutorials.

Approximately 60 people attended the general introductions on the first day and around 35 people were in attendance on each of the following days.





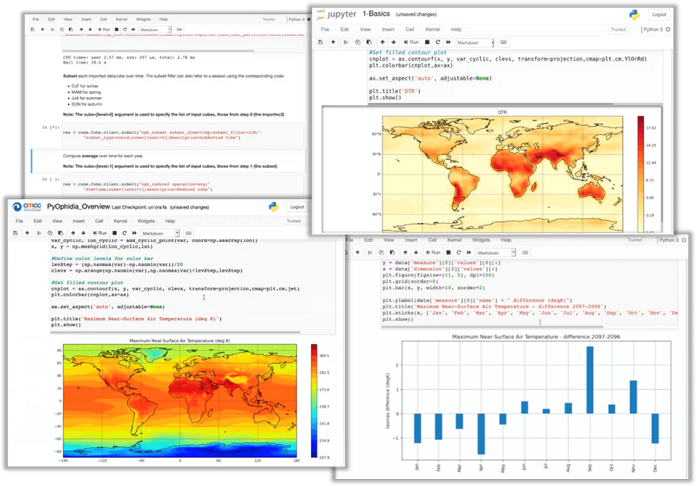
All of the presentations were recorded and the videos will be uploaded to the ESiWACE2 YouTube channel. The associated slides and related documents will soon be made available via the ESiWACE2 DSL training page. The tutorials themselves are also freely available. The PSyclone tutorials are provided with the PSyclone distribution, and so can be accessed once the software has been downloaded.

The tutorials for DAWN (and its front-end DUSK) were provided via binderhub. If you missed some or all of the training event, we encourage you to take a look and if you have any subsequent questions please feel free to contact rupert.ford@stfc.ac.uk for PSyclone or carlos.osuna@meteoswiss.ch for DUSK and DAWN.

Online training on High-Performance Data Analytics and Visualisation organised by ESiWACE2

The first training course on High Performance Data Analytics (HPDA) and Visualisation was organised by CMCC and DKRZ in the context of ESiWACE2 as four 2-hour sessions held on October 6th, 13th, 22nd and on November 3rd. The topics covered by the training included:

- Introduction to scientific data challenges, HPDA and analytics workflows
- Introduction to data visualisation workflows, from post to in-situ
- Overview of open-source solutions, such as Ophidia for HPDA and ParaView for visualisation
- Data analytics demo/examples with Ophidia and Python data science libraries
- Visualisation demo/examples with ParaView



The online training course aimed to increase scientists' expertise on data analysis and visualisation applied to climate and weather, using high-performance data analytics and visualisation tools available from the open source market

(i.e., Ophidia and ParaView). It was very practical and provided examples of real-world applications, as well as demos and hands-on with Ophidia for data analytics and ParaView for visualisation in the climate and weather domain.

The 2020 online training course had registrations from several European and non-European countries. Additional information about the event and links to the material and recordings are available at: https://www.esiwace.eu/events/hpda-training-2020/hpda-training-2020.

DYAMOND paper by Stevens et al. wins Most Downloaded Paper Award 2020 of PEPS journal

We are pleased to announce that the scientific paper on "DYAMOND: the DYnamics of the Atmospheric general circulation Modeled On Non-hydrostatic Domains" published by Bjorn Stevens et al. in the journal "Progress in Earth and Planetary Science" and supported by ESiWACE has received the journal's "Most Downloaded Paper Award 2020".

ECMWF begins collaboration with RIKEN Centre for Computational Science to accelerate Earth-system models on Fugaku

ECMWF has recently established a collaboration with Dr Hirofumi Tomita's team at the RIKEN Centre for Computational Science (R-CCS) in Kobe, Japan. R-CCS is the home to Fugaku, currently the world's fastest supercomputer. The collaboration will identify ways to exploit Fugaku's novel ARM-based architecture to accelerate Earth-system models, including ECMWF's model, the IFS. There will be a particular focus on the use of half-precision floating-point arithmetic to accelerate models.

Snapshots

Atos Bull

Atos is finalising the 2020 HPC Service 1 projects:
In collaboration with NLeSC, The Cyprus Institute and Forschungszentrum Jülich, a poster named "GPU Optimizations for Atmospheric Chemical Kinetics" has been accepted at the HPC Asia 2021 conference, which will be online and free to attend from 20 to 22 January 2021.
On the OBLIMAP2 project, in collaboration with KNMI, all the goals have been achieved: reducing the memory footprint with MPI shared memory, IO and inter node parallel scheme implementation and additional improvements, leading to some speedups.
On the FESOM2 project, in collaboration with NLeSC and AWI, the new OpenACC and CUDA versions developed by NLeSC have been benchmarked on a BullSequana XH2000 equipped X2610 Nvidia blades (2x Intel Xeon 6248 and 4x GPU V100 Nvidia).

BSC

BSC is currently working on the XIOS benchmark. Preliminary results have been presented in a meeting with other XIOS users in mid-December. This benchmark includes "Grand Challenge" simulations with OpenIFS, using a big part of Mare Nostrum 4 to push the I/O server to its limits.

CERFACS

Interesting interactions are going on between CERFACS and CNRS-IPSL on modifications needed in OASIS3-MCT (WP1) to support management of ensemble simulations by XIOS (WP4), in coupled applications using both OASIS3-MCT and XIOS. Developments are done and under test.
Work is also going on to include additional exercises in the online training course on OASIS3-MCT (WP6).

CMCC

A technical report about the initial release of the ESDM PAV runtime and the related Python library has been published on Zenodo in mid October (https://zenodo.org/record/4095479). Activities on the ESDM PAV are continuing in order to improve the system and introduce additional features for experiment management at the level of the Python library. A preliminary version of new Ophidia import/export operators has been implemented, which directly integrates the ESDM library for I/O. The first online training course on HPDA and Visualisation, jointly organised by CMCC and DKRZ, has been completed.

DKRZ

Together with our colleagues from CMCC, we have delivered the first edition of the ESiWACE2 Training on High Performance Data Analytics (HPDA) and Visualisation. Moreover, we have submitted Deliverable D1.2 "Model inter-comparison for global high resolution simulations" and have supported STFC/UKRI, MeteoSwiss and colleagues in organising and hosting the virtual ESiWACE2 Domain Specific Language (DSL) training.
Furthermore we have prepared for the arrival of the DYAMOND Winter data. Together with MPI-M, we are working on R2B11 simulations on Mistral and have passed the technical hurdles. We have improved the ParaView CDI reader and have submitted three pull requests for fixes to KitWare.

ETH Zürich / CSCS

Our team has worked well in spite of the pandemic. Towards the end of the year we successfully completed the containerisation of the ICON model for quasi-biennial oscillation (QBO) simulations using a R2B7 global medium-resolution test case. The performance results indicate that there is no major performance impact for running ICON within a container. These results were published in Milestone MS2.4 The Containerisation of the ICON model for quasi-biennial oscillation simulations.

MeteoSwiss

Collaborating with STFC/UKRI and supported by colleagues from the Met Office and the Bureau of Meteorology in Australia, we organised the first ESiWACE2 DSL training in November 2020 and delivered the training part on DUSK and DAWN.

Met Office

We have contributed to the PSyclone part of the ESiWACE2 DSL training held in November 2020.

NLeSC

Together with Atos Bull we have organised a call for proposals for new Service 1 projects on porting and optimising weather and climate models for upcoming computer architectures. The project proposals have been reviewed by a team of international scientists and four new projects have been granted to run in 2021.
We have also participated in a panel during the Research Software Engineers in HPC (RSE-HPC-2020) workshop at the Supercomputing conference in November (SC20), where we also published a paper on the ESiWACE2 Services. We were also involved in part of teaching the online PRACE course on "Porting of Codes for Next Generation GPU Architectures" in December 2020.

Seagate

Seagate is now actively building a global community around Mero by open sourcing it in September 2021. The open source version of Mero is known as CORTX, which is available for viewing and downloading at: https://github.com/Seagate/cortx. It is hence available for 'test driving' and further developing by all weather and climate communities!

UKRI/STFC

We presented PSyclone at the recent week-long DSL training workshop and supported attendees as they worked through the associated tutorials that we developed (in collaboration with colleagues from the Met Office and the Bureau of Meteorology in Australia). Work also continues on the potential interoperability between PSyclone and DAWN via their internal representations and on the performance of the PSyclone-generated GPU version of NEMO.

University of Reading

We have been conducting an extensive performance test for ESDM with NetCDF on Mistral comparing the performance of ESDM with NetCDF (shared file) and NetCDF (file per process) showing the performance advances by the optimised data layouting and the concurrent usage of the two Lustre file systems concurrently. The ESiWACE summer school on Effective HPC for Climate and Weather will take place in August 2021 and we will start the planning for it soon. Given the circumstances, it will likely be a virtual event, open to everyone. Please see the previous summer school for further information: https://hps.vi4io.org/events/2020/esiwace-school

News from the neighbors

News from the ENES Carbon footprint group !

The "Carbon Footprint" group is a **joint initiative** gathering about 30 volunteers from **both the IS-ENES3 and ESiWACE2 projects**, and representing most of the partner institutions. This group has started to launch a few initiatives to estimate and encourage the reduction of the carbon footprint in both projects and in the partner institutions by **developing a network between partners to share experiences** and elaborate new possible ways of working.

One of the first initiatives is to **encourage people to travel by train** rather than plane. Based on the travel options booked for the First IS-ENES3 General Assembly and before the decision to hold it virtual because of Covid, a map of the CO2 footprint per person round-trip from the partners city to Toulouse was created and disseminated. This action will be repeated for the next in-person meetings. **A survey** will be also disseminated to all project partners to assess their feelings about having more virtual meetings (vs. in-person meetings) in the post-pandemic future, built on their experiences during the pandemic.

The "Carbon Footprint" group also aims to **summarise good practices regarding all project aspects** (e.g. travelling, organising workshops, etc..) in a short document to be distributed to IS-ENES3 and ESiWACE2 partners, and **share success stories** to convince people that reducing their professional carbon footprint is possible. It also contributes to the CPMIP effort (IS-ENES3 WP4) trying to **assess the energy consumption and carbon footprint linked to the CMIP6 simulations**. Finally, it encourages the different partner institutions to evaluate the carbon footprint of their own institution and help them by **collecting examples**.

A new action will start in 2021 gathering volunteers willing to elaborate community ways and paths to a "**1.5 transition**" in our work based on numerical modelling and HPC. A mailing list will be opened soon to start this work.

For more information, please contact Sophie Valcke (valcke@cerfacs.fr).

The project ESiWACE2 has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 823988.