

# Annual report 2021 for Flagship Pilot Study on Convection over Europe and the Mediterranean

## Status and progress during the year including scientific highlights, end to end perspective and participants engaged in the project

Work in 2021 focused on finishing our simulations and commencing work on compositing and preparing files for upload to the ESGF. There is still much to do in this regard as our new outputs require changes to quality control software. At the same time topic teams worked on preparing manuscripts for a soon-to-be-launched special issue in Climate Dynamics. We have 10 confirmed manuscripts with many others likely to be submitted during the special issue period. An FPS-themed EGU2022 session was proposed as an evolution of the “Convection permitting modelling” session of years past. This new session more explicitly acknowledges the aims of convection permitting modelling which are to elucidate local scale impacts, processes and extremes. A highlight of the past year was a post in CarbonBrief co-authored by FPS scientists: <https://www.carbonbrief.org/guest-post-how-high-resolution-climate-models-will-help-europe-plan-for-extreme-weather> and the publication of the IPCC WGI AR6 where all the FPS papers published so far have been assessed and contributed to shape the content of the regional chapters ( Chapter 10, 11, 12 and the Atlas). At the annual meeting in November, we saw the continued trend towards process-based investigations that focus on the improved physics in these simulation in addition to the now canonical analyses of extreme events. Some examples are the uptick in feature tracking studies, heatwaves and land-atmosphere coupling, precipitation feedbacks, atmospheric instability. Many of these will appear in the upcoming special issue.

## Summary of each workshop/activity held during the year

Title, date, short description, location, website, links	Responsible person/-s	Funder
Annual Meeting (22-23, Nov, 2021), online, <a href="https://drive.google.com/drive/folders/1wm13jl46F12_jmb_FoijON-gYOy1rBV4?usp=sharing">https://drive.google.com/drive/folders/1wm13jl46F12_jmb_FoijON-gYOy1rBV4?usp=sharing</a>	Erika Coppola, Stefan Sobolowski	n/a

## Related publications during the year

Title, journal and link to publication	Author/-s	Date
Ban, N., Caillaud, C., Coppola, E., Pichelli, E., Sobolowski, S., Adinolfi, M., Ahrens, B., Alias, A., Anders, I., Bastin, S., Belušić, D., Berthou, S., Brisson, E., Cardoso, R. M., Chan, S. C., Christensen, O. B., Fernández, J., Fita, L., Frisius, T., ... Zander, M. J. (2021). The first multi-model ensemble of regional climate simulations at kilometer-scale resolution, part I: Evaluation of precipitation. <i>Climate Dynamics</i> , 1–28. <a href="https://doi.org/10.1007/s00382-021-05708-w">https://doi.org/10.1007/s00382-021-05708-w</a>		
Caillaud, C., Somot, S., Alias, A., Bernard-Bouissières, I., Fumière, Q., Laurantin, O., Seity, Y., & Ducrocq, V. (2021). Modelling Mediterranean heavy precipitation events at climate scale: An object-oriented evaluation of the CNRM-AROME convection-permitting regional climate model. <i>Climate Dynamics</i> , 56(5–6), 1717–1752. <a href="https://doi.org/10.1007/s00382-020-05558-y">https://doi.org/10.1007/s00382-020-05558-y</a>		
Pichelli, E., Coppola, E., Sobolowski, S., Ban, N., Giorgi, F., Stocchi, P., Alias, A., Belušić, D., Berthou, S., Caillaud, C., Cardoso, R. M., Chan, S., Christensen, O. B., Dobler, A., de Vries, H., Goergen, K., Kendon, E. J., Keuler, K., Lenderink, G., ... Vergara-Temprado, J. (2021). The first multi-model ensemble of regional climate simulations at kilometer-scale resolution part 2: Historical and future simulations of precipitation. <i>Climate Dynamics</i> . <a href="https://doi.org/10.1007/s00382-021-05657-4">https://doi.org/10.1007/s00382-021-05657-4</a>		

Manning, C., Kendon, E.J., Fowler, H.J. et al (2021) Extreme windstorms and sting jets in convection-permitting climate simulations over Europe. <i>Climate Dynamics</i> <a href="https://doi.org/10.1007/s00382-021-06011-4">https://doi.org/10.1007/s00382-021-06011-4</a>		
Kahraman, A., Kendon, E. J., Chan, S. C. & Fowler, H. J. (2021) Quasi-Stationary Intense Rainstorms Spread Across Europe Under Climate Change. <i>Geophysical Research Letters</i> 48, (13) <a href="https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020GL092361">https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020GL092361</a>		
Emma D. Thomassen; Elizabeth J. Kendon; Hjalte J. D. Sorup; Steven C. Chan; Peter L. Langen; Ole B. Christensen; Karsten Arnbjerg-Nielsen (2021) Differences in Representation of Extreme Precipitation Events in Two High Resolution Models, <i>Climate Dynamics</i> , doi:10.1007/s00382-021-05854-1		
Lenderink, G., de Vries, H., <b>Fowler, H.J.</b> , Barbero, R., van Uft, B., van Meijgaard, E. 2021. Scaling and responses of extreme hourly precipitation in three climate experiments with a convection-permitting model. <i>Phil. Trans. Roy. Soc. A.</i> , 379, 20190544, DOI: 10.1098/rsta.2019.0544.		
Douglas Maraun, Raphael Knevels, Aditya N. Mishra, Heimo Truhetz, Emanuele Bevacqua, Herwig Proske, Giuseppe Zappa, Alexander Brenning, Helene Petschko, Armin Schaffer, Philip Leopold and Bryony L. Puxley (2022) A severe landslide event in the Alpine foreland under possible future climate and land-use changes, conditionally accepted for publication in <i>Communications Earth &amp; Environment</i>		
Lavin-Gullon, A., Fernandez, J., Bastin, S., Cardoso, R. M., Fita, L., Giannaros, T. M., Goergen, K., Gutierrez, J. M., Kartsios, S., Katragkou, E., Lorenz, T., Milovac, J., Soares, P. M. M., Sobolowski, S., & Warrach-Sagi, K. (2021). Internal variability versus multi-physics uncertainty in a regional climate model. <i>International Journal of Climatology</i> , 41(S1). <a href="https://doi.org/10.1002/joc.6717">https://doi.org/10.1002/joc.6717</a>		
Vergara-Temprado, J., Ban, N., & Schär, C. (2021). Extreme Sub-Hourly Precipitation Intensities Scale Close to the Clausius-Clapeyron Rate Over Europe. <i>Geophysical Research Letters</i> , 48(3). <a href="https://doi.org/10.1029/2020GL089506">https://doi.org/10.1029/2020GL089506</a>		
Raffa, M., Reder, A., Adinolfi, M., & Mercogliano, P. (2021). A Comparison between One-Step and Two-Step Nesting Strategy in the Dynamical Downscaling of Regional Climate Model COSMO-CLM at 2.2 km Driven by ERA5 Reanalysis. <i>Atmosphere</i> , 12(2), 260. <a href="https://doi.org/10.3390/atmos12020260">https://doi.org/10.3390/atmos12020260</a>		
Van de Vyver, H., Van Schaeybroeck, B., De Troch, R., De Cruz, L., Hamdi, R., Villanueva-Birriel, C., Marbaix, P., van Ypersele, J.-P., Wouters, H., Vanden Broucke, S., van Lipzig, N. P. M., Doutreloup, S., Wyard, C., Scholzen, C., Fettweis, X., Caluwaerts, S., & Termonia, P. (2021). Evaluation framework for sub-daily rainfall extremes simulated by regional climate models. <i>Journal of Applied Meteorology and Climatology</i> . <a href="https://doi.org/10.1175/JAMC-D-21-0004.1">https://doi.org/10.1175/JAMC-D-21-0004.1</a>		
Lucas-Picher, P., Argüeso, D., Brisson, E., Trambly, Y., Berg, P., Lemonsu, A., Kotlarski, S., & Caillaud, C. (2021). CONVECTION -permitting modeling with regional climate models: Latest developments and next steps. <i>WIREs Climate Change</i> , 12(6). <a href="https://doi.org/10.1002/wcc.731">https://doi.org/10.1002/wcc.731</a>		
Ahrens, B., N. Leps (2021) Sensitivity of Convection Permitting Simulations to Lateral Boundary Conditions in Idealised Experiments. <i>Journal of Advances in Modeling Earth Systems</i> . 13(12) e2021MS002519 <a href="http://doi.org/10.1029/2021MS002519">http://doi.org/10.1029/2021MS002519</a>		

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**Planned activities for next year**

- Special Issue in Climate Dynamics with at least 10 planned contributions.
- Convene FPS-related EGU session CL4.2 “Local scale climate impacts processes and exrtemes”
- Publish full ensemble on ESGF by end of 2022.
- Plan legacy of project (final GA, fall 2022)

**Additional relevant information****Contact person/-s**

Erika Coppola: [coppolae@ictp.it](mailto:coppolae@ictp.it)  
Stefan Sobolowski: [stefan.sobolowski@norcerech.no](mailto:stefan.sobolowski@norcerech.no)