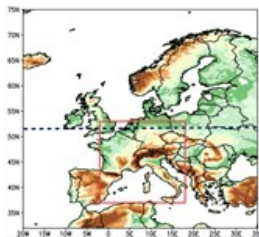


## CORDEX Flagship Pilot Studies

In 2016 CORDEX Flagship Pilot Studies (FPSs) were established with the aim of improving the capability of the models in reproducing regional climate features and producing actionable information for impact studies. FPSs are intended to specifically tackle scientific questions for any given region of the world for which current RCMs are still unable to reproduce the regional climate features adequately.

The FPSs focus on extreme events with large socioeconomic impacts and can for example handle intensive rain, droughts, floods and heatwaves.



### Convective phenomena at high resolution over Europe and the Mediterranean (FPSCONV)

The FPS on convective processes over Europe and the Mediterranean (FPSCONV) began in late 2016 with the aim to create the first multi-model ensemble of convection permitting climate simulations.

It also investigate, for the first time, the uncertainty range of the climate responses at truly local scales. The project was originally planned to finished at the end of 2021 but will probably be extended. The contributions to the regional climate community are really just beginning. In addition to numerous on-going investigations and community papers, the FPSCONV consortium will make all its data available via the Earth System Grid Federation (ESGF).

[FPSCONV website](#)

The FPS principal investigator tells us to read this Carbon Brief:

[The FPSCONV was highlighted in CarbonBrief.](#)

Domain: Europe & Mediterranean

Contact: Erika Coppola and Stefan Sobolowski

### Rainfall responses to climate change in a convective-permitting model over Western Cape (HighResWC)

This is a newly endorsed Flagship Pilot Study.

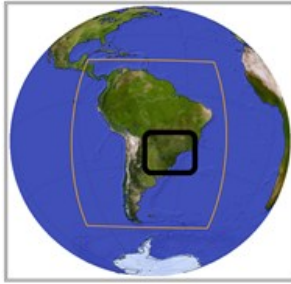
The study aims at understanding drivers of mean and extreme rainfall in a region with complex topography including both mountains and coastal plains. The changing characteristics of precipitation and related processes under human-induced climate change is of particular importance as they carry both society-relevant and scientific challenges to be tackled in the coming years.

Among the objectives are to investigate benefits of convection permitting models, explore dynamics of rainfall, provide an assessment of extreme weather events and to shape an assessment of the possible consequences of a 2°C global warming impact on the water sector in the Western Cape .

No website yet, as newly endorsed.

Domain: Africa

Contact: Izidine Pinto and Piotr Wolski



## The CORDEX Flagship Pilot Study in Southeastern South America: A comparative study of statistical and dynamical downscaling models in simulating daily extreme precipitation events

The FPS in Southeastern South America (FPS-SESA) initiative seeks to promote inter-institutional collaboration and further networking with focus on extreme rainfall events.

The main scientific aim is to study the most important multi-scale processes and interactions behind extreme events through both statistical and dynamical downscaling techniques, including convection-permitting simulations.

The targeted experiment includes ESD and RCM comparisons, assessing ESD methods to simulate daily precipitation over the region, assessing RCM simulations at convective permitting resolution, producing simulations as input data for crop and hydrological models to study the impact of extreme precipitation events.

The FPS-SESA is in its final phase, the group is currently working on the analysis of simulations and publication of results.

[FPS SESA web site](#)

Domain: South America

Contact: Maria Laura Bettoli

## Role of the natural and anthropogenic aerosols in the Mediterranean region: past climate variability and future climate sensitivity

The Aerosol FPS aims to better apprehend the regional climatic effect of aerosol over the Euro-Mediterranean basin, with scientific questions like exploring feedback mechanisms and assessing the impact of aerosol evolution in regional climate change signal.

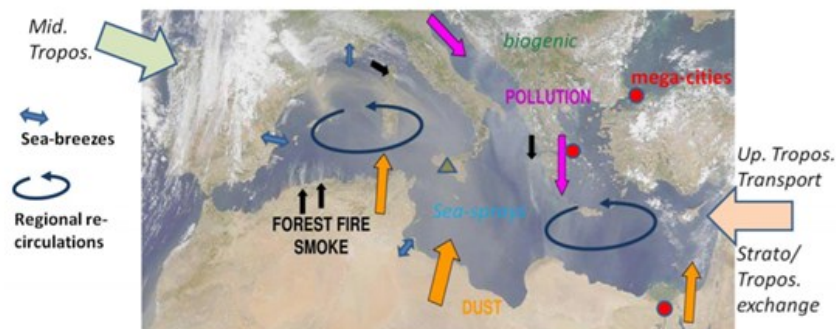
This FPS is at middle stage. A major outcome has been to provide a multi-model analysis of European aerosol trend contribution to the climate change signal in regional climate models which also explains a large part of the discrepancies in regional and global climate change models signals.

Publications and ensemble outputs are coming soon. Protocol and a database for the inclusion of realistic aerosol trend representation for the whole CORDEX experiment are also developed. Other expected outcomes focus on the interactive modelling of aerosol-climate interactions and model inter-comparisons for specific periods of interest.

Domain: Mediterranean

[Med-CORDEX FPS web site](#)

Contact: Fabien Solmon and Marc Mallet



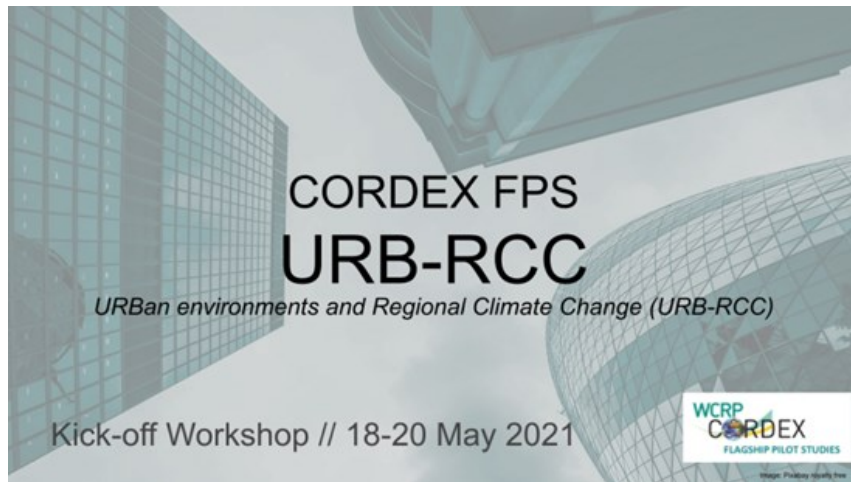
## Role of the air-sea coupling and small scale ocean processes on regional climate

The FPS on air-sea interactions aims at describing and quantifying the role of air-sea interactions in the regional climate. In particular, to quantify the added value of simulating realistic air-sea interactions and the role of small scale ocean processes. At present we are in the last year of the FPS and we recently had a virtual workshop to plan the last phase. We have launched several coordinated studies with results expected during this year, and a review paper will be prepared after that.

Domain: Mediterranean

Contact: Gianmaria Sannino and Gabriel Jordà

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### **URBan environments and Regional Climate Change (URB-RCC)**

This FPS was newly endorsed and started 1 May 2021.

URB-RCC's main goal is to understand the effect of urban areas on the regional climate, as well as the impact of regional climate change on cities, with the help of coordinated experiments with urbanized Regional Climate Models.

URB-RCC involves over 30 partners across the globe, from different [CORDEX domains](#) and the objectives are to 1) understand and assess urban climate change impacts, 2) investigate how urban environment interacts with local/regional climate for (mega)cities, 3) assess options for urban parameterization schemes in high-resolution simulations and 4) to better understand urban areas' vulnerability to Climate Change.

A virtual kick-off workshop was held from 18-20 May 2021 to launch the URB-RCC FPS.

Domain: across domains

Contact: Tomáš Halenka and Gaby Langendijk

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### **Modelling the Southeast African regional climate**

The Flagship Pilot Study (FPS) aims to study processes and phenomena relevant to regional climate change in south-eastern Africa and foster regional collaboration on modelling and the analysis of precipitation and temperature that will be beneficial for the society in general. The region is vulnerable to climate change due to socio-economic factors as well as its exposure to weather and climate extremes such as floods, droughts and heatwaves.

The research will involve analysis of local observations, reanalysis, simulations from regional climate models (RCMs) and empirical-statistical downscaling (ESD) to study dependencies between large-scale conditions and local variability in the rain and temperature statistics. The expected impacts of the FPS are skills development in data analysis and modelling, and a better understanding of regional climate that is fundamental to climate services and provides guidance to decision-makers and planners.

The groupe has been engaged in online training in R programming language, downscaling and climate analysis.

Domain: Africa

[Web site of Modelling the Southeast African regional Climate](#)

Contact: Bernardino Nhantumbo and Jonas Zucule

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### **Dynamical downscaling experiments and hydrological modelling for**

## Canada and Mexico

Based on the contrasting nature of the tropics and the extra-tropics, this FPS will carry out a dynamical downscaling experiment for Mexico, the United States, and Canada. Two selected CMIP6 Earth System Models will force two regional models and be evaluated. The regional models will run under three different resolutions. The "convection-permitting" option will be used for the highest resolution covering two domains over river basins in the tropical zone of Mexico and the southern province of Quebec in Canada. We will analyze two extreme climate change scenarios in a historical period, near future and far future to estimate the temporal and spatial variability over the two regions. We will run a hydrological model to evaluate the local impacts in precipitation.

The first validated simulations of precipitation, surface temperature etc are expected by the end of 2022.

Domain: North America

Contact: José Antonio Salinas Prieto



### High resolution climate modelling with a focus on mesoscale convective systems and associated precipitation over the Third Pole (TP) region

This FPS is shortly called CPTP (Convection-Permitting Third Pole) and was endorsed by WCRP-CORDEX in 2019. It aims to enhance our understanding of the water cycle over the TP region with an initial focus on assessing model skill in the simulation of convection and precipitation, building towards skilful multi-year simulation of the regional precipitation and hydrological regime. The project was started in 2020 and will deliver a multiple year high resolution (a few km) climate simulations over the TP using several regional climate models.

Domain: Central Asia – East Asia

[Website of CORDEX-FPS: CPTP](#)

Contact: Deliang Chen



Figure 2. LUCAS PFT distribution 2025 derived from ESA-CCI Land cover data (Source: Hoffmann et al., in prep., Reinhard et al., in prep.)

### LUCAS - Land Use & Climate Across Scales" - Impact of land use changes on climate in Europe across spatial and temporal scales

LUCAS is an initiative on coordinated regional climate multi-model experiments for Europe which includes land use change forcing. The overall objective of LUCAS is to identify robust impacts of land use changes on climate from regional to local scales and from extreme events to seasonal variations and multi-decadal trends.

The first results from LUCAS Regional Climate Model intercomparison studies were published in two papers in 2020 and several journal publications are in preparation.

Annual land cover maps are generated for the past and scenarios 2016-2100.

FPS LUCAS is now running the 5th year and was originally planned to finish at the end of 2021, but will probably be extended. The new high-resolution annual land cover maps LUCAS are currently tested and recommendations for implementing land use changes into regional climate change projections will be derived and provided.

[LUCAS website](#)

[LUCAS LUC annual land cover maps for the past](#)

[LUCAS LUC future scenarios](#)

Domain: Europe

Contact: Diana Rechid

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### **Assessing the Use of Regional Models in a Storyline Framework for Understanding Climate Hazards**

This recently-endorsed FPS, will be leveraging the physical storyline framework to better understand model performance and future projected changes for extreme weather and climate events or periods of interest to project stakeholders. We will draw on eight different physical storylines (case studies) to assess if regional models can well reproduce our chosen rare events, better understand the processes behind the events, and assess how they may look in the future. The physical storylines include for instance wildfires, hurricanes, floodings and droughts.

We will distill the information gained from the use of these storylines into actionable information for the regional modeling community and potential interested stakeholders.

Domain: North America

Contact: Melissa Bukovsky

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