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A first-of-its-kind multi-model convection permitting ensemble for investigating convective phenomena over Europe and the Mediterranean

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A recently launched project under the auspices of the World Climate Research Program's (WCRP) Coordinated Regional Downscaling Experiments Flagship Pilot Studies program (CORDEX-FPS) is presented. This initiative aims to build first-of-its-kind ensemble climate experiments of convection permitting models to investigate present and future convective processes and related extremes over Europe and the Mediterranean. In this manuscript the rationale, scientific aims and approaches are presented along with some preliminary results from the testing phase of the project. Three test cases were selected in order to obtain a first look at the ensemble performance. The test cases covered a summertime extreme precipitation event over Austria, a fall Foehn event over the Swiss Alps and an intensively documented fall event along the Mediterranean coast. The test cases were run in both "weather-like" (WL, initialized just before the event in question) and "climate" (CM, initialized one month before the event) modes. A total of 22 ensemble members, representing six different modeling systems with different physics and modelling chain options, was generated for the test cases (26 modeling teams have committed to perform the longer climate simulations). Results indicate that, when run in WL mode, the ensemble captures all three events quite well. They suggest that the more the event is driven by large-scale conditions, the closer the agreement between the ensemble members. Even in climate mode the large-scale driven events over the Swiss Alps and the Mediterranean coasts are still captured, but the inter-model spread increases as expected. In the case over Mediterranean the effects of local-scale interactions between flow and orography and land-ocean contrasts are readily apparent. However, there is a much larger, though not surprising, increase in the spread for the Austrian event, which was weakly forced by the large-scale flow. The preliminary results illustrate both the promise and the challenges that convection permitting modeling faces and make a strong argument for an ensemble-based approach to investigating high impact convective processes.