EMS Annual Meeting Abstracts
Vol. 16, EMS2019-484, 2019

Future precipitation changes over the Alpine region in a multi-model convection-permitting ensemble: a first look

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Changes in precipitation at local to regional scales in a warmer world remain highly uncertain. This is especially true of both moderate and high extremes (e.g. > 90%-iles and > 99.9%-iles, respectively). While a relationship between increasing model resolution and increasing precipitation (both means and extremes) appears to be present for both GCMs and RCMs there are conflicting results when convection-permitting scales are reached. These differences can be region as well as model dependent. A project under the auspices of the World Climate Research Program's (WCRP) Coordinated Regional Downscaling Experiments Flagship Pilot Studies program (CORDEX-FPS) was established to investigate these, and other issues. This initiative aims to build first-of-their-kind ensemble climate experiments using convection permitting models to investigate present and future convective processes and related extremes over Europe and the Mediterranean. In this presentation we offer a first look at the scenario simulations (Historical 2000-2009 and RCP8.5 2090-99 timeslices) and an analysis of precipitation changes and their drivers over various sub-regions of a large domain, which cover the Alps, parts of central Europe and the Mediterranean and Adriatic coasts (0-17E x 40-50N). To maintain consistency and compatibility to earlier studies we first examine changes in percentiles, seasonality and wet day frequency before moving on to an investigation of changes in the full distribution using e.g. intensity-duration metrics. Finally we employ process-based metrics using vorticity and vertical velocity to split precipitation into stratiform, orographic and convective categories. This new approach focuses on the physical processes leading to precipitation of a certain type rather than use the circular reasoning of employing the result to determine the cause. We conclude with a discussion of the changes to the underlying physical processes driving convective and other types of precipitation at highly localized scales.