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Subsampling effect on the climate change signal based on simulations from statistical and dynamical downscaling

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We tested the influence of selecting a subset of global climate models to drive two downscaling strategies. The two strategies consisted of i) Empirical-Statistical (ESD) and ii) Dynamical downscaling (DD) to produce regional and local climate information required for most of impact studies. As dynamical downscaling is demanding and expensive, there has been a tendency for climate modelers to consider or run a small set of simulations instead of carrying the downscaling on a large ensemble (e.g. CMIP5 simulations). We found that selecting a subset of global climate models in downscaling (e.g. EURO-CORDEX simulations) has an impact on the magnitude of the estimated climate change signal. The experiments driven here included three test levels such as global, regional and local scales. For each of the scales, we additionally tested whether both strategies agreed or not, and assessed the spread of the climate change signal for both precipitation and temperature from the large ensemble (in case of ESD), the small ensemble as in the case for DD, and the common ensemble of the two strategies. Results over Norway and Poland, exhibiting two different climate and topographical features, showed that selecting a small subset of GCMs may lead to a significant reduction in the estimated climate change spread, especially for precipitation. However, the ensemble mean is not affected. Both ESD and DD showed similar tendencies of the climate change signal for the the near future. However, the two strategies showed disagreement in projecting future changes by the end of the 21st century.