



From ENSEMBLES to CORDEX: exploring the progress for hydrological impact research for the upper Danube basin

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EURO-CORDEX Regional Climate Model (RCM) data are available as result of the latest initiative of the climate modelling community to provide ever improved simulations of past and future climate in Europe. The spatial resolution of the climate models increased from 25 x 25 km in the previous coordinated initiative, ENSEMBLES, to 12 x 12 km in the CORDEX EUR-11 simulations. This higher spatial resolution might yield improved representation of the historic climate, especially in complex mountainous terrain, improving applicability in impact studies. CORDEX scenario simulations are based on Representative Concentration Pathways, while ENSEMBLES applied the SRES greenhouse gas emission scenarios. The new emission scenarios might lead to different projections of future climate.

In this contribution we explore these two dimensions of development from ENSEMBLES to CORDEX – representation of the past and projections for the future – in the context of a hydrological climate change impact study for the Danube River. We replicated previous hydrological simulations that used ENSEMBLES data of 21 RCM simulations under SRES A1B emission scenario as meteorological input data (Kling et al. 2012), and now applied CORDEX EUR-11 data of 16 RCM simulations under RCP4.5 and RCP8.5 emission scenarios. The climate variables precipitation and temperature were used to drive a monthly hydrological model of the upper Danube basin upstream of Vienna (100,000 km²). RCM data was bias corrected and downscaled to the scale of hydrological model units. Results with CORDEX data were compared with results with ENSEMBLES data, analysing both the driving meteorological input and the resulting discharge projections.

Results with CORDEX data show no general improvement in the accuracy of representing historic climatic features, despite the increase in spatial model resolution. The tendency of ENSEMBLES scenario projections of increasing precipitation in winter and decreasing precipitation in summer is reproduced with the CORDEX RCMs, albeit with slightly higher precipitation in the CORDEX data. The distinct pattern of future change in discharge seasonality – increasing winter discharge and decreasing summer discharge – is confirmed with the new CORDEX data, with a range of projections very similar to the range projected by the ENSEMBLES RCMs.

References: Kling, H., Fuchs, M., Paulin, M. 2012. Runoff conditions in the upper Danube basin under an ensemble of climate change scenarios. *Journal of Hydrology* 424-425, 264-277.