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Development of Probability Distributions for Regional Climate Change from Uncertain Global Mean Warming and Uncertain Scaling Relationship

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To assess potential impacts of climate changes on given water resource system one basically needs to characterize regional changes, for exp. as a result of anthropogenic increases of greenhouse gases, in different key meteorological variables such as precipitation and temperature. The projections of regional climate changes are based on the results of the so-called coupled **A**tmosphere-**O**cean **G**eneral **C**irculation **M**odels (AOGCM's) and **R**egional **C**limate **M**odels (RCM's). These projected regional changes (for the period 2070-2099 according to 1961-1990) are uncertain because of uncertain gas emission story lines and imperfect models. A probabilistic approach is used to account for different sources of uncertainty. An extended range of regional changes is next obtained combining both PDF's of global mean warming provided by Wigley and Raper (2001) and PDF's of scaling ratios for both seasonal temperature and precipitation. The latter PDF's are derived from a scaling analysis based on an ANOVA of 19 regional climate experiments of the PRUDENCE EC Project.

The methodology is applied to 5 case study regions (CSRs) studied within the SWURVE EC project: NW-England, Iberia-Spain, the Rhine, the Jura and Mauvoisin-Switzerland. It's shown that precipitation is expected to decrease in summer in all CSR's and to increase in winter in NW-England, the Rhine basin and the Swiss CSR's. The direction of change (increase or decrease) is uncertain for Iberia in winter and for the other CSR's in spring and fall.