



Using historical data to make regional climate projections to 2100

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The relationship between temperature and anthropogenic forcing, CO_2 in particular, is so strong that the decomposition of climate variability into stochastic natural and deterministic anthropogenic components is quite accurate. The forcing due to either the actual CO_2 or CO_{2EQ} , that is the equivalent radiative forcing in CO_2 of anthropogenic effects, leads to an increasing trend whose proportionality coefficient corresponds to the “effective climate sensitivity” or the “effective equivalent climate sensitivity” respectively i.e. the actual temperature sensitivity to the historical anthropogenic forcings. We estimate these effective climate sensitivities for local series of monthly gridded historical temperature records: HadCRUT4, NASA Goddard Institute for Space Studies and NOAA National Climatic Data Center. This allows us to establish long term regional empirical projections of expected anthropogenic warming up to the target period 2081-2100, following the Radiative Carbon Pathways, RCP, scenarios. This approach is complementary to GCM projections and we compare the two. This approach is based on observations and implies only a limited number of parameters and assumptions, providing results completely independent from those obtained through GCMs. Our results indicate a global effective climate sensitivity of $2.06 \pm 0.23^\circ C$ per doubling of CO_{2EQ} .