Geophysical Research Abstracts
Vol. 15, EGU2013-4575-1, 2013
EGU General Assembly 2013

An observationally centred method to quantify local climate change as a distribution

David Stainforth (1,2), Sandra Chapman (1,4), Nicholas Watkins (1,2,3)

(1) University of Warwick, Physics Dept., Coventry CV4 7AL, United Kingdom (s.c.chapman@warwick.ac.uk, +44 2476 692016), (2) CATS, London School of Economics, London, United Kingdom, (3) British Antarctic Survey, Cambridge, United Kingdom, (4) University of Tromso, Dept. of Mathematics and Statistics, Norway

For planning and adaptation, guidance on trends in local climate is needed at the specific thresholds relevant to particular impact or policy endeavours. This requires quantifying trends at specific quantiles in distributions of variables such as daily temperature or precipitation. These non-normal distributions vary both geographically and in time. The trends in the relevant quantiles may not simply follow the trend in the distribution mean. We present a method[1] for analysing local climatic timeseries data to assess which quantiles of the local climatic distribution show the greatest and most robust trends. We demonstrate this approach using E-OBS gridded data[2] timeseries of local daily temperature from specific locations across Europe over the last 60 years. Our method extracts the changing cumulative distribution function over time and uses a simple mathematical deconstruction of how the difference between two observations from two different time periods can be assigned to the combination of natural statistical variability and/or the consequences of secular climate change. This deconstruction facilitates an assessment of the sensitivity of different quantiles of the distributions to changing climate. Geographical location and temperature are treated as independent variables, we thus obtain as outputs how the trend or sensitivity varies with temperature (or occurrence likelihood), and with geographical location. These sensitivities are found to be geographically varying across Europe; as one would expect given the different influences on local climate between, say, Western Scotland and central Italy. We find as an output many regionally consistent patterns of response of potential value in adaptation planning. We discuss methods to quantify the robustness of these observed sensitivities and their statistical likelihood. This also quantifies the level of detail needed from climate models if they are to be used as tools to assess climate change impact.

[1] S C Chapman, D A Stainforth, N W Watkins, 2013, On Estimating Local Long Term Climate Trends, Phil. Trans. R. Soc. A, in press

[2] Haylock, M.R., N. Hofstra, A.M.G. Klein Tank, E.J. Klok, P.D. Jones and M. New. 2008: A European daily high-resolution gridded dataset of surface temperature and precipitation. J. Geophys. Res (Atmospheres), 113, D20119, doi:10.1029/2008JD10201