Geophysical Research Abstracts
Vol. 14, EGU2012-11068, 2012
EGU General Assembly 2012

Territorial Climate Profiles: a methodological approach to provide local climate information for climate change adaptation

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Assessing local impacts driven by change is getting more attention from policy makers involved in defining adaptation strategies. Providing local climate information to end users along with its uncertainties is crucial for this assessment. Initiatives such as the UNDP Climate Change Country Profiles [McSweeney, 2010] already provide valuable climate information for developing countries. However this information is delivered at country scale while local authorities, which play a major role in tackling climate change, need climate information at a scale coherent with their territory for assessing possible impacts and adaptation plans.

While the need for higher resolution climate information is obvious, there is much debate about the "scientifically sound resolution" of climate changes that present day knowledge and climate models can provide. Building on our experience from the participation to research projects like FP6 ENSEMBLES and our interactions with academics, national and international governmental organisations, we believe that the uncertainty issue is much more important than the resolution one, whatever the resolution of the provided climate information.

Here, we propose a methodology to produce local observed and projected climate information, at subnational territorial scale. It is based on the combination of dynamical and statistical downscaling methods. First, high resolution climatologies are produced at the desired resolution with a regional climate model (RCM) forced by a reanalysis product. Here WRF [Skamarock et al., 2008] is forced by NCEP2 [Kanamitsu et al., 2002] to enhance resolution. Second, climate projections from the IPCC database (CMIP3 [Meehl et al., 2007]) are downscaled statistically onto the high resolution climatology domain, using CDF-t [Michelangeli et al., 2009]. Statistical downscaling is preferred here to dynamical downscaling. Indeed, the latter would require very large computational resources (10 to 20 GCMs forced by multiple SRES scenarios and downscaled at a high spatio-temporal resolution); and as a consequence such adaptation studies would not meet the local authorities' agendas for their adaptation plans. The assessment of the errors/uncertainties is conducted at each step of the methodology. It concerns essentially the quality of the high resolution climatology derived from the RCM simulation, the CMIP3 simulations for present and future climates, the statistical downscaling technique. An insight of the results drawn from its application on the Montevideo metropolitan area (Uruguay) at a 5x5km resolution is presented.