Geophysical Research Abstracts
Vol. 14, EGU2012-5770, 2012
EGU General Assembly 2012

Recent climate change: Steady linear process or abrupt transition?

A. K. Stips (1) and M. J. Lilover (2)

(1) Joint Research Centre, Water Resources Unit, Italy (adolf.stips@jrc.ec.europa.eu), (2) Marine Systems Institute, Akadeemia tee 15a, 12618 Tallinn, Estonia

Systems that have an internal feedback mechanism can principally behave non-linear. The climate on earth is such a complex system with internal feedback and a non-linear characteristic should therefore be expected.
Nevertheless it is common practice to calculate and publish linear trends from global data sets. The classical example is the often cited (IPCC) global warming trend of 0.05°C/decade for air temperature during the last 150 years. The inadequacy of this linear trend model over such a long period becomes obvious when looking at the difference of the observed 2009 mean temperature to that estimated from the calculated linear trend. The trend calculation gives an underestimation of about 48% (∼0.36°C to low, compared to a total change of 0.75°C). A similar inspection of several global atmospheric and oceanographic data time series provides reasonable doubt concerning the correctness of the application of linear regression analysis to century long time series. Using a structural test based on the F statistics to test for breakpoints we can show that most of the analyzed global climate time series contain statistical significant structural changes (breaks in the mean or in the slope of a linear regression). We will reveal the existence of breakpoints for most investigated parameters at the end of the 70ties beginning of the 80ties of the last century. Breakpoints detected at a comparable time in many different regional and global climate variables are a strong indication for the existence of a regime shift in the state of the climate.
The enormous difference between trends calculated with and without consideration of breakpoints has significant implications for any predictions based on the calculated trends. From the results of any statistical investigation alone we cannot make a decisive conclusion about the underlying process dynamics. The final confirmation has to come from an accurate and complete geophysical description of the climate system, a difficult and complex task still to be done.