Geophysical Research Abstracts, Vol. 9, 10049, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10049

Eliminating the advective influence on the daily temperature range using an approach developed by Julius von Hann

K. Makowski, M. Wild, A. Ohmura
Institute of Atmospheric and Climate Science, ETH Zurich (makowski@env.ethz.ch)

In this study a new method to remove the advective component of the diurnal temperature range (DTR) is presented, it is based on a separation of the diurnal temperature amplitude developed by Julius von Hann in 1908. The method was developed to obtain additional information about solar influence stored in the daily temperature cycle. DTR contains both the information on solar forcing that is largely influential for determining the daily maximum, and on greenhouse effect that affects night-time cooling hence the minimum temperature. The key idea of the approach is to separate the DTR further, into a periodic amplitude (PA) and an aperiodic part. The PA is defined as the difference between the warmest and coldest hour of the day on a monthly average basis. Von Hann assumed that by averaging the measurements over the time of a month all warming and cooling advective influences will cancel each other out. In consequence, the only factors influencing the PA are the reflection and absorption of long wave radiation (Greenhouse Effect) by local atmosphere in mean condition on the one hand and the incoming shortwave radiation on the other hand. As change in Greenhouse Effect develops continuously, changes in PA during the last decades have to be attributed to change in incoming shortwave radiation. To test the suitability of the method mean annual cycles for eight different stations around the globe with different time resolution (hourly and 10 minute) and altitude were investigated. Concerning the solar influence on the daily temperature amplitude good results could be achieved by applying the advective reduction especially for polar stations like Barrow and South Pole the PA shows reasonable annual cycles compared to the DTR. Besides an analytical approach concerning the energy budget, correlations with available global radiation measurement timeseries were calculated to ensure the improvement concerning the solar driven nature of the corrected DTR or PA respectively.