



## **On the neglect of causality principles in solar activity – climate relations.**

Peter Stauning (1,2)

(1) Danish Meteorological Institute, Copenhagen, Denmark(pst@dmi.dk), (2) DCGA Consult, Alleroed, Denmark  
(pst@dcga.dk)

Many research papers have claimed to demonstrate close relations between solar activity and the terrestrial climate. In most cases the relations have been based on comparisons between time series of solar activity parameters, for instance sunspot numbers, and climate parameters, for instance terrestrial temperatures. However, many of the reported close relations are based on skilfully manipulated data and neglect of basic causality principles. For cause-effect relations to be reliably established, the cause must obviously happen prior to the effects. Thus it is problematic to use, for instance, running averages of parameters if the result depends too much on posterior elements of the causative time series or precursory elements of the effects. Even more neglected are the causality principles for cause-effect relations with a strongly varying source function. Damping of source variations by smoothing data handling introduces additional implied delays, which should be considered in the judgement of apparent correlations between processed time series of cause and effect parameters. The presentation will discuss examples of frequently quoted solar activity-climate relations (e.g., by Reid, Friis-Christensen, and Svensmark), which violate basic causality principles.