15-16 October 2017 2nd International Symposium on Climate and Earth System Modeling

Nanjing

Deconstructing recent regional climate change: Is CO2 a sufficient driver?

Hans von Storch

Regional and global climate conditions undergo permanent variations; in the past this was due to the ubiquitous natural variability of the high-dimensional, multiply chaotic weather system; additionally slow natural factors had an imprint. To this complex mix of drivers causing the climate system to exhibit variations of the weather statistics (i.e., its climate), humans are now adding factors which act on time scales of decades – namely foremost greenhouse gas emissions, but also contributions to more, or less, aerosol loads and changing surface conditions. For responding properly to these changing conditions it is useful if one would know if ongoing changes will prevail for a long time and will possibly even become stronger, or if they will persist for a limited time (such as an ENSO event or the impact of volcanoes). For sorting this out, a methodology has been developed, named “detection and attribution”, which allows to first identify changes beyond the range of natural variations, and then determine which mix of causes is most plausible in dynamically explain the changes. Here, simulations with climate models play a key role, namely in estimating the level of natural variations, and in suggesting the space/time patterns, which are supposedly characteristic for which driver.

In the past the methodology has been mostly used on the global and on continental scales. We have now used the methodology for examining ongoing climate change in sub-continental parts of Europe (Baltic Sea Basin and Mediterranean Region). We found changes beyond the range of natural variations, so that external drivers are needed for explanation. While greenhouse gases turned out to provide plausible explanations in some seasons, in others they were insufficient, and additional other drivers are needed. Such drivers could be the reduction of aerosols in the regional atmosphere.