February/March 2022 - Seminar series at Meteorological Institute of **Hamburg** University; 22 February 2022; 14:15, online

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Detection and attribution of climate change

Climate science is nowadays dominated by the quest of anthropogenic climate change. Originally, the perception that human activities have the potential for changing the climate, i.e., the statistics of weather, was derived from theoretical arguments in the 19th century. In the middle of the 20th century, arguments were presented that this would not only be a theoretical possibility, but that such a changer is beginning to form, and that such a change would be societally significant.

The obvious question arose, how such a change could be identified, given the stochastic character of the climate system. What is the "signal" in an ocean of "noise"? One of Klaus Hasselmann's Nobel Prize achievements was the solution of this problem, with his "detection and attribution" concept. The two-step procedure may be compared to the murder investigation. After having ensured that the body is really dead, that is: the data are not contaminated by problems in recording and monitoring, a medical experts needs to determine if the person was ceased naturally or was killed by an external factor – here: is the a "signal", or could the variations be a mere manifestation of ubiquitous random fluctuations; if the "detection" of an anthropogenic signal has been achieved, the criminal investigator is examining the various suspects, which the evidence would point to as a murderer – this is the "attribution" step, which assigns a plausible and consistent cause to the considered variations.