Klaus Hasselmann
Recipient of IMSC award 2007

When Klaus Hasselmann was invited to found the Max-Planck Institute of Meteorology in 1975, which became one of the leading institutes of climate science, he introduced the use of statistical concepts when analyzing climate data and numerical climate experiments right from the very beginning. With his background in theoretical physics, and possibly also under the influence of Walter Munk, he was more interested in conceptual models that needed to be fitted to the available data than in exploratory analysis, fishing expeditions and fashionable methods. Statistical analysis was just one tool for him, albeit an important one. Based on a sound understanding of the basic concepts, he developed innovative approaches on the fly whenever needed. I personally believe that nobody was more innovative and creative in inventing statistical methodology in climate research than Klaus. This was likely because he was lead by the problems he encountered while in the pursuit of understanding of the climate system, and rather than being driven by the wish to apply concepts developed in other fields for different purposes – a phenomenon often seen at IMSC meetings.

A major achievement was the formulation, in 1975, of the stochastic climate model and its publication in *Tellus* in 1976 in a very complex and barely understandable article. It later became easier and easier to describe this concept, which employs, in a nutshell, the phenomenon that short term fluctuations in an inert system are integrated so that red spectra emerge. The stochastic climate model is one of the most powerful concepts extant in explaining natural climate variability.

Stochastic differential equations were also at the core of his most general concept, namely the identification of low dimensional statistically open dynamical subsystems. While these “Principal Interaction Patterns” (PIPs), of which the Principal Oscillation Patterns (POPS) are a rather simple version, remain to be implemented in their full generality, it seems certain that future efforts will lead to exciting and significant examples of such sub-spaces.

Klaus recognized early that the variability of the climate system would exhibit a continuous spectrum, with significant contributions from internal variability, together with some variability from externally induced components. The separation of this mix is a key challenge in climate science, specifically these days, when we need to quantify the human influence on climate, where climate means not just the statistics of weather in the atmosphere but also that in the oceans. His first version of “detection and attribution”, which meant “detecting” non-natural components with sufficiently small risk of error and “attributing” the most plausible dynamical driver of this non-natural component, was first published in another one of Klaus’ difficult-to read-papers in 1979. This concept also became easier and easier to explain as time evolved. Eventually, in 1993 a wonderfully clear paper on the issue appeared in the *Journal of Climate*. The concept of detection and attribution has become a key part of the IPCC assessments of ongoing climate change. Later, he generalized the concept to include elements of social conditioning by employing Bayesian concepts.

Klaus had, and has, a broad range of interests, some of which are beyond my competence to grasp. I am sure that he also has built advanced and powerful yet problem-adequate statistical approaches in these other fields, in particular in ocean wave modeling, remote sensing and concepts of theoretical physics.

I had the privilege of recording and editing an extensive interview with Klaus Hasselmann in 2006. It was published in 2007 and can be downloaded from http://coast.gkss.de/staff/storch/Media/interviews/hasselmann/hasselmann.pdf
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Hans von Storch, 31 December 2007