

## **Mathematical aspects within the epistemology of modeling**

Dirk Langemann

TU Braunschweig, Inst. Computational Mathematics, AG PDE, Germany

Since the last decades, mathematical modeling plays an increasing role in e.g. life-science applications. Oftentimes, the mechanisms are not well-distinguished from each other, not really quantified and not given in a hierarchical order. Thus, the questions occur what we do, when we construct a mathematical model, and what we expect.

We present a conceptual framework which allows us to differentiate between mathematical and epistemological questions. For this purpose, we use a general evolution equation representing the system to be modeled, and formulate the question of model selection as an approximation of the system equations by model equations.

This approach enables us to determine the causation structure in systems, to formalize and evaluate the model selection process, to discuss the hierarchical order in model families and to describe the robustness of model components and the respective reproduction of observations against model refinements.