

The Climate as Problem in Theoretical Physics

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Many important problems in science are characterized by the presence of very different time scales. Among the most relevant and challenging examples we have the climate where the characteristic times of the involved processes vary from days (for the atmospheric phenomena) to thousands years for the deep ocean flows and ice shields.

The necessity of treating the “slow dynamics” in terms of effective equations is both practical (even modern supercomputers are not able to simulate all the relevant scales involved in certain difficult problems) and conceptual.

In order to build efficient model, it is necessary to find the direct causal links between the variables and introduce a degree of causation.

An approach in terms of linear response theory allows for a critical analysis of paleoclimate data.