

## On the added value generated by dynamical models

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### Abstract:

Dynamical models are tools for scientific analysis, experimentation and prediction; they are constructed for a specific purpose, namely to understand dynamical processes and the interaction of different forcing factors, to predict future states, and to consistently interpret limited observational evidence (data assimilation). The models are tailored to these purposes.

Models and reality share some properties, named positive analogs; they have many properties, which are not common to both, model and reality (negative analogs) and there are also properties, which are not known if the model incorporate them in a realistic manner (neutral analogs). Determining the positive and negative analogs means “validating” a model – and it is not associated with learning something about the real world but only something about the model. However, dealing with the neutral analogs provides new knowledge about the real world, even if this step is conditioned by an assumption of the skill of the model. Since this skill can hardly been proven, the model results represent mostly hypotheses, some of which may be falsified with new observations, while others will survive the test of time, by being consistent also with additional data collected in the future.

The concept of “added values” generated by dynamical model has historically received too little attention, as modelling is seen by many as a purely technical task, while the deeper questions of philosophy of science have rarely been addressed by the modelling community.

See also

Müller, P., and H. von Storch, 2004: *Computer Modelling in Atmospheric and Oceanic Sciences - Building Knowledge*. Springer Verlag Berlin - Heidelberg - New York, 304pp, ISN 1437-028X

and

von Storch, H., and G. Flöser (Eds.), 2001: *Models in Environmental Research*. Proceedings of the Second GKSS School on Environmental Research, Springer Verlag ISBN 3-540-67862, 254 pp.

**Key Words:** dynamical models, purpose of models, added value