Is the climate system an anticipatory system that minimizes free energy?

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All systems, whether they are alive or not are structured determined systems, i.e. their present states $[x(t)]$ depends of past states $[x(t-\alpha)]$. However it has been suggested [Rosen, 1985; Friston, 2013] that systems that contain life are capable of anticipation and active inference. The underlying principle is that state changes in living systems are best modelled as a function of past *and* future states $[\ x(t) = f(x(t-\alpha), x(t), x(t+\beta))\ ]$. The reason for this is that living systems contain a predictive model of their ambiance on which they are active: they appear to model their ambiance to preserve their integrity and homeorhesis. We therefore formulate the following hypothesis: can the climate system be interpreted as an anticipatory system that minimizes free energy? Can its variability (catastrophe, bifurcation and/or tipping points) be interpreted in terms of active inference and anticipation failure? Here we present a mathematical formulation of the climate system as an anticipatory system that minimizes free energy and its possible implication in the future climate predictability.

References

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