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Predictability of stochastic climate models with red noise

Faming Wang
Chinese Academy of Sciences, Institute of Oceanology, Qingdao, China (faming_wang@ms.qdio.ac.cn, 86 532-8289 8612)

The predictability of a 1-D stochastic climate system under red noise forcing is analytically derived. The results show that when the forcing time scale is shorter (longer) than the climate time scale, then the system's predictability is primarily controlled by the internal climate dynamics (external stochastic forcing). When the two time scales are comparable, however, the internal dynamics and external forcing have equal contributions to the climate predictability. Hence, the ability of an atmosphere-ocean model in capturing the whole climate predictability is questionable if it fails to correctly simulate the red climate noise that exists in nature.