



Stability, Variability and long-term forcing in a monthly-averaged temperature data

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A periodic non-autonomous stochastic model is suggested to approximate the monthly-averaged data spanning decades. The model consists of the deterministic part showing the monthly sensitivity, a long-term forcing and the stochastic noise implying short-time processes such as weather. The time functions in the model, the monthly sensitivity, the magnitude of the noise and the long-term forcing, are determined by the statistics deduced from the original target data based on the assumption that there exists a clear distinction among time-scales. The generally constructed model is applied to global and hemisphere-averaged surface temperature spanning 133 years. The non-autonomous stochastic model successfully obtains the seasonal statistics similar to those from the data and constructs the long-term forcing, which could be interpreted as an additional heat flux caused by on-going global warming. Based on the results we could provide the information of climate sensitivity under global warming.