

LONG-TERM MEMORY OF THE ATMOSPHERE: ON THE CONSTITUTIVE EFFECTS OF CYCLIC FORCING

P. Carl

Climate Dynamics Project, c/o FV Berlin, D-10117 Berlin, Germany.

Recent paleoclimatic studies point to frequency modulation (FM) effects in response to Milankovich forcing, or of these cycles themselves. This appears to be but half the truth. Adaptive joint analysis of related oscillation parameters using a broad set of intraseasonal to centennial climatic time series unveils ubiquitous presence of FM for both real world and conceptual GCM data. For the latter, 'breathing' of the seasonal cycle (SC) due to temporary excitation of, and retreat from, highly organized intraseasonal activity controlled by the monsoon system, has been blamed for climate variability throughout the interannual spectrum. The annual forcing is thus both cause (driving the system into the corresponding intraseasonal regimes) and carrier of a memory that is based on self-organized SC phase modulation and will not be lost as long as external control does not change the system's dynamic architecture. There are hints at mechanisms, from tropical convection to the katabatic wind regime of Antarctica, ready for mediating a contribution of even the diurnal forcing, and thus of synoptic-scale feedbacks, in organized dynamics that make up the 'modulation unit' of this GCM's climate system. Switching off the diurnal cycle damped its dynamical excitation by an equivalent of as much as 5% insolation. Conceptually, long-term memory of the atmosphere may hardly be understood from an equilibrium dynamics perspective, from a viewpoint of amplitude relaxation, and without considering the constitutive effects of cyclic forcing.