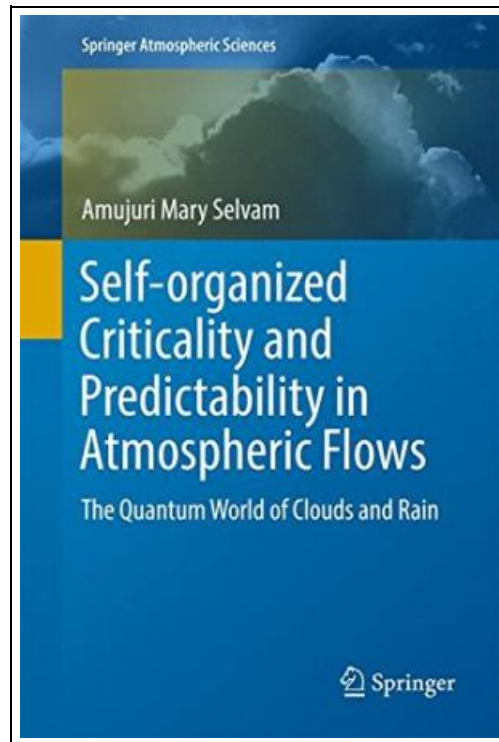


## Selforganised Criticality and Predictability in Atmospheric Flows



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Springer-Verlag GmbH Mai 2017, 2017. Buch. Condition: Neu. Neuware - This book presents a new concept of General Systems Theory and its application to atmospheric physics. It reveals that energy input into the atmospheric eddy continuum, whether natural or manmade, results in enhancement of fluctuations of all scales, manifested immediately in the intensification of high-frequency fluctuations such as the Quasi-Biennial Oscillation and the El-Nino-Southern Oscillation cycles. Atmospheric flows exhibit self-organised criticality, i.e. long-range correlations in space and time manifested as fractal geometry to the spatial pattern concomitant with an inverse power law form for fluctuations of meteorological parameters such as temperature, pressure etc. Traditional meteorological theory cannot satisfactorily explain the observed self-similar space time structure of atmospheric flows. A recently developed general systems theory for fractal space-time fluctuations shows that the larger-scale fluctuation can be visualised to emerge from the space-time averaging of enclosed small-scale fluctuations, thereby generating a hierarchy of self-similar fluctuations manifested as the observed eddy continuum in power spectral analyses of fractal fluctuations. The interconnected network of eddy circulations responds as a unified whole to local perturbations such as global-scale response to El-Nino events. The general systems theory model predicts an inverse power law form incorporating the golden mean for the distribution of space-time fluctuation patterns and for the power (variance) spectra of the fluctuations. Since the probability distributions of amplitude and variance are the same, atmospheric flows exhibit quantumlike chaos. Long-range correlations inherent to power law distributions of fluctuations are identified as nonlocal connection or entanglement exhibited by quantum systems such as electrons or photons. The predicted distribution is close to the Gaussian distribution for small-scale fluctuations, but exhibits a fat long tail for large-scale fluctuations. Universal inverse power law for fractal fluctuations rules out unambiguously linear secular trends in climate parameters. 139 pp. Englisch.



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