# Abstract Details

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**Title:** Entropy exchange and the organization of severe atmospheric systems

**Abstract:** The relation between the entropy exchange of an open atmospheric system in non-equilibrium conditions with its environment and the organization of the system is examined in terms of the theory of dissipative structures. In this paper, starting from the Gibbs relation, we derive the integrative form of entropy balance equation, which is suitable for describing the entropy budget of an atmospheric system and then use this balance equation to diagnose the distribution of the entropy flow for a Bay of Bengal cyclone and a West Pacific typhoon. The computational results demonstrate the dissipativity of these atmospheric systems and show that the maintenance of such systems requires the continuous supply of negative entropy flows from their environments, with the level of dissipation reflecting the distance from equilibrium. Once the negative entropy flow decreases or if there is positive entropy flow, a weakening in the organization of the system will follow. It can be seen from the Table 1 that TEF is always negative so the Bay of Bengal cyclone and Typhoon 7507 receive negative entropy from their environments. According to the theory of dissipative structures [Glansdorff and Prigogine, 1971; Nicolis and Prigogine, 1977], any irreversible process is always accompanied by entropy-increment, which is the fundamental implication of dissipation. If a system is not supplemented with enough negative entropy flows, its entropy will grow so that the system will tend to wither away. Our computational results confirm this point. It is suggested that the evolution of the negative entropy flow is a significant indicator of the life cycle of an atmospheric system. Table 1. The Entropy Budget for the Atmospheric Systems (unit: cal K-1 s-1 m-2) MONEX cyclone Typhoon 7507 Formation(July 6) Maturity(July 7) Formation(Aug.18) Maturity(Aug.22) TEF -0.6008×102 -0.3239×102 -0.1060×103 -0.2534×102 (TEF)' id. id. -0.1057×103 -0.2170×102 References Glansdroff, P, I. Prigogine, Thermodynamic Theory of Structure, Stability and Fluctuations, Wiley-Interscience, London, 1971. Nicolis, G., I. Prigogine, Self-Organization in Non-equilibrium Systems, John Wiley & Sons Inc., New York, 1977.

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