



What is the role of information in matter and energy exchanges?

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Understanding matter and energy exchange across the living earth's surface requires the consideration of information flow. Terrestrial ecosystems are open, self-organizing systems and energy of different quantity and quality provides the stimulus for organization, enabling different processes to progress at different rates. Information acts internally within the system to constrain its behavior, which can also flow into the system from outside, thereby prompting the direction of self-organization. The interplay of environmental conditions, matter, energy and information defines the context and constraints for the set of processes and structures that may emerge during self-organization in living systems on earth's surface. Using the multi-year tower-based flux measurements of energy and matter at the forest-atmosphere interface and the resulting network statistics (following Ruddell and Kumar 2009), we have examined statistical measures of characterizing the organization of the information flow in a process network. The goal of this study is to better understand the role of information in matter and energy exchanges based on an attempt to connect complex systems thinking to information theory and the thermodynamic principle.