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Earth System Dynamics
Discussions

Interactive comment on "ESD Ideas: Structures dominate the functioning of Earth systems, but their dynamics are not well represented" *by* Axel Kleidon et al.

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This paper raises the valuable concept of structures in systems (Earth, societal, planetary etc.) and notes that the growth and sustainment of structures should be able to be quantified. This seems like a promising avenue of enquiry, but the present paper fails to adequately develop the concept. While I recognize that an 'ESD ideas' format should encourage advancement of concepts that may not be fully mature, the present very short manuscript really doesn't do enough by itself to merit publication. In particular, there is a yawning gap – not to say a gross inconsistency in physical dimensions/units – between the (obvious, and qualitatively well-discussed in previous

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works – e.g. Lineweaver, Bejan and others) structures like vascular networks, sewage systems and flow structures (lines 32-37) and the **energies** discussed in equation 1 in lines 45-52. For each of the environments discussed in section 2, the authors should make at least a token effort to (1) define the physical quantities involved (kinetic energy and viscous dissipation in flow, volume of material and transport rates in geomorphic structures like rivers, metabolic rate and biomass? in plants etc.), and (2) identify the destruction mechanisms against which growth must compete – otherwise the paradigm is meaningless. Then, for at least a couple of these, provide a numerical example or two where these properties, and the resultant timescale, is actually quantified. This exercise, which probably involves half an afternoon, some coffee and a whiteboard, could turn this half-developed 'placeholder' of analogies into a valuable contribution to the literature where the idea is shown to have predictive utility.

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