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Interactive comment on "Spectral solar irradiance and its entropic effect on Earth's climate" *by* W. Wu et al.

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The paper entitled "Spectral solar irradiance and its entropic effect on Earth's climate" by Wu et al. quantifies the TOA radiation entropy flux based on observations using the well established Planck expression given in Equations (1) and (2) of the manuscript. However, it is not clear to me why in this study a hemispheric flux of isotropic radiation was assumed. The radiation flux from the sun may be isotropic close to the sun, but is definitely not isotropic close to the Earth, where it is restricted to a small incident angle. This means that $L_\lambda(\Omega)$ can not be factorized into a frequency-dependent and an angle dependent function, so that the double integration in Equation (3) and (4) can not be carried out separately.

To convert the directed solar light into isotropic radiation the light would have to be

scattered, which is an irreversible process and produces entropy. This is why assuming isotropic radiation unavoidably leads to an overestimation of the entropy flux.

This has also implications for the section "Dependence of spectral solar radiation entropy flux on radiation traveling distance". The authors did include the effect of r^2-dependent weakening of radiation; however, as one increases the distance to the radiation source, the solid angle under which the radiation hits the target decreases. Therefore the intensity per unit solid angle increases and due to the non-linear form of the entropy formula (Eq. (1) and (2)) the overall entropy flux decreases. This may be a reason for the disagreement of presented results and the results obtained with Equation (5), since equation (5) does not assume hemispheric isotropic flux. For thes reasons, it appears to me that the results presented in the manuscript do not necessarily invalidate equation (5), as is implied in the conclusions.

As a reader, I would benefit from a discussion of the above points in the context of the conclusions drawn, especially when the authors compare their entropy flux results under the assumption of isotropic radiation with others that include the reduction of entropy by concentrating radiation. I was also a bit dissapointed that there was only a very brief discussion on climatic effects, given that the title of the manuscript promised an evaluation of entropic effects on Earth's climate.

Interactive comment on Earth Syst. Dynam. Discuss., 2, 45, 2011.