SOME CRITICAL COMMENTS

Harold J. Blaauw physicist, Oosteinde 16, 2266 HK Leidschendam-Voorburg, h.j.blaauw@casema.nl
November 15, 2018

On the Earth's energy budget as presented by Wild et al.

The scheme from Wild et al (figure 2) is much the same as the updated scheme presented by Kiehl, Fasullo and Trenberth (2007). That update was affected by analyses through radiative computations contrary to the original scheme Kiehl and Trenberth proposed in 1997. The latter was primarily based on observations. The IR-emission by the surface reads 397 W m^{-2}, meaning the surface temperature is set 1.3 K higher than the value adopted by Kiehl and Trenberth in 1997, i.e. 288 K. This difference cannot be explained by the global warming over a decade. Even if it is understood as an improved estimate, it is too far off from the accepted mean temperature.

The estimate for the IR "returning" to the surface, 342 W m^{-2}, is questionable and so is the heat transfer from the surface to the atmosphere. Wild's scheme presents a residual energy transfer of 0.6 W m^{-2} from the atmosphere to the surface. It is the figure proposed by James Hansen and Karen Von Schuckmann to underline global warming. Certainly, it is at odds with the surface temperature levelling off over the time span from 1997 up to 2013 (the energy imbalance should be close to 0 as is confirmed by several other publications, e.g. Douglass and Knox, Levitus et al and Domingues et al).

Another remarkable point concerns the heat transfers, both latent and sensible. Wild et al mention 85 W m^{-2} and 20 W m^{-2} respectively for the world-wide averages. These values differ significantly from those presented by Kiehl and Trenberth. The new value for the latent heat transfer would imply that the precipitation averaged over the globe be 1100 mm m^{-2} per annum in stead of the generally accepted 990 mm m^{-2} per annum. Data on the cloud cover indicate a slight reduction of the precipitation since 1950 rather than a serious increase. Even the IPCC data for the precipitation since 1950 say so. The figure for the transfer of sensible heat, 20 W m^{-2}, can be challenged also. Most probably it is too high. Budyko and several others mention 17 to 18 W m^{-2} whereas Blaauw arrives, indirectly, at 13 to 14 W m^{-2}. It cannot be measured but is only inferred from other energy transfers assuming energy balances. Of course, the transfers differ greatly from place to place and are strongly fluctuating in time. But a study on the global level reveals that some of the values may be quite critical, the value for the sensible heat transfer in particular.

Ref.: H.J. Blaauw (2017), *Global Warming: Sun and Water*, Energy & Environment **28** (4), 468 – 483. http://journals.sagepub.com/doi/abs/10.1177/0958305X17695276.

On the optical window.

In principle the width of the optical window as defined in this comment depends on the atmospheric CO_2-concentration. In the 15 μm band of CO_2 the absorption is 100% apart from the frequencies at the very edges of the band. If the concentration increases the absorption at the edges will go up thereby narrowing the optical window. Is it significant? In section 17 referring to several authors and the IPCC Rörsch mentions a narrowing of about 4 to 5 W m^{-2} when the CO_2-concentration doubles. The doubling means a CO_2-increase of about 250 ppm. The annual increase of anthropogenic CO_2 is roughly 2 ppm at present. Hence doubling takes about a century and the 4 to 5 W m^{-2} has to be spread over that period of time. It may not be a uniform spreading as the phenomenon is non-linear (Lambert-Beer law). But the contribution to the annually averaged energy budget of the Earth may well be less than 0.1 W m^{-2}.

On the response of the surface skin to temperature variations.

It may be interesting to also consider Blaauw's argument about the response of the energy transfers from the surface (skin) on raising its temperature. In terms of feedbacks he found for a surface temperature rise of 1 °C:

a. change of IR emission by the surface is + 5.55 W m^{-2} (meaning a cooling effect),
b. change of latent heat transfer is – 7.05 W m^{-2} (meaning a warming effect because the evaporation rate is reduced),
c. change of convective sensible heat transfer is + 1.72 W m^{-2} (meaning cooling).

The second entry (which can well be explained by elementary physics) makes the difference and is forgotten in the usual treatments on the greenhouse effect. In total the response reads + 0.22 W m^{-2}, i.e. close to 0 making Blaauw speak of a near singularity. It is still positive as is necessary to have a stable climate system. Incorporation of this change of the latent heat transfer into the analysis of the climatic energy transfers does away with the need to resort to CO_2 for explaining global warming.

Ref.: H.J. Blaauw (2017), *Global Warming: Sun and Water*, Energy & Environment **28** (4), 468 – 483. http://journals.sagepub.com/doi/abs/10.1177/0958305X17695276.