Review of the article

The effect of radiometer placement and view on inferred directional and hemispheric radiometric temperatures of a urban canopy

C. Adderley, A. Christen, and J. A. Voogt

This paper is very interesting. It provides useful information about the bias of thermal infrared sensors, with either a small FOV or an hemispherical FOV, that observe an urban canopy at different altitudes, and under different view directions at different solar hours. As expected, at large altitudes, the acquisition of an hemispherical sensor is no more dependent on the sensor altitude. However, the paper provides quantitative information, which allows one to calculate the most appropriate altitude. This provision of quantitative results is undoubtedly a major point of the work.

The work is impressive with interesting conclusions. All steps are well explained. Generally speaking, the paper is clear and well presented. Moreover, the abstract gives a good overview of the whole work. I give below some comments and advise minor corrections.

Page 1894, line 6: the sentence is not perfectly correct. Indeed, Stefan-Boltzman law links the brightness temperature and the emittance. In short, the sentence should be a bit more general.

For explaining the difference between brightness temperature Tb and thermodynamic temperature, the authors introduce the canopy thermodynamic temperature $T_{oc} = \frac{\sum_f S_f . T_{of}}{\sum_f S_f}$. If we neglect, the impact of emissivity, one should consider $\sqrt[4]{\frac{\sum_f S_f . T_{of}^4}{\sum_f S_f}}$ instead of T_{oc}. Actually, the authors adopt this approach when they initialize Equation 2.

Page 1895. For low altitude sensors, another factor contributes to the difference between T_{od} and T_{oc}: if the sensor is at low altitude, 2 surfaces with the same area but at different distances from the sensor will tend to be seen under different solid angles, with the closer one being seen under the larger solid angle.

Some atmosphere correction was applied. Which atmosphere parameters were used? Which gas model? Which aerosol model? How was atmosphere information available?

The authors mention that the atmosphere correction reached 8.6K. Was it for an unrealistic configuration such as tremendous atmosphere humidity and/or very large distance.

For the atmosphere correction:

- the authors pre-compute a number N of scenarios, which gives the LUT(T_B, T_a, RH). I tend to think that distance d should be also a variable parameter. Isn'it?
- If the LUT which is computed is LUT(T_B, T_a, RH, d), then it could have been more efficient to compute the 2 LUTS: t_{atm}(T_a, RH, d) and L_{atm}(T_a, RH, d), where t_{atm} is atmosphere transmittance and L_{atm} is the

atmosphere path radiance. Indeed, one can consider that the measured radiance from a facet i is equal to:

$$L_{measure,i} = L_B(T_{B,i}).t_{atm}(T_a, RH, d_i) + L_{atm}(T_a, RH, d_i)$$

In Equation 2, the authors assume that atmosphere radiance is isotropic, which is not exact. This simplifying hypothesis should be mentioned.

In the work, surface emissivity is assumed to be isotropic. I did not notice that this simplifying hypothesis is mentioned in the text. If should be mentioned, if it is not.

Page 1906, Line 17: the word "opposite" should be replaced by "least contrasted".

Page 1910: the authors give tentative explanations for the difference of temperature anisotropy for different configurations (Marseille versus Vancouver). Maybe sky irradiance in the short wavelengths is another contributing factor. Indeed, if the sky irradiance is small relative to total (direct sun + Earth sky), then Earth surfaces are more isotropically illuminated, which tends to lead to more homogeneous temperatures, which tends to lead to smaller anisotropy of thermal acquisitions. Maybe, the orientation of the road is another factor.

Page 1913, Line 6: according to equation 5, RMSE = $a.e^{-b}$ if $z/z_b = 1$, and not RMSE = a.

Some terms are sometimes improperly used:

- IFOV: Instantaneous field of view. It informs on how much a single detector pixel can see in terms of field of view (FOV). Basically: IFOV=FOV/number of pixels in the direction of the FOV. In case, the sensor corresponds to a single pixel, then the terms FOV and IFOV have the same meaning.

  Figure 1.a is an example of ambiguous use of IFOV. It displays an image that represents the spatial extent of a surface that corresponds to the IFOV of a single detector of a satellite sensor.

  Page 1905, Line 3 is another example.

- radiance L: radiant flux emitted, reflected, transmitted or received by a surface, per unit solid angle per unit projected area. In equation 1, the term L corresponds to an emittance. Thus, page 1901, line 21, the term longwave radiation L should be replaced by longwave emittance M.

- shortwave reflectance (p 1898, line 21): it should be replaced by "shortwave emittance". Similarly, "longwave reflectance" (p 1898, line 22) should be replaced by "longwave emittance"

The authors created a very interesting data set: urban model with facets, with reflectance / emissivity per facet. Is there a way to open this dataset to the community. As a scientist, I would be very interested in using this dataset with the DART model that I develop in order to simulate the 2 types of radiometers, using radiative transfer. The analysis of differences between the radiometer simulations and acquisitions would be useful. In addition, the possibility to simulate airborne / satellite images (UV to TIR) and LiDAR data with "DART + Data set" could be also of interest.

Gastellu-Etchegorry J.P.
jean-philippe.gastellu@cesbio.cnes.fr