**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "Atmospheric effect on the ground-based measurements of broadband surface albedo" *by* T. Manninen et al.

Anonymous Referee #2

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This paper offers a parametrization for deriving the black-sky albedo by correcting for the fraction of the ground-based measurement of blue-sky albedo that is caused by the diffuse radiation component. A simple radiative transfer model (SPCTRAL2) is used to calculate the clear-sky diffuse irradiance using aerosol optical depth (AOD) measurements at two wavelengths and ignoring every other variable except the solar zenith angle. The AOD range measured at the Cabauw BSRN site and 87 tabulated albedo spectra serve as inputs to the model to simulate the deviations between blue-sky and black-sky albedos that can reach 20%. Calculations specific to the Cabauw site using actual AOD and albedo measurements demonstrate typical blue-sky albedos that were 5% higher than black-sky albedos.

Many issues of this paper have been pointed out by Referee #1; I agree with most of

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them, and these will not be repeated.

I think this paper could have been much better with not much more effort. I would have used the more accurate SMARTS model that the authors reference, but do not use, for the direct and diffuse calculations. I would have used ozone and water vapor inputs from the Cabauw site for the model. Using these and a nominal single scattering albedo and asymmetry parameter would have improved the Cabauw calculations as has been demonstrated by Wang et al. JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 114, D14206, 10 PP., 2009 doi:10.1029/2009JD011978.

Since it is a BSRN site a much better downwelling is available that does not require a cosine correction. The downwelling irradiance can be calculated by summing the direct * cos(sza) + diffuse (assuming an offset correction for the diffuse is made, if needed). Since most pyranometers are calibrated at 45 degs and the weighted effective angle of incidence for both the diffuse and upwelling is not far from 45 degs, there may be negligible cosine correction needed if the sum is used instead of the single pyranometer measurement of downwelling.

I think this paper needs more effort to produce a useful parameterization that is acceptable for publication.

On p 390, lines 11-13, I am confused by their definition of shortwave and what a pyranometer measures; the shortwave is usually considered to extend from 290 out to 3000 or even 4000 nm, although there is little energy there and 4000 overlaps the thermal infrared

Eqn (3) neglects Rayleigh scattering, ozone absorption, water vapor absorption, and mixed gas absorption; moreover, why not use the SPCTRAL2 direct irradiance output if you are going to use the SPCTRAL2 model

Sentence on lines 9-11 on p 392 is not correct

In last paragraph before section 4 Results, there is a discussion about cosine correcting

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irradiance in which the same cosine correction is applied to the diffuse as is applied to the direct; the cosine correction for diffuse is not the same as the direct since the diffuse impinges on the pyranometer from the entire hemisphere.

Sentence beginning on line 15, p 394 is wrong, or at least confusing as to the meaning (if there is less attenuation in the near-infrared compared to the visible, then there is relatively more infrared than visible, not less).

See line 14 p 395; if AOD is zero, Rayleigh scattering is still producing diffuse irradiance

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