

Interactive comment on “Retrieval of cloud spherical albedo from top-of-atmosphere reflectance measurements performed at a single observation angle” by A. Kokhanovsky et al.

Anonymous Referee #1

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This paper presents an approximate formula for the albedo of a plane-parallel, optically thick cloud in which the principal unknown is a single diffuse reflectance measurement; the error in the formula depends on the illumination (i.e., solar) angle. Significant parts of the cloud physical model on which the approximation is based are not discussed (at all) in this paper, but are treated in the references. Typical errors, estimated from comparison with a standard radiative transfer code, range from a few percent to, in a few cases, a few tens of percent. The formula is applied to diffuse reflectances of cloud tops in a hurricane, as observed using MODIS. The authors claim that application of this formula to satellite observations will contribute to climate research.

The paper leaves several, major issues unaddressed, however. First, the approximate formula applies only to a very restricted class of clouds, and to an oversimplified physical model of clouds at that (since the radiative properties of actual clouds depend on their vertical structure [Huang et al., 2005] and three-dimensional structure [Oreopoulos et al., 2006]). The question of whether the formula applies to some important subset of clouds so that it can actually influence climate studies is not addressed. Second, the physical properties of clouds that must be estimated to support climate studies includes many properties in addition to albedo [Zhang et al., 2005]. The contribution of the formula given here to current studies is thus called further into question. Third, even for plane-parallel, homogeneous, optically thick clouds, the errors incurred in using the formula are far from small, in comparison to the limits on errors for useful studies of radiative energy balance.

I therefore conclude that the contribution of this paper is unclear and dubious, and that the paper is not suitable for publication in its present form.

References

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