**Atmospheric
Chemistry
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Discussions**

Interactive
Comment

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.

A. Kokhanovsky et al.

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Answer to the interactive comment of anonymous referee 1.

General

The reviewer finds that the contribution of this paper is not clear and dubious. We think otherwise. In particular, we propose to use analytical Eq. (4) for satellite retrievals of cloud spherical albedo for clouds having optical thickness (OT) larger than 10. Then the error is smaller than 2 percent (see Fig.2b), which is better than the calibration error of optical instruments currently orbiting the planet. The application of the technique does not require multi-angle measurements.

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Errors increase for thinner clouds. Therefore, the use of Eq. (4) is justified for clouds having spherical albedo larger than 40 percent (see Fig.3). For thinner clouds, other approaches must be used.

Specific comments

1. The reviewer correctly points out that our paper presents an approximate formula for the albedo of a plane-parallel, optically thick cloud. This is our Eq. (4). However, we do not agree that the principal unknown is a single diffuse reflectance measurement. Instead, the principal unknown in Eq. (4) is the reflection function , which is routinely measured by optical instruments orbiting the planet. 2. It is stated by a reviewer that the significant parts of the cloud physical model are not discussed in the paper. There is nothing to discuss here. We consider the standard case of a homogeneous plane-parallel cloud layer. The derivation of Eq. (1) is given by van de Hulst (1980). 3. The range of errors shown in Fig. 2b is given only to warn readers against the use of Eq. (4) for all types of clouds. We clearly state that only thick clouds (see Fig. 2b) must be treated in the framework of the theory presented here. So we do not advice to use Eq. (4) in the region, where the error is above 5 percent. 4. We will remove all wording related to climate issues in this paper. We only would like to propose a simple and convenient way to get the spherical albedo of a thick cloud from observation of the cloud reflection at a fixed geometry. This is accomplished by Eq. (4). 5. The reviewer discusses some current problems in modeling of light transport in clouds, including cloud inhomogeneity effects. These problems are addressed in our other publications. They are well outside of the scope of this work. 6. We do not agree that errors of Eq. (4) are large for the subset of clouds we consider . They are typically below 2 percent in this case. 7. We will consider remarks of the reviewer in the improved version of the paper. The figures will be re-plotted to show only regions, where we advice the application of Eq. (4). Also abstract, conclusions, and introduction will be improved.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 2175, 2006.

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