Atmos. Chem. Phys. Discuss., 10, C690–C691, 2010
www.atmos-chem-phys-discuss.net/10/C690/2010/
© Author(s) 2010. This work is distributed under
the Creative Commons Attribute 3.0 License.

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Testing remote sensing on artificial observations: impact of drizzle and 3-D cloud structure on effective radius retrievals" *by* T. Zinner et al.

Anonymous Referee #1

Received and published: 18 March 2010

Authors used LES generated cloud fields and a Monte Carlo model to investigate whether or not the presence of drizzle affects the cloud droplet size retrieval by MODIS. Through their detailed simulations, they concluded that drizzle unlikely affects cloud droplet retrieval. While the result is welcome to those who retrieve cloud droplet from passive instrument observations, the presentation of their results is not well organized. As a result, how the authors derived such conclusion is not clear. The optical thickness of the base case is ranging from 7.8 to 9.4. The authors state in the abstract that "the optical thickness 8 to 9 is large enough to mask the drizzle". But using only 1 case, how do the authors derive this conclusion? In addition, Table 4 shows a similar retrieved size with and without drizzle for all three channels. However, the retrieved

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

size for all channels are significantly different from the true value (especially 1.6 and 2.1, if I am reading the level correctly. I am not sure, however, what 0.86/1.6, 0.86/2.1 mean). Is it possible that the retrieved particle size difference with and without drizzle for all three wavelengths is masked by a large optical thickness error? The 1D case with and without drizzle does not show a large retrieved size difference either despite the abundance of drizzle particles in this case. The result that the retrieved size in he 1D case does not change by the presence of drizzle makes wonder if this is the right cloud field to asses the 3D effects on the size retrieval with drizzle. If the question is whether or not 1D retrieval is affected by a presence of drizzle, you need to change a size of drizzle particles and optical thickness using a plane parallel cloud and see the retrieved particle size as a function of drizzle particle size and optical thickens.

In addition, earlier studies (Marshak et al. 2006 JGR; Kato et al. 2006 JGR) show that the retrieved cloud droplet size using a coarse resolution (500 m in this case) is larger than the true value. The result for without drizzle shown in Table 4 contradicts with results in earlier studies. The part of the reason for a larger particle size is a smaller retrieved optical thickness. Because the reflectance at a near IR wavelength saturates at a smaller optical thickness than the reflectance at a visible wavelength, a larger particle size is needed to match the observed reflectance at a near IR wavelength for a given optical thickness retrieved at a visible wavelength.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 1221, 2010.