

Interactive comment on “A better understanding of POLDER’s cloud droplet size retrieval: impact of cloud horizontal inhomogeneity and directional sampling” by H. Shang et al.

Anonymous Referee #1

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General comments: In this paper, a couple of sensitivity tests were carry out to examine the impact of horizontal cloud inhomogeneity and directional sampling on the retrieved cloud effective radius and effective variance by the POLDER instrument. The authors divided the cloud field into various portions that were consisted of different cloud properties and expanded the range of scattering angles used for retrieval. Their results showed that the cloud size retrievals can be improved by accounting for the horizontal inhomogeneity and the expanded use of the primary rainbow region. I don’t have major concern about the science part. But major revision on the English language is needed. I recommend publication of this paper after revision.

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Specific comments: 1. I suggest the authors changing the title of this manuscript to “Impact of cloud horizontal inhomogeneity and directional sampling on the retrieval of cloud droplet size by POLDER instrument”. 2. The authors should have briefly described how the retrieval is implemented, instead of just claiming it is the same as Breon and Boutriaux-Boucher (2005). This should be a critical part to help the readers understand this paper! I strongly suggest the authors really put some effort to describe the retrieval process. I also think the introduction of RT3 model is too simple and need more descriptions. 3. I don’t find much problem with the science part, but I do concern about the English language expression in this manuscript. I have listed more than 50 minor changes below, but I couldn’t track all typos and errors. If possible, I suggest the authors seeking for more professional English editing to improve the manuscript. 4. Another problem is about the figures: (1) the font size of the labels is generally too small to be legible; (2) please use degree symbol instead of using “degree”; (3) please explain (in text or in figure caption) the meanings of the solid and dash lines in Figure 8; (4) Figure 9a: be careful about whether it is “150 km²” or “150 km * 150 km”. 5. Some formatting problems (references in the text and references part) should be fixed. For example, page 3, line 32; page 20, line 4; page 23, line 9 and line 14; page 24, line 4;

Technical corrections: 1. Page 1, line 16: “size parameter” has other meaning in the light-scattering and remote sensing community. Here it should be “cloud particle size distribution parameters”. 2. Page 1, line 20: I am confused about whether it is “150 km²” or “150*150 km²” (page 11, line 10; page 14, line 24-25). The authors should be careful about the unit. 3. Page 1, line 20-22: Remove “Nevertheless”, “However”, and “then”. These conjunctions (and many others in this manuscript, i.e., “then” in page 1, line 24; “hence” in page 2, line 28) are not needed/appropriate at all. Please check and revise accordingly. 4. Page 2, line 2: “nearly” – do you mean “evenly”? 5. Page 2, line 12: Please avoid using words like “current” because it is confusing: are you referring to the default POLDER retrieval or the new one? 6. Page 2, line 31: “satellite measurements” should be “satellite retrievals” 7. Page 3, line 2: Some references should be added here. 8. Page 3, line 7: What do you mean by “shortwave infrared”?

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What's the spectral range? 9. Page 3, line 10-18: Please also add references for ATSR-GRAPE, PATMOS-x, VIIRS, etc. 10. Page 3, line 26: "Nevertheless" should be "However" 11. Page 4, line 25: Remove "satellite". "have been conducting" should be "have been conducted". 12. Page 4, line 27: "The same paper" – do you mean Alexandrov et al. (2012)? Please avoid using ambiguous words. 13. Page 4, line 27-28: "the range of scattering angle range" should be "the range of scattering angle" 14. Page 5, line 1: "radii results of POLDER" should be "radii from POLDER" 15. Page 6, line 8: What does "CNES" mean? 16. Page 6, line 14-16: Is it "nine" or "eight" bands? 17. Page 7, line 4: "opposite" should be "opposite to" 18. Page 7, line 8: "100*100 km²" should be "100 km * 100 km" 19. Page 7, line 20: "obey" should be "follow" 20. Page 7, line 24: "gamma" should be "Gamma" 21. Page 8, line 3: it looks like Figure 1 shows P12/P11 instead of P12. Please double check. 22. Page 8, line 4: "Mie theory" should be "Lorenz-Mie theory". Lorenz actually discovered the theory ahead of Mie. 23. Page 8, line 11: "modeled" should be "calculated" 24. Page 8, line 18: "suggest to use" should be "suggest using" 25. Page 8, line 17-22: this sentence is too long. Please separate it into short ones. 26. Page 8, line 23: "applied by" should be "applied in" 27. Page 8, line 25: "in the range 145-180 of scattering angle" should be "in the scattering angles between 145 and 180" 28. Page 9, line 9: Typo of "to" 29. Page 9, line 10: ", two fit" should be ". Two fitting" 30. Page 9, line 26: Please add the references to the doubling and adding method. 31. Page 10, line 31: "Indeed, . . . , while . . ." should be "Because . . . , and . . ." 32. Page 11, line 16: "vales" should be "values" 33. Page 11, line 27: "whether a resolution is sufficient" – the authors should define the criteria of "sufficient" first! 34. Page 12, line 7: "solar-view" should be "solar-viewing" 35. Page 12, line 18: "5 to 100" – From Figure 4, it looks like it is "5 to 80". Please check! 36. Page 12, line 27: What do you mean by "although the result is invalid despite the good accuracies"? 37. Page 13, line 4: "at wavelengths of . . ." should be "at the wavelengths of . . ." 38. Page 13, line 12-13: This sentence is wrong. It should be "The better performance for 490 nm than for 670 nm is . . .". 39. Page 13, line 15: "samely good" should be "similarly good" 40. Page 14, line 11: Remove "either". 41.

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Page 14, line 13: "less than" should be "are less than" 42. Page 14, line 21: "official CDRs" may be better to be called "operational CDRs". Please change accordingly. 43. Page 14, line 23: "from June 2008" should be "in June 2008" 44. Page 14, line 29: The authors should also explain the meaning of "Qual". What's the physical meaning? 45. Page 15, line 2-4: Please rewrite the sentence. 46. Page 15, line 29: "derailed CDR" should be "detailed CDR" 47. Page 15, line 31: "at scattering angles" should be "at the scattering angles"; "in 865 nm wavelength" should be "at the wavelength of 865 nm" 48. Page 16, line 18: "(Breon and Goloub) or (. . .)" – this is not a correct way to cite! 49. Page 16, line 22-23: "because the rainbow structure can be changed by varying the rainbow structures" – this sentence doesn't make any sense! 50. Page 16, line 26: "affects significantly" should be "significantly affects" 51. Page 16, line 27: "but with discernable impact" should be "but exert/have discernable impact" 52. Page 17, line 13: "CDRswere" – add a space between "CDRs" and "were" 53. Page 25, Table 1: several variables in the table are not appropriate. They are used without definition.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 6559, 2015.

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