

## ***Interactive comment on “Retrieval of liquid water cloud properties from POLDER-3 measurements using a neural network ensemble approach” by Antonio Di Noia et al.***

### **Anonymous Referee #2**

Received and published: 16 January 2019

The paper presents a new algorithm based on neural network to retrieve liquid water cloud properties from multi-angular POLDER-3 measurements. The training of neural networks is done from synthetic measurements and are next applied on one year of POLDER-3 measurements. Comparisons are realized with MODIS and POLDER-3 official products to valid the algorithm.

The paper fits perfectly the scope of AMT as it proposes a new way to obtain cloud products from the multi-angular and polarized measurements of POLDER. The methods and results are clearly and honestly presented. The paper can thus be published in AMT. I suggest below some comments that could from my point of view improve the

C1

paper before publication.

1) In introduction or in section 3-1, a discussion about the advantages and disadvantages of using neural network should be added comparing to classical method (LUT) or more recent method such as variational method that should be able to handle multi-angular measurements without database constraints.

2) In section 3-1 can the authors give elements on which data give which information. For example, what is the information provide by the degree of linear polarization (DoLP) for the cloud optical thickness retrieval

3) Page 5, line 29: I'm not agree: the saturation reflectance of the optical thickness is not "inherent to POLDER-3 measurements" but comes from the 1D homogenous cloud assumption.

4) Overall, some explanations of the observed differences are missing. For instance, Figures 7 and 8, how do the authors explains the observed bias in optical thickness between POLDER-NN and MODIS retrieval given that the same cloud model is used for the retrieval?

5) I was also curious to know how the algorithm works in the sun-glnt region. It can be an advantage of the multi-angular and neural network retrieval comparing to LUT with measurement in a single direction. Could the authors show analysis of results obtained for pixels including sun-glnt directions?

6) Figure 16 and Figure 17. you mentioned in the text that correlation with MODIS is better for POLDER CDR than for POLDER NN which is true. But, I would add that POLDER-NN does not retrieve as many Reff value limits (at  $20\mu\text{m}$ ) than POLDER-CDR, which appears to be a progress.

---

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-345, 2018.

C2