

Interactive comment on “Potential of airborne lidar measurements for cirrus cloud studies” by S. Groß et al.

Anonymous Referee #2

Received and published: 14 May 2014

General comments:

This work presents an interesting study using two aircrafts simultaneously to retrieve water vapor mixing ratio in cirrus clouds. The HALO aircraft was situated above the cirrus using a lidar to retrieve water vapor mixing ratio using remote-sensing while Falcon flew below through the lower parts of the cirrus cloud while measuring in-situ water vapor mixing ratio. This enables a validation of the values retrieved by the lidar. ECMWF-data is used to analyze the RHi-fields inside and outside of cirrus as well. The authors find that the fluctuations in RHi are caused by fluctuations in water vapor mixing ratio rather than variations in temperature. This paper is well-written and suitable for publication in AMT. There are merely some minor issues to be clarified before publication.

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Specific comments:

Page 3, line 11: You write here that HALO cruises at an altitude of 14 km, about one kilometer above the cirrus cloud. On page 2, line 30 you state that an optimal distance to the cirrus cloud is around two kilometers. In the conclusions, on the other hand, you state this value to be 1.5 km. Which statement is true? Why did you choose to fly only one kilometer above it? The technical specifications of HALO (Table 1) indicates a maximum cruise altitude of more than 15 km.

Page 5, line 16-17: Please use repetition rate instead of repetition frequency

Page 7, line 3-4: The Falcon was situated below HALO from 11:25 until 11:54 UTC. Which distance does this correspond to (you mention that HALO covered 910 km from 10:47 until 11:54 UTC)? How many loops from Fig. 2 were flown within this time frame? There seems to be a repetitive pattern in Fig. 3, possibly because you flew through the same location several times. How did the airmasses change in the time needed to fly one loop? Please comment on this.

Page 7, line 8-9: The retrieved OD ranges between 0.1 and 1.5. What is the accuracy on these numbers? How is the OD retrieved?

Page 8, line 1-4: You have a mean difference in temperature between Falcon and ECMWF of -0.9K. Did you check if this could be improved if you used COSMO-instead of ECMWF-data? COSMO-data is available in a better resolution.

Page 9, line 5-6: Could you comment on the vertical resolution of ECMWF at cirrus altitude? How representative is this resolution as compared to the cloud thickness?

Page 11, line 21: Please change "Figure 11" to "Figure 10" as there is no Figure 11.

Page 11, line 24-25: Could you please comment on the occurrence of regions within the cirrus clouds having values of RH_i exceeding 130%?

Page 12, line 20 showses -> shows

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Figure 3: The black lines indicating the isolines of IWC from ECMWF are diffuse. I therefore suggest to plot these as well as the corresponding numbers clearer. The solid line indicating the altitude of the DLR Falcon might be indicated with another colour.

Figure 4: Why are there gaps in the series of the water vapour mixing ratio retrieved by WALES?

Figure 10: Please plot isolines of BSC=4 as this is your limit for detecting the cirrus cloud. Then it would be clearly visible which data points are found inside the cirrus cloud and which ones are located outside the cloud.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 4033, 2014.

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