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Atmospheric Measurement Techniques Discussions

Interactive comment on "Airborne lidar reflectance measurements at 1.57 μm in support of the A-SCOPE mission for atmospheric CO_2" *by* A. Amediek et al.

Anonymous Referee #2

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General Comments

Amediek et al. present airborne lidar reflectance measurements in the near infrared taken during several measurement flights over central Europe. Different upscaling methods are applied to transfer the airborne measurement data on spatial scales accessible by spaceborne instruments. In support of ESA's A-SCOPE project for spaceborne CO2 measurements the data are used to estimate the retrieval error in XCO2 due to reflectance variability. The paper is generally well written, interesting to read, and within the scope of AMT. It should be published after the following specific comments and technical corrections are properly addressed by the authors.

Specific Comments

Abstract: Please include some quantitative results in the abstract, e.g. that the estimated A-SCOPE XCO2 error due to reflectance variability is well below 1 ppm.

Abstract: Utilization of MODIS data should be mentioned in the abstract.

p. 1490, l. 1-3: Are ambiguities due to the fact that the detector does not separate between different wavelengths?

section 2: To assist readers not familiar with the IPDA measurement technique it would be good to add at the begin of this section a short paragraph introducing the basic principles rather than starting directly discussing the retrieval error.

p. 1492, l. 19-21: I got confused since it was stated in the introduction that 'on-line' and 'off-line' refer to different wavelengths rather than consecutive values?

p. 1494, l. 4-5: Add a sentence like 'B being normalized, i.e. ...'.

p. 1494, l. 14-15: Should be '\delta\rho_2' rather than '\delta_2' in Eq. (10) in line 14 and 15, I guess?

p. 1495, l. 21: Point out in the text that B no longer is assumed to be normalized.

p. 1496, l. 1: Please explain 'Using the property Var[\int\int \rho(x,y) dx dy]=kS' in more detail. Do you mean 'Var[rho(x,y)]', rather than variance of integrated lidar reflectivity? For uncorrelated data variance will be constant, i.e. independent of the area S? Does 'very small areas' refer to fully correlated reflectivity values?

p. 1500, l. 3-6: Please provide a reference or quantitative statement.

p. 1500, l. 9-10: What about clouds?

p. 1500, l. 22-23: This sentence is a bit unclear. Data analysis of what?

p. 1503, l. 14: 'best possible matching' is too vague. Least square fit? Visual inspection?

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p. 1503, l. 19-20: 'a certain deviation' is too vague. Can this be quantified, e.g. by applying the upscaling methods presented before?

p. 1503, l. 23: 'ASTER' not introduced before.

p. 1503, l. 25: Please expand on the MODIS measurement geometry.

p. 1503, l. 26-27: 'could also lead to deviations' is too vague. Please quantify or provide a reference.

p. 1507, l. 10-15: Even though the 1D unweighted upscaling approach provides a conservative estimate in the error analysis, the autocorrelation methods provide clearly better results (Fig. 9). Why don't you use these methods for the subsequent studies?

p. 1509, l. 1-8: There seems to be a large constant offset in the autocorrelations plotted in Fig. 12. Please explain.

p. 1512, l. 14: '(ESA, personal communication, 2009)' is too vague for a reference.

p. 1525, Fig. 4: The red curve does not really allow to identify unreliable outliers in the measurement data. Better remove them completely from the plot?

Technical Corrections

section 2: unify use of '2-D' or '2D' in text and equations

p. 1494, l. 9-17: align equations properly, e.g. by use of eqnarray-environment in LaTeX

p. 1495, l. 6-8: align equations properly, e.g. by use of eqnarray-environment in LaTeX

p. 1519, Tab. 2: aver -> over

p. 1525, Fig. 4: font size in the plots is rather small

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 1487, 2009.