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Interactive comment on "Intercomparison of aerosol extinction profiles retrieved from MAX-DOAS measurements" *by* U. Frieß et al.

Anonymous Referee #2

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The authors present an intercomparison of aerosol measurements made during the CINDI campaign held in summer 2009 with emphasis on MAX-DOAS retrievals of aerosol profiles, in particular aerosol extinction profiles and AOT as retrieved from O4 DSCDs. The actual MAX-DOAS retrievals for the different groups are only discussed briefly within this manuscript but sufficient reference material is provided covering the retrieval methods in more detail.

The MAX-DOAS aerosol data sets are then compared with independent aerosol measurements made during the CINDI campaign as well and the following conclusions were drawn by the authors. First, the MAX-DOAS aerosol profiles are compared to smoothed backscatter profiles from a ceilometer and show good agreement regarding the vertical structure of aerosol in the boundary layer. Second, the MAX-DOAS AOT is compared with the AOT from an Aeronet sun photometer with the MAX-DOAS AOT

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time series showing overall good agreement with the sun photometer measurements but all MAX-DOAS retrievals systematically underestimate the AOT with potential reasons being briefly discussed in the manuscript. Third, substantial differences exist between the MAX-DOAS surface aerosol extinction when compared to the data measured with the in-situ nephelometer. Potential reasons are discussed but it is acknowledged that the clear disagreement remains largely unresolved.

I have no major comments that need to be addressed. The manuscript is well written, the content is presented clearly, and the paper is recommended for publication in AMT.

Comments to be addressed before publication:

Page 4, line 14: Delete 'a' before 'relatively'

Page 4, line 15: Replace 'On the other hand,' with something like 'Furthermore'

Page 4, line 17: Add one sentence to say if MAX-DOAS can address the issues mention above or not, then continue with 'The usage . . .'

Page 5, lines 1,2: Change to (or rather add) 'Compared to lidar profiles, MAX-DOAS measurements have . . .'

Page 5, line 10: Could add: '... FOV of the receiving telescope of the MAX-DOAS instrument . . .'

Page 5, line 4 and other places: My preference is to rather use 'group' instead of 'workgroup' as used on page 22, line 25.

Page 9, line 13: This should read: '. . .CINDI campaign with their own instrument, but used data . . . '

Page 9, lines 15-29: Wouldn't it make sense for every group to agree and then use the same or as similar as possible a priori?

Page 12, line 23: replace 'Our . . .' with 'The MPIC retrieval . . .'

Page 15, line 1: ‘golden days’ should be explained where first used, currently explained on page16, lines 2-3.

Page 16, lines 19-22: Please explain briefly if and/or how smoothing the ceilometer profiles with the Heidelberg average kernels might have impacted on the comparison study, i.e. how different would the smoothed ceilometer profiles have looked if the averaging kernels of a different group would have been used.

Page 18, line 21: Use ‘ceilometer’ (no capital c, not consistent within the manuscript).

Page 19, lines 17-22: Sounds somewhat contradictory: the authors write that BIRA, Heidelberg and AIOFM are similar re their choice in a priori but then they point out that the difference between them could also be caused by the different choice of a priori. That needs some rewording or clarification. And it raises again the question if this could be avoided by streamlining the a priori used for the retrievals as much as possible between the groups.

Page 19, lines 20-22: In case of the BIRA retrievals, these should be redone using the some subset of elevation angles the other groups used which - when compared with the original BIRA set (including all the angles in the retrieval) - would then show if this causes some of the differences seen in the profiles or not.

Page 20 & Figure 7: Somewhere in the discussion should also be mentioned that the AIOFM retrieval gets the elevated cloud layer in the afternoon of 4 July right – actually a very nice example and rather impressive. However, that is not at all the case in the Heidelberg data set which uses the same MAX-DOAS data, correct? Any explanation? Interestingly, the elevated layer is not visible in the ceilometer data set smoothed with the Heidelberg averaging kernels either – any thoughts??? Maybe I missed that but didn’t see any discussion in the text.

Page 21, line 25: typo ‘agreement’

Page 23, line 23L typo ‘do not have’

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