

## ***Interactive comment on “Tracking of urban aerosols using combined lidar-based remote sensing and ground-based measurements” by T.-Y. He et al.***

**Anonymous Referee #1**

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The paper presents first example of ground-based lidar measurements of 2D horizontal aerosol extinction in an area really interesting from the pollution point of view. Because of orography and typical winds, the site can be potential affected by high level of pollution. Even if this problem is well recognized at National level and PM10 concentration is routinely measured by the national environment agency, there is a lack of information about the 2d distribution of aerosol. Only this information could permit the identification of specific local sources of pollution. In this context the paper shows potential applications and utility of lidar scanning measurements. The paper is suitable for the publication on a journal devoted to describe technical methods as AMT is, however

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there are points that should be addressed in more details or in a more appropriate way before the paper would be suitable for the final publication on AMT.

Major comments:

Section1 : the description of lidar technique for aerosol study is not up to date. Authors should at least mention that there is a satellite with lidar on board specifically designed for aerosol and clouds study. In addition, it is well know that ground-based lidar measurements for aerosol study are today the state-of-the-art measurements for aerosol optical properties characterization. What authors reported instead is not updated and too much focused on air quality/boundary layer. A short introduction of lidar for aerosol (in general) would be appropriate.

Section 4 Four examples of lidar applications are reported. For each one of these cases, results are not well commented. Even if AMT is more focused on technical and methodological topics, something should be added. In particular:

4.1: lines23-25, how large is it the uncertainty for the extinction in this case? Here authors could quantify this uncertainty and avoid to anticipate results of section 4.4.

4.2: what happened on 24 May? There is any difference between these 2 days? (Figure 7 would suggest this)

4.3: what about the peak in NO<sub>x</sub> in the evening? The plateau in PM10 is reported as a maximum in the abstract. Authors should better explain difference between fig 6 and 7. It si probably true that aerosol extinction measurements performed at 200 m above the ground have in some sense more inertia and therefore reaction time is longer. But what about the sudden decrease on 14:30? (13:30 for 25 may)And what can authors tell about the second maximum observed on 25 May around 16CET? Surprisingly it seems to reflect NO<sub>x</sub> measurements more than PM10 ones. In addition, uncertainty on extinction on 24 and 25 May seems to be almost equal and not affected by the large uncertainty mentioned for 25 May on section 4.2.

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4.4: Are all points available reported in fig 8? There is a difference if 24 and 25 May cases are treated separately? The correlation of 0.64 is not so good. On the other hand, it cannot be good because of different temporal behavior observed in fig7 and 6. This would mean that actually lidar extinction measurements are not useful for the PM10 investigation, unless lidar measurements could be used for identifying special cases in which measurements at the ground level cannot be considered representative of a larger (in 2d space) area. For example, Figure 8 would suggest that a good correlation is observed for almost all values apart from 3-4 values with low extinction (in the graph points below the solid line). Authors could better investigate this point, even if of course 2 case studies are not enough for developing a method or providing assessed results.

Additional minor comments are reported in the following: Page 6388 line 9: investigate ...an evidence? Please check the syntax of the phrase Page 6388, line 11: point or Punctual ? Page 6393 line 4, lidar ratio is not defined Page 6394 line 26 maybe investigated is more suitable than performed

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6387, 2011.

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