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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Tracer concentration profiles measured in central London as part of the REPARTEE campaign" *by* D. Martin et al.

Anonymous Referee #2

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This paper is a welcome and important addition to the small set of publications that present measurements of vertical dispersion in urban areas. However, the paper appears to have been prepared in haste, without proof reading, and requires a thorough revision. It's easiest to deal with matters page by page. One thing though, throughout the paper the experiments are sometimes referred to by year and sometimes as Repartee 1 and 2 – use one or the other, not both.

A useful addition would be a tabulation of all the tracer concentration data and associated meteorological information (the latter probably only requiring that Repartee 1 is added to Table 3). A very nice paper should result with this added and following a careful revision of the text.

page 25246 Abstract, lines 5/6 – As written, this text doesn't mean anything - gradient

of what?. Introduction – there seems to be no acknowledgement of or reference to the large body of wind tunnel and small scale field studies of urban dispersion that have considerable bearing on some of the issues discussed in the paper.

page 25247 Rotach 2004, should be 2005 or vice versa; Prairie Grass, 1956 isn't a reference; there are numerous errors in the referencing throughout the paper. I'm not going to list any more, but the whole set needs careful checking. Allwine et al 2007 is listed but not referred to in the text. Bottom – smoke and SO2 are hardly exotic tracers.

page 25248 I think it is a lattice tower, not an aerial, at the top of the BT Tower.

page 25250 Analysis, line 12/13 – grammar Section 2.3.1 Isn't it really an arc of 4 receptors and a vertical array of 3? This is not easy to follow as the map given as Fig 1 isn't relevant (I now realize). Another map should be provided showing the location of the source and receptors. Why give a map for one case and not the other (ditto, but the other way around, for the detail in Table 1)?

Page 25251 Section 2.3.2 – Present rather than past tense is used in places. Add the source letters and receptor numbers. Section 2.4, line 1 – grammar

Page 25252 line 3 - . . . sites at 1.5 m . . . There are numerous omissions of this kind (more commonly definite and indefinite articles) that need to be put right. Section 3. There's 3.1.1 for REPARTEE 1 but no equivalent section for 2. line 2 – Fig 2 shows 6 not 5 receptors and the plot is the sequence of 9 minutes averaged concentrations not time-resolved concentrations.

Page 25253 line 2 – it doesn't suggest, it shows, but it should be no surprise as Brigg's urban vertical spread increases as 0.14x (140 m at 1 km). The discussion about travel times is confused. I think reference to and use of Chatwin's analysis of vertical dispersion and advection speeds is needed here. para 3 discusses sites 8, 9, 10 on Arc 1 (not mentioned before), which is Repartee 2 – make it clear which experiment is being discussed. I'm not sure what the final sentence is meant to convey – the plume

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will simply be wider. A general point about interpreting the vertical profiles in terms of s – even with much more comprehensive data this is hard – ratios of concentrations from three heights (and two are not that far apart) are not good indicators of s.

Page 25254 Top – there's no mystery here, vertical spread implies that at any position downwind, concentrations at some heights are increasing and at others decreasing. Section 3.2. The discussion here about the value of s ignores all the wind tunnel results that clarify the matter for neutral conditions.

Page 25255 Much of the theory discussed here is dated and not particularly helpful (e.g. the use of power law profiles) – Hunt and Weber is a good reference though. This section needs revising. Again, results from wind tunnel work have been ignored. Figure 4 needs some explanation as there was 1 experiment in 2006 and six in 2007. Note in the legend which of the 2007 experiments has been plotted (presumably, those for which BT is in the plume centre, more or less). These results are effectively 15 minute averages, which is rather short and some variability should be expected between runs. Variability will be greater for the 2006 data, as these are 9 minute averages, though they could be combined to give a 1 hour average - but only some have been plotted. Say which in the legend and why in the text.

Page 25256 Section 3.3, line 4 – repetition (but not hesitation . . .). A normal lateral profile has been found in many urban dispersion studies, not just BUBBLE. Same comments as above regarding averaging times - lateral spread is likely to be more variable than vertical though. What values of sigma y and z were deduced?

Page 25257 Section 3.4.1 – some reference to DAPPLE is needed here. The final sentence needs to be expressed more clearly. Section 3.4.2 – not sure why agreement seems to be expected between the BT and street wind directions - explain the relationship in terms of the known behaviour of winds in street canyons, or omit the section.

Page 25258 line 2 – various variables? line 5 – grammar Explain the threshold criterion

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used with the Lidar turbulence data - para 3. Actually, I don't think there's any demonstration given that the boundary layers are convective – it's November and quite windy. The neutral height scale, u*/f, is about 1km. Soem further discussion is called for.

Page 25259 Notation varies in (5) and (6). Need to refer to Hanna's work here, testing (6) to quite large fetches. Final sentence - grammar

Page 25260 Para 1 – refer to Wood et al (2009). Conclusions – I don't think that the conclusion about vertical profiles is that definite. It would probably be different if all the studies of vertical dispersion had been taken into account. line 7 prefers to lateral spread. line 7-9 - grammar para 2, line 3 – variation, not variability. Hanna's work should be mentioned as he has extended the analysis of decay rate to greater distances.

Page 25261 DAPPLE should be acknowledged both for the source of data but also for the use of expertise and project time/funds.

References – check for accuracy.

Table 1: distance above ground was not 0. Add release point and equivalent data for Repartee 2. Table 3: add Repartee 1. Correct grammar in caption. Any comment on 40% along wind turbulence in Epxt 1, 2 and 3? Where's the anemometer relative to the flow and lattice tower? Table 4: rather too many Nottinghams in the caption. Are X and Y now velocity components? Explain notation. Data for wind speed are wrong, well perhaps missing a decimal point. Fig 1. Need the equivalent for Repartee 1. Receptor 3 was not at 0 m. Fig 2. Add source to caption and that the lower figure is an expanded version of the upper. Fig 3. Simplest to refer to Table 2 for the timing. Fig 4. Make data points larger and don't connect them. Add to Brigg's urban or rural (whichever is correct). Is the ground the appropriate origin for analysing the data? Probably not – I expect the zero-plane level (or roof level) is more sensible. Does that change anything? Fig 5. Curious units for y axis. Add the lateral spread assumed to give the 'black' profile, and the downwind distance of the observations. Show the data

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points, don't join them and remove coloured background. Fig 6. Lidar measurements of what

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