REPLY TO REFEREE #1

We thank Referee 1 for his thorough review of the article and useful comments.

This paper describes the comparison of the 25 year time series of Lidar ozone measurements made at the Observatoire de Haute Provence with satellite measurements and with co-located sonde and Umkehr measurements. It is clearly structured and written and is a valuable contribution to the subject.

 # Thank you.

1. I think it would be valuable if the authors could highlight the 2001-2005 period slightly more. This would allow then to indirectly compare the 'new' satellite instruments to SAGE and HALOE and possibly allow them to say something about the possibility of extending those records. I am not suggesting much additional work, just that the authors should make the implications of the current work clearer. A drift of 1%/decade has become the achieved target for drift in combined total ozone time series – what might be achievable for ozone concentrations at 20km, 25km, etc.?

 # An additional figure (Fig.7) is included to highlight the results during the overlapping period (2002 - 2005) of SAGE II, HALOE and the new satellite data sets (GOMOS and Aura MLS), and is described in Section 4.1.2, Paragraph 2. Also, the relative drifts of GOMOS and Aura MLS with lidar are estimated to explain the possibilities of expanding the SAGE II and HALOE data with GOMOS and Aura MLS data. Maximum drifts up to 10%/decade are estimated below 20 and above 40 km for SAGE II and HALOE. Between 20 and 40 km drifts vary from 1 to 5%/decade.

2. A statement or discussion about the stability of the lidar system is needed in section 2.1.1 in order to underpin the later discussion about drifts in section 4.3. Ideally the authors should give their best estimate of the possible drift of the lidar system based on instrumental considerations alone.

 # A paragraph describing the stability of the lidar is included in the revised version. Please see Section 2.1.1, Paragraph 5.

Minor comments

28520, 17 '...stratosphere, with a near zero bias....'

 # This has been done. Please find the revised Abstract, Line 23.

28520, 25 Be more precise when saying 'ozone recovery'

 # The sentence has been restructured. Please see Introduction, Paragraph 1, Line 6.

28521, 17+ The levelling off can be attributed to Cly changes In some regions, but not all. Need to mention dynamical changes in regard to the Northern hemisphere

 # The sentence has been modified with additional information. Please find the Introduction, Paragraph 2, Line 6-12.

28528, 8+ Rephrase this sentence as the word 'voltage' comes as a bit of a shock!

 # The sentence has been modified. Please find the revised text in Section 2.2.3, Line 6.

28531, 3+ It is not quite clear why a coincidence is not used if it meets the selection criteria. I doubt it makes much difference, but I would think that all acceptable overpass measurements should be used to estimate

instrumental differences. (If there are enough days on which multiple overpasses occur, then the dependence on distance could be studied.)

 # When we consider all coincidences, more weight will be taken by the profiles far away from the location. In order to avoid the biases in terms of the distance and time, a closest profile in distance and time is preferred to the analysis.

28532, 11 Can this sentence ('These results...') be rewritten as it is rather cryptic?

 # The sentence has been restructured. Please see the revised text in Section 3.2, Paragraph 2, Line 8-9.

28532 21+ 'The vertical resolutions of.....GOMOS) are similar to that of...'

 # This has been changed.

28533, 2 The important point is that the difference between geopotential height and geometric altitude does not affect derived ozone values even in regions with steep gradients. So it is probably worth re-stating this in terms of ozone.

 # The sentence has been restated in Section 3.2, Paragraph 3, Line 10-14.

28535, 20 delete 'only'

 # Done.

28536, 11 'A similar result...'

 # This has been done. Please find the revised version in Section 4.1.1, Paragraph 6, Line 9.

28537, 5 I do not think 'Additionally' is the right word. 'Alternatively' or 'A further factor' seem better. However the authors should make a judgement as to what they think caused the discrepancy. Given the other studies it seems reasonable for them to say '...variations are probably due to the..' in lines 1 and 2, and then to say 'It should be noted, however, that the Dobson...'

 # Done. Section 4.1.1, Paragraph 8, Line 13-16.

28537, 21+ '...comparisons of..... exhibit smaller..'

 # Changed. Please find the revised text in Section 4.2, Paragraph 1, Line 4-5.

28544, 7+ I doubt the differences are only due to atmospheric variability. Satellite measurements are worse below 20 km as well.

 # This has been modified. Please find the revised text in Section 5, Paragraph 2, Line 8-11.