Supplement of The SPARC water vapor assessment II: assessment of satellite measurements of upper tropospheric water vapor

William Read¹, Gabriele Stiller², Stefan Lossow², Michael Kiefer², Farahnaz Khosrawi², Dale Hurst³, Holger Vömel⁴, Karen Rosenlof⁵, Bianca M. Dinelli⁶, Piera Raspollini⁷, Gerald E. Nedoluha⁸, John C. Gille⁹,¹⁰, Yasuko Kasai¹¹, Patrick Eriksson¹², Christopher E. Sioris¹³, Kaley A. Walker¹⁴, Katja Weigel¹⁵, John P. Burrows¹⁵, and Alexei Rozanov¹⁵

¹Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Ca., USA.
²Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research, Karlsruhe, Germany.
³Global Monitoring Division, NOAA, Earth System Research Laboratory, Boulder, Colorado, USA.
⁴Earth Observing Laboratory, National Center for Atmospheric Research, Boulder, Colorado, USA.
⁵Chemical Science Division, NOAA, Earth System Research Laboratory, Boulder, Colorado, USA.
⁶Istituto di Scienze dell’Atmosfera e del Clima del Consiglio Nazionale delle Ricerche (ISAC-CNR), Via Gobetti, 101, 40129 Bologna, Italy.
⁷Istituto di Fisica Applicata del Consiglio Nazionale delle Ricerche (IFAC-CNR), Via Madonna del Piano, 10, 50019 Sesto Fiorentino, Italy.
⁸Naval Research Laboratory, Remote Sensing Division, 4555 Overlook Avenue Southwest, Washington, DC 20375, USA.
⁹National Center for Atmospheric Research, Atmospheric Chemistry Observations & Modeling Laboratory, P.O. Box 3000, Boulder, CO. 80307-3000, USA.
¹⁰University of Colorado, Atmospheric and Oceanic Sciences, Boulder, CO 80309-0311, USA.
¹¹National Institute of Information and Communications Technology (NICT), 20 THz Research Center, 4-2-1 Nukui-kita, Koganei, Tokyo 184–8795, Japan.
¹²Chalmers University of Technology, Department of Space, Earth and Environment, Hösalsvägen 11, 41296 Göteborg, Sweden.
¹³York University, Center for Research in Earth and Space Science, 4700 Keele Street, Toronto, Ontario M3J 1P3, Canada.
¹⁴University of Toronto, Department of Physics, 60 St. George Street, Toronto, Ontario M5S 1A7, Canada.
¹⁵University of Bremen, Institute of Environmental Physics, Otto-Hahn-Allee 1, 28334 Breman, Germany.

Correspondence: Read (william.g.read@jpl.nasa.gov)

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S1 Introduction

Figures S1–S30 show coincident scatter plots for several instruments versus MLS-Aura or MIPAS-ESA either as a probability density function (PDF, Figure 16 in the main manuscript) or as a scatter of the individual coincidences when their number are few. Figures S31–S33 Show gridded mapped comparisons for other heights in the same format as Figure 21 in the main manuscript. Figures S34–S36 Show a scatter plot of the grid box averages for other heights in the same format as Figure 22 in the main manuscript. Figures S37–S39 Show mapped humidity fields for the SMILES products for several heights in the...
same format as Figure 21 in the main manuscript. Figures S40–S42 Show a scatter plot of the grid box averages for SMILES humidity product versus MLS-Aura for several heights in the same format as Figure 22 in the main manuscript. Figures S43–S44 Show mapped humidity fields for the occultation instruments for several heights in the same format as Figure 21 in the main manuscript. Figures S45–S46 Show a scatter plot of the grid box averages for the occultation instruments versus MLS-Aura for several heights in the same format as Figure 22 in the main manuscript.
Comparisons between MLS-Aura HALOE 90S-90N MERRA_TP
Location of coincidences

Figure S1. Scatter plot of coincident humidity measurements between MLS-Aura and HALOE
Comparisons between MLS-Aura  HIRDLS  90S-90N MERRA_TP

Location of coincidences

Figure S2. Scatter plot of coincident humidity measurements between MLS-Aura and HIRDLS
Comparisons between MLS-Aura  MIPAS-Bologna  90S-90N MERRA_TP
Location of coincidences

![Scatter plot of coincident humidity measurements between MLS-Aura and MIPAS-Bologna](image)

**Figure S3.** Scatter plot of coincident humidity measurements between MLS-Aura and MIPAS-Bologna
Figure S4. Scatter plot of coincident humidity measurements between MLS-Aura and MIPAS-ESA.
Figure S5. Scatter plot of coincident humidity measurements between MLS-Aura and MIPAS-Oxford
Comparisons between MLS-Aura  POAM-III  90S-90N MERRA_TP
Location of coincidences

Figure S6. Scatter plot of coincident humidity measurements between MLS-Aura and POAM-III
Figure S7. Scatter plot of coincident humidity measurements between MLS-Aura and SAGE-II

Comparisons between MLS-Aura  SAGE-II  90S-90N MERRA_TP
Location of coincidences

<table>
<thead>
<tr>
<th>Location</th>
<th>MLS-Aura (ppmv)</th>
<th>SAGE-II (ppmv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>261.02 hPa</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>215.44 hPa</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>177.83 hPa</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>146.78 hPa</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>121.15 hPa</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure S8. Scatter plot of coincident humidity measurements between MLS-Aura and SAGE-III
Comparisons between MLS-Aura SCIAMACHY 90S-90N MERRA_TP

Location of coincidences

Figure S9. Scatter plot of coincident humidity measurements between MLS-Aura and SCIAMACHY
Figure S10. Scatter plot of coincident humidity measurements between MLS-Aura and SMILES Chalmers AB
Figure S11. Scatter plot of coincident humidity measurements between MLS-Aura and SMILES Chalmers CA
Figure S12. Scatter plot of coincident humidity measurements between MLS-Aura and SMILES Chalmers CB
Comparisons between MLS-Aura  SMILES-JPL-A  90S-90N MERRA_TP
Location of coincidences

Figure S13. Scatter plot of coincident humidity measurements between MLS-Aura and SMILES JPL A
Comparisons between MLS-Aura and SMILES-JPL-B 90S-90N MERRA TP

Location of coincidences

Figure S14. Scatter plot of coincident humidity measurements between MLS-Aura and SMILES JPL B
Figure S15. Scatter plot of coincident humidity measurements between MLS-Aura and SMILES JPL C
Comparisons between MLS-Aura, SMILES-NICT-A, 90S-90N MERRA_TP

Location of coincidences

Figure S16. Scatter plot of coincident humidity measurements between MLS-Aura and SMILES NICT A
Comparisons between MLS-Aura, SMILES-NICT-B, 90S-90N MERRA_TP

Figure S17. Scatter plot of coincident humidity measurements between MLS-Aura and SMILES NICT B
Figure S18. Scatter plot of coincident humidity measurements between MLS-Aura and TES.
Comparisons between MIPAS-ESA  ACE-FTS  90S-90N MERRA_TP
Location of coincidences

Figure S19. Scatter plot of coincident humidity measurements between MIPAS ESA and ACE-FTS
Figure S20. Scatter plot of coincident humidity measurements between MIPAS ESA and HIRDLS.
Figure S21. Scatter plot of coincident humidity measurements between MIPAS ESA and MIPAS Bologna
Figure S22. Scatter plot of coincident humidity measurements between MIPAS ESA and MIPAS Oxford
Comparisons between MIPAS-ESA  MIPAS-Oxford  90S-90N MERRA_TP
Location of coincidences

Figure S23. Scatter plot of coincident humidity measurements between MIPAS ESA and MIPAS Oxford
Comparisons between MIPAS-ESA MLS-Aura 90S-90N MERRA_TP

**Location of coincidences**

<table>
<thead>
<tr>
<th>261 hPa</th>
<th>215 hPa</th>
<th>178 hPa</th>
<th>147 hPa</th>
<th>121 hPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>100</td>
<td>1000</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure S24.** Scatter plot of coincident humidity measurements between MIPAS ESA and MLS Aura
Figure S25. Scatter plot of coincident humidity measurements between MIPAS ESA and POAM-III.
Comparisons between MIPAS-ESA and SAGE-II for 90S-90N MERRA_TP Location of coincidences

261.02 hPa

215.44 hPa

177.83 hPa

Comparisons between MIPAS-ESA and SAGE-II

MIPAS-ESA (ppmv)

SAGE-II (ppmv)

Figure S26. Scatter plot of coincident humidity measurements between MIPAS ESA and SAGE-II
Figure S27. Scatter plot of coincident humidity measurements between MIPAS ESA and SAGE-III.
Figure S28. Scatter plot of coincident humidity measurements between MIPAS ESA and SCIAMACHY
Figure S29. Scatter plot of coincident humidity measurements between MIPAS ESA and SMR.
Comparisons between MIPAS-ESA TES 90S-90N MERRA_TP

Figure S30. Scatter plot of coincident humidity measurements between MIPAS ESA and TES
2007.12.01-2008.02.29 p = 250hPa

Figure S31. Gridded maps for nine instruments at 250 hPa.
Figure S32. Gridded maps for nine instruments at 200 hPa.
2007.12.01-2008.02.29 p = 150hPa

Figure S33. Gridded maps for nine instruments at 150 hPa.
**Figure S34.** Scatter plot of mapped grid box values of 8 instruments versus MLS Aura at 250 hPa.
Figure S35. Scatter plot of mapped grid box values of 8 instruments versus MLS Aura at 200 hPa.
Figure S36. Scatter plot of mapped grid box values of 8 instruments versus MLS Aura at 150 hPa.
Figure S37. Gridded maps for SMILES humidity retrieval products at 250 hPa.
Figure S38. Gridded maps for SMILES humidity retrieval products at 200 hPa.
Figure S39. Gridded maps for SMILES humidity retrieval products at 150 hPa.
Figure S40. Scatter plot of mapped grid box values of SMILES humidity retrievals versus MLS Aura at 250 hPa.
Figure S41. Scatter plot of mapped grid box values of SMILES humidity retrievals versus MLS Aura at 200 hPa.
Figure S42. Scatter plot of mapped grid box values of SMILES humidity retrievals versus MLS Aura at 150 hPa.
2005.01.01-2005.12.31 p = 200hPa

Figure S43. Gridded maps for occultation humidity retrieval products at 200 hPa.
Figure S44. Gridded maps for occultation humidity retrieval products at 150 hPa.
Figure S45. Scatter plot of mapped grid box values of humidity from occultation instruments versus MLS Aura at 200 hPa.
Figure S46. Scatter plot of mapped grid box values of humidity from occultation instruments versus MLS Aura at 150 hPa.