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Supplement of

Retrievals of tropospheric ozone profiles from the synergism of AIRS and OMI: methodology and validation

Dejian Fu et al.

Correspondence to: Dejian Fu (dejian.fu@jpl.nasa.gov)

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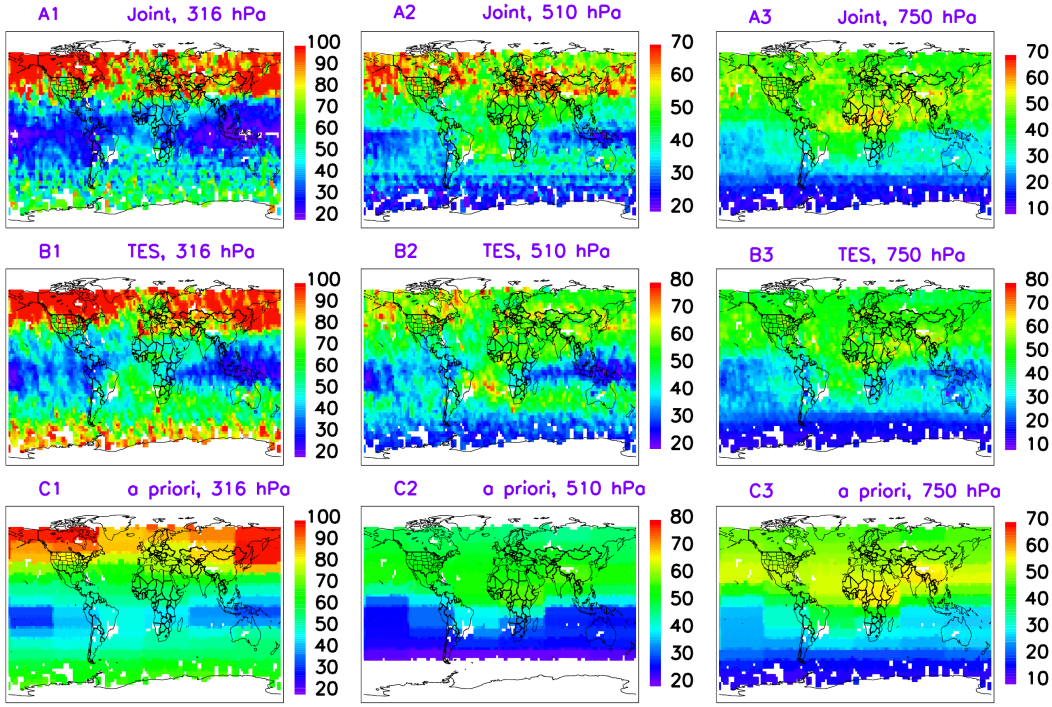

Figure S1: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in January 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

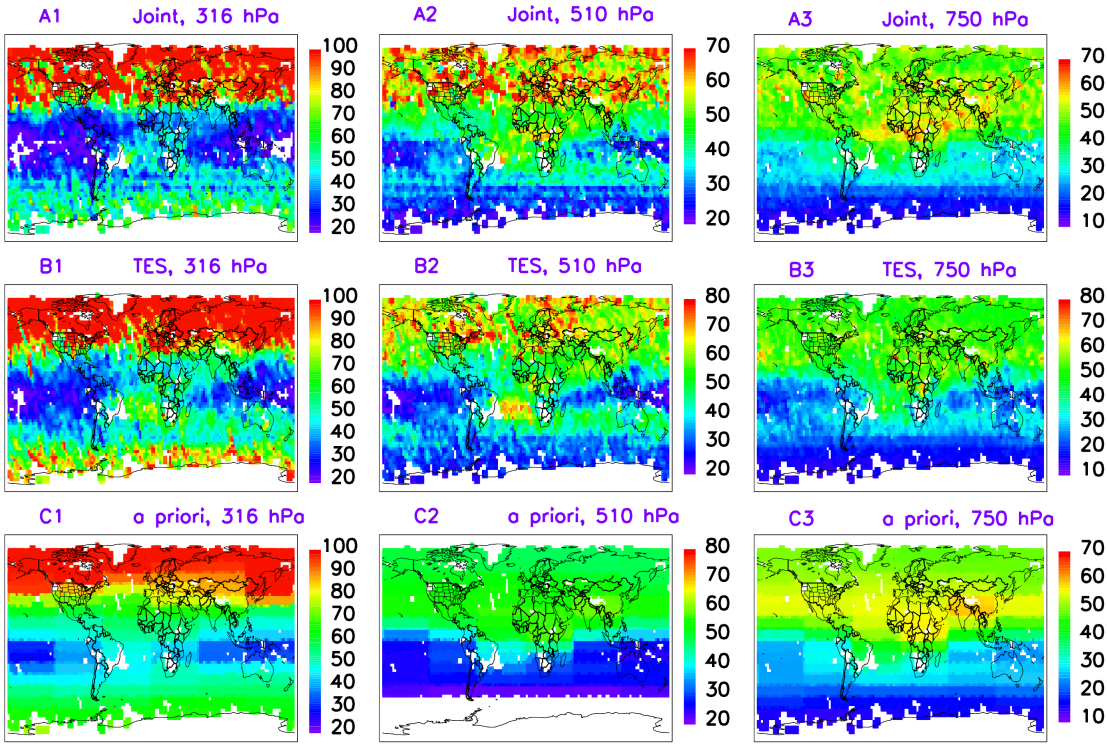

Figure S2: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in February 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

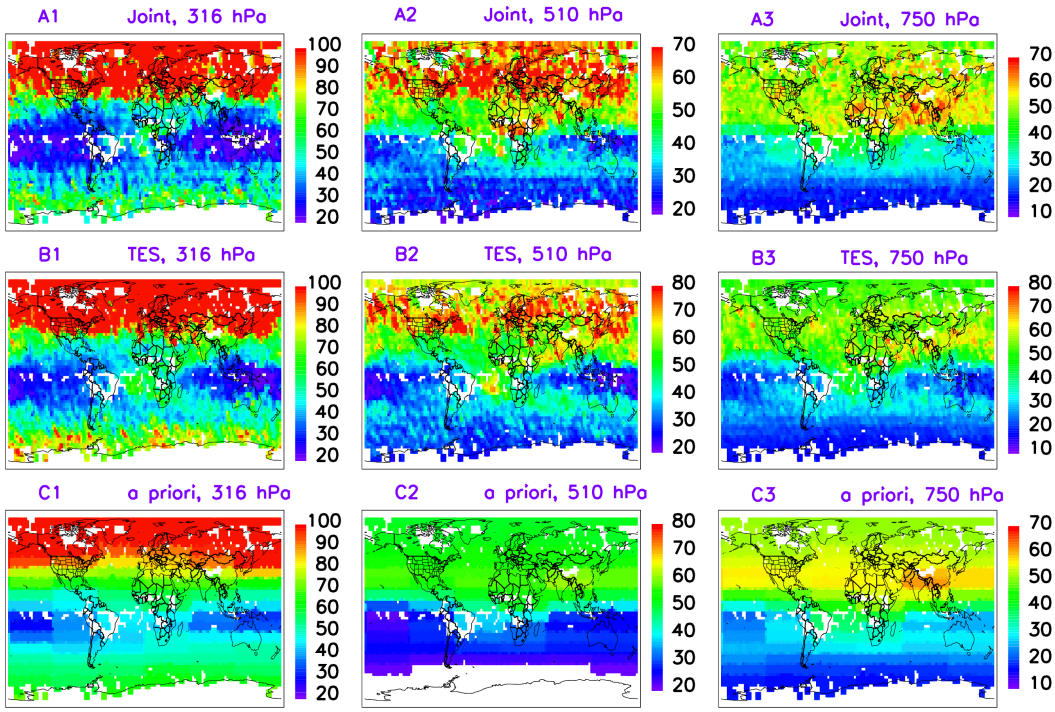

Figure S3: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in March 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

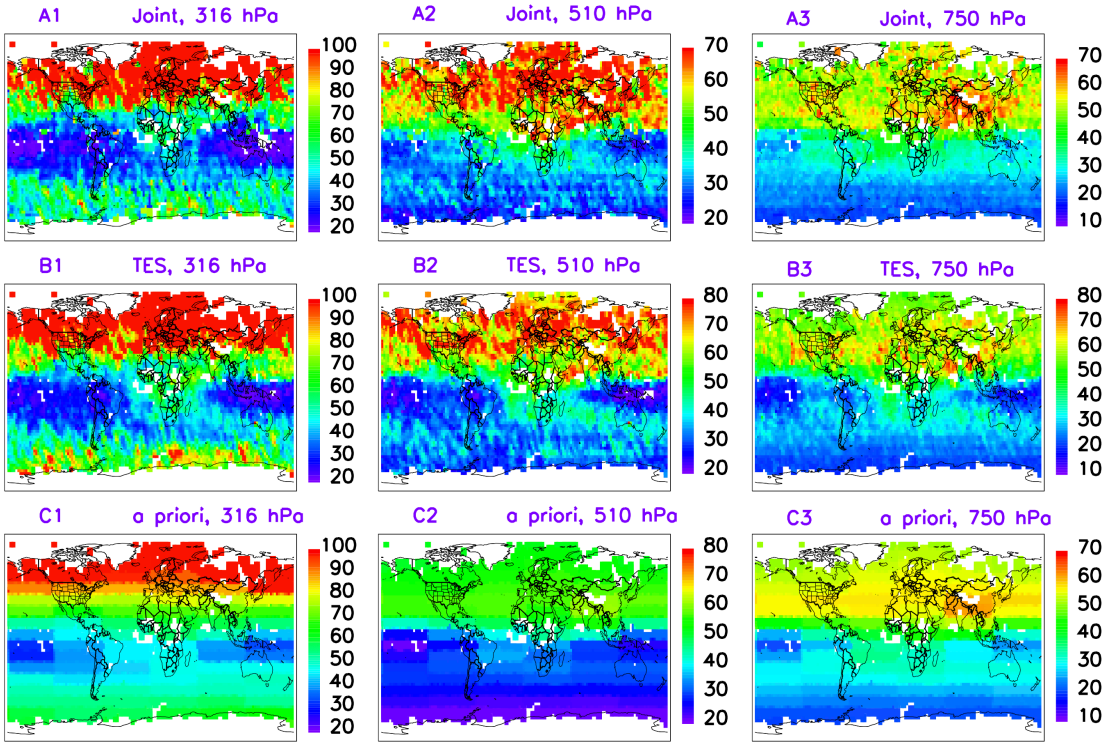

Figure S4: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in April 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

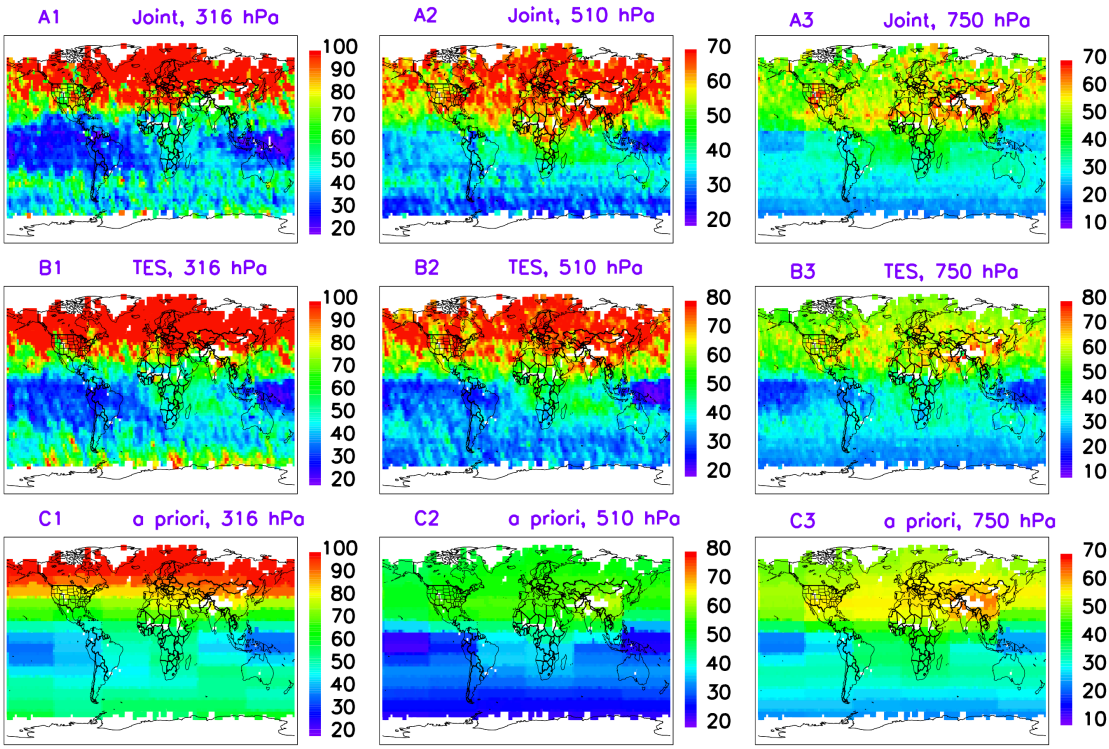

Figure S5: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in May 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

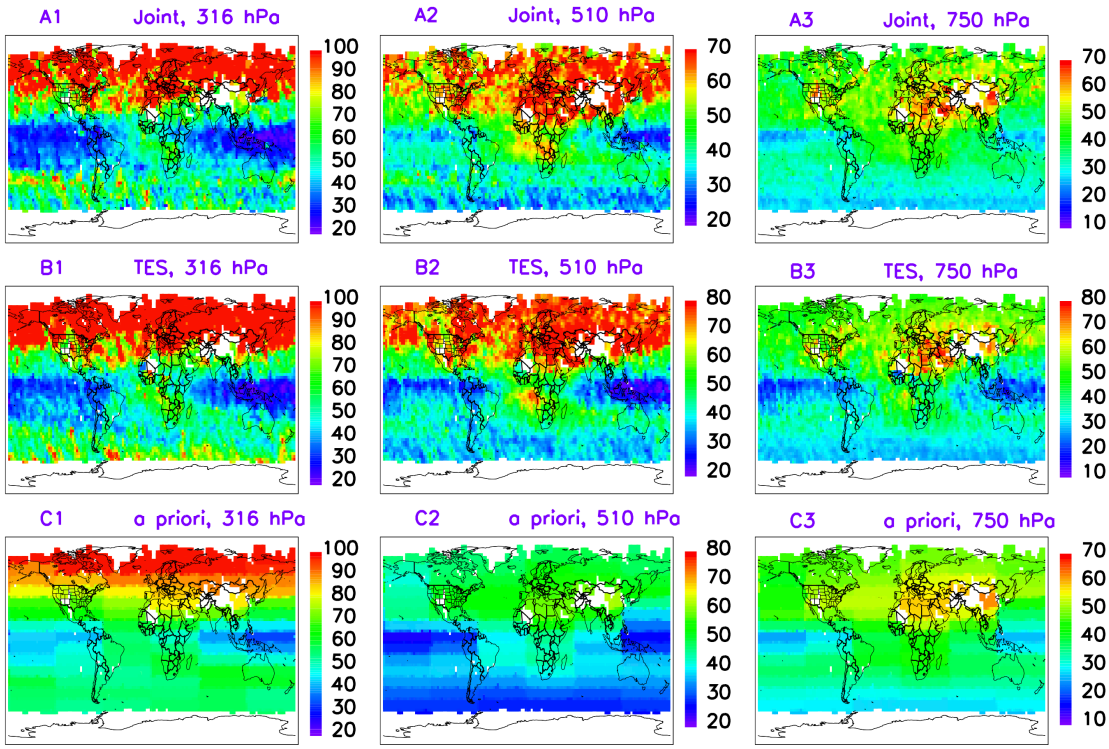

Figure S6: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in June 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

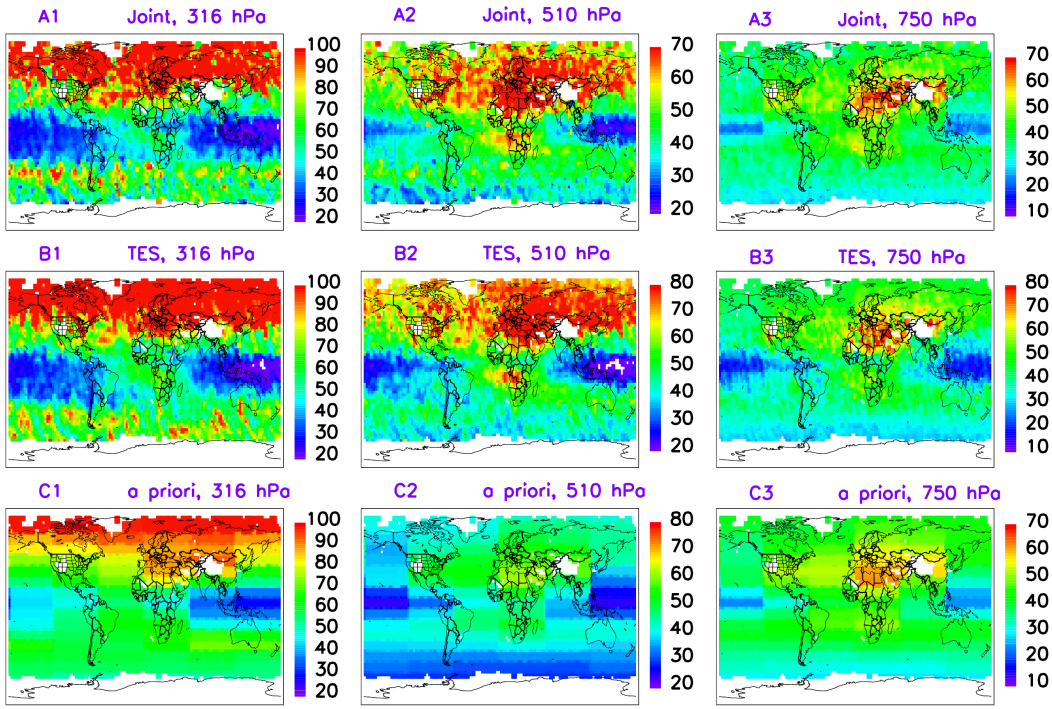

Figure S7: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in July 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

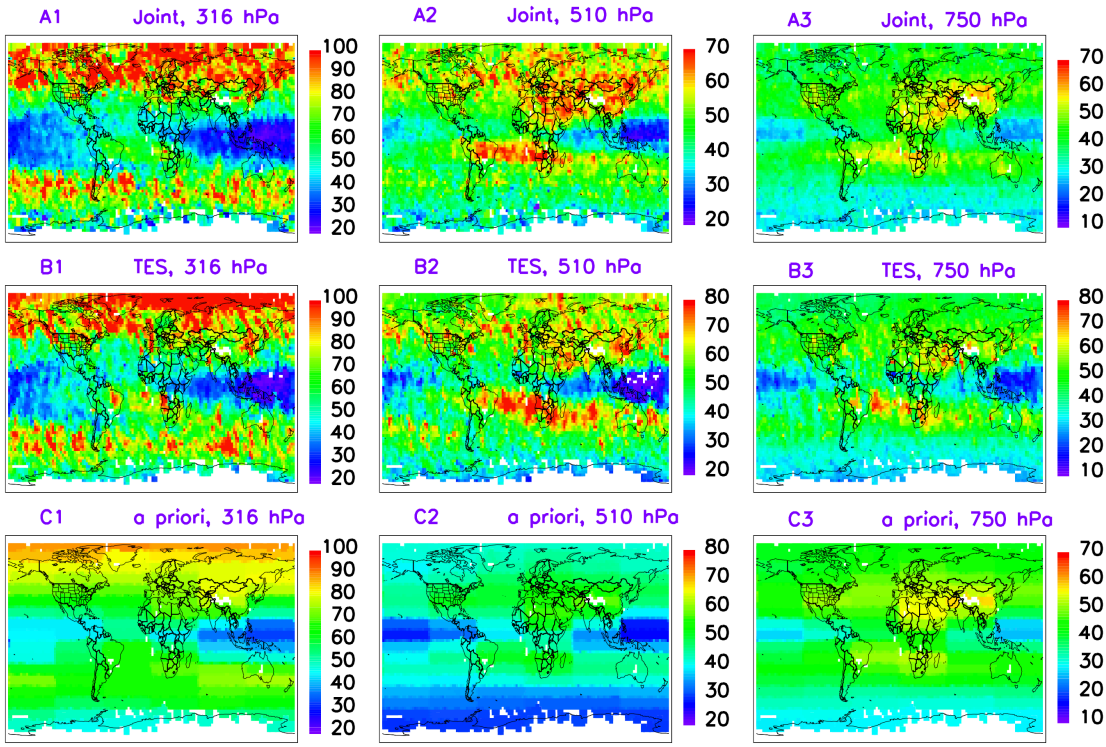

Figure S8: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in September 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

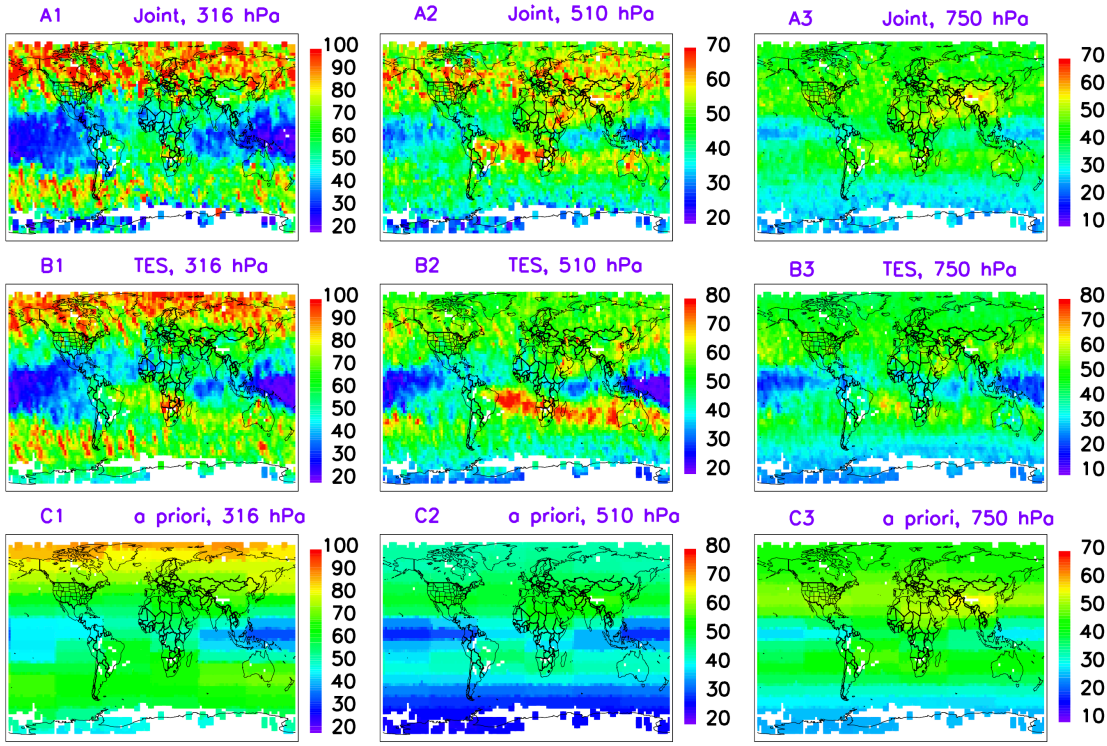

Figure S9: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in October 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

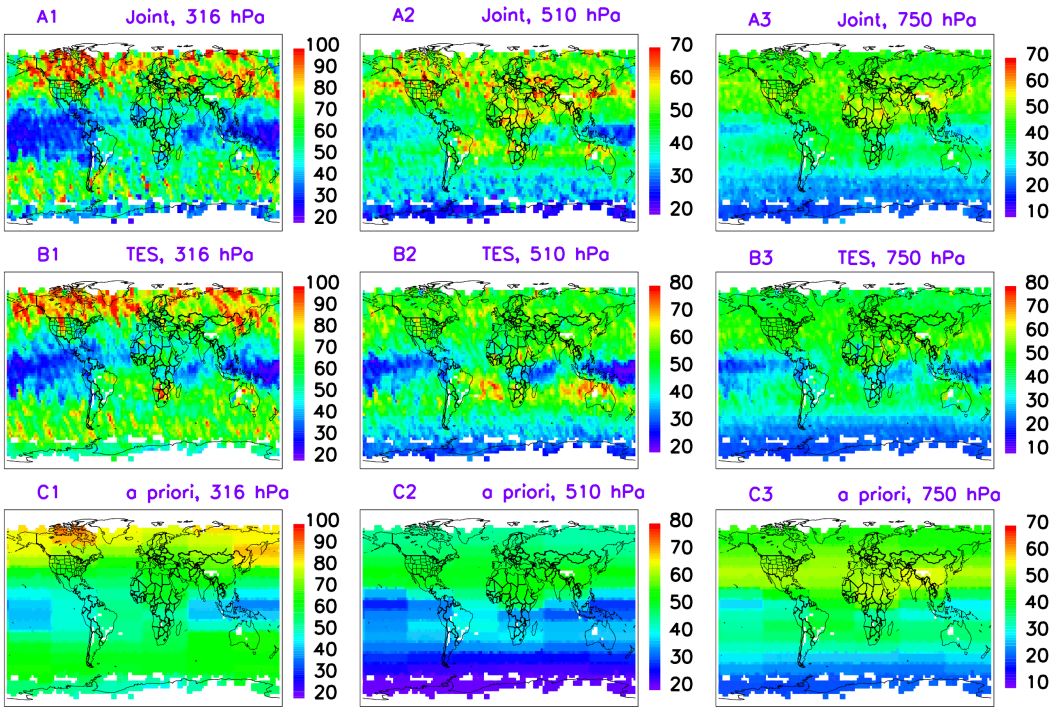

Figure S10: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in November 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

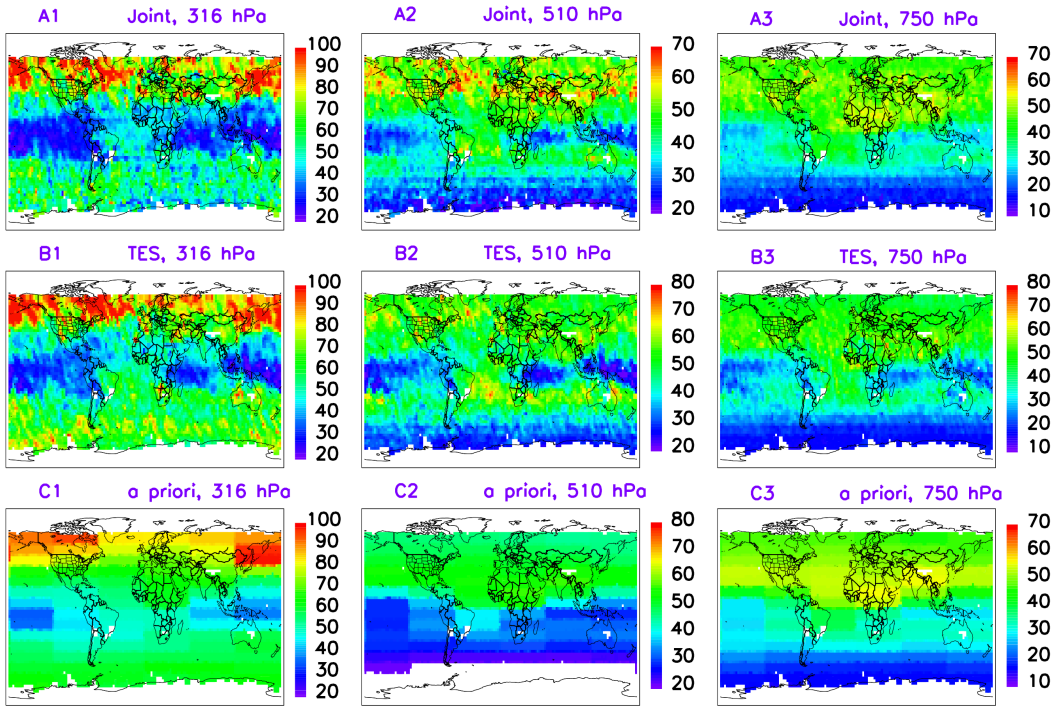

Figure S11: Global maps of monthly averaged ozone (O_3) volume mixing ratio (VMR) with a unit of ppb. The A-Train measurements in December 2006 were used in creating these global maps. Comparison of Joint AIRS+OMI (top row, A), TES (middle row, B), and a priori (bottom row C) ozone VMR for the pressure level of 316, 510 and 750 hPa (columns left, middle, right), respectively. All data have been gridded to 2.5° × 2.5° cells.

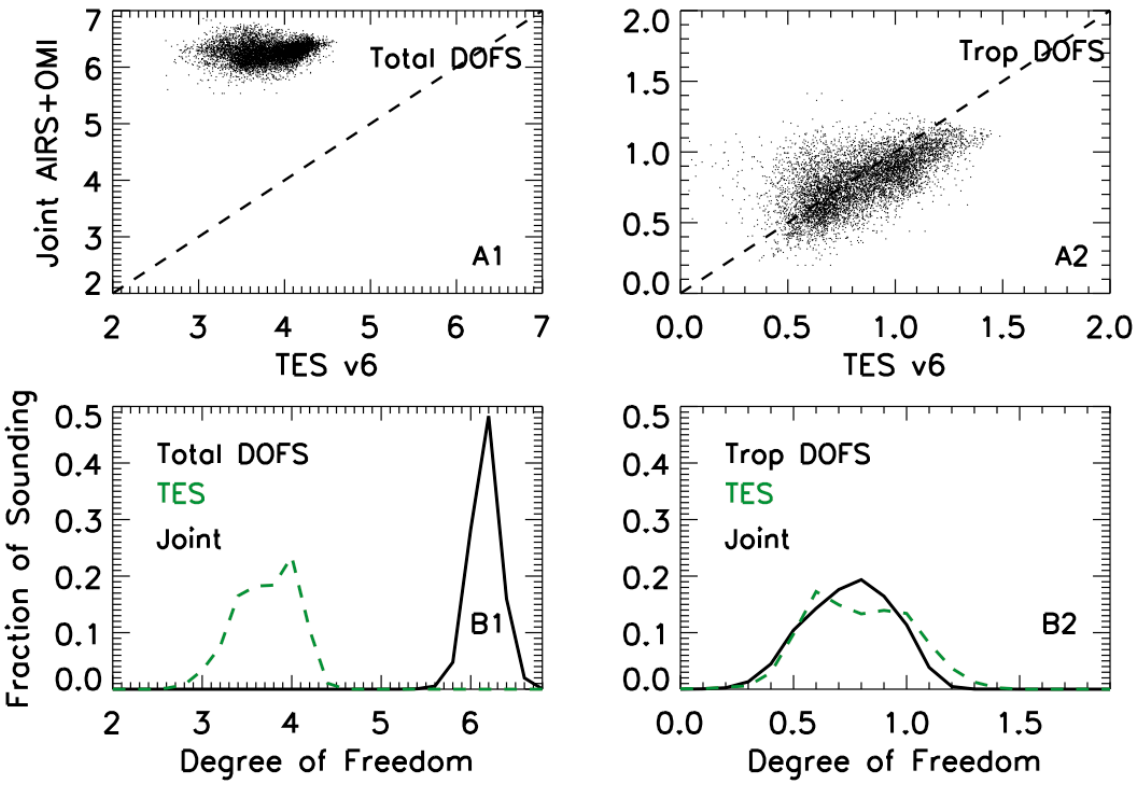

Figure S12: Degree of freedom of signals (DOFS) for January 2006 monthly mean O_3 over globe shown in Fig. S1. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

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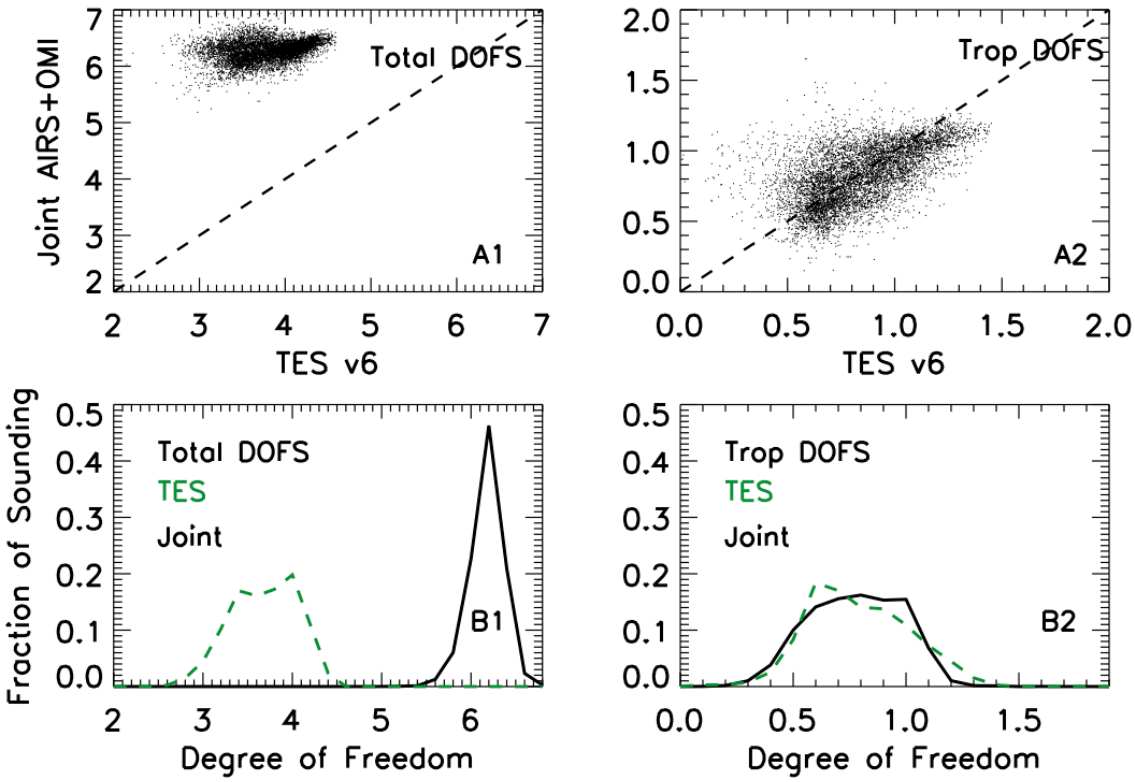

Figure S13: Degree of freedom of signals (DOFS) for February 2006 monthly mean O_3 over globe shown in Fig. S2. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

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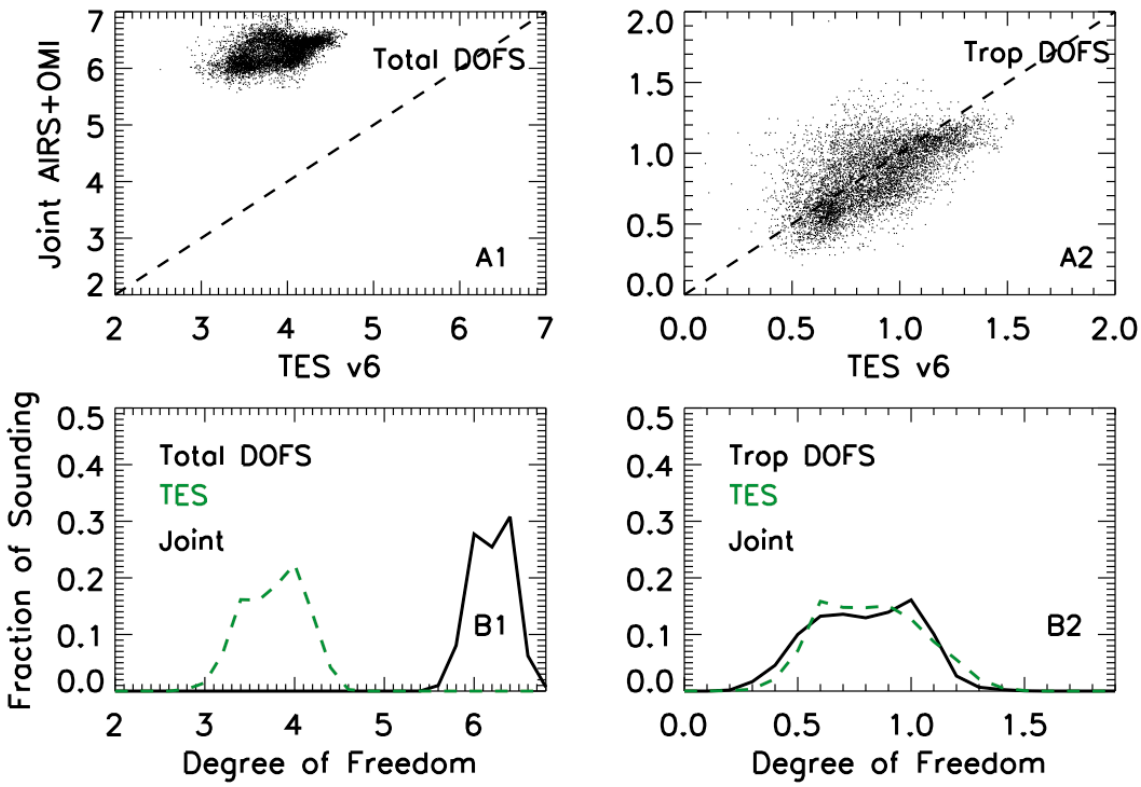

Figure S14: Degree of freedom of signals (DOFS) for March 2006 monthly mean O_3 over globe shown in Fig. S3. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

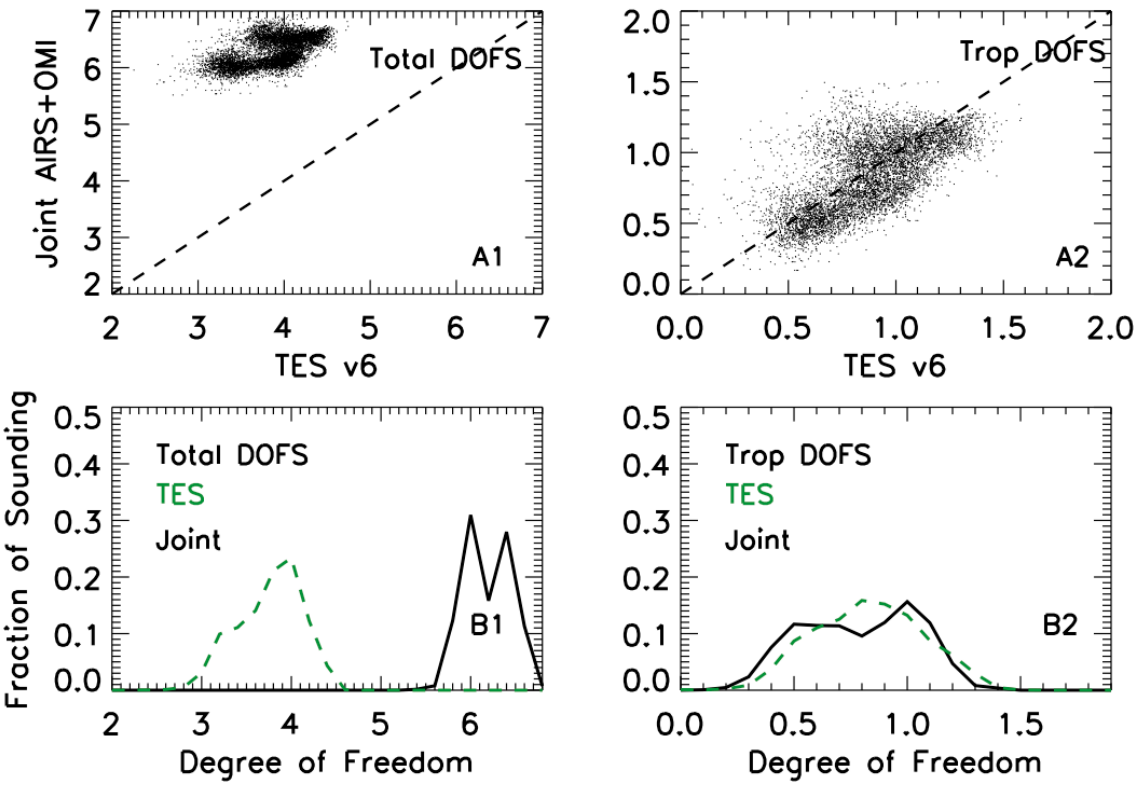

Figure S15: Degree of freedom of signals (DOFS) for April 2006 monthly mean O_3 over globe shown in Fig. S4. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

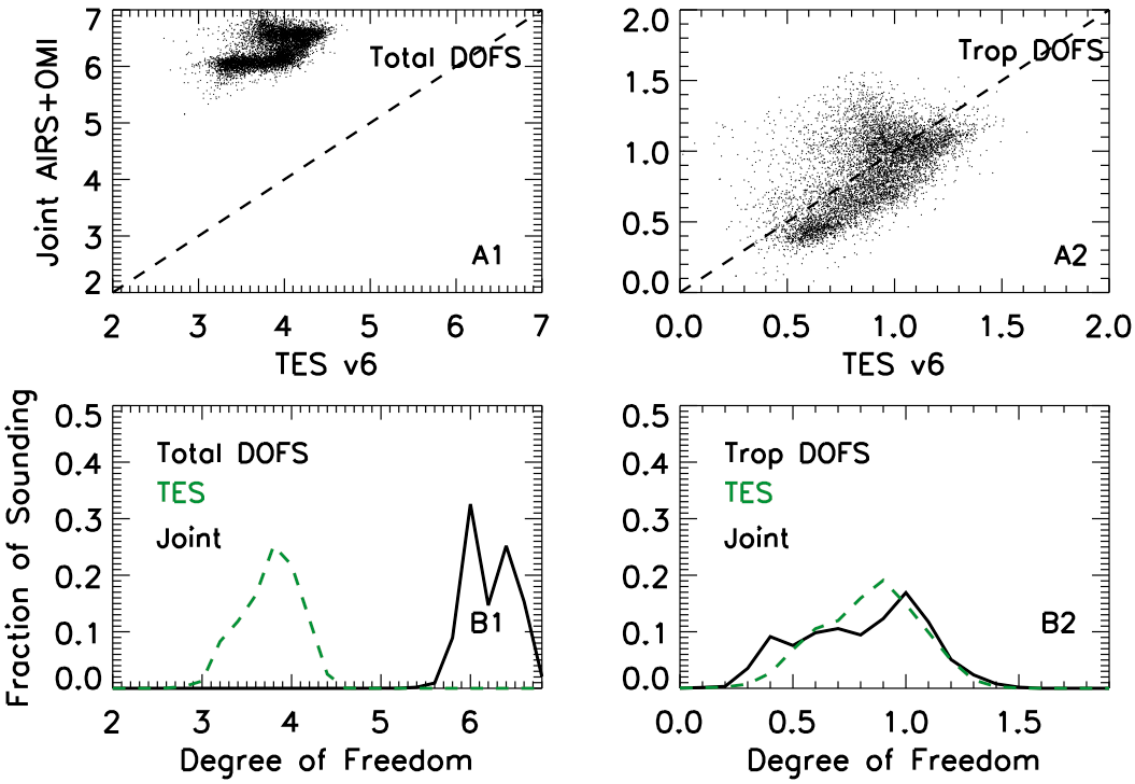

Figure S16: Degree of freedom of signals (DOFS) for May 2006 monthly mean O_3 over globe shown in Fig. S5. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

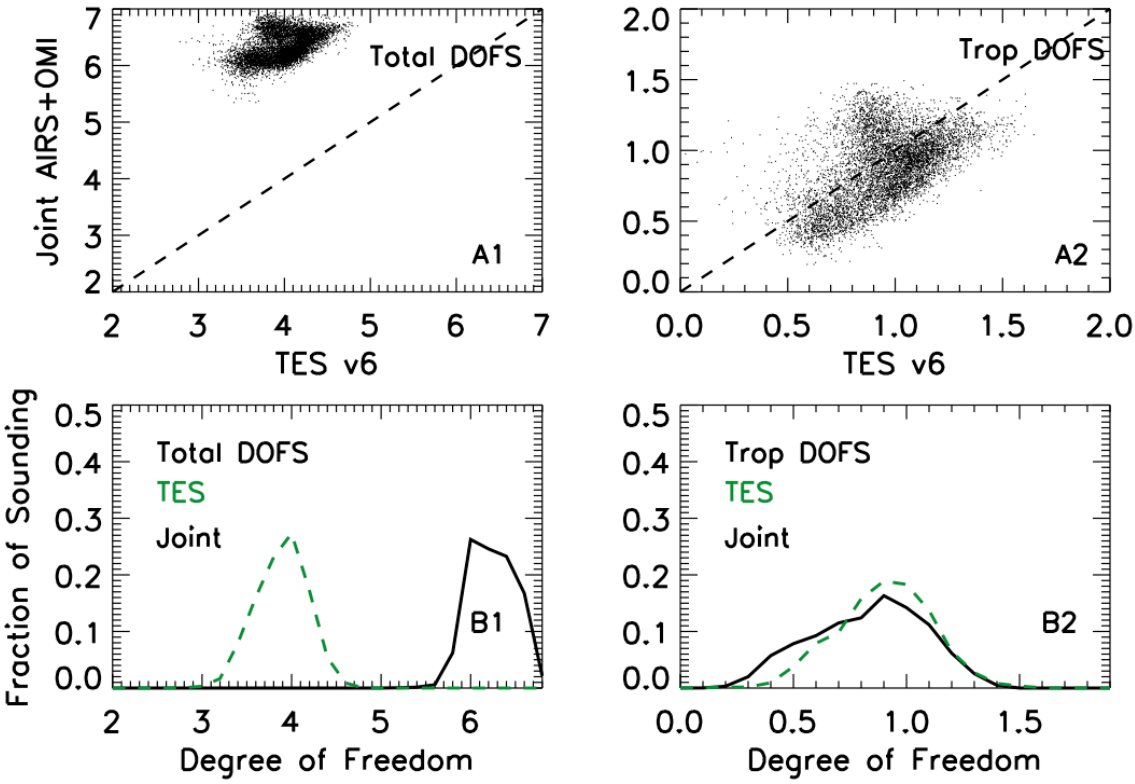

Figure S17: Degree of freedom of signals (DOFS) for June 2006 monthly mean O_3 over globe shown in Fig. S6. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

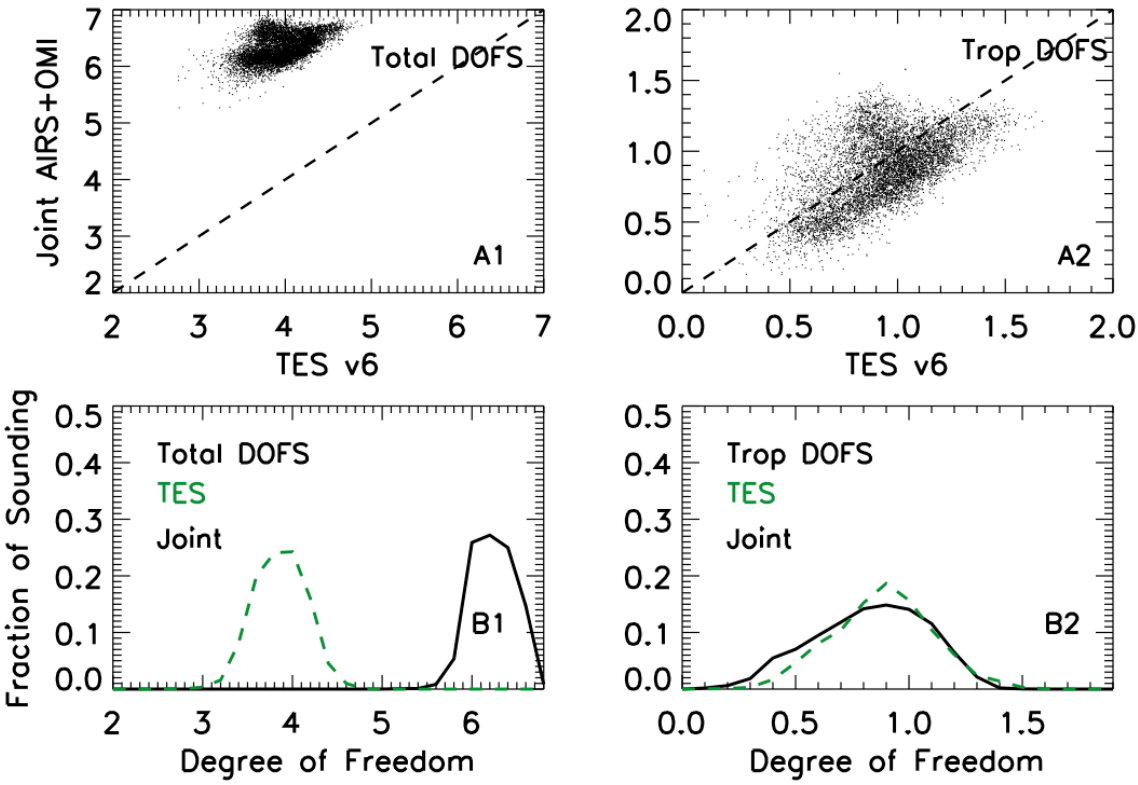

Figure S18: Degree of freedom of signals (DOFS) for July 2006 monthly mean O_3 over globe shown in Fig. S7. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

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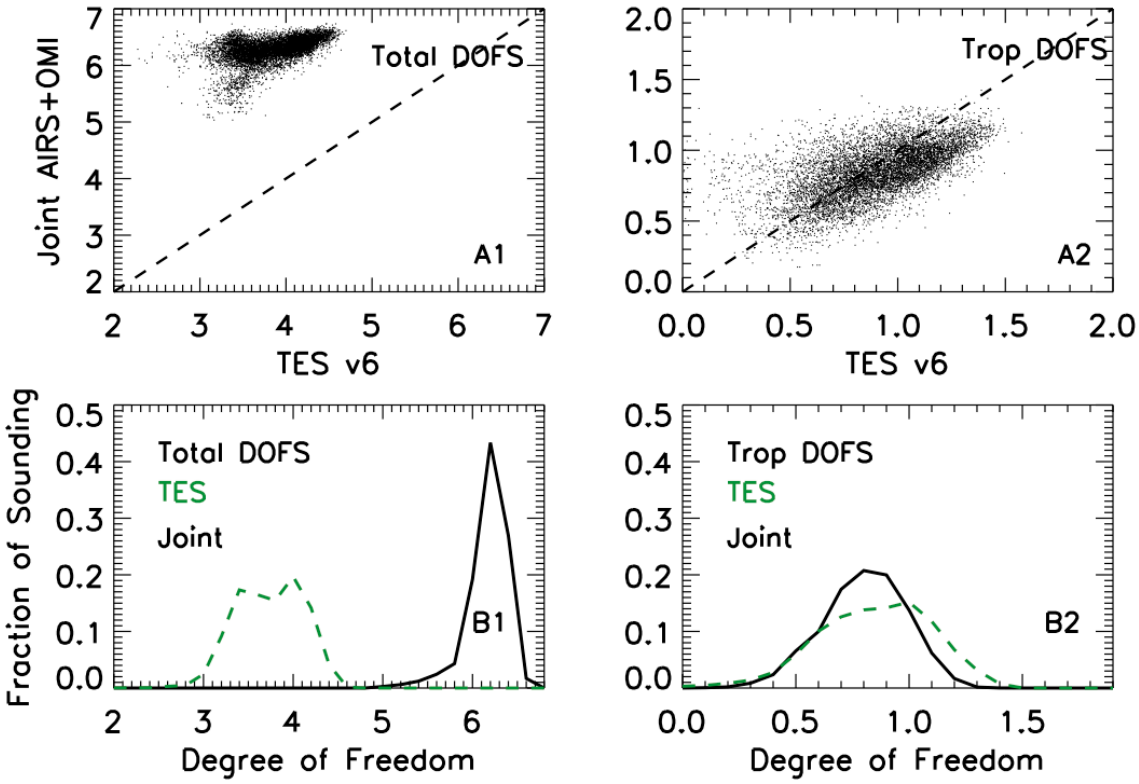

Figure S19: Degree of freedom of signals (DOFS) for September 2006 monthly mean O_3 over globe shown in Fig. S8. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

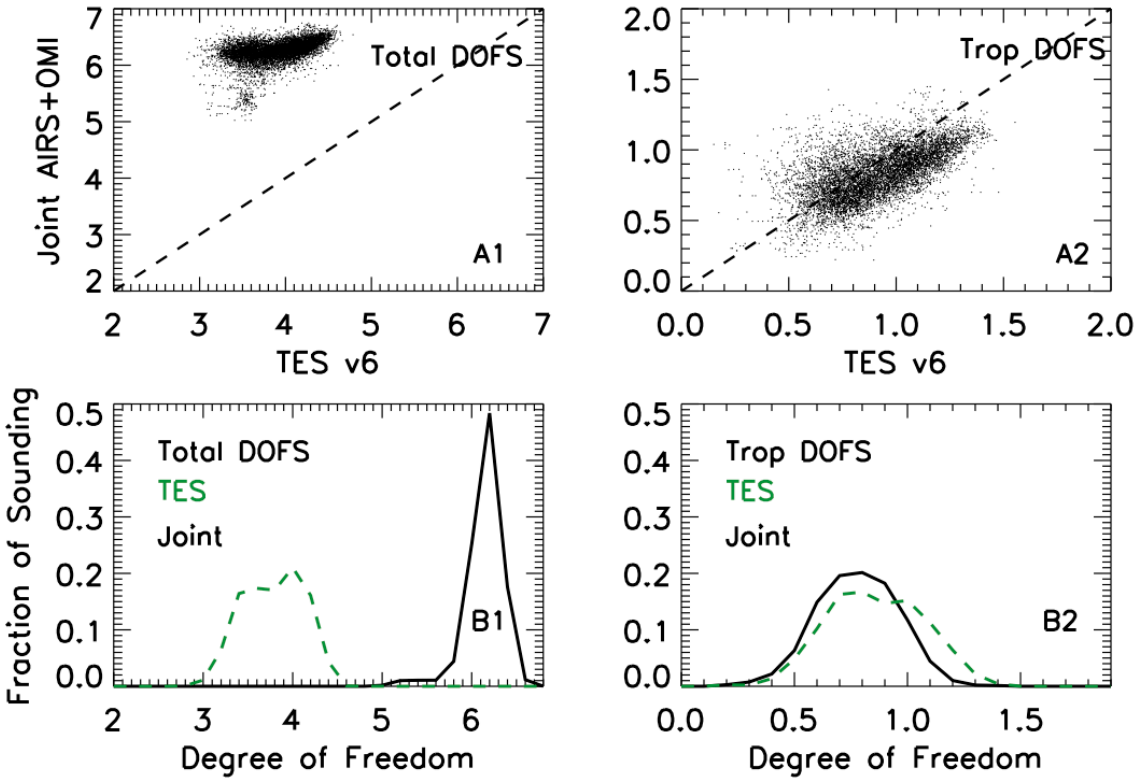

Figure S20: Degree of freedom of signals (DOFS) for October 2006 monthly mean O_3 over globe shown in Fig. S9. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

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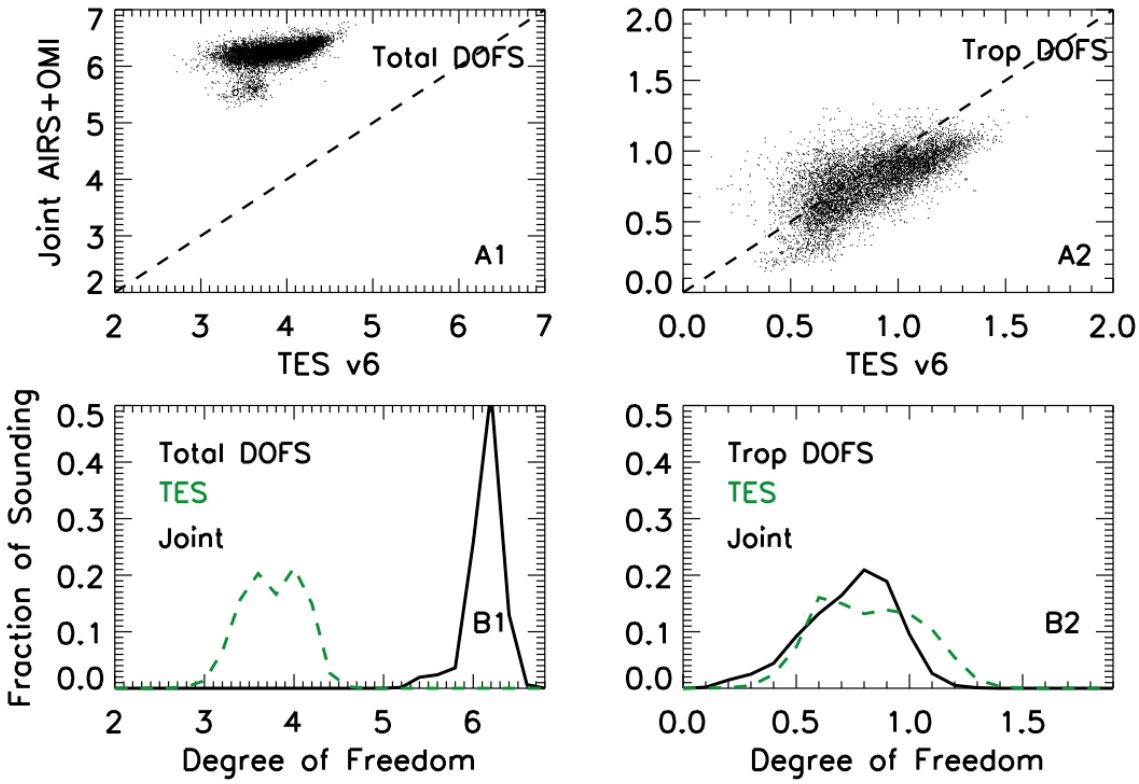

Figure S21: Degree of freedom of signals (DOFS) for November 2006 monthly mean O_3 over globe shown in Fig. S10. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

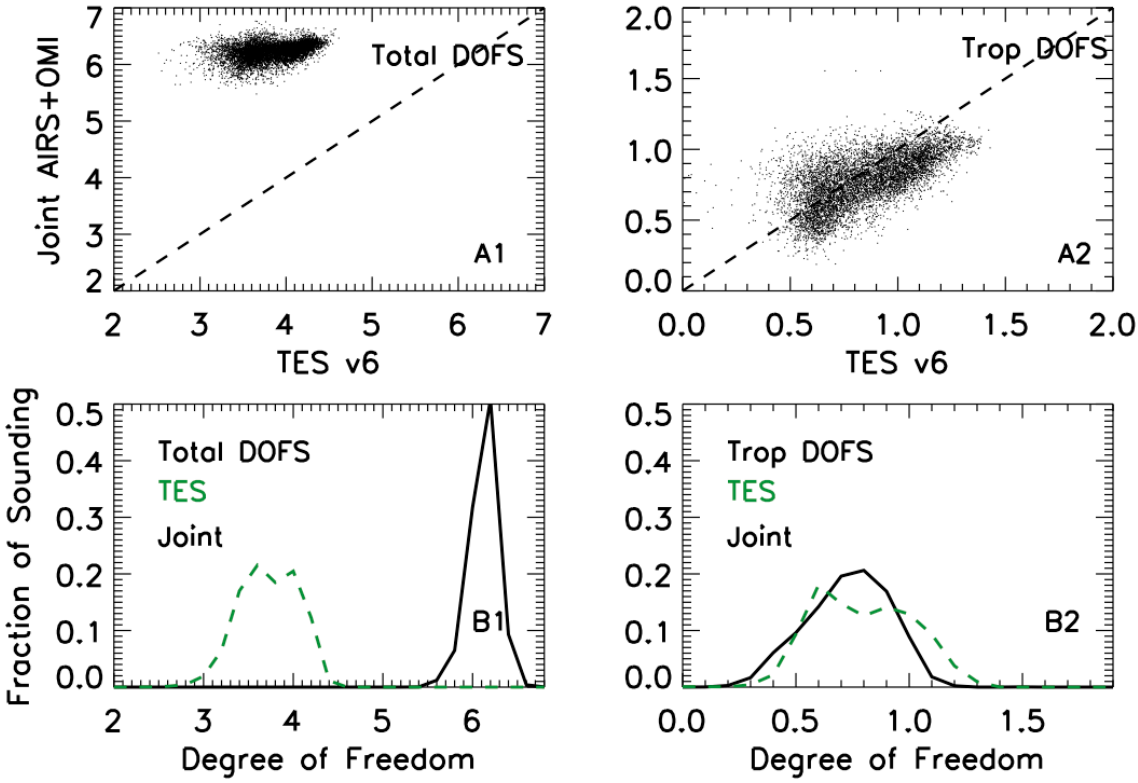

Figure S22: Degree of freedom of signals (DOFS) for December 2006 monthly mean O_3 over globe shown in Fig. S11. (A1) total DOFS; (A2) tropospheric DOFS; and (B1) histogram of total DOFS: joint AIRS+OMI (black line) and TES version 6 (green dash); (B2) histogram of tropospheric DOFS joint AIRS+OMI (black line) and TES version 6 (green dash).

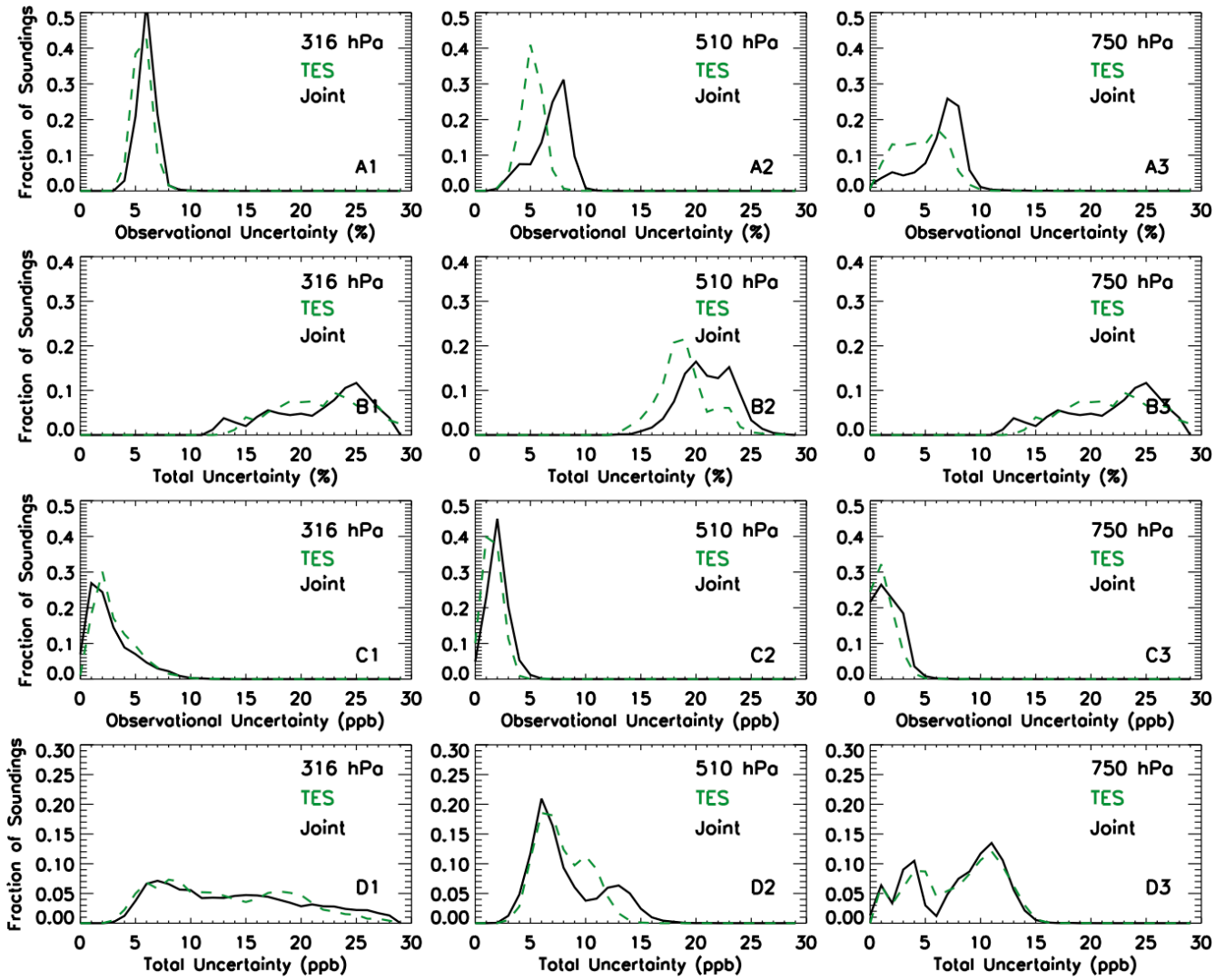

Figure S23: Estimated error of retrieved global O_3 concentration for January 2006 shown in Fig. S1. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

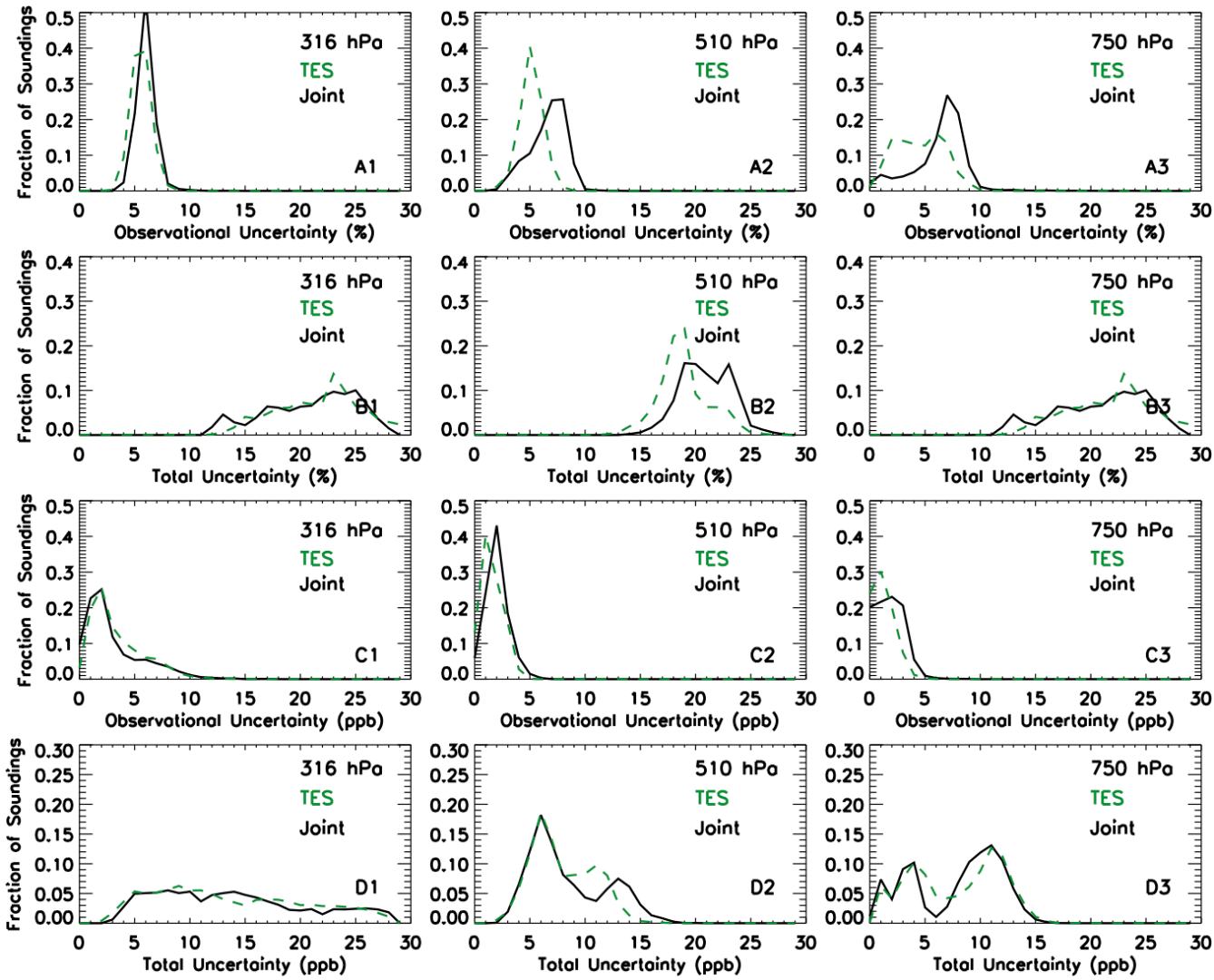

Figure S24: Estimated error of retrieved global O_3 concentration for February 2006 shown in Fig. S2. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

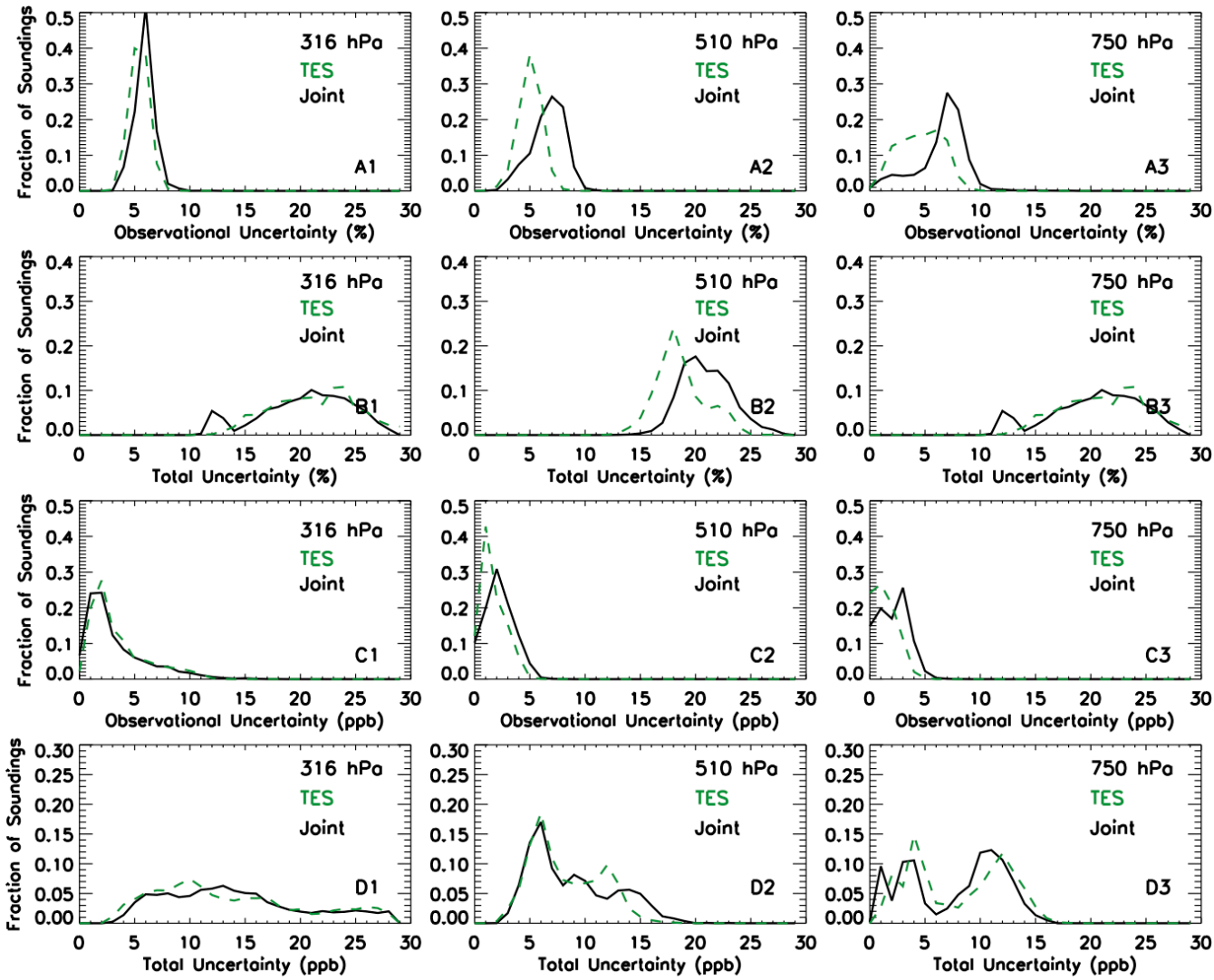

Figure S25: Estimated error of retrieved global O_3 concentration for March 2006 shown in Fig. S3. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

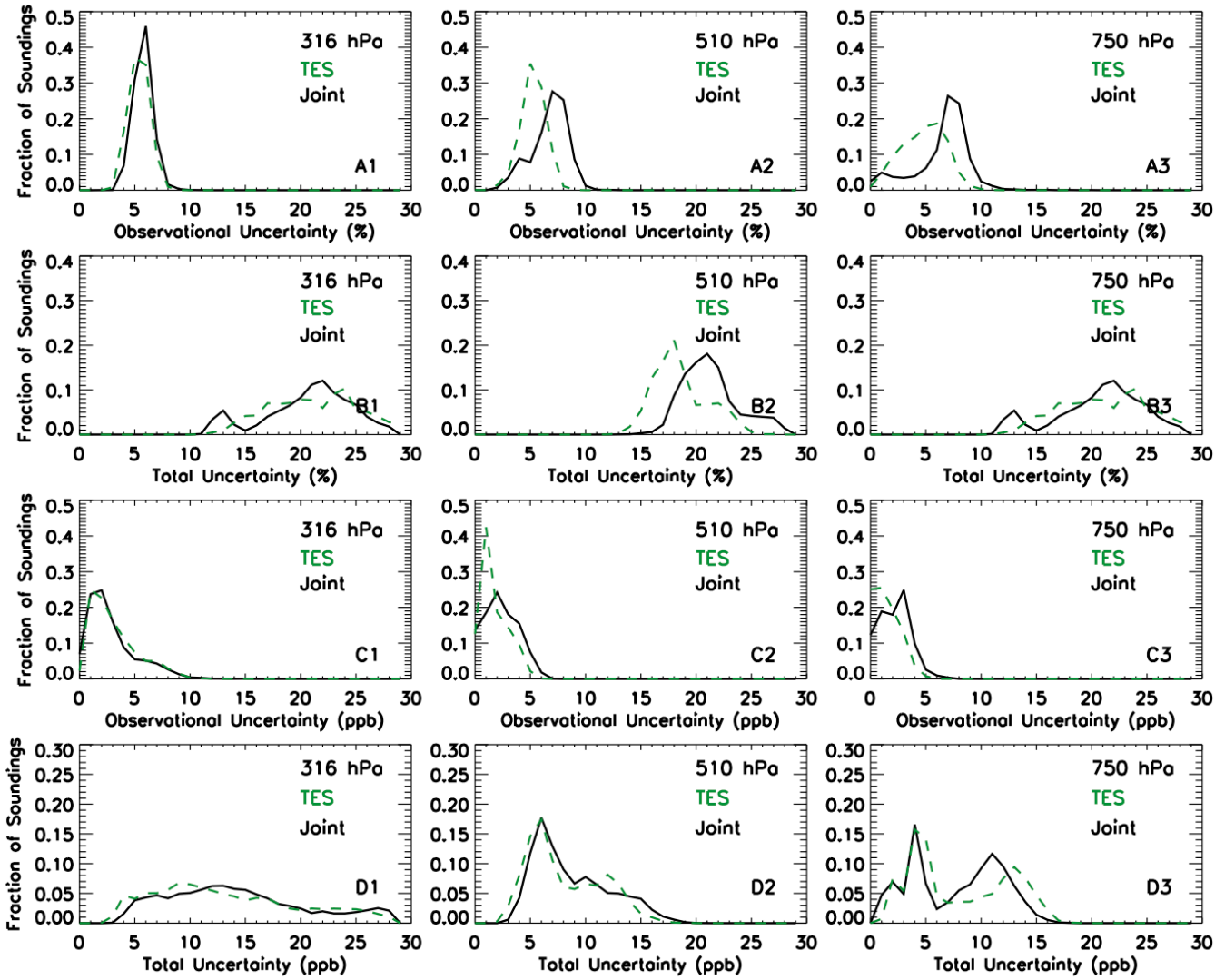

Figure S26: Estimated error of retrieved global O_3 concentration for April 2006 shown in Fig. S4. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

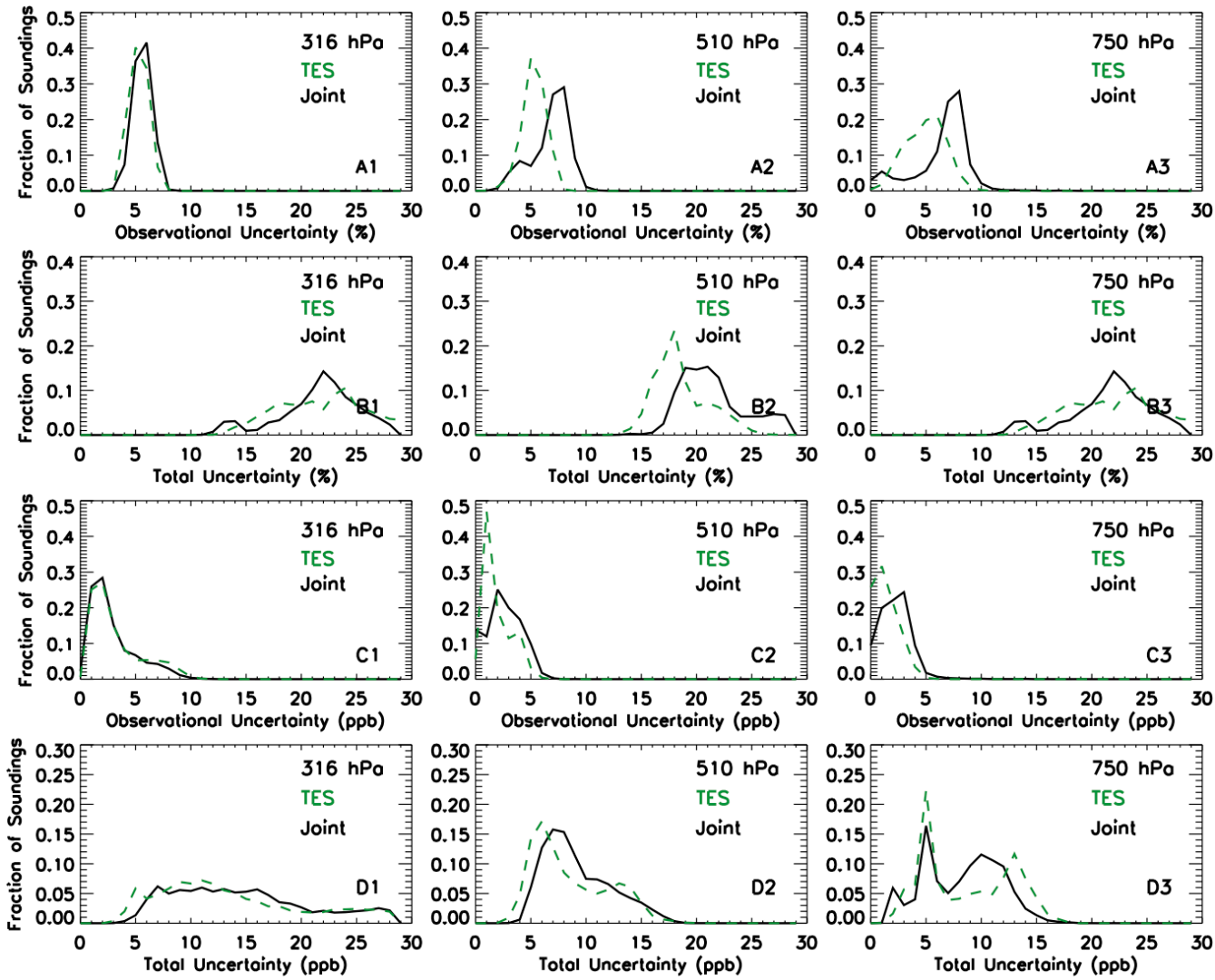

Figure S27: Estimated error of retrieved global O_3 concentration for May 2006 shown in Fig. S5. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

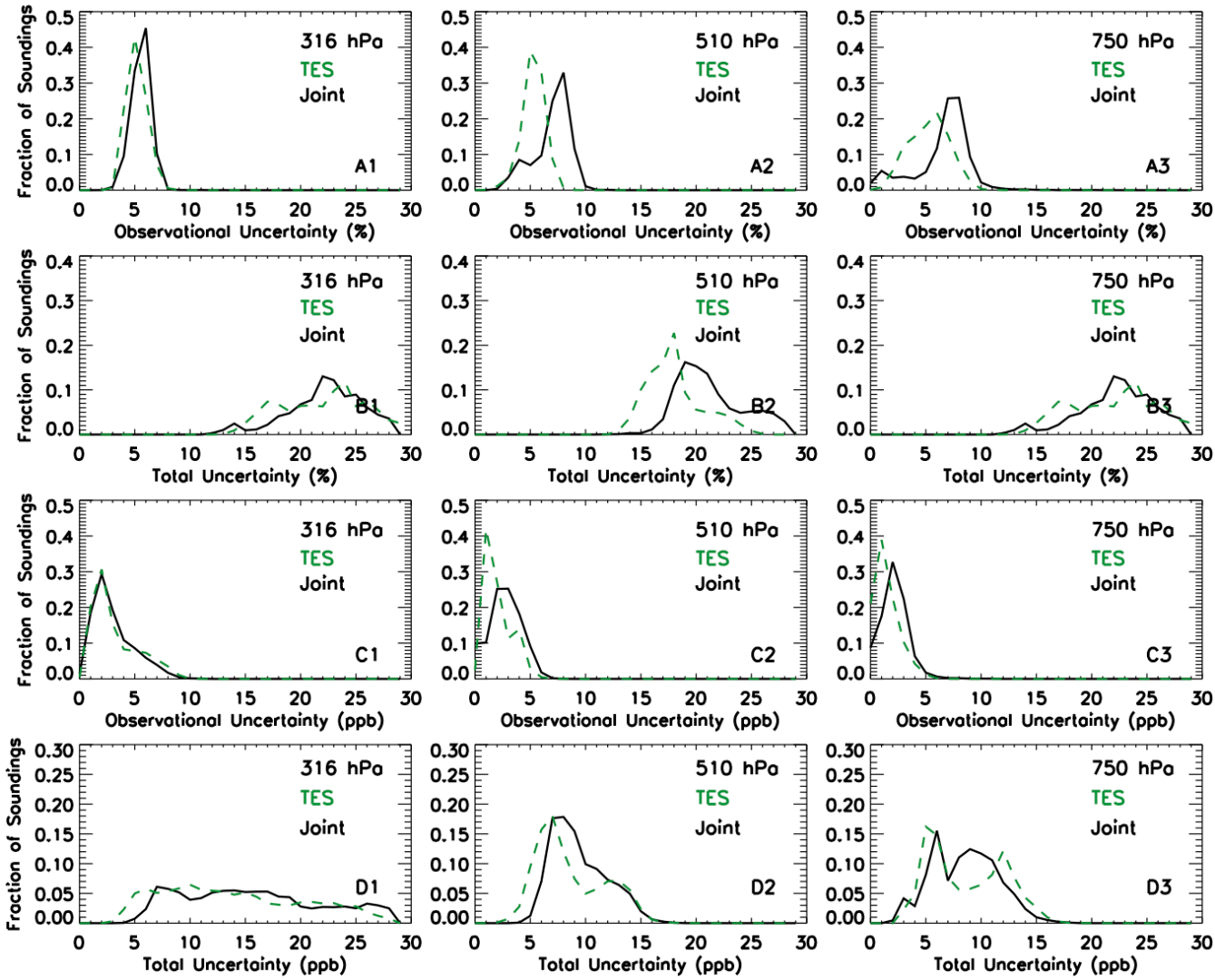

Figure S28: Estimated error of retrieved global O_3 concentration for June 2006 shown in Fig. S6. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

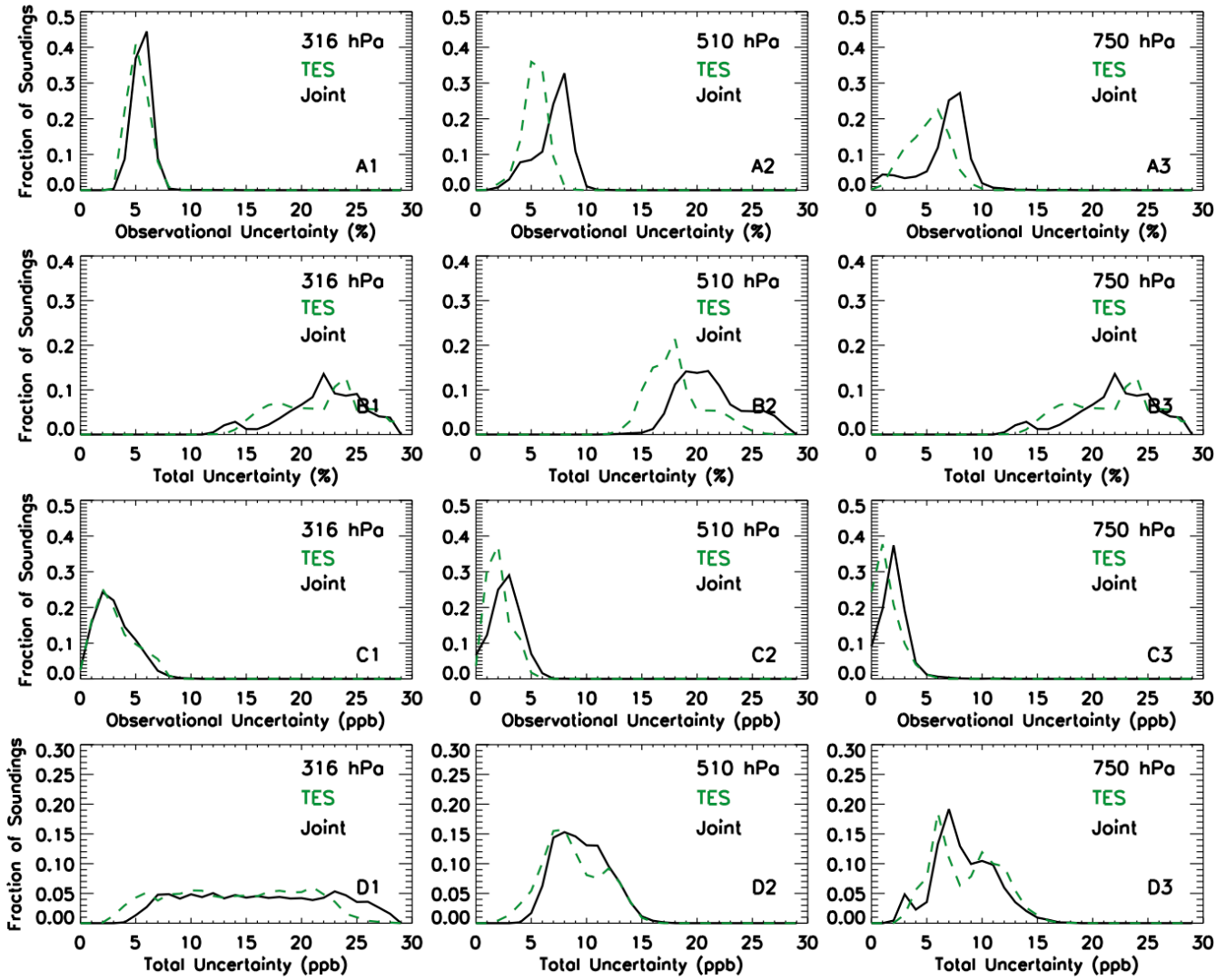

Figure S29: Estimated error of retrieved global O_3 concentration for July 2006 shown in Fig. S7. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

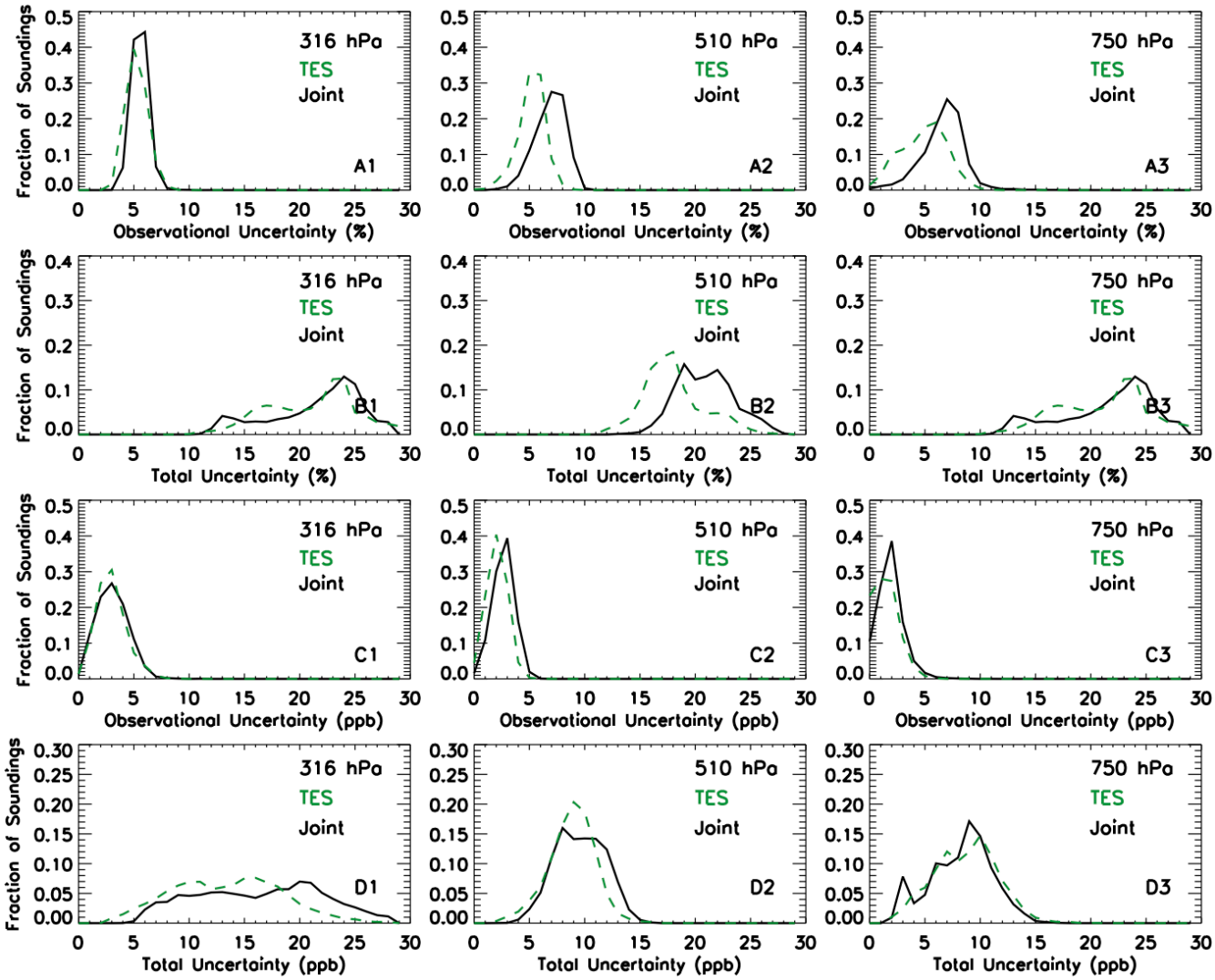

Figure S30: Estimated error of retrieved global O_3 concentration for September 2006 shown in Fig. S8. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

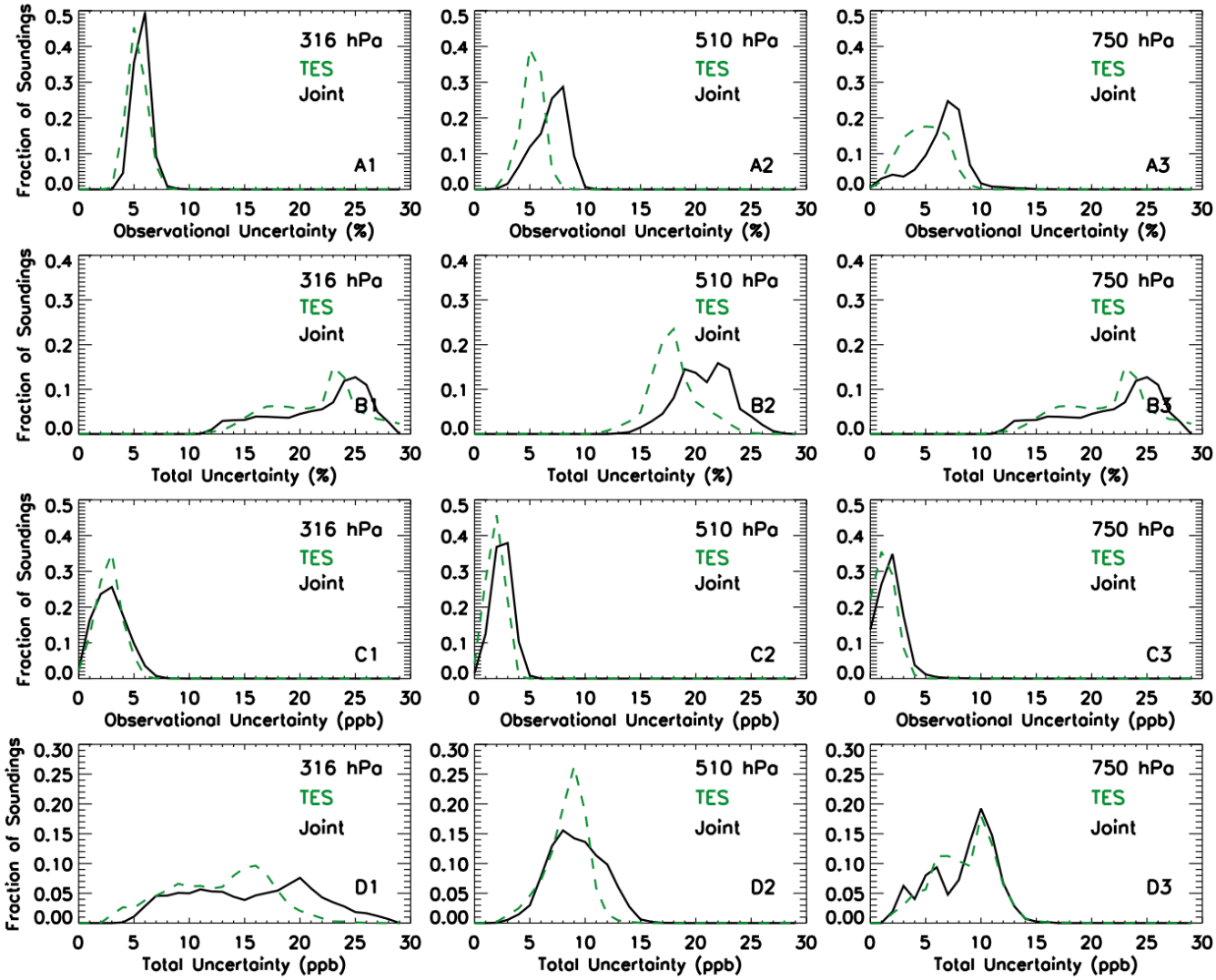

Figure S31: Estimated error of retrieved global O_3 concentration for October 2006 shown in Fig. S9. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

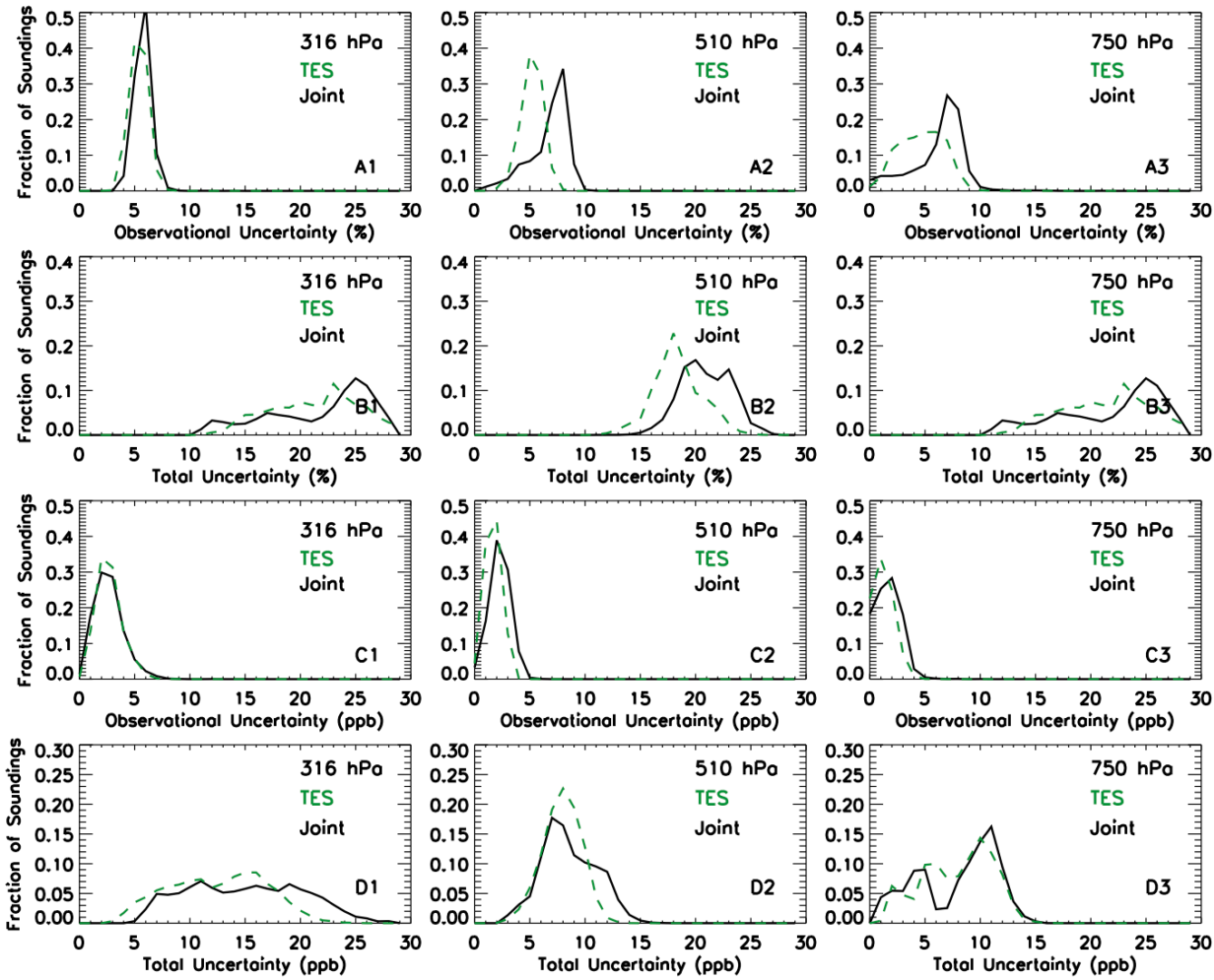

Figure S32: Estimated error of retrieved global O_3 concentration for November 2006 shown in Fig. S10. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.

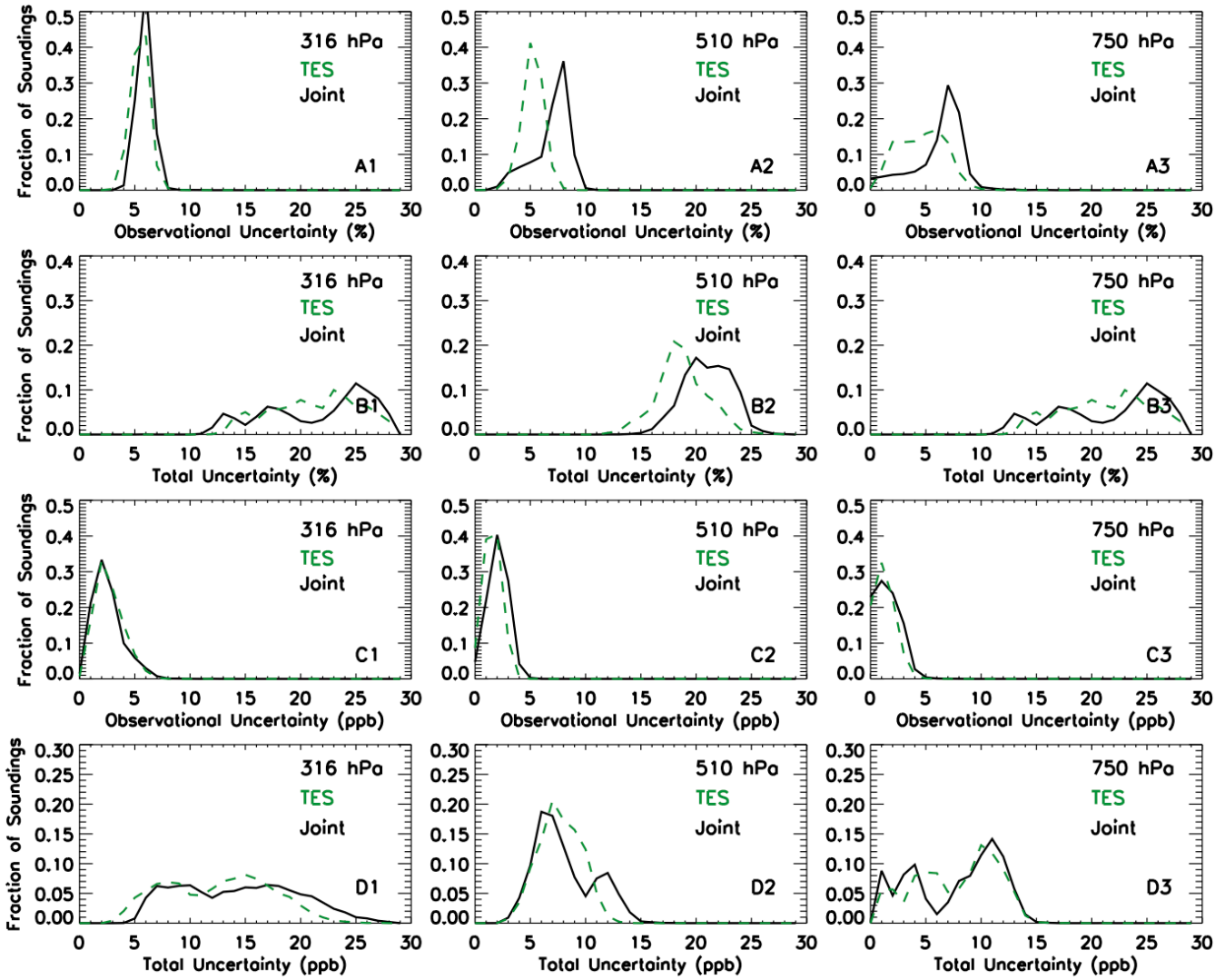

Figure S33: Estimated error of retrieved global O_3 concentration for December 2006 shown in Fig. S11. (A1–A3) observational error; (B1–B3) total error; (C1–C3) observational error in ppb; (D1–D3) total error in ppb. Joint AIRS+OMI data are shown in black line, and TES version 6 data are shown in green dash.