



Supplement of

5 years of Sentinel-5P TROPOMI operational ozone profiling and geophysical validation using ozonesonde and lidar ground-based networks

Arno Keppens et al.

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Table S1. List of ozonesonde stations (90° to 20° north) providing correlative data for the TROPOMI validation in this work. Subsequent columns show the station name, location, archive / PI institute abbreviation, validation period (Full for the entire five year TROPOMI time range: May 2018 to April 2023), and number of co-locations in the comparative validation. Horizontal black lines separate the latitude zones defined in Figure 3.

NameLocation [°N,°E]Archive / PI inst.Period [YY/MM]Co-locsAlert[82.45, -62.51]WOUDC / MSC18/05 - 22/069Eureka[79.99, -85.93]WOUDC / MSC18/05 - 23/0312Ny-Alesund[78.93, 11.93]NDACC / AWI18/05 - 23/0312Resolute[74.72, -94.98]NDACC / MSC18/05 - 20/0455Scoresbysund[70.48, -21.95]NDACC / MSC18/05 - 20/0455Sodankyla[67.37, 26.63]NDACC / FMIFull10Jokioinen[60.81, 23.50]NDACC / IKMO18/05 - 22/0920Churchill[58.74, -94.07]NDACC / MSC19/01 - 22/02100Edmonton[53.55, -114.10]NDACC / MSC18/05 - 22/06122Legionowo[52.40, 20.97]NDACC / MSC18/05 - 22/06122Legionowo[52.21, 14.12]NDACC / MSC18/05 - 23/03192Valentia[51.94, -10.25]NDACC / MSC18/05 - 23/03192Valentia[51.94, -10.25]NDACC / MSC18/06 - 23/03112Port Hardy[50.68, -127.38]WOUDC / MSC18/06 - 23/03111Praha[50.00, 14.44]NDACC / CHMI18/05 - 22/06123Hohenpeissenberg[47.81, 11.01]WOUDC / MSC18/05 - 22/11188Yarmouth[43.87, -66.1]WOUDC / MSC18/05 - 22/1118Madrid[40.45, -3.72]WOUDC / MSC18/05 - 22/0618Trinidad Head[40.03, -105.25]NOAA / GML					
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Ny-Alesund [78.93, 11.93] NDACC / AWI 18/05 - 23/03 12 Resolute [74.72, -94.98] NDACC / MSC 18/05 - 20/04 55 Scoresbysund [70.48, -21.95] NDACC / DMI Full 17 Sodankyla [67.37, 26.63] NDACC / FMI 20/01 - 22/04 52 Jokioinen [60.81, 23.50] NDACC / IKMO 18/05 - 22/09 20 Churchill [58.74, -94.07] NDACC / MSC 19/01 - 22/02 10 Edmonton [53.55, -114.10] NDACC / MSC 19/01 - 22/02 10 Goose Bay [53.31, -60.36] NDACC / MSC 18/05 - 22/06 12/2 Legionowo [52.40, 20.97] NDACC / MSC 18/05 - 22/06 12/2 Legionowo [52.21, 14.12] NDACC / MSC 18/05 - 23/03 19/2 Valentia [51.94, -10.25] NDACC / KMI 18/05 - 23/03 19/2 Valentia [51.94, -10.25] NDACC / RMI Full 12/2 Uccle [50.80, 4.35] NDACC / CMI Full 23/04 23/2 Port Hardy [50.68, -127.38] WOUDC / MSC	Eureka	[79.99, -85.93]	WOUDC / MSC	18/05 - 23/03	15
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Sodankyla [67.37, 26.63] NDACC / FMI Full 10 Jokioinen [60.81, 23.50] NDACC / FMI 20/01 - 22/04 9 Lerwick [60.13, -1.18] NDACC / UKMO 18/05 - 22/09 20 Churchill [58.74, -94.07] NDACC / MSC 19/01 - 22/02 10 Edmonton [53.55, -114.10] NDACC / MSC 19/01 - 22/06 12 Legionowo [52.40, 20.97] NDACC / MSC 18/05 - 22/06 12 Legionowo [52.21, 14.12] NDACC / MSC 18/05 - 22/06 12 Legionowo [52.21, 0.5.18] NDACC / MSC 18/05 - 23/03 19 Valentia [51.94, -10.25] NDACC / KNMI 18/05 - 23/03 11 Valentia [51.94, -10.25] NDACC / MSC 18/06 - 23/03 11 Praha [50.00, 14.44] NDACC / CHMI 19/01 - 23/04 23 Hohenpeissenberg [47.81, 11.01] WOUDC / DWD Full 62 Payerne [46.82, 6.95] WOUDC / MSC 18/05 - 22/11 18 <	Scoresbysund	[70.48, -21.95]	NDACC / DMI	Full	174
Jokioinen [60.81, 23.50] NDACC / FMI 20/01 - 22/04 Lerwick [60.13, -1.18] NDACC / UKMO 18/05 - 22/09 20 Churchill [58.74, -94.07] NDACC / MSC 19/01 - 22/02 10 Edmonton [53.55, -114.10] NDACC / MSC Full 19 Goose Bay [53.31, -60.36] NDACC / MSC 18/05 - 22/06 12/ Legionowo [52.40, 20.97] NDACC / IMGW Full 23 Lindenberg [52.21, 14.12] NDACC / MSC 18/05 - 23/03 19/ Valentia [51.94, -10.25] NDACC / KNMI 18/05 - 23/03 19/ Valentia [51.94, -10.25] NDACC / ME Full 23 Valentia [51.94, -10.25] NDACC / MSC 18/06 - 23/03 11' Port Hardy [50.68, -127.38] WOUDC / MSC 18/06 - 23/03 11' Praha [50.00, 14.44] NDACC / CHMI 19/01 - 23/04 23 Hohenpeissenberg [47.81, 11.01] WOUDC / MSC 18/05 - 22/11 18' <td< td=""><td>Sodankyla</td><td>[67.37, 26.63]</td><td>NDACC / FMI</td><td>Full</td><td>10'</td></td<>	Sodankyla	[67.37, 26.63]	NDACC / FMI	Full	10'
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Legionowo [52.40, 20.97] NDACC / IMGW Full 23 Lindenberg [52.21, 14.12] NDACC / DWD Full 24 De Bilt [52.10, 5.18] NDACC / KNMI 18/05 - 23/03 19 Valentia [51.94, -10.25] NDACC / ME Full 12 Uccle [50.80, 4.35] NDACC / ME Full 65 Port Hardy [50.68, -127.38] WOUDC / MSC 18/06 - 23/03 11 Praha [50.00, 14.44] NDACC / CHMI 19/01 - 23/04 23 Hohenpeissenberg [47.81, 11.01] WOUDC / DWD Full 62 Payerne [46.82, 6.95] WOUDC / MeteoSwiss Full 62 Payerne [43.94, 5.71] NDACC / LATMOS 18/05 - 22/11 18 Yarmouth [43.87, -66.11] WOUDC / MSC 18/05 - 22/06 18 Trinidad Head [40.45, -3.72] WOUDC / INM Full 23 Boulder [40.03, -105.25] NOAA / GML Full 27 Wallops Island [37.93, -75.48] NDACC / NASA 18/05 - 22/06 15 T	Goose Bay	[53.31, -60.36]	NDACC / MSC	18/05 - 22/06	12
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De Bilt [52.10, 5.18] NDACC / KNMI 18/05 - 23/03 19 Valentia [51.94, -10.25] NDACC / ME Full 12 Uccle [50.80, 4.35] NDACC / RMI Full 65 Port Hardy [50.68, -127.38] WOUDC / MSC 18/06 - 23/03 11 Praha [50.00, 14.44] NDACC / CHMI 19/01 - 23/04 23 Hohenpeissenberg [47.81, 11.01] WOUDC / DWD Full 62 Payerne [46.82, 6.95] WOUDC / MeteoSwiss Full 62 Varmouth [43.94, 5.71] NDACC / LATMOS 18/05 - 22/11 18 Yarmouth [43.87, -66.11] WOUDC / MSC 18/05 - 22/06 18 Trinidad Head [40.45, -3.72] WOUDC / INM Full 21 Madrid [40.3, -105.25] NOAA / GML Full 23 Boulder [40.03, -105.25] NOAA / GML Full 21 Madrid [36.05, 140.13] WOUDC / JMA Full 21 Wallops Island [37.93, -75.48] NDACC / NASA 18/05 - 22/06 15 Tsukub	Lindenberg	[52.21, 14.12]	NDACC / DWD	Full	24
Valentia[51.94, -10.25]NDACC / MEFull12Uccle[50.80, 4.35]NDACC / RMIFull65Port Hardy[50.68, -127.38]WOUDC / MSC18/06 - 23/0311Praha[50.00, 14.44]NDACC / CHMI19/01 - 23/0423Hohenpeissenberg[47.81, 11.01]WOUDC / DWDFull62Payerne[46.82, 6.95]WOUDC / MeteoSwissFull54Obs. Haute Provence[43.94, 5.71]NDACC / LATMOS18/05 - 22/1118Yarmouth[43.87, -66.11]WOUDC / MSC18/05 - 22/0618Trinidad Head[40.80, -124.15]NOAA / GMLFull23Boulder[40.03, -105.25]NOAA / GMLFull23Wallops Island[37.93, -75.48]NDACC / NASA18/05 - 22/0615Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/0618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	De Bilt	[52.10, 5.18]	NDACC / KNMI	18/05 - 23/03	19
Uccle [50.80, 4.35] NDACC / RMI Full 65 Port Hardy [50.68, -127.38] WOUDC / MSC 18/06 - 23/03 11 Praha [50.00, 14.44] NDACC / CHMI 19/01 - 23/04 23 Hohenpeissenberg [47.81, 11.01] WOUDC / DWD Full 62 Payerne [46.82, 6.95] WOUDC / DWD Full 62 Obs. Haute Provence [43.94, 5.71] NDACC / LATMOS 18/05 - 22/11 18 Yarmouth [43.87, -66.11] WOUDC / MSC 18/05 - 22/06 18 Trinidad Head [40.80, -124.15] NOAA / GML Full 23 Boulder [40.03, -105.25] NOAA / GML Full 23 Boulder [40.03, -105.25] NOAA / GML Full 27 Wallops Island [37.93, -75.48] NDACC / NASA 18/05 - 22/06 15 Tsukuba [36.05, 140.13] WOUDC / JMA Full 21 Huntsville [34.72, -86.64] NOAA / UAH 18/05 - 20/03 2 Izana [28.31, -16.50] NDACC / AEMET 18/05 - 22/12 18 <t< td=""><td>Valentia</td><td>[51.94, -10.25]</td><td>NDACC / ME</td><td>Full</td><td>12</td></t<>	Valentia	[51.94, -10.25]	NDACC / ME	Full	12
Port Hardy [50.68, -127.38] WOUDC / MSC 18/06 - 23/03 11 Praha [50.00, 14.44] NDACC / CHMI 19/01 - 23/04 23 Hohenpeissenberg [47.81, 11.01] WOUDC / DWD Full 62 Payerne [46.82, 6.95] WOUDC / MeteoSwiss Full 54 Obs. Haute Provence [43.94, 5.71] NDACC / LATMOS 18/05 - 22/11 18 Yarmouth [43.87, -66.11] WOUDC / MSC 18/05 - 22/06 18 Trinidad Head [40.80, -124.15] NOAA / GML Full 23 Boulder [40.03, -105.25] NOAA / GML Full 23 Boulder [40.03, -105.25] NOAA / GML Full 27 Wallops Island [37.93, -75.48] NDACC / NASA 18/05 - 22/06 15 Tsukuba [36.05, 140.13] WOUDC / JMA Full 21 Huntsville [34.72, -86.64] NOAA / UAH 18/05 - 22/12 18 Taipei [25.04, 121.51] WOUDC / CWBT 18/11 - 22/03 1 Hong Kong Obs. [22.31, 114.17] WOUDC / HKO 18/05 - 22/06 <	Uccle	[50.80, 4.35]	NDACC / RMI	Full	65
Praha [50.00, 14.44] NDACC / CHMI 19/01 - 23/04 23 Hohenpeissenberg [47.81, 11.01] WOUDC / DWD Full 62 Payerne [46.82, 6.95] WOUDC / MeteoSwiss Full 54 Obs. Haute Provence [43.94, 5.71] NDACC / LATMOS 18/05 - 22/11 18 Yarmouth [43.87, -66.11] WOUDC / MSC 18/05 - 22/06 18 Trinidad Head [40.80, -124.15] NOAA / GML Full 21 Madrid [40.03, -105.25] NOAA / GML Full 23 Boulder [40.03, -105.25] NOAA / GML Full 23 Wallops Island [37.93, -75.48] NDACC / NASA 18/05 - 22/06 15 Tsukuba [36.05, 140.13] WOUDC / JMA Full 21 Huntsville [34.72, -86.64] NOAA / UAH 18/05 - 20/03 2 Izana [28.31, -16.50] NDACC / AEMET 18/05 - 22/12 18 Taipei [25.04, 121.51] WOUDC / CWBT 18/11 - 22/03 1 Hong Kong Obs. [22.31, 114.17] WOUDC / HKO 18/05 - 22/06 18<	Port Hardy	[50.68, -127.38]	WOUDC / MSC	18/06 - 23/03	11
Hohenpeissenberg[47.81, 11.01]WOUDC / DWDFull62Payerne[46.82, 6.95]WOUDC / MeteoSwissFull54Obs. Haute Provence[43.94, 5.71]NDACC / LATMOS18/05 - 22/1118Yarmouth[43.87, -66.11]WOUDC / MSC18/05 - 22/0618Trinidad Head[40.80, -124.15]NOAA / GMLFull21Madrid[40.03, -105.25]NOAA / GMLFull23Boulder[40.03, -105.25]NOAA / GMLFull27Wallops Island[37.93, -75.48]NDACC / NASA18/05 - 22/0615Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/0618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Praha	[50.00, 14.44]	NDACC / CHMI	19/01 - 23/04	23
Payerne[46.82, 6.95]WOUDC / MeteoSwissFull54Obs. Haute Provence[43.94, 5.71]NDACC / LATMOS18/05 - 22/1118Yarmouth[43.87, -66.11]WOUDC / MSC18/05 - 22/0618Trinidad Head[40.80, -124.15]NOAA / GMLFull21Madrid[40.45, -3.72]WOUDC / INMFull23Boulder[40.03, -105.25]NOAA / GMLFull27Wallops Island[37.93, -75.48]NDACC / NASA18/05 - 22/0615Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/0618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Hohenpeissenberg	[47.81, 11.01]	WOUDC / DWD	Full	62
Obs. Haute Provence[43.94, 5.71]NDACC / LATMOS18/05 - 22/1118Yarmouth[43.87, -66.11]WOUDC / MSC18/05 - 22/0618Trinidad Head[40.80, -124.15]NOAA / GMLFull21Madrid[40.45, -3.72]WOUDC / INMFull23Boulder[40.03, -105.25]NOAA / GMLFull27Wallops Island[37.93, -75.48]NDACC / NASA18/05 - 22/0615Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/0618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Payerne	[46.82, 6.95]	WOUDC / MeteoSwiss	Full	54
Yarmouth[43.87, -66.11]WOUDC / MSC18/05 - 22/0618Trinidad Head[40.80, -124.15]NOAA / GMLFull21Madrid[40.45, -3.72]WOUDC / INMFull23Boulder[40.03, -105.25]NOAA / GMLFull27Wallops Island[37.93, -75.48]NDACC / NASA18/05 - 22/0615Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/0618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Obs. Haute Provence	[43.94, 5.71]	NDACC / LATMOS	18/05 - 22/11	18
Trinidad Head[40.80, -124.15]NOAA / GMLFull21Madrid[40.45, -3.72]WOUDC / INMFull23Boulder[40.03, -105.25]NOAA / GMLFull27Wallops Island[37.93, -75.48]NDACC / NASA18/05 - 22/0615Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/0618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Yarmouth	[43.87, -66.11]	WOUDC / MSC	18/05 - 22/06	18
Madrid[40.45, -3.72]WOUDC / INMFull23Boulder[40.03, -105.25]NOAA / GMLFull27Wallops Island[37.93, -75.48]NDACC / NASA18/05 - 22/0615Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/0618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Trinidad Head	[40.80, -124.15]	NOAA / GML	Full	21
Boulder[40.03, -105.25]NOAA / GMLFull27Wallops Island[37.93, -75.48]NDACC / NASA18/05 - 22/0615Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/1618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Madrid	[40.45, -3.72]	WOUDC / INM	Full	23
Wallops Island [37.93, -75.48] NDACC / NASA 18/05 - 22/06 15 Tsukuba [36.05, 140.13] WOUDC / JMA Full 21 Huntsville [34.72, -86.64] NOAA / UAH 18/05 - 20/03 2 Izana [28.31, -16.50] NDACC / AEMET 18/05 - 22/12 18 Taipei [25.04, 121.51] WOUDC / CWBT 18/11 - 22/03 1 Hong Kong Obs. [22.31, 114.17] WOUDC / HKO 18/05 - 22/06 18 Hanoi [21.03, 105.85] SHADOZ / GSFC 18/05 - 21/11 8	Boulder	[40.03, -105.25]	NOAA / GML	Full	27
Tsukuba[36.05, 140.13]WOUDC / JMAFull21Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/1618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Wallops Island	[37.93, -75.48]	NDACC / NASA	18/05 - 22/06	15
Huntsville[34.72, -86.64]NOAA / UAH18/05 - 20/032Izana[28.31, -16.50]NDACC / AEMET18/05 - 22/1218Taipei[25.04, 121.51]WOUDC / CWBT18/11 - 22/031Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/1618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Tsukuba	[36.05, 140.13]	WOUDC / JMA	Full	21
Izana [28.31, -16.50] NDACC / AEMET 18/05 - 22/12 18 Taipei [25.04, 121.51] WOUDC / CWBT 18/11 - 22/03 1 Hong Kong Obs. [22.31, 114.17] WOUDC / HKO 18/05 - 22/06 18 Hanoi [21.03, 105.85] SHADOZ / GSFC 18/05 - 21/11 8	Huntsville	[34.72, -86.64]	NOAA / UAH	18/05 - 20/03	2
Taipei [25.04, 121.51] WOUDC / CWBT 18/11 - 22/03 1 Hong Kong Obs. [22.31, 114.17] WOUDC / HKO 18/05 - 22/06 18 Hanoi [21.03, 105.85] SHADOZ / GSFC 18/05 - 21/11 8	Izana	[28.31, -16.50]	NDACC / AEMET	18/05 - 22/12	18
Hong Kong Obs.[22.31, 114.17]WOUDC / HKO18/05 - 22/0618Hanoi[21.03, 105.85]SHADOZ / GSFC18/05 - 21/118	Taipei	[25.04, 121.51]	WOUDC / CWBT	18/11 - 22/03	1
Hanoi [21.03, 105.85] SHADOZ / GSFC 18/05 - 21/11 8-	Hong Kong Obs.	[22.31, 114.17]	WOUDC / HKO	18/05 - 22/06	18
	Hanoi	[21.03, 105.85]	SHADOZ / GSFC	18/05 - 21/11	8

Table S2. List of ozonesonde stations (20° north to 90° south) providing correlative data for the TROPOMI validation in this work. Subsequent columns show the station name, location, archive / PI institute abbreviation, validation period (Full for the entire five year TROPOMI time range: May 2018 to April 2023), and number of co-locations in the comparative validation. Horizontal black lines separate the latitude zones defined in Figure 3.

Name	Location [°N,°E]	Archive / PI inst.	Period [YY/MM]	Co-locs.
Hilo	[19.72, -155.07]	NOAA / GML	Full	237
Costa Rica (3 locs.)	[9.94, -84.04]	SHADOZ / NCAR	18/05 - 23/03	112
Paramaribo	[5.81, -55.22]	NDACC / KNMI	Full	161
Sepang Airport	[2.73, 101.70]	SHADOZ / MMD	18/05 - 22/12	79
Quito	[-0.20, -78.44]	SHADOZ / USFQ	21/10 - 22/11	10
San Cristobal	[-0.92, -89.60]	SHADOZ / USFQ	21/12 - 22/12	23
Nairobi	[-1.27, 36.80]	SHADOZ / MeteoSwiss	18/06 - 20/03	43
Ascension Island	[-1.98, -14.42]	SHADOZ / GSFC	18/05 - 22/09	144
Natal	[-5.83, -35.20]	SHADOZ / INPE	18/05 - 22/12	83
Watukosek	[-7.50, 112.60]	SHADOZ / BRIN	21/03 - 22/12	23
Pago Pago	[-14.23, -170.56]	NOAA / GML	Full	155
Suva	[-18.13, 178.40]	NOAA / GML	Full	54
St. Denis	[-20.90, 55.48]	SHADOZ / LACY	18/05 - 20/12	87
Irene	[-25.92, 28.22]	SHADOZ / SAWS	18/05 - 22/08	33
Broadmeadows	[-37.69, 144.95]	WOUDC / ABM	18/05 - 23/02	226
Lauder	[-45.04, 169.68]	NDACC / NIWA	18/05 - 22/06	208
Macquarie	[-54.50, 158.95]	WOUDC / ABM	18/05 - 23/02	231
Ushuaia	[-54.85, -68.31]	WOUDC / SMNA	18/08 - 19/11	18
Marambio	[-64.23, -56.62]	WOUDC / FMI	18/08 - 19/11	43
Dumont d'Urville	[-66.67, 140.02]	NDACC / LATMOS	18/08 - 19/12	13
Davis	[-68.58, 77.97]	WOUDC / ABM	18/08 - 23/02	166
Syowa	[-69.01, 39.58]	WOUDC / JMA	18/08 - 23/04	176
Neumayer	[-70.68, -8.26]	NDACC / AWI	18/08 - 23/03	209
Belgrano	[-77.77, -38.18]	NDACC / INTA	18/10 - 23/02	52
Amundsen Scott	[-89.98, -24.80]	NOAA / GML	18/10 - 21/11	72
South Pole	[-90.00, -169.00]	NOAA / GML	19/11 - 23/03	55

Table S3. List of DIAL stations providing correlative data for the TROPOMI validation in this work. Subsequent columns show the station name, location, archive / PI institute abbreviation, validation period (Full for the entire five year TROPOMI time range), and number of co-locations in the comparative validation. The horizontal black line separates tropospheric (top) and stratospheric (bottom) lidar instruments.

Name	Location [°N,°E]	Archive / PI inst.	Period [YY/MM]	Co-locs.
Greenbelt	[38.99, -76.84]	TOLNet / GSFC	20/05 - 21/07	118
Langley	[37.10, -76.39]	TOLNet / LaRC	18/05 - 19/11	15
Huntsville	[34.72, -86.64]	TOLNet / UAH	18/05 - 20/08	103
Table Mountain (t.)	[34.40, -117.70]	TOLNet / JPL	18/05 - 20/07	456
Eureka	[79.99, -85.93]	NDACC / U. Toronto	20/03	2
Hohenpeissenberg	[47.81, 11.01]	NDACC / DWD	Full	532
Obs. Haute Provence	[43.94, 5.71]	NDACC / LATMOS	Full	595
Table Mountain (s.)	[34.40, -117.70]	NDACC / JPL	Full	722
Mauna Loa	[19.53, -155.58]	NDACC / JPL	18/05 - 22/11	592
Lauder	[-45.04, 169.68]	NDACC / NIWA	18/05 - 21/07	108



Figure S1. The percentage of good quality pixels after applying separately each of the recommended filters on the QA value, cost function, the a-priori condition in Eq. (2). Each line represents the average percentage of the same orbit number over all the days of the specific month analysed.



Figure S2. Layer-DFS (bottom to top row: 0-6 km, 6-12 km, 12-18 km, 18-24 km, 24-32 km, 32-82 km) as a function of (from left to right) solar zenith angle (SZA), viewing zenith angle (VZA), cloud fraction, and surface albedo. 84, 50, and 16 % quantiles are added in red for ten bins (with a thicker line for the median), together with the overall layer mean (black line).



Figure S3. Differences between the lowest five ozone subcolumns as observed by TROPOMI and the coincident vertically integrated ozonesonde measurements (bottom to second row: 0-6 km, 6-12 km, 12-18 km, 18-24 km, 24-32 km), and their overall sum (top row). Subsequent columns show the differences as a function of solar zenith angle (SZA), viewing zenith angle (VZA), cloud fraction, and surface albedo. 84, 50, and 16 % quantiles are added in red for ten bins (with a thicker line for the median), together with the overall mean difference (black line), and the product requirements for each subcolumn (grey areas).



Figure S4. Comparison between S5P RPRO/OFFL ozone number density profile data and all co-located ozonesonde reference measurements, for five latitude bands sorted north (a) to south (e). Each panel shows six graphs, respectively, from left to right: the difference and the percent relative difference between S5P and ozonesonde, the chi-square (χ^2) profile, the vertical sensitivity, the altitude registration offset, and the averaging kernel FWHM associated with the satellite retrieval. The colour scale indicates the TROPOMI solar zenith angle. Black dashed lines show mean values (thick lines) and standard deviations (thin lines, around the mean), while white dashed lines indicate the mean difference between the a-priori profile and the reference measurement. Dotted black lines indicate the total ex-ante (inductive) uncertainty of TROPOMI and the reference measurements combined (around the mean difference). The black full lines show the same, after adding the retrieval's smoothing error.