



## Supplement of

## An intercomparison of tropospheric ozone reanalysis products from CAMS, CAMS interim, TCR-1, and TCR-2

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Figure S1. Evaluation of ozone normalized mean bias (reanalysis-observation, top) and standard deviation of difference (bottom) 20 for the four reanalysis products at 850, 650 and 350 hPa against sondes, computed for various regions, for the 2005-2016 time period.



Figure S2. Evaluation of ozone partial columns (surface - 300 hPa) for the four reanalysis products for the 2005-2016 time period against sonde observations within five latitude bands. Left: normalized mean bias (reanalysis-observation), right: normalized standard deviation of differences.

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35 Figure S3. Time series of regionally and monthly aggregated ozone concentrations at different altitudes (850, 650 and 350 hPa), sampled at ozone sonde locations, against ozone sonde observations (black). The gray dashed line refers to the number of stations that contribute to the statistics (right vertical axis).

















Bias CAMS-Rean 03 - 2005 - 2012

Bias TCR1 03 - 2005 - 2012

Bios CAMS-IREAN 03 - 2005 - 2012

Bios CAMS-Reon 03 - 2005 - 2012

Bios TCR1 03 - 2005 - 2012

Bias CAMS-IREAN 03 - 2005 - 2012



Bigs CAMS-iREAN 03 - 2005 - 2012



TOAR 03 - 2005 - 2012



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TOAR 03 - 2005 - 2012



Figure S4: Multi-annual (2005-2012) mean surface ozone from TOAR for three regions, (top figures), along with corresponding relative mean bias (reanalysis-observation) for the reanalyses CAMS-iRean, CAMS-Rean, TCR1 and TCR2, respectively.



Figure S5: Time series of regional, monthly mean surface ozone against TOAR observations. The dashed line indicates the number of TOAR 2°×2° grid boxes contributing to the statistics (see also right axis). Also the temporal correlation for the 2005-2014 time series is given in the figure legends.

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Figure S6: Intercomparison of regionally averaged monthly mean partial columns up to 300 hPa.

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Figure S7: Normalized frequency distributions of O<sub>3</sub> mixing ratios sampled at individual ozone sonde observations between 2005 and
2016 at 850 (left), 650 (middle) and 350 hPa (right) for the four reanalyses, together with the corresponding frequency distribution for
the observations. The sum of the absolute differences between the frequency distribution of the reanalyses and observations is also
given as d.



Figure S8: Anomalies in monthly mean O<sub>3</sub> partial columns (surface to 300 hPa) in four reanalyses, averaged for six regions: Arctic (>60°N), Eastern US (90°W – 70°W; 30°N - 43°N) Europe (10°W-30°E; 35°N-60°N), East Asia (108°E-160°E, 20°N-50°N), Tropics (30°S-30°N) and Antarctic (>60°S). Standard deviations for monthly mean anomalies are given, computed for the 2005-2016 time period.

80 Table S1: correlation coefficient R of the interannual variability in tropospheric O<sub>3</sub> columns between the four reanalyses, as computed for the 2005-2016 monthly mean time series in tropospheric O<sub>3</sub> columns from the surface to 300 hPa for different regions, see Figure S8.

Southeast Asia	CAMS-Rean	CAMS-iRean	TCR-2	TCR-1
CAMS-Rean	1.00	0.93	0.82	0.73
CAMS-iRean		1.00	0.83	0.76
TCR-2			1.00	0.90
TCR-1				1.00
ENSO_3.4	CAMS-Rean	CAMS-iRean	TCR-2	TCR-1
CAMS-Rean	1.00	0.83	0.78	0.73
CAMS-iRean		1.00	0.57	0.48
TCR-2			1.00	0.77
TCR-1				1.00
Arctic	CAMS-Rean	CAMS-iRean	TCR-2	TCR-1
CAMS-Rean	1.00	0.50	0.60	0.35
CAMS-iRean		1.00	0.48	0.26
TCR-2			1.00	0.46
TCR-1				1.00
Europe	CAMS-Rean	CAMS-iRean	TCR-2	TCR-1
CAMS-Rean	1.00	0.33	0.42	0.07
CAMS-iRean		1.00	0.47	0.24
TCR-2			1.00	0.40
TCR-1				1.00
Eastern US	CAMS-Rean	CAMS-iRean	TCR-2	TCR-1
CAMS-Rean	1.00	0.41	0.63	0.45
CAMS-iRean		1.00	0.54	0.46
TCR-2			1.00	0.64
TCR-1				1.00

Eastern Asia	CAMS-Rean	CAMS-iRean	TCR-2	TCR-1
CAMS-Rean	1.00	0.52	0.52	0.29
CAMS-iRean		1.00	0.69	0.55
TCR-2			1.00	0.59
TCR-1				1.00
Tropics	CAMS-Rean	CAMS-iRean	TCR-2	TCR-1
CAMS-Rean	1.00	0.17	0.29	0.01
CAMS-iRean		1.00	0.55	0.45
TCR-2			1.00	0.73
TCR-1				1.00
Antarctic	CAMS-Rean	CAMS-iRean	TCR-2	TCR-1
CAMS-Rean	1.00	0.65	0.33	0.39
CAMS-iRean		1.00	0.16	0.46
TCR-2			1.00	0.56
TCR-1				1.00