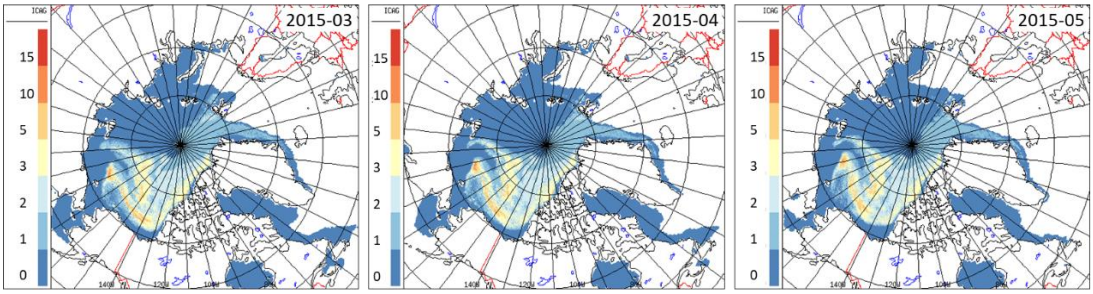
Supplementary Materials for

Modelling Arctic Lower Tropospheric Ozone: processes controlling seasonal variations

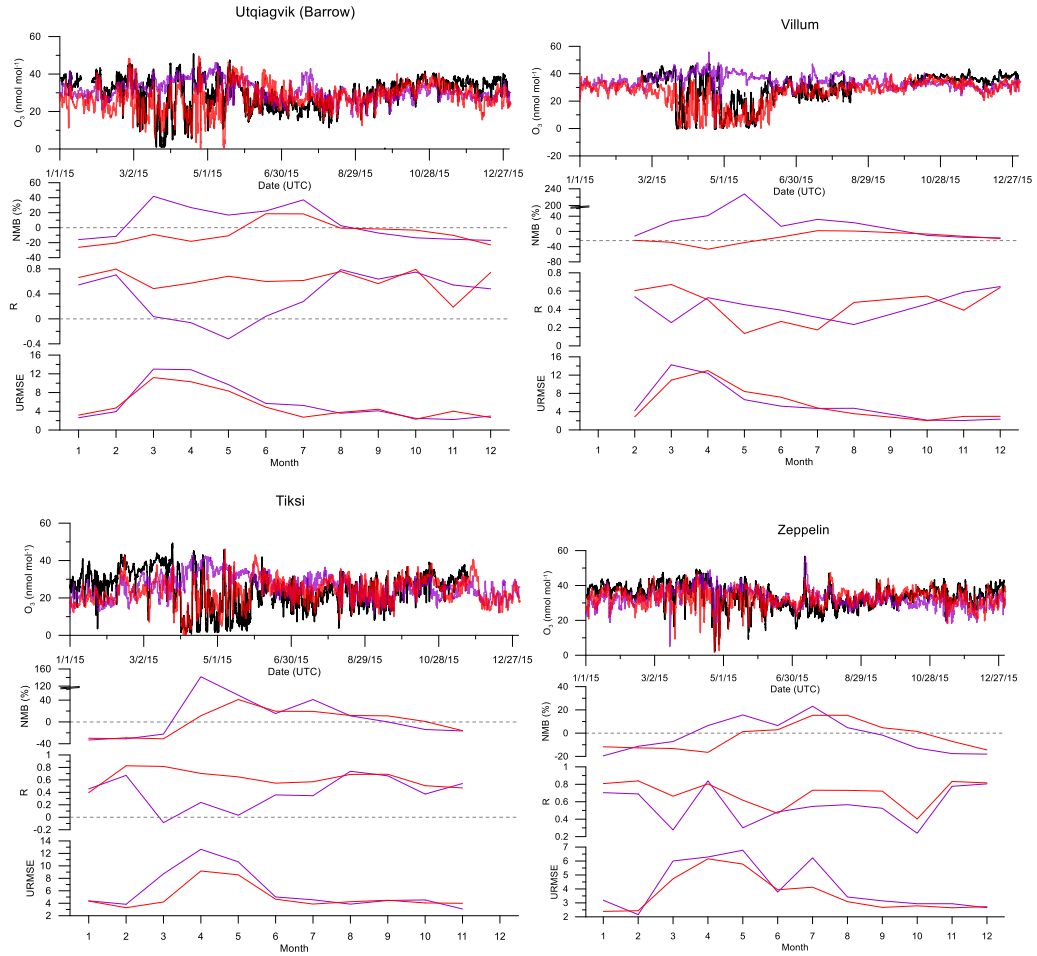
Wanmin Gong et al.

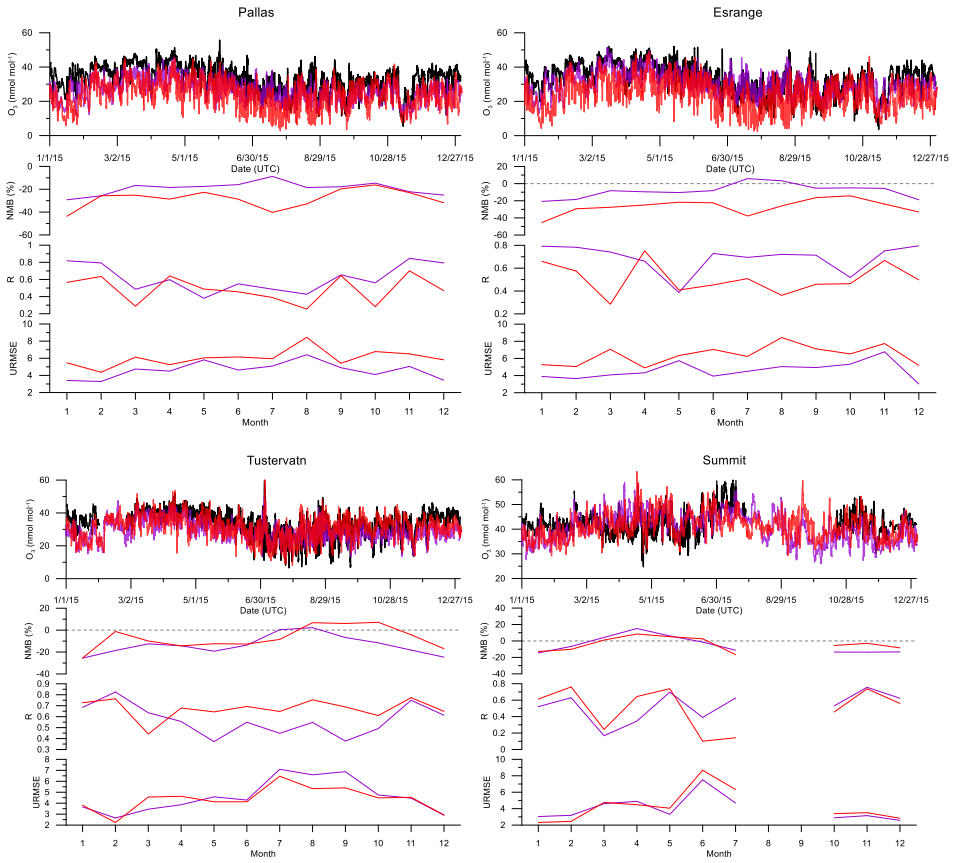
Correspondence: Wanmin Gong (wanmin.gong@ec.gc.ca)

Figures (SF.1 to SF.10)

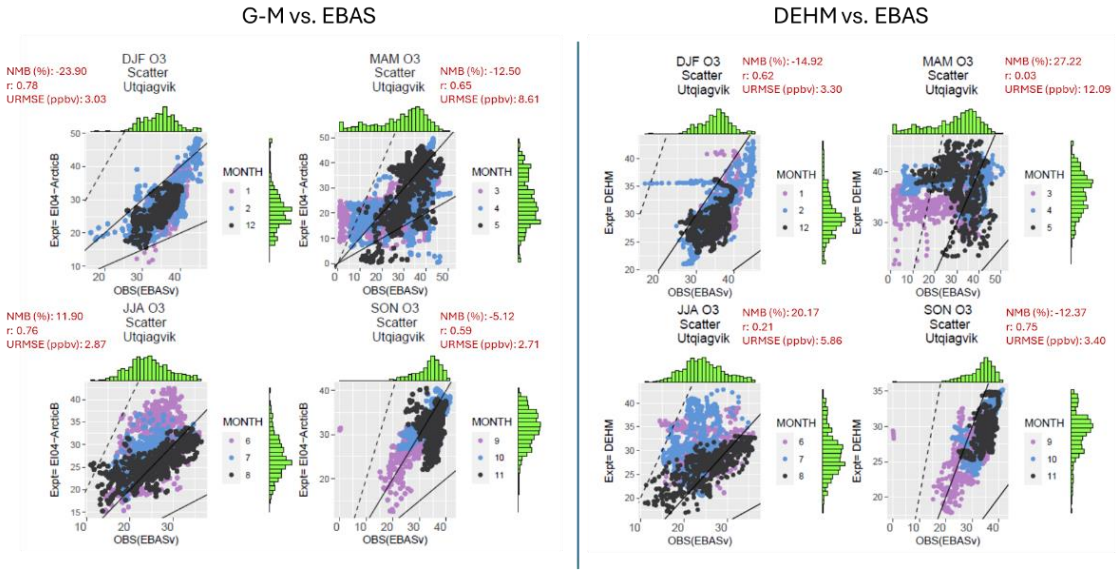


SF.1 Monthly mean sea ice age (year), for March, April, and May 2015, from the EASE-Grid Sea Ice Age Version 4 dataset used by GEM-MACH.

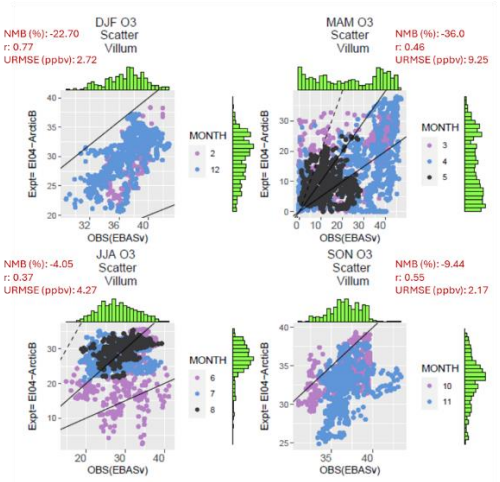




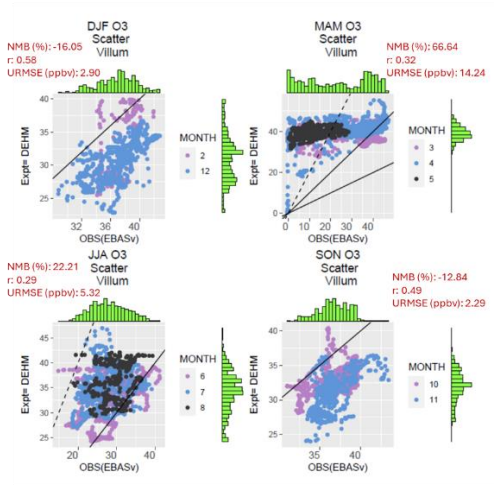
SF.2 O_3 time series comparisons between models (GEM-MACH and DEHM) and observations at Arctic surface sites accompanied by monthly evaluation statistical metrics (NMB, R, URMSE).



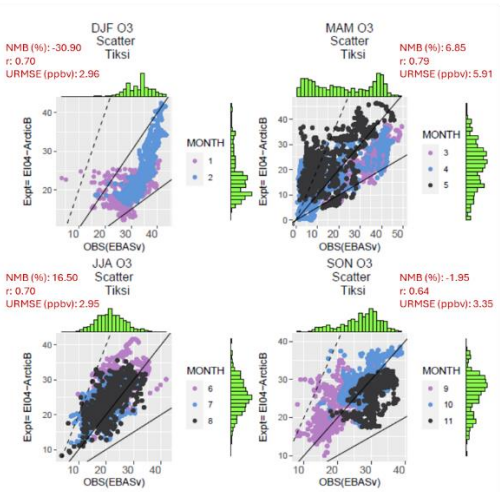
G-M vs. EBAS



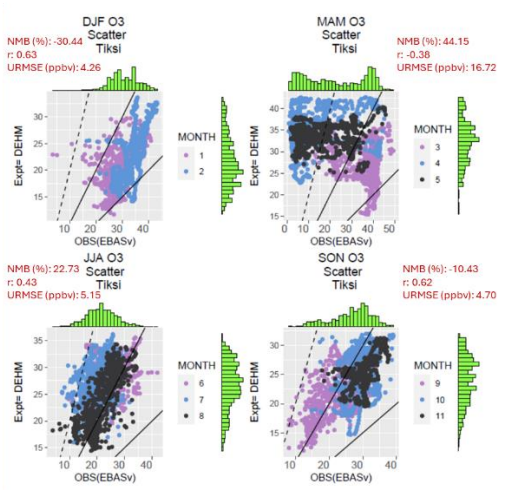
DEHM vs. EBAS



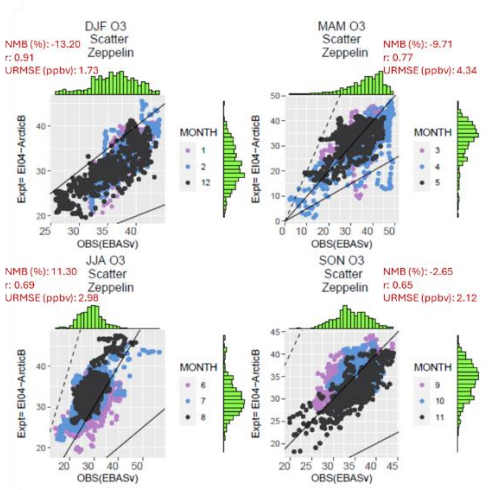
G-M vs. EBAS



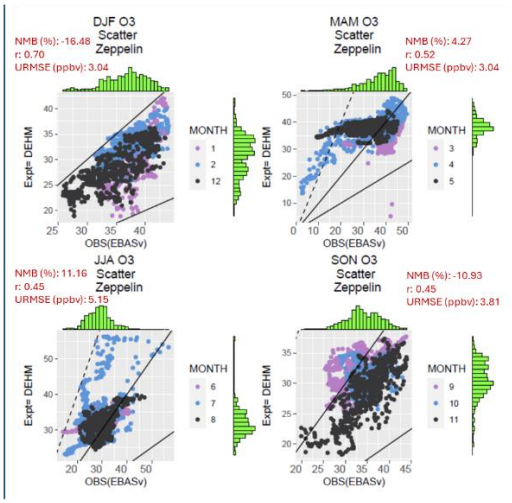
DEHM vs. EBAS



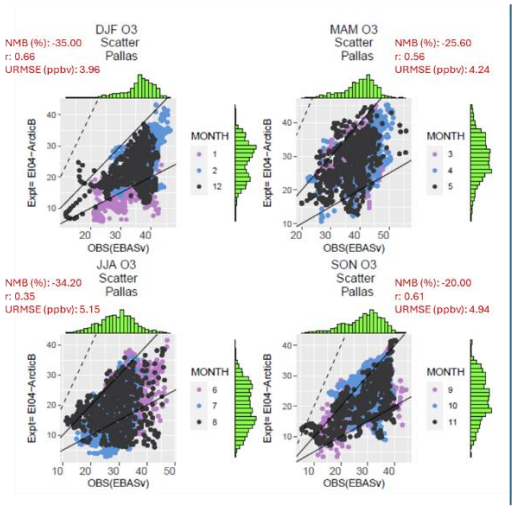
G-M vs. EBAS



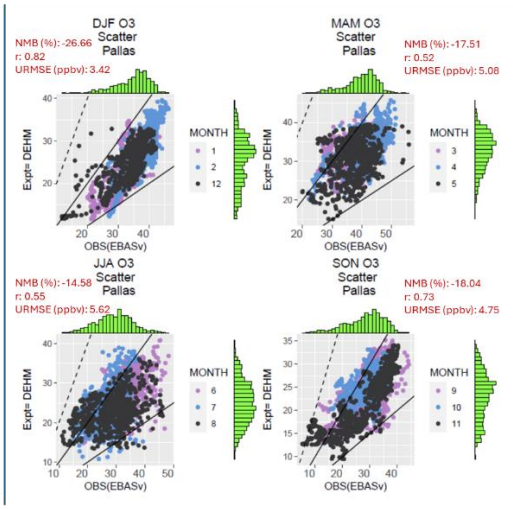
DEHM vs. EBAS



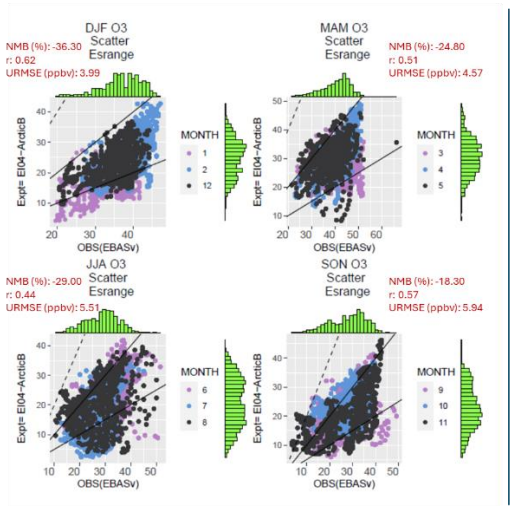
G-M vs. EBAS



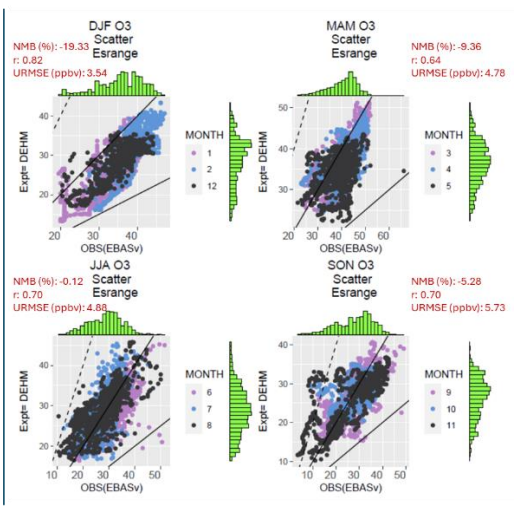
DEHM vs. EBAS



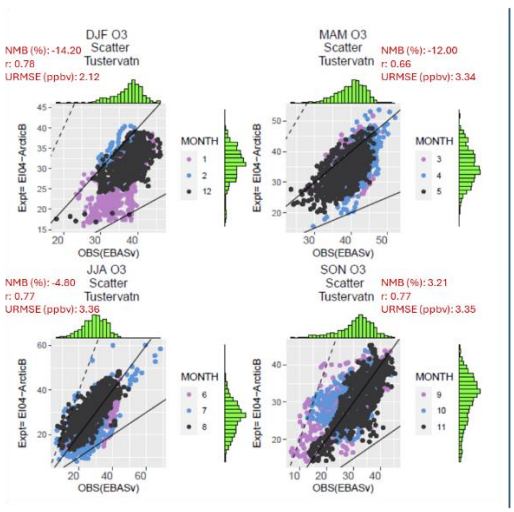
G-M vs. EBAS



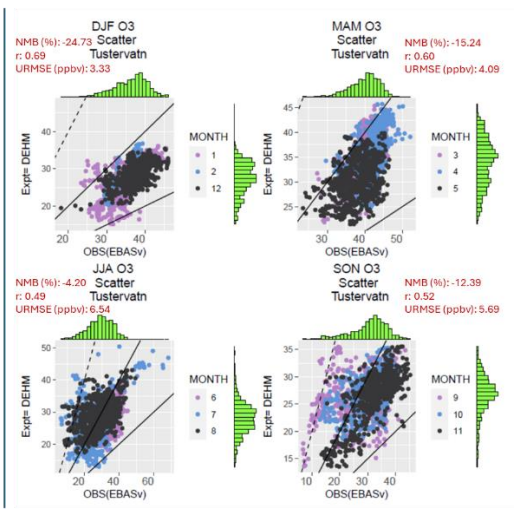
DEHM vs. EBAS

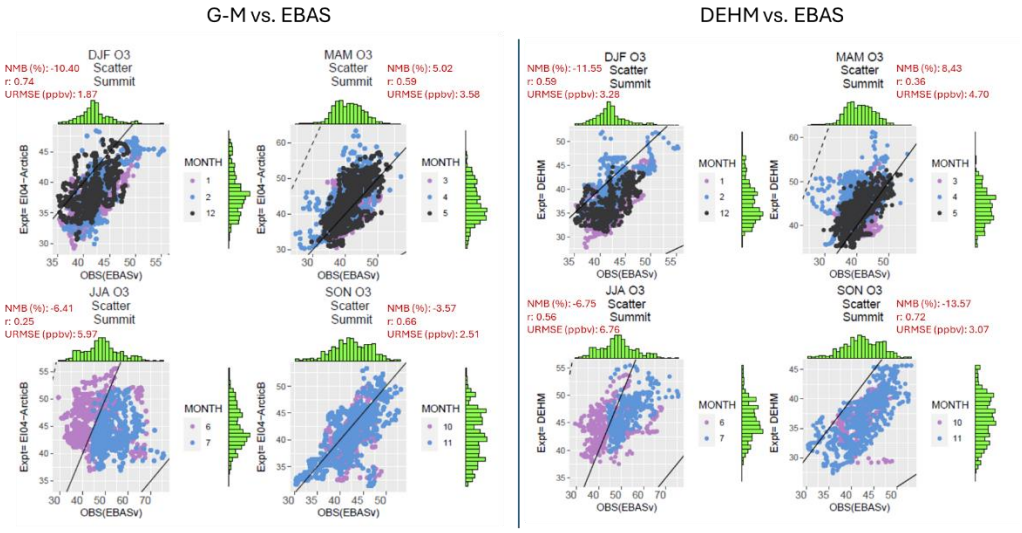


G-M vs. EBAS

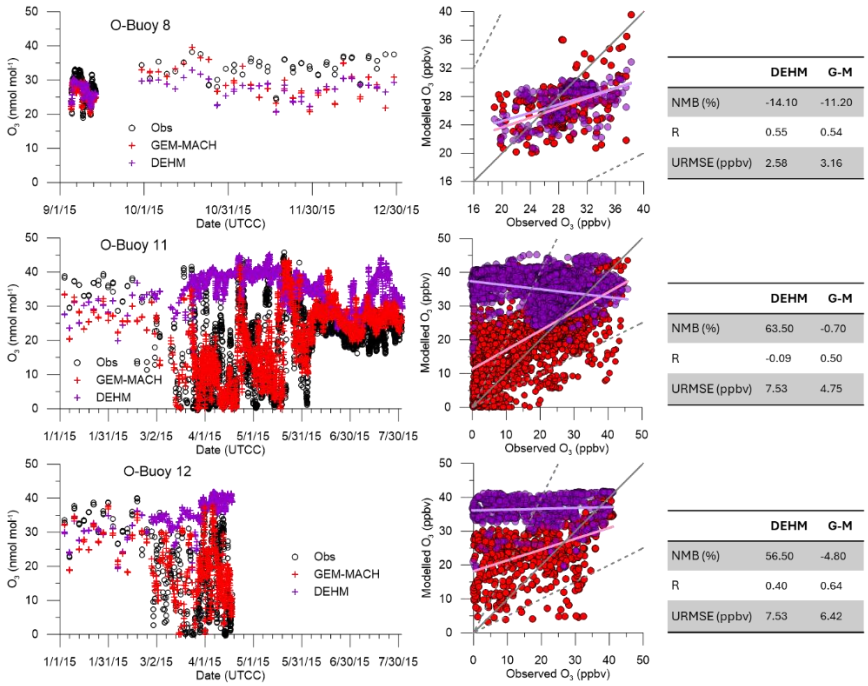


DEHM vs. EBAS





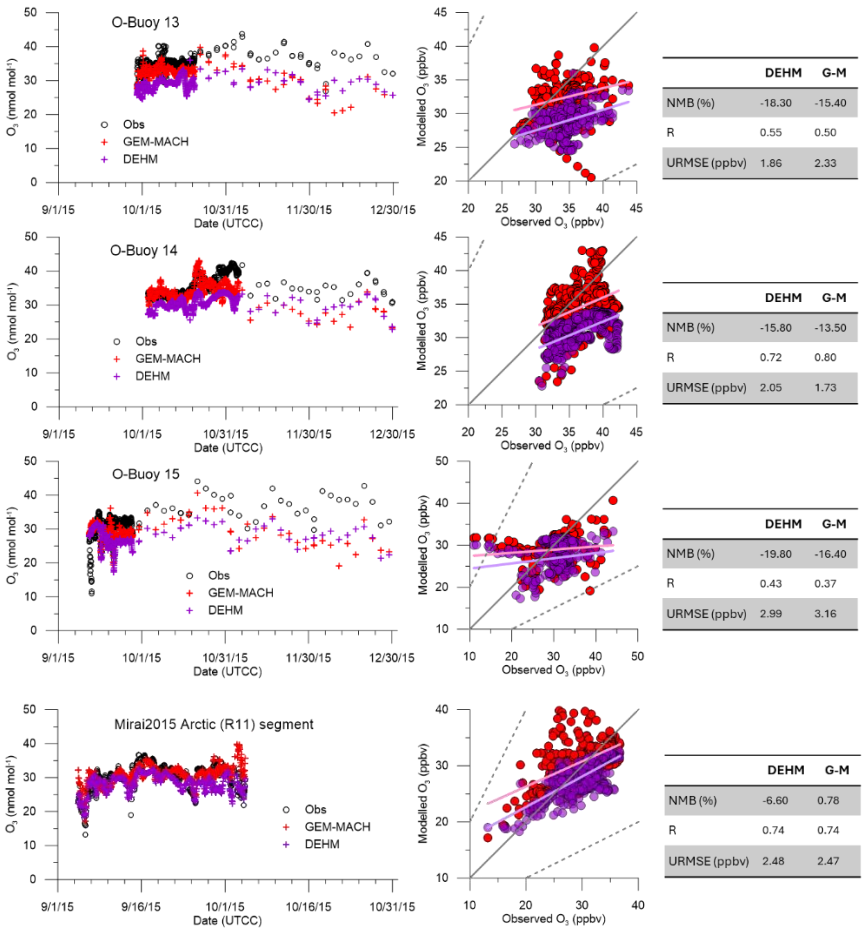
SF.3 Seasonal statistical evaluation (NMB, R, URMSE) based on 2015 hourly model and observational O_3 data at Arctic surface sites for GEM-MACH and DEHM, respectively.



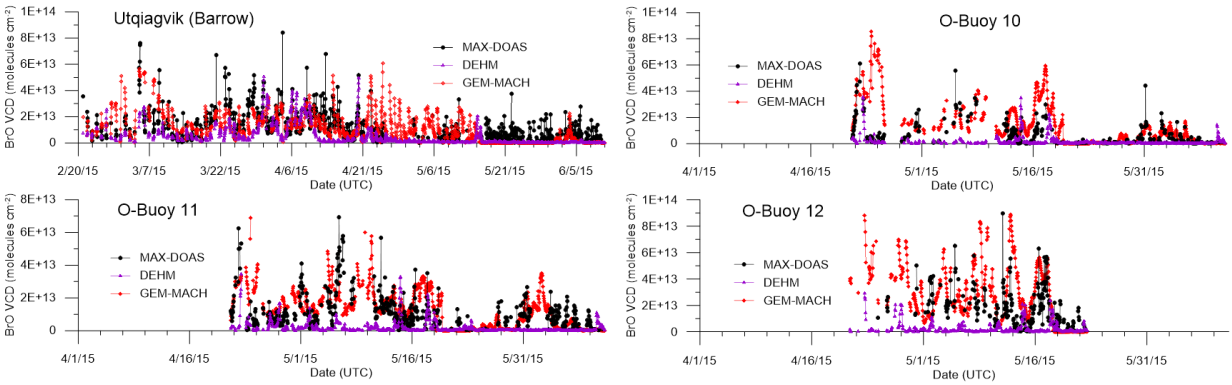
	DEHM	G-M
NMB (%)	-14.10	-11.20
R	0.55	0.54
URMSE (ppbv)	2.58	3.16

	DEHM	G-M
NMB (%)	63.50	-0.70
R	-0.09	0.50
URMSE (ppbv)	7.53	4.75

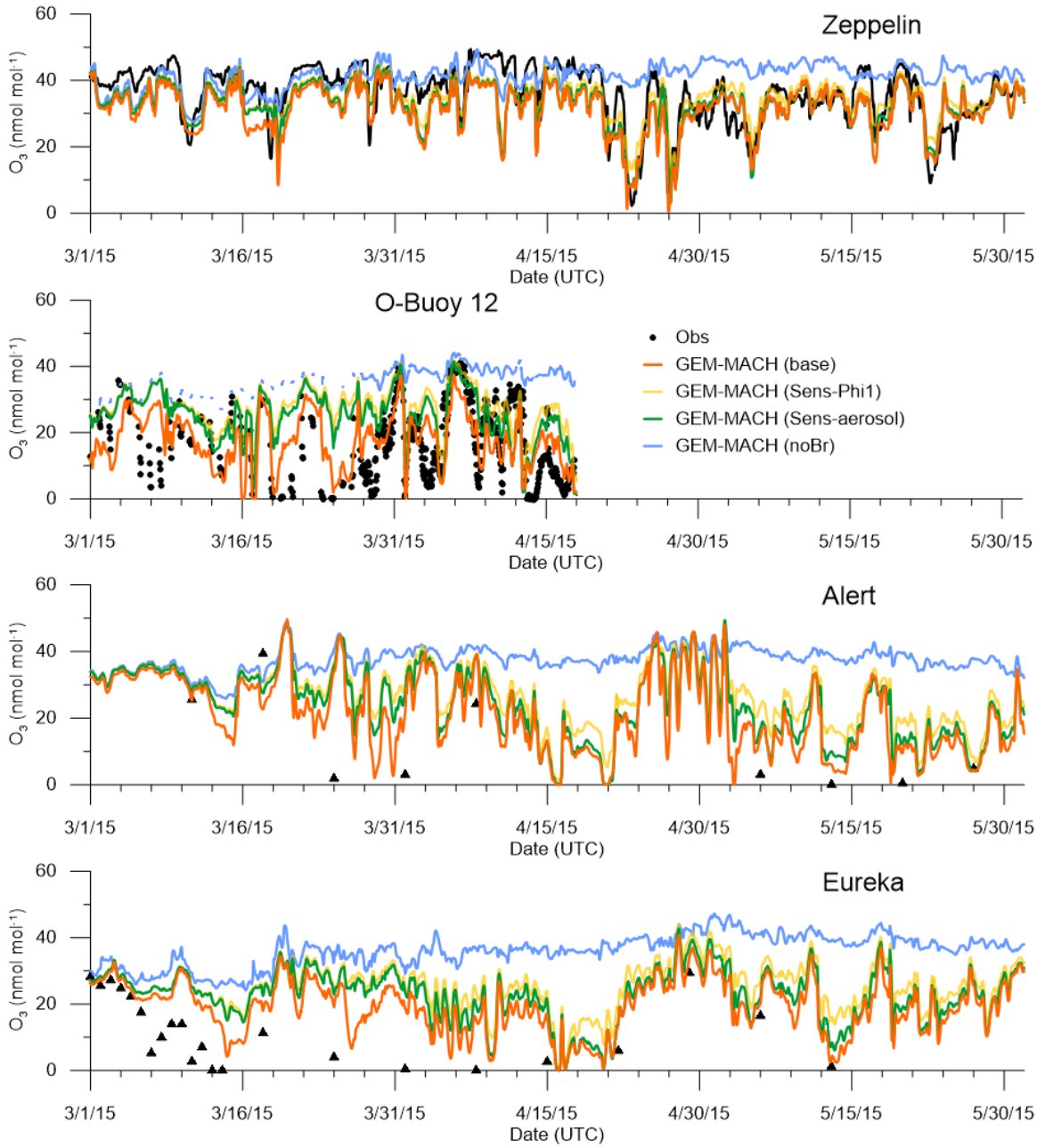
	DEHM	G-M
NMB (%)	56.50	-4.80
R	0.40	0.64
URMSE (ppbv)	7.53	6.42



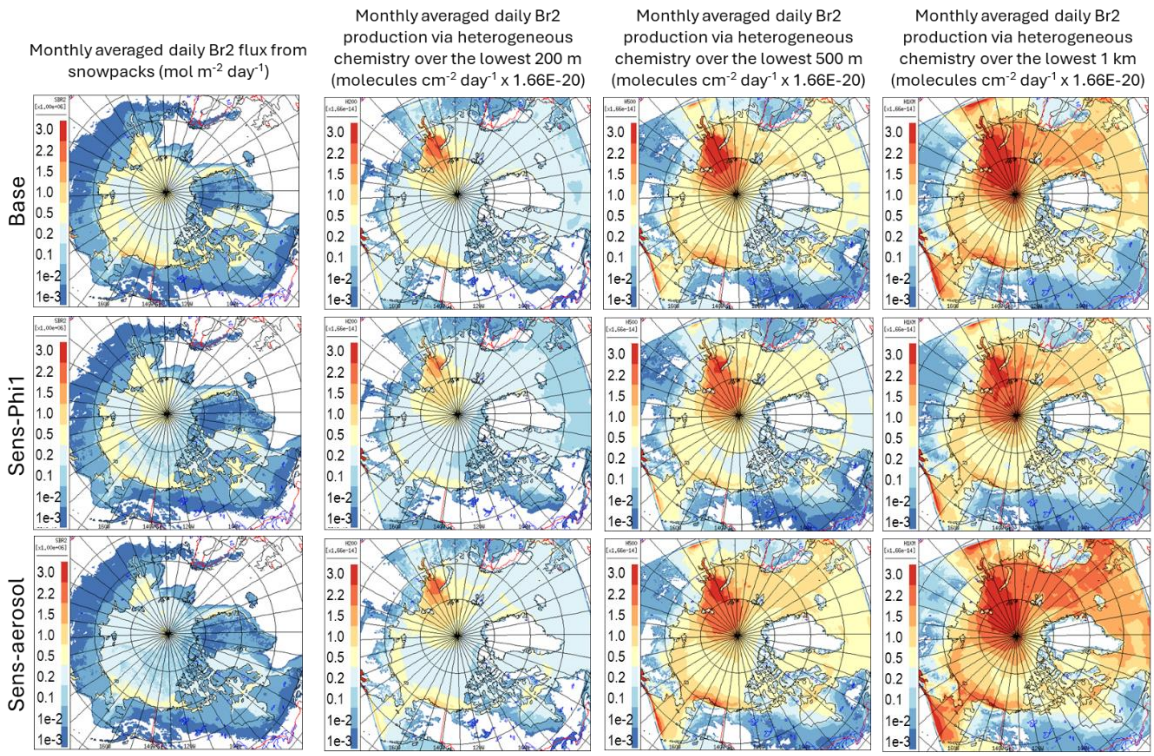
SF.4 O_3 time series comparison between model and observation for individual O-buoy deployment and Mirai cruise during 2015.



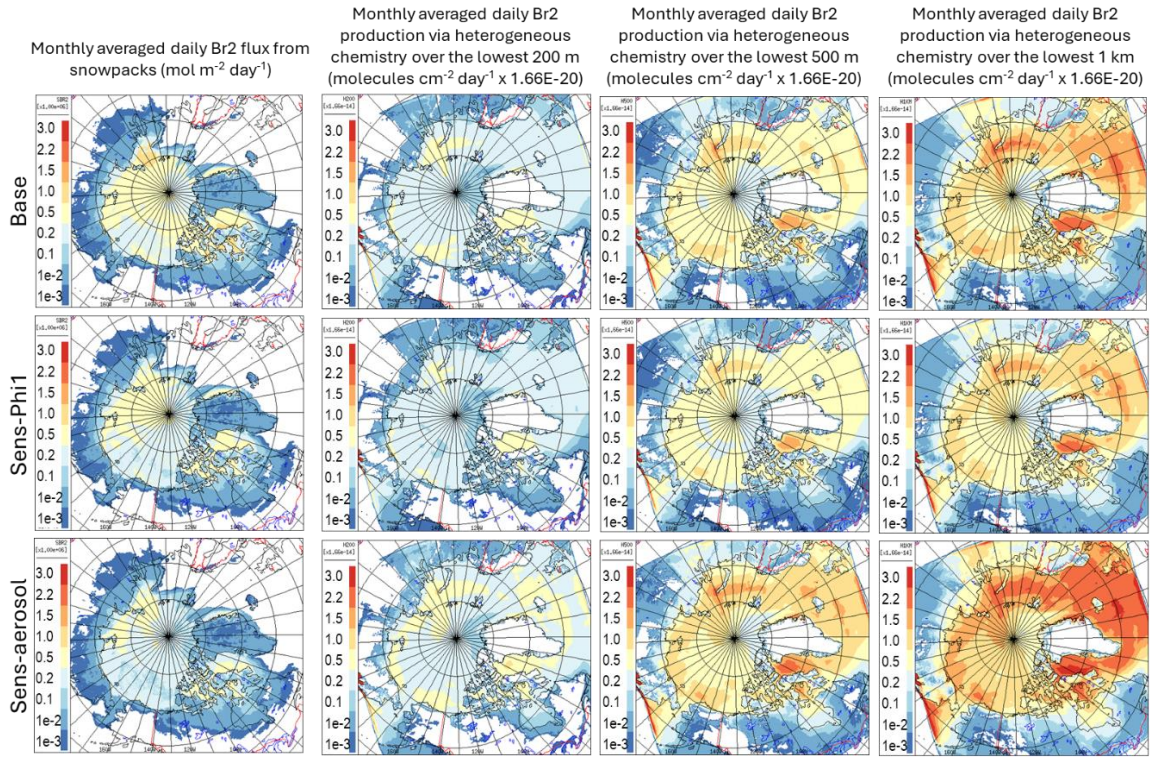
SF.5 Comparison of modelled BrO (GEM-MACH in red, DEHM in purple) against MAX-DOAS observations (black) at Utqiagvik and on O-buoys during 2015.



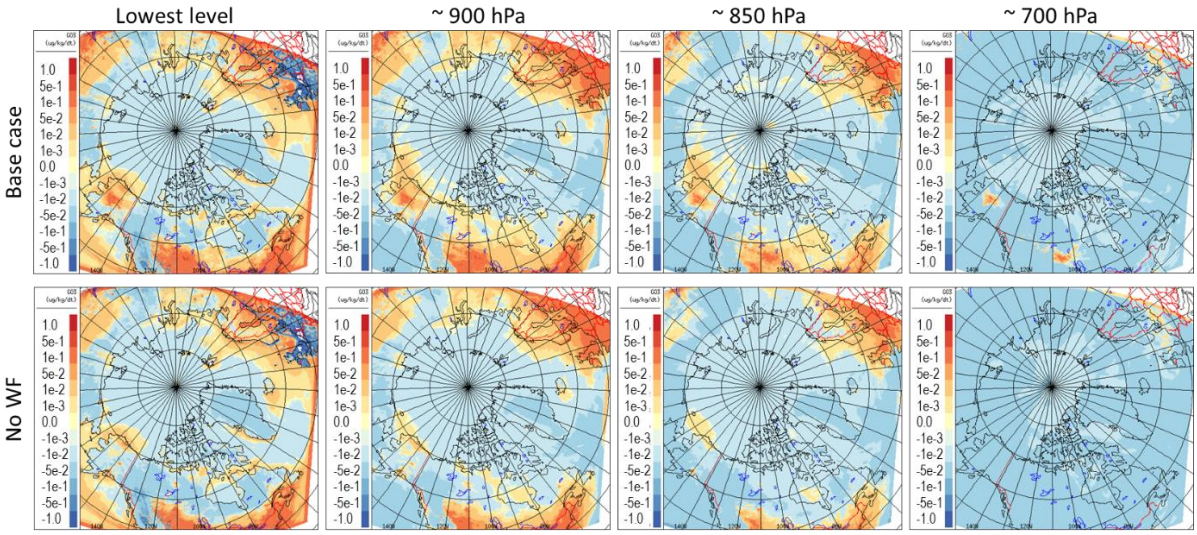
SF.6 GEM-MACH simulated O_3 time series from the base (red) and sensitivity runs, Sens-Phi1 (turquoise) and Sens-aerosol (green), compared with observations (black) over Beaufort Sea (O-Buoy 12) and at coastal sites: Zeppelin, Alert, and Eureka. Also plotted are the modelled O_3 timeseries from the No-bromine run (blue).



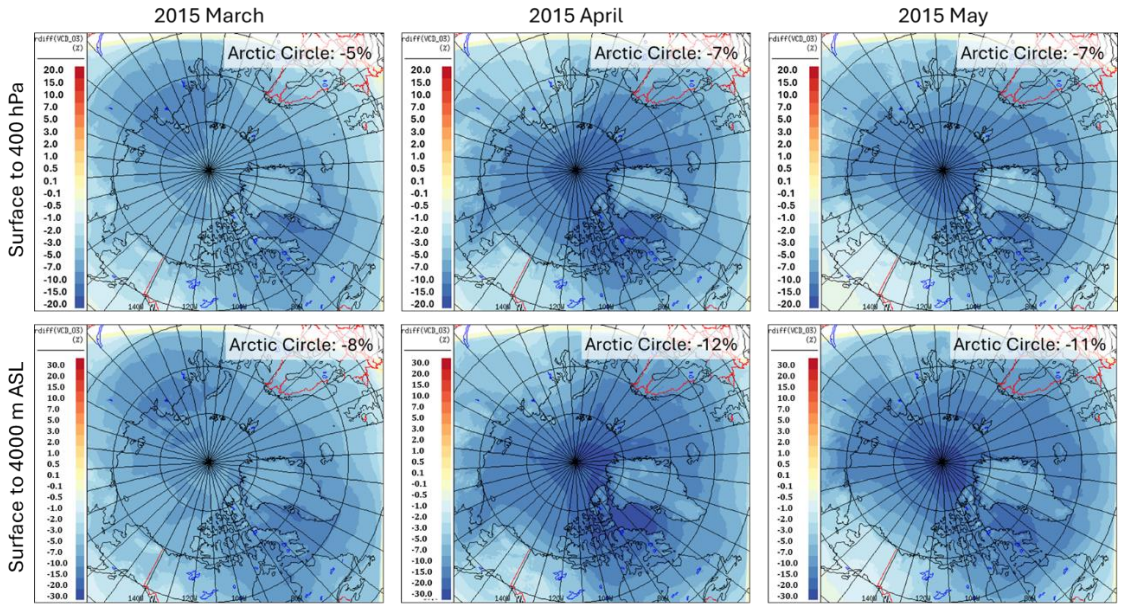
SF.7 GEM-MACH modelled monthly mean (2015 April) Br_2 daily flux from snowpacks (leftmost column) and Br_2 daily production from aerosol heterogeneous reaction over the lowest 200 m (2nd column from left), the lowest 500 m (3rd column from left), and the lowest 1 km (rightmost column), all in moles m^{-2}, from the base (top), Sens-Phi1 (middle), and Sens-aerosol runs (bottom).



SF.8 Same as SF.7 but for 2015 May.



SF.9 July monthly net O_3 chemical tendency at model levels (from left to left): lowest surface level, ~ 900 hPa, ~850 hPa, and ~ 700 hPa, from the GEM-MACH base annual simulation (with wildfires) (top row) and the GEM-MACH simulation without the wildfire emissions in the model LAM domain (bottom row).



SF.10 Reduction in monthly mean O_3 partial columns due to snowpack bromine in GEM-MACH, surface to 400 hPa (top row) and surface to 4000 m ASL (bottom row), shown in relative difference (%): (Base-noBr)/noBr*100. The corresponding reductions in pan-Arctic (> 66.5°N; "Arctic Circle") integrated monthly mean O_3 partial columns due to snowpack bromine are indicated in each plot.