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Climate-driven biogenic emissions alleviate the impact of human-made emission reductions on O_3 control in the Pearl River Delta region, southern China

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Supporting Information

Supporting Information includes 5 pages, 1 figures and 3 tables

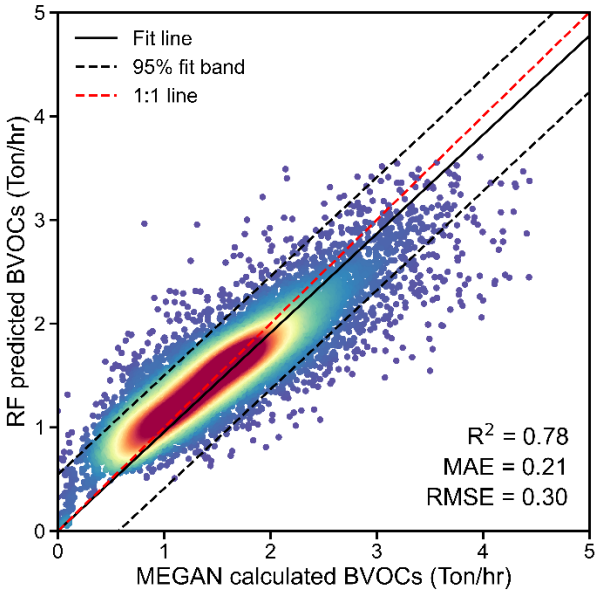

Fig S1 Evaluation of Random Forest model using a 10-fold cross-validation

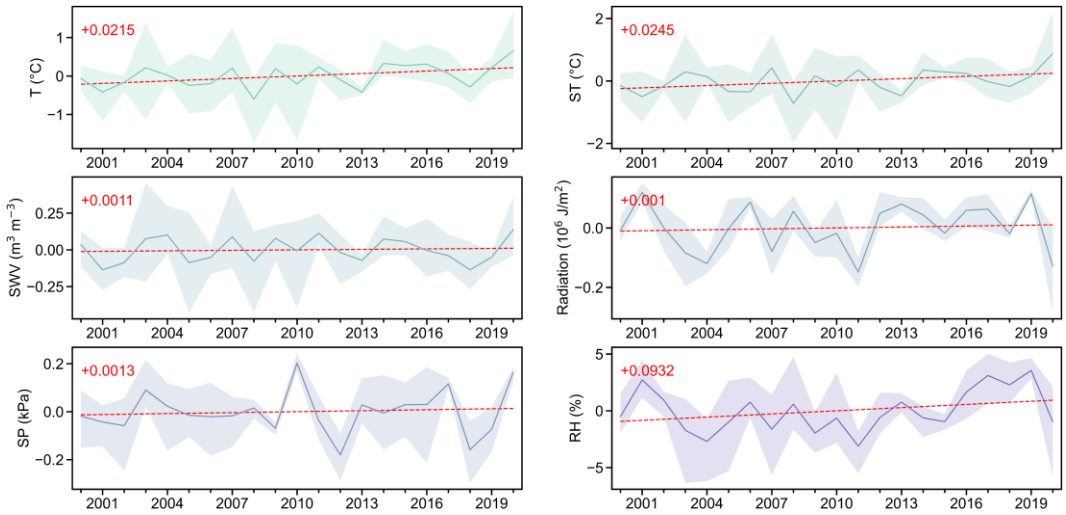

Fig S2 Annual variations of meteorological parameters in the PRD region from 2000-2020

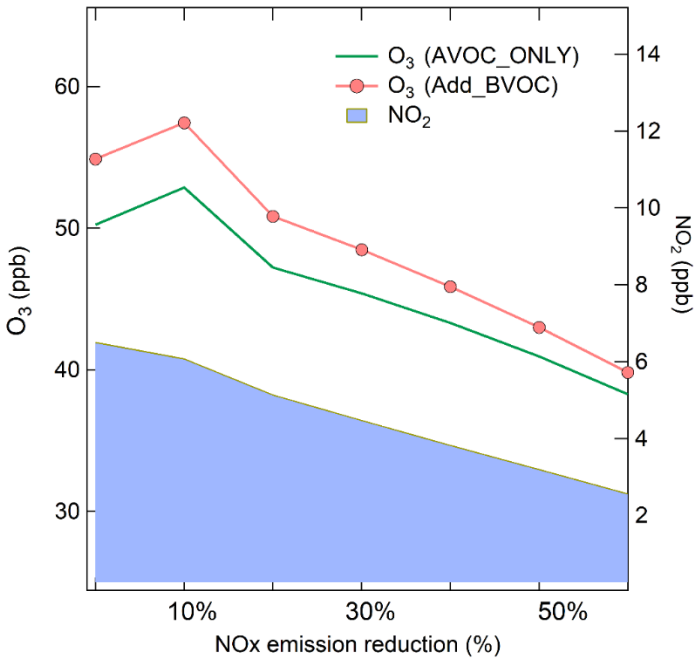

Fig S3 Responses of O_3 concentration to NO_x emission reduction under different scenarios.

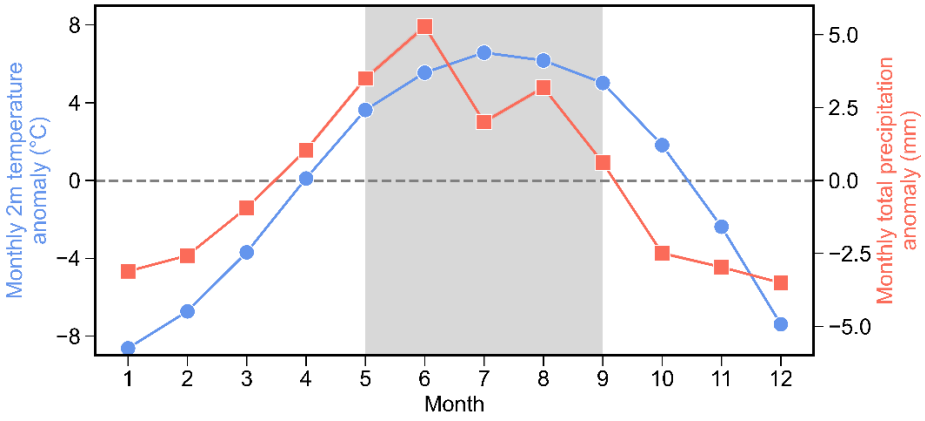

Fig S4 Climatic monthly anomaly of 2m-temperature and total precipitation during 2000-2020 in PRD

Table S1: Mapping of MODIS vegetation types to MEGAN-PFT based on climatic standards and climate data

Original vegetation type	Mapped vegetation type	Climate standard
Evergreen Needle leaf Forests	Needleleaf evergreen temperate tree	Tc > -19°C and GDD > 1200
Deciduous Needle leaf Forests	Needleleaf deciduous boreal tree	-
Evergreen Needle leaf Forests	Needleleaf evergreen boreal tree	Tc ≤ -19°C or GDD ≤ 1200
Evergreen Broadleaf Forests	Broadleaf evergreen tropical tree	Tc > 15.5°C
Evergreen Broadleaf Forests	Broadleaf evergreen temperate tree	Tc ≤ 15.5°C
Deciduous Broadleaf Forests	Broadleaf deciduous tropical tree	Tc > 15.5°C
Deciduous Broadleaf Forests	Broadleaf deciduous temperate tree	-15°C <Tc ≤ 15.5°C， and GDD>1200
Deciduous Broadleaf Forests	Broadleaf deciduous boreal tree	Tc ≤ -15°C or GDD ≤ 1200
Shrublands	Broadleaf evergreen temperate shrub	Tc > -19°C ， GDD > 1200，P_{ann} > 520 mmand P_{win} > 2/3 P_{ann}
Shrublands	Broadleaf deciduous temperate shrub	Tc > -19°C ， GDD > 1200，and meeting either one of the following standard (1) P_{ann} ≤ 520 mm (2) P_{win} ≤ 2/3 P_{ann}
Shrublands	Broadleaf deciduous boreal shrub	Tc ≤ -19°C or GDD ≤ 1200
Grasslands	Cold C3 grass	GDD < 1000
Grasslands	Cool C3 grass	GDD > 1000 ， and meeting either one of the following standard (1) T_w ≤ 22°C (2) For months with temperatures exceeding 22°C, Pmon ≤ 25 mm.
Grasslands	Warm C3 grass	GDD > 1000，T_c > 22°C and P_{mon} > 25mm in the driest month
Croplands	Other crops	-

Noting: T_c is the average temperature of the coldest month of the year, T_w is the average temperature of the warmest month, GDD represents the growing degree days (temperature above 5°C), P_{ann} refers to annual precipitation, P_{win} is winter precipitation, and Pmon denotes monthly precipitation.

Table S2 Statistical validation of WRF-CMAQ performance in PRD region

	MB	RMSE	IOA
T2 (°C)	-0.6	2.1	0.91
RH(%)	-4.5	8.6	0.99
Pressure (hPa)	-15.1	28.5	0.89
WS10 (m/s)	1.6	1.8	0.97
O_3 (ppb)	3.5	27.05	0.78

Noting: T2 indicates 2-meter temperature, WS10 indicates 10m wind speed. MB is mean bias, RMSE is root mean square and IOA is index of agreement.

Table S3 Parallel numerical simulation experiments

Impact of each process	Parallel numerical experiment	Land cover and LAI	Meteorology for BVOC emission	Meteorology for Chemistry	Anthropogenic emission
Man-made emission control	EXP1	2020	2020	2020	2012
	EXP2	2020	2020	2020	2020
Vegetation-Change BVOC	EXP1	2001	2020	2020	2020
	EXP2	2020	2020	2020	2020
Climate-driven BVOC	EXP1	2020	2001	2020	2020
	EXP2	2020	2020	2020	2020
Climate-driven meteorology	EXP1	2020	2020	2001	2020
	EXP2	2020	2020	2020	2020