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Supporting Information for

Development and Evaluation of a North America Ensemble Wildfire Air Quality Forecast: Initial Application to the 2020 Western United States "Gigafire"

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Introduction

The configurations of participating models are included in the ensemble forecast. And the evaluation results for the weighted ensemble.

Table S1. The configurations of participating models are included in the ensemble forecast.

Air Quality Model	Operational/ Research Center	Domain	IC/BC (for regional model)	Grid Spacing	Fire Emission	Plume Rise Scheme	Other Emission
GMU-CMAQ	GMU	CONUS	Meteorology: GFS Chemical: GEOS5	12km×12km	GBBEPx (Zhang et al., 2012, 2014, 2019)	Sofiev 2012	Anthropogenic, biogenic, dust, seasalt
NACC-CMAQ	NOAA/GMU	CONUS	Meteorology: GFS Chemical: GEFS-Aerosol	12km×12km	GBBEPx (Zhang et al., 2012, 2014, 2019)	Briggs 1969	Anthropogenic, biogenic, dust
HYSPLIT	NOAA	CONUS	Meteorology: NAM Chemical: N/A	0.15°×0.15°	NOAA NESDIS Hazard Mapping System; USFS BlueSky (Larkin et al., 2009)	Briggs 1969	N/A
GEOS	NASA	Global	-	12km×12km, with output at 0.25°×0.3125°	QFED (Darmenov and da Silva, 2015)	Distributed in the PBL	Anthropogenic, biogenic, dust, seasalt, volcano

GEFS-Aerosol	NOAA	Global	-	0.25°×0.25°	GBBEPx (Zhang et al., 2012, 2014, 2019)	Freitas 2007	Anthropogenic, dust, seasalt
ICAP-MME	NRL	Global	-	1°×1°	Varies (Xian et al., 2019)	Varies (Xian et al., 2019)	Varies
NAAPS	NRL	Global	-	0.333×0.333°	FLAMBE (Reid et al., 2009)	Distributed uniformly through the bottom 4 layers	Anthropogenic, biogenic, dust, seasalt

GMU: George Mason University
CMAQ: The Community Multiscale Air Quality Modeling System
NACC: National Oceanic and Atmospheric Administration-U.S. Environmental Protection Agency Atmosphere-Chemistry Coupler
HYSPLIT: Hybrid Single-Particle Lagrangian Integrated Trajectory
GEOS: Goddard Earth Observing System
GEFS: Global Ensemble Forecast System Aerosols
ICAP-MME: International Cooperative for Aerosol Prediction Multi-Model aerosol forecasting Ensemble
NAAPS: Navy Aerosol Analysis and Prediction System
NOAA: National Oceanic and Atmospheric Administration
NASA: National Aeronautics and Space Administration
NRL: Naval Research Laboratory
GFS: Global Forecast System
NAM: North American Mesoscale Forecast System
GBBEPx: Blended Global Biomass Burning Emissions Product
HMS: Hazard Mapping System
QFED: Quick Fire Emissions Dataset
FLAMBE: Fire Locating and Modeling of Burning Emissions

Table S2. Evaluation surface $PM_{2.5}$ prediction compared to EPA Airnow measurements for the days has all individual model forecast available.

	Ensemble Mean	**Weighted Ensemble Mean**
RMSE (mg/m^3)	33.26	10.80
CORR	0.52	0.57
NMB	0.38	-0.22
NME	0.66	0.47
MB (mg/m^3)	3.9	-2.24
ME (mg/m^3)	6.67	4.74
aH	97.84	79.28
aFAR	14.69	6.21