Effect of potential HONO sources on ROx budgets and SOA and PAN formation in North China in winter

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Background

➢HONO contributes 30~80% of primary OH, yet its sources are not fully understood.

➢The default mechanism in 3-D models severely underestimated the observed HONO.

➢SOA or PAN are mainly formed through oxidation of VOCs by OH/O3

➢The current models largely underestimated SOA or PAN concentrations

Methods

➢WRF-Chem 3.7.1, domain1 for East Asia (81Km); domain 2 for East china (27Km)

➢Six additional HONO sources, 4 direct emissions (traffic, biomass burning, soil, indoor) and 2 heterogeneous reactions(aerosol/ground surface).

➢VBS(Volatility Basic Set) approach for SOA partition.

➢Containing glyoxal SOA formation mechanism

➢February of 2017 for PAN simulation; Nov.29~Dec.03 of 2017 for SOA simulation.

Physical/Chemical schemes

Advection scheme	Runge-Kutta 3rd order
Boundary layer scheme	YSU
Cloud microphysics	Lin et al. (1983)
Cumulus parameterization	New Grell scheme
Land-surface model	Noah
Long-wave radiation	RRTM
Short-wave radiation	Goddard
Surface layer	Revised MM5 Monin-Obukhov scheme
Aerosol option	MOSAIC
Chemistry option	Updated MOZART mechanism
Photolysis scheme	F-TUV

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Reference:

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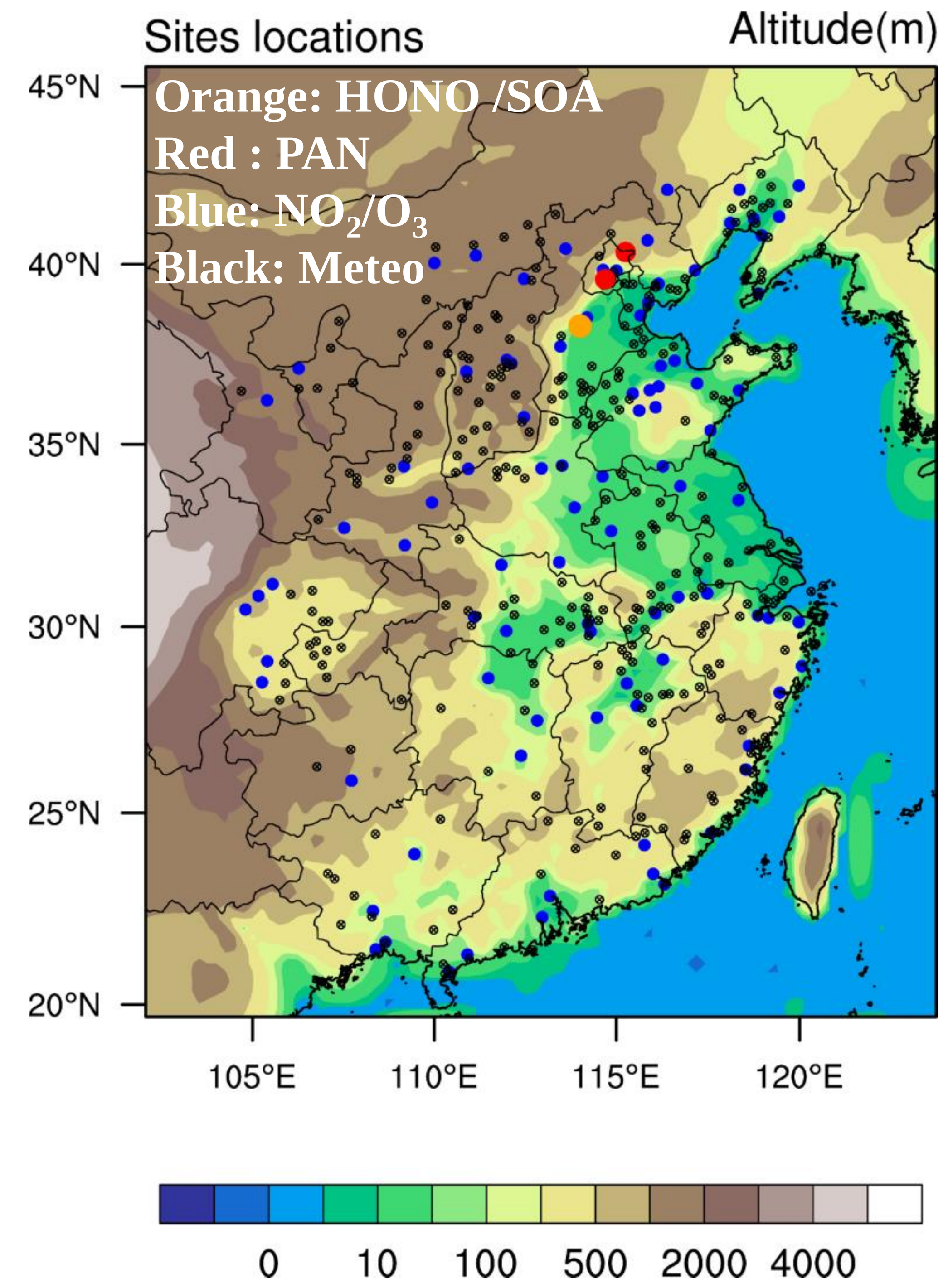
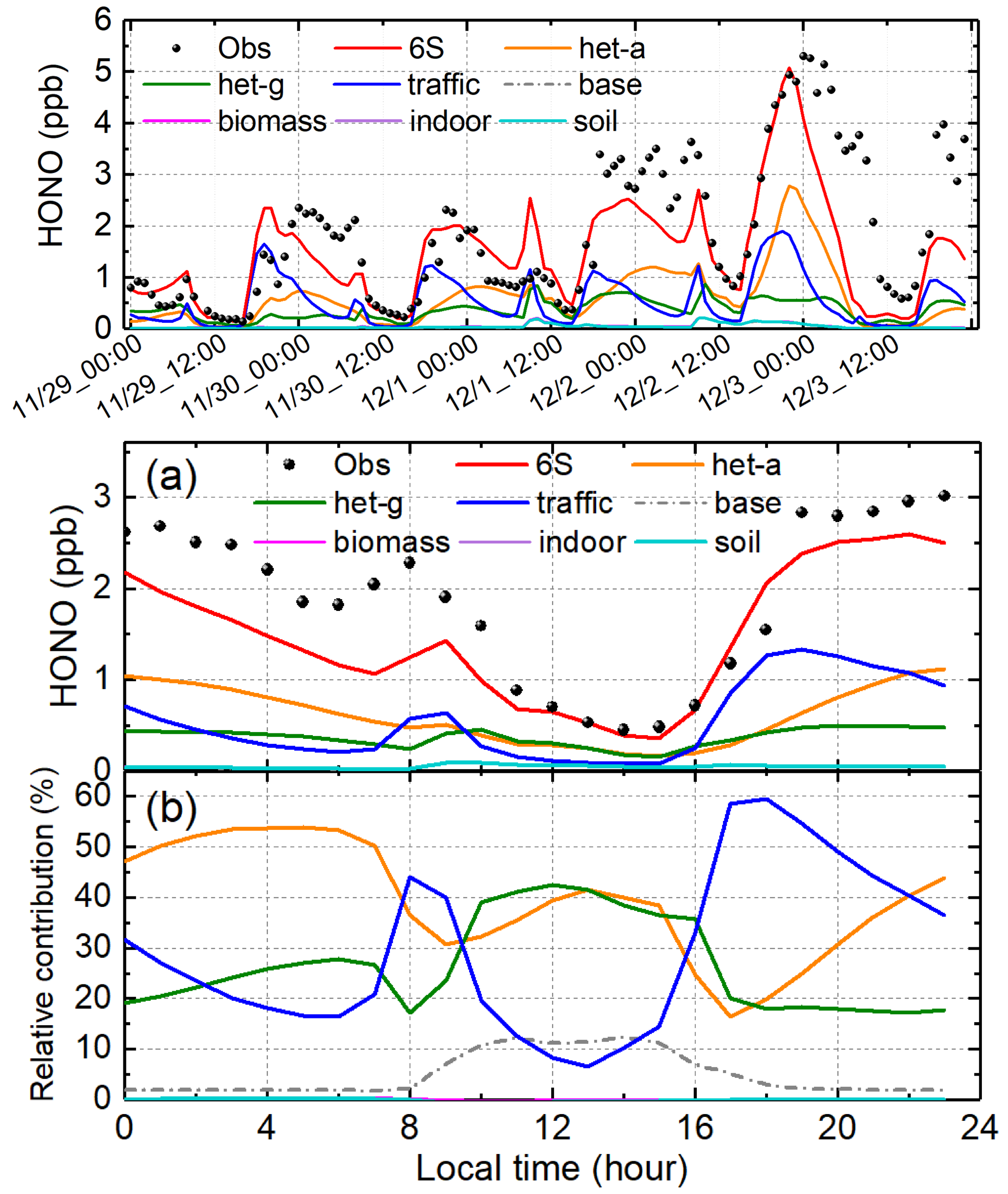
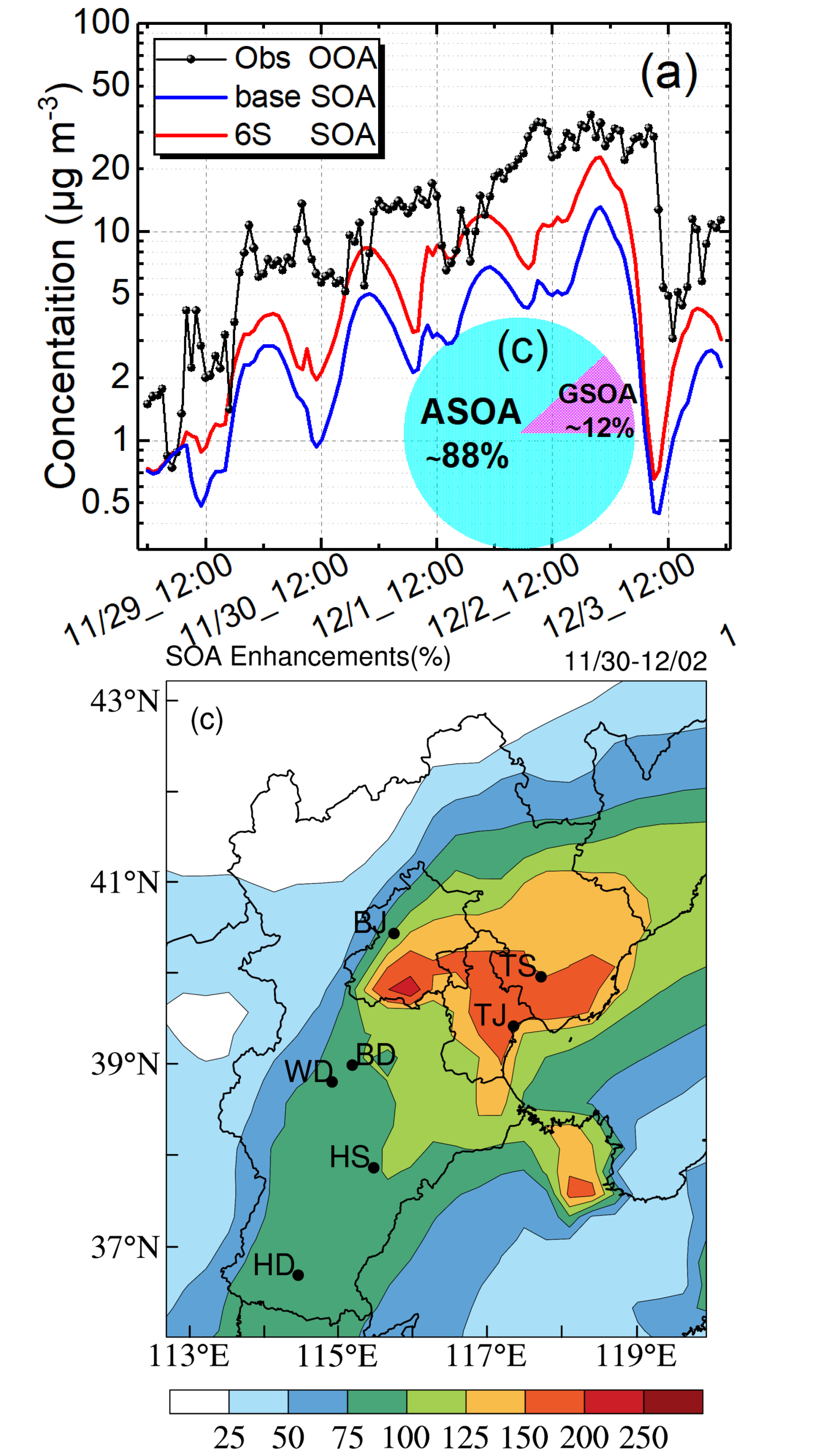
Results







HONO and SOA simulations

PAN simulations and typical ROx cycles in typical clean day (Feb.13) and haze day (Feb.15), bold values (6S), normal (base)