

Estimation of mercury dry deposition in the Western United States: results from Community Multi-scale Air Quality (CMAQ) and surrogate surface

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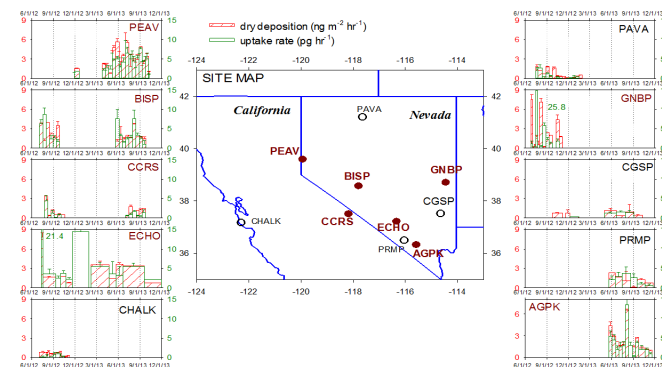
INTRODUCTION

- Discrepancy of mercury deposition from CMAQ model and measurements in the Western United States (Baker and Bash, 2012).
- Mercury and Air Toxics Standards (MACT) has proposed a new emission standard for electricity generator units (EGUs) in US
- Long range transport of Hg from Asia is considered to be an important source in the Western United States

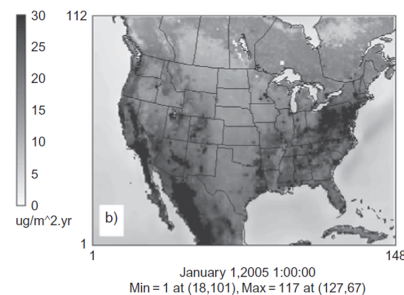
OBJECTIVES

- To compare gaseous oxidized mercury (GOM) dry deposition measured by CMAQ results and surrogate surface measurements
- To compare GOM dry deposition from CMAQ simulations with different emission scenarios in the United States and boundary conditions.

Measured GOM dry deposition in the Western US 2012-2013, Huang and Gustin, 2014



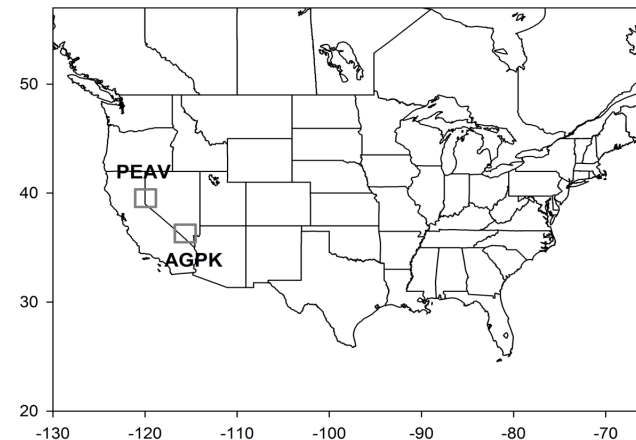
Modeled GOM dry deposition in the US-Lin et al., 2012



$$10 \mu\text{g m}^{-2} \text{yr}^{-1} = 1.14 \text{ ng m}^{-2} \text{hr}^{-1}$$

Sources	Pacific	
	Mg yr ⁻¹	ng m ⁻² hr ⁻¹
BC	50.03	3.07
Natural	2.41	0.15
Anthropogenic	2.60	0.16
EGU	0.19	0.01
OIPM	1.16	0.07
IRST	0.06	0.00
RA	1.19	0.07
Total	55.04	3.38

CMAQ domain



- CONUS: 36 km 15 vertical layers

- Sampling sites: 4 km 15 vertical layers

Methods

- CMAQ v4.6 (Wang et al. 2014), v4.7.1, v5.0.1 (Baker and Bash, 2012) with bi-directional flux on and off

- Different dry deposition scheme: M3dry, bi-directional flux

- Meteorology: WRF-ARW, ACM2, Pleim-Xiu LSM, surface layer, and multiple resistance scheme

- Emissions: NEI 2011, bi-directional flux, and natural emission

- Sensitivities investigation:

- MACTs with different emission reduction

- In plume reduction reaction

- The influence of GOM dry deposition from Asia Transport from high elevation

- Br chemistry and dry deposition scheme modification

References

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