

Reactive Gaseous Mercury (RGM) Measurements using KCl-Coated Denuders

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Two Forms of Gas-Phase Hg in Atmosphere

- Gaseous Elemental Mercury (GEM)
 - Not very soluble
 - Long lifetime in atmosphere
 - Reactive Gaseous Mercury (RGM)
 - All Hg(II) species
 - Water Soluble
 - “Sticky”: enhanced dry deposition
- ➔ While $[RGM] \ll [GEM]$, RGM could significantly influence Hg uptake in ecosystems.

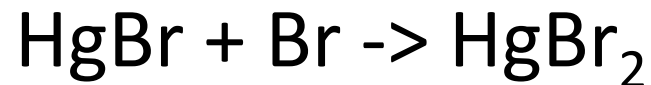
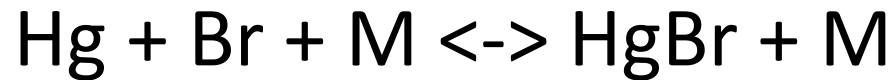
How is GEM oxidized?

- Very challenging problem; we can't yet speciate RGM in the atmosphere!
- **Traditional Process:** Hg oxidized by OH, O₃
 - Used in most current models
 - Product is HgO
 - Challenged by recent thermodynamic calculations
- **Alternative Process:** Hg oxidized by Bromine atoms
 - Consistent with recent field experiments

Field Observations

- Mercury Depletion Events
 - Observed in Arctic, Antarctic, Dead Sea (Schroeder, Linberg, Brooks, Peleg)
 - Strong correlation observed between Hg, O₃ depletion
 - Halogen chemistry implicated
- Previous High Altitude Measurements
 - Elevated RGM observed in upper troposphere.
 - Aircraft Measurements (Landis, Hynes)
 - High altitude ground sites (Schwartzendruber, Landis)

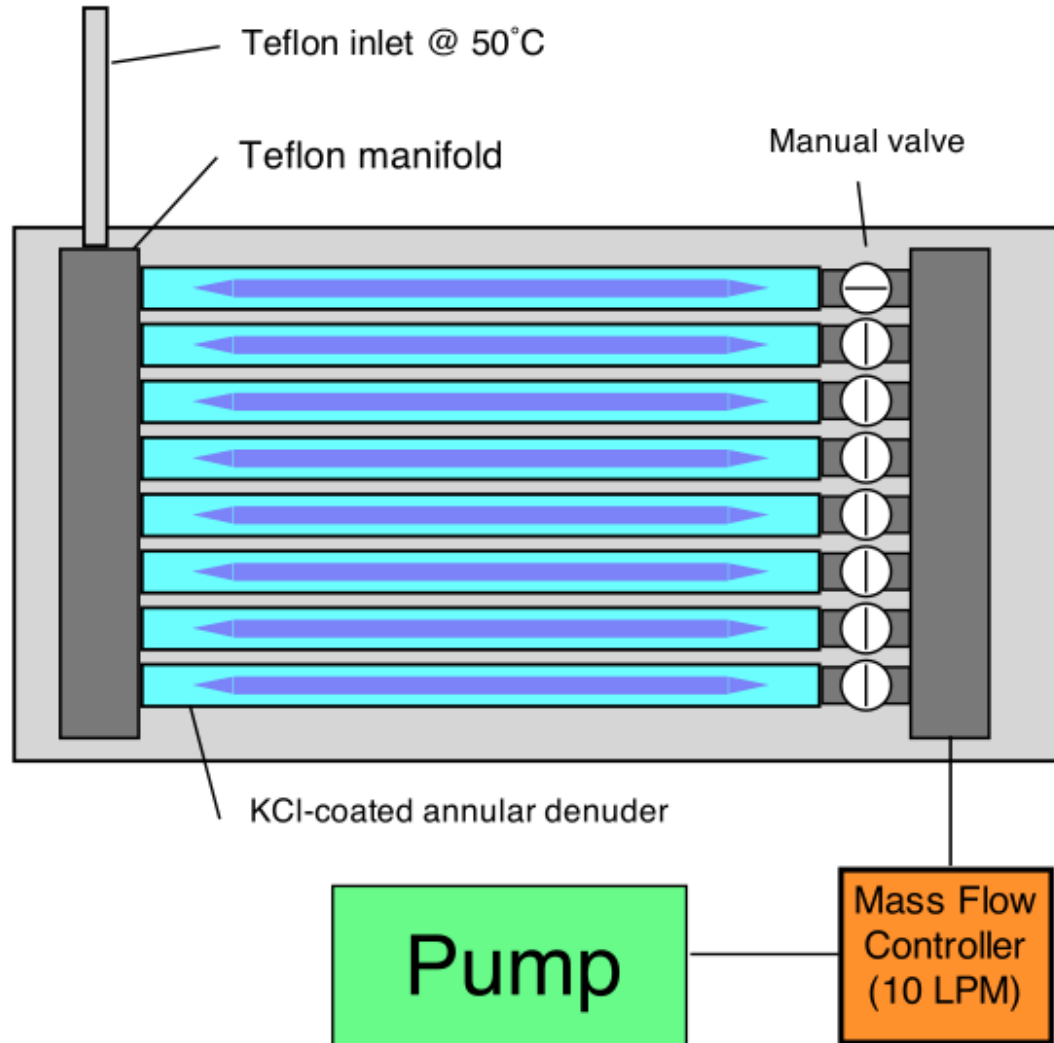
If Br is important on global scale look for RGM in the upper troposphere.



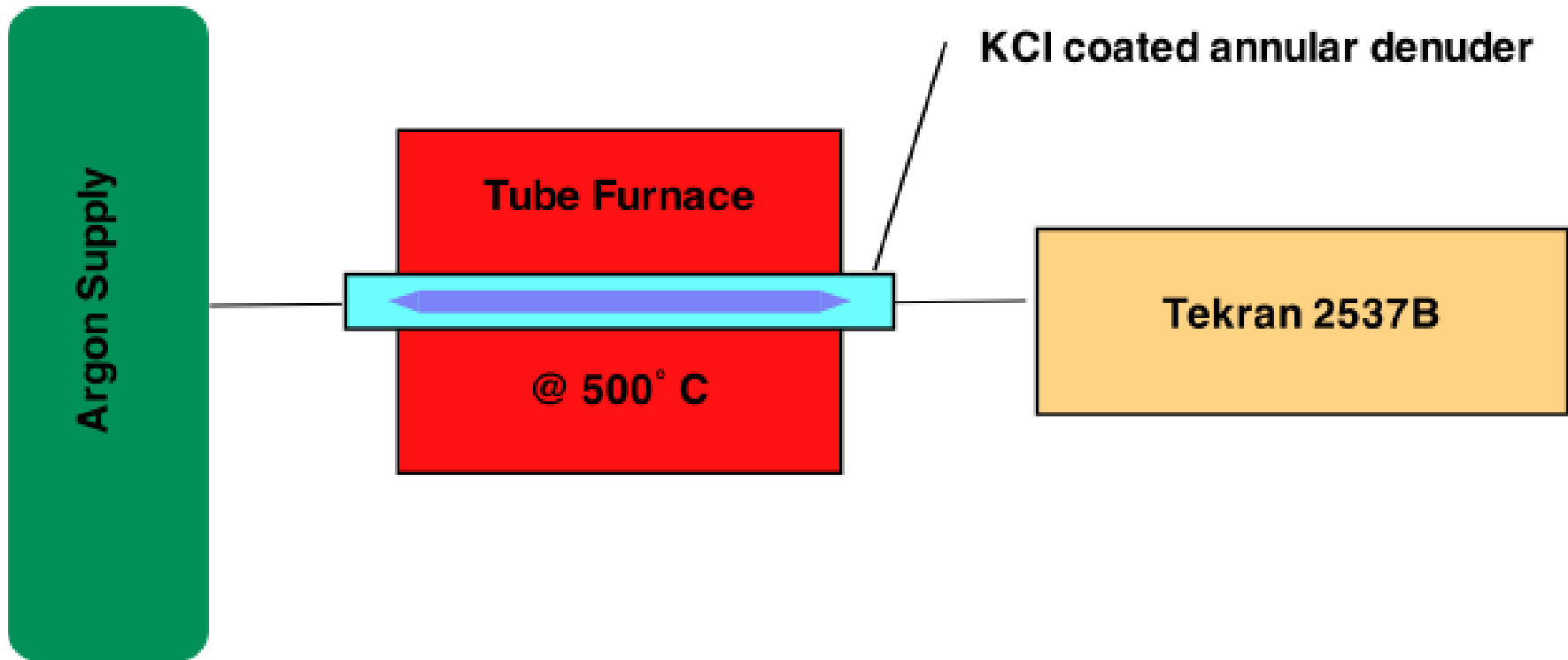
- Br : BrO ratio most favorable
- Recombination reaction faster at lower temp but slower at lower P so not much gain
- Lifetime of HgBr is much longer at lower T

Experimental Setup

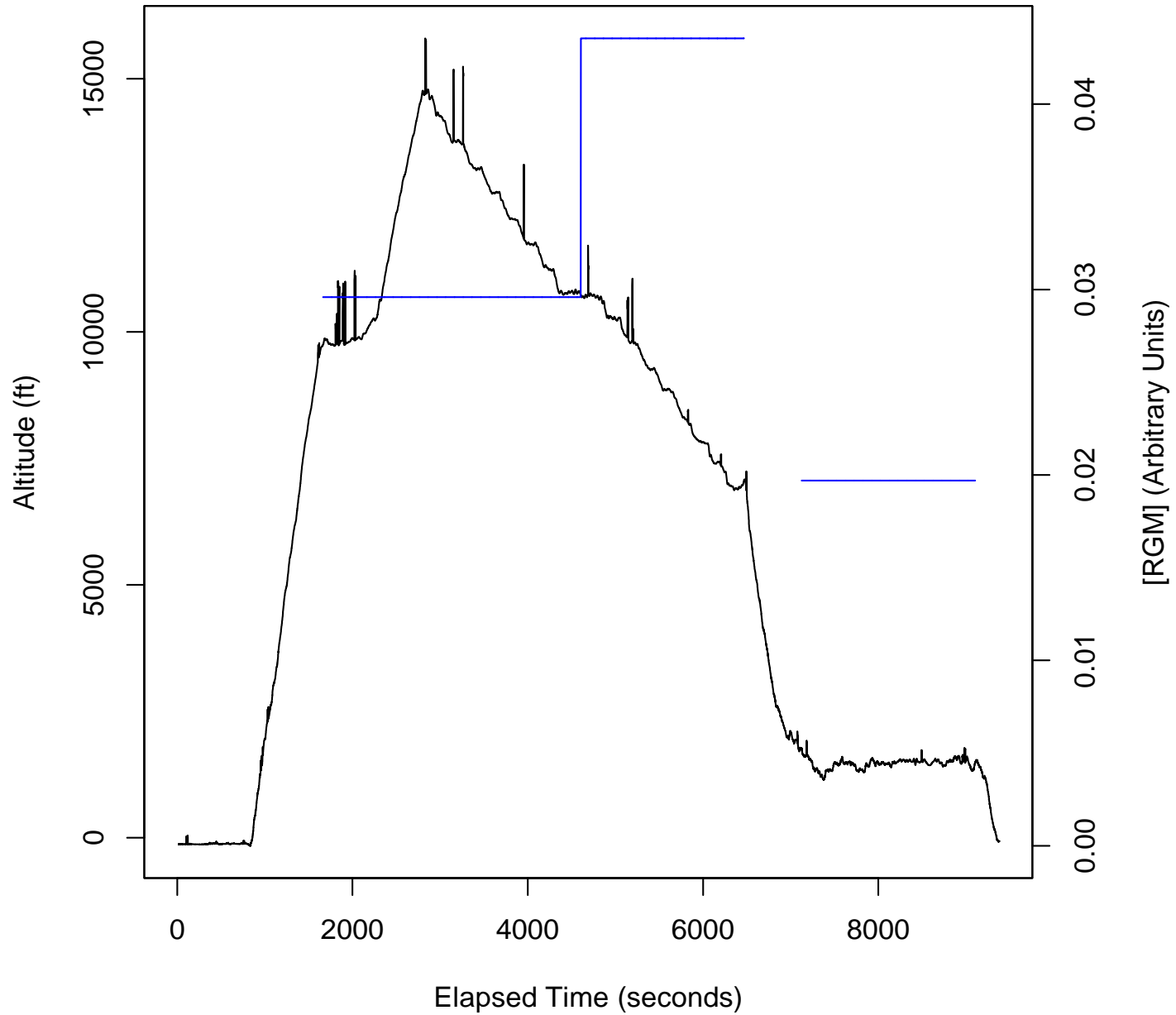
Collection System (In-Plane)



Analysis System



Flight #1: 6 May 2010



Calibration / QA

- Daily Calibrations of Tekran GEM analyzer
 - Internal and External sources
- Installation and flight blanks of denuders
 - Daily installation blanks
 - ?? Flight blanks

Challenges / Open Qs

- Clean working area on ground
- Shared inlet protocol