The UW Detector for Oxidized Hg Species (DOHGS):
Overview for NOMADSS Participants

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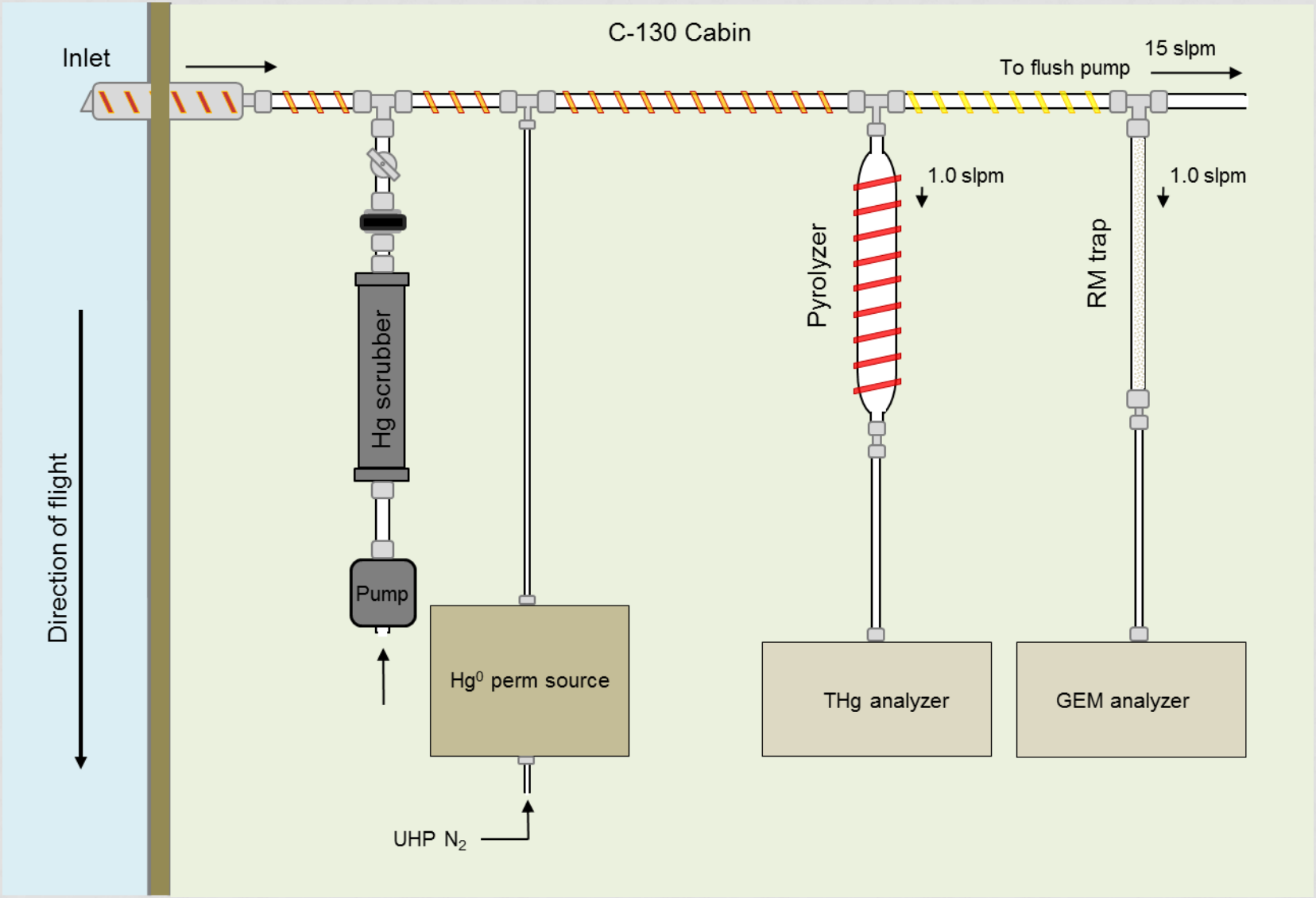
Outline

- Description of DOHGS instrument
- Measurement capabilities:
  - Hg species measured; time resolution; detection limits
- Instrument development history

The UW Detector for Oxidized Hg Species (DOHGS)



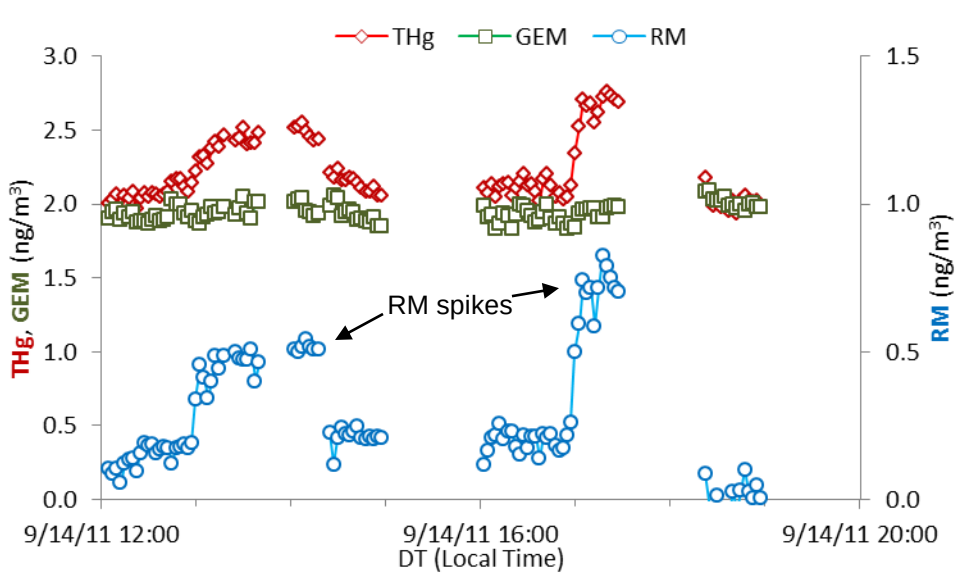
THg, Total Airborne Mercury; GEM, Gaseous Elemental Mercury; RM, Reactive Mercury

DOHGS Onboard NCAR C-130 in 2010

DOHGS on C-130

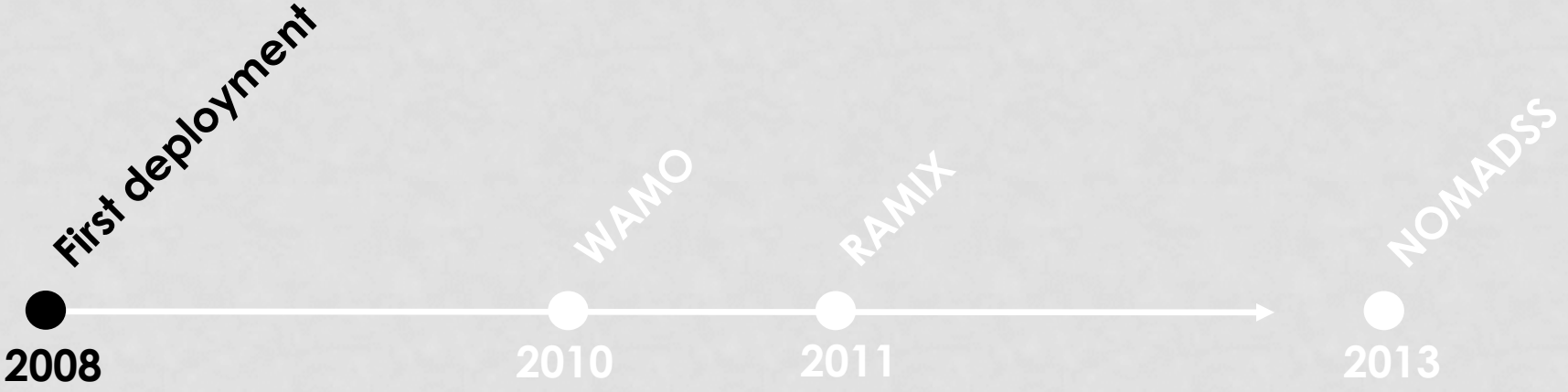
DOHGS Measurement Capabilities

- Hg species measured:
  - THg, GEM, RM (e.g., $HgBr_2$, $HgCl_2$)
- Time resolution:
  - 2.5 min
- LODs (3σ):
  - THg, GEM: ~30 pg/m^3; RM: ~75 pg/m^3
- Data turnaround:
  - <24 hrs (post-flight) for preliminary data



Example DOHGS data from RAMIX

2008: First Deployment

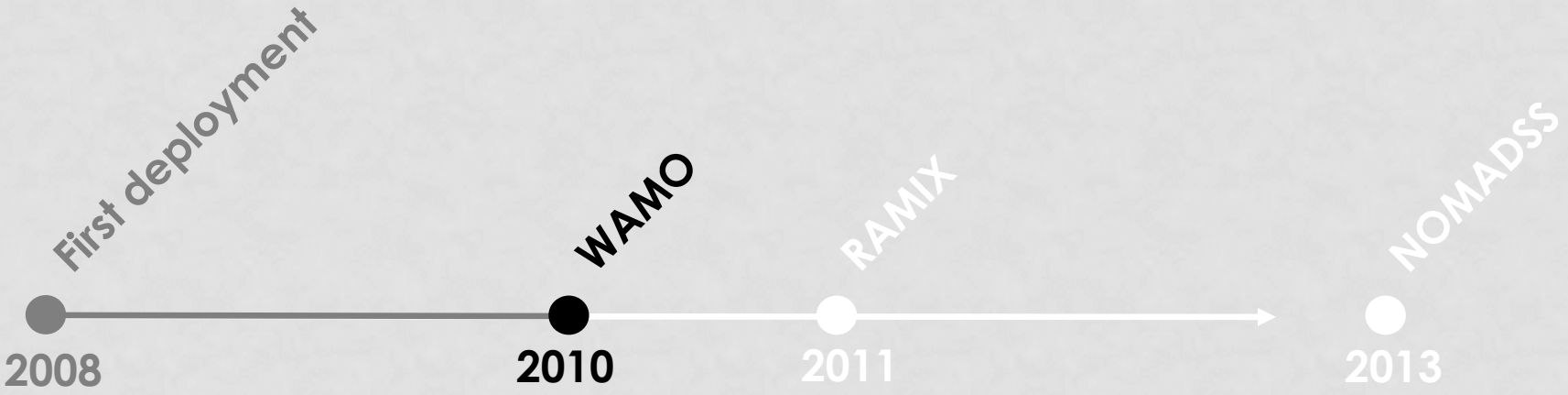


Prototype instrument deployed on a small aircraft over Pacific Northwest

- Swartzendruber et al., Atmos. Environ., 2009; ES&T, 2009

- **Key developments:**
  - **RM quantified by two complementary methods**
- **Key results:**
  - **Difference method can measure RM in real time**
  - **RM is not fully retained on standard KCl denuders**

2010: Western Airborne Mercury Observations

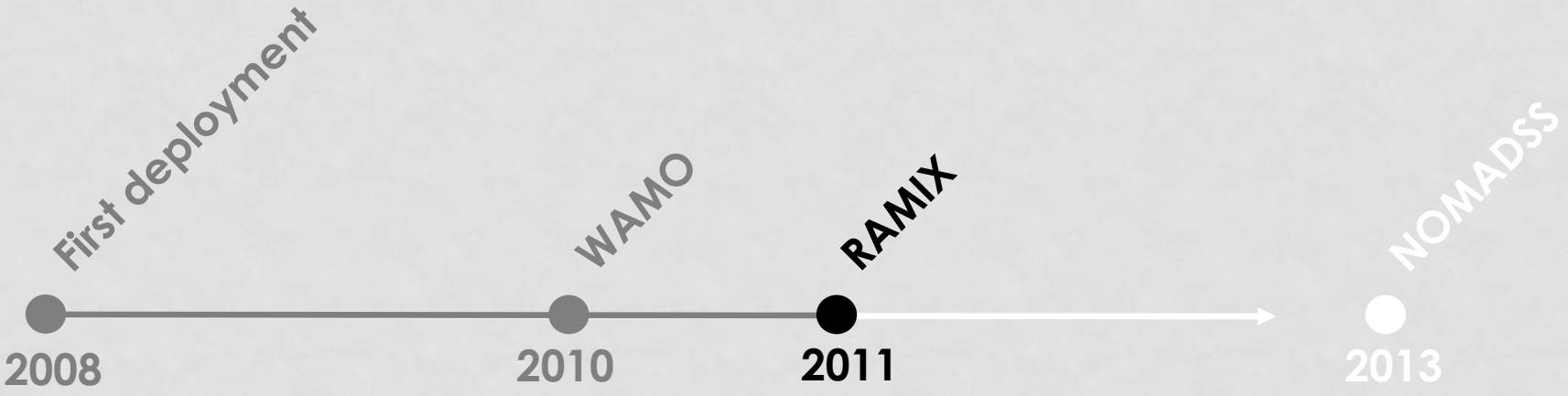


Modified instrument deployed on C-130 over U.S. and N. Atlantic

- Lyman et al., ACP, 2010; Lyman and Jaffe, Nature Geosci., 2011

- **Key developments:**
  - KCl denuders replaced with quartz wool traps for RM capture
  - Improved Hg^0 and RM calibration methods
- **Key Results:**
  - RM capture on KCl denuders reduced in presence of O_3
  - O_3 interference is minimal for quartz wool traps

2011: Reno Atmospheric Mercury Intercomparison Expt.



Instrument deployed at a ground site with std. Hg instruments

- Ambrose et al., ES&T, (in review)

- **Key developments:**
  - Spectrometers modified to improve LODs
  - RM capture efficiency more rigorously evaluated
  - Improved methods for RM calibration
- **Key results:**
  - DOHGS showed linear response to RM standard additions
  - Mean RM recovery was ~70%
  - Negligible O_3 interference confirmed

2011–2013: Preparation for NOMADSS

Instrument operated in lab at UW

- **Key development areas:**
  - **Further improve methods for RM calibration**
  - **Hone field operation protocols**