



Comparing 6 years of event-based rainfall deposition of mercury and major ions collected close to a coal-fired power plant with nearby NADP/MDN sites

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NADP 2012 Fall Meeting and Scientific Symposium

South Portland, ME

October 2-5, 2012

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Introduction

- Atmospheric deposition can be a significant source of nutrients and other contaminants in many watersheds.
- Contaminants come from local and regional emissions as well as the global background pool.
- Deposition of such compounds may have a negative impact on plant and animal communities, ecosystem function and human health.
- **The primary objective of this project is to measure mercury, trace metals and major ions in rainfall over annual cycles around plant Crist in Pensacola, FL and for the Pensacola Bay watershed.**

Introduction

- MDN network: regional, weekly integrated, not designed for source apportionment
- Few event-based networks
- Prior and existing event-based networks short-lived
- **Need multi-year data records due to inter annual variability**
- Coal-fired power plants are the largest anthropogenic source of mercury to the atmosphere
 - thought to contribute to local deposition
 - but no long-term measurements available
- **Need multi-year, event-based data records to detect signal and signal change.**

Material and Methods: Sites



Material and Methods: Plant Crist



Material and Methods: Sampling

- 4 sampling sites in Pensacola
- 3 Aerochem Metrics rainfall collectors with 3 sets of nested polycarbonate funnels/bottles
 - Beach site uses NCON sampler
- 2 Teflon bottle replicates for Hg and trace metals (FSU)
- 1 polyethylene bottle for major ions and pH (UWF)

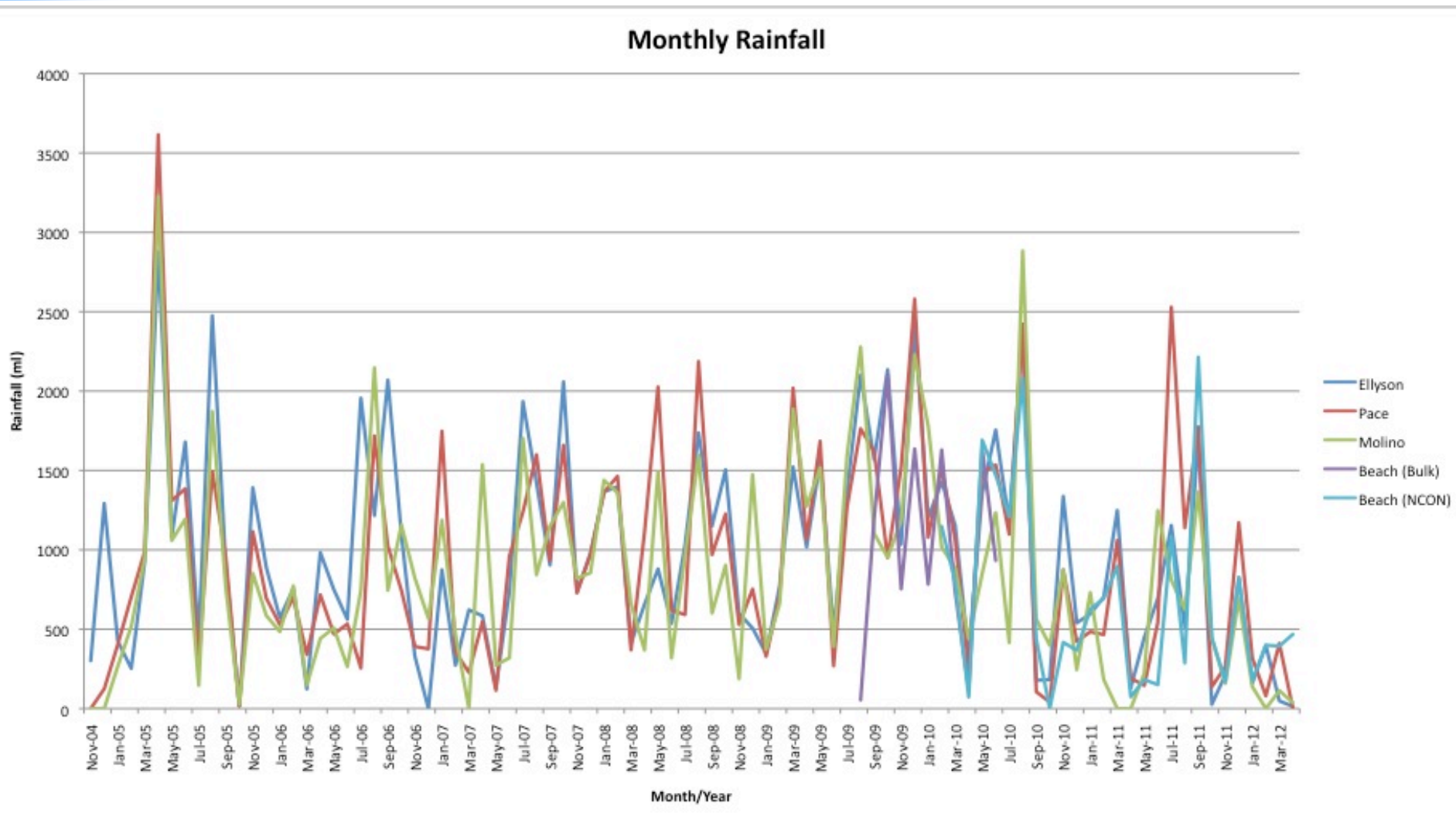


Material and Methods: Sample Preparation

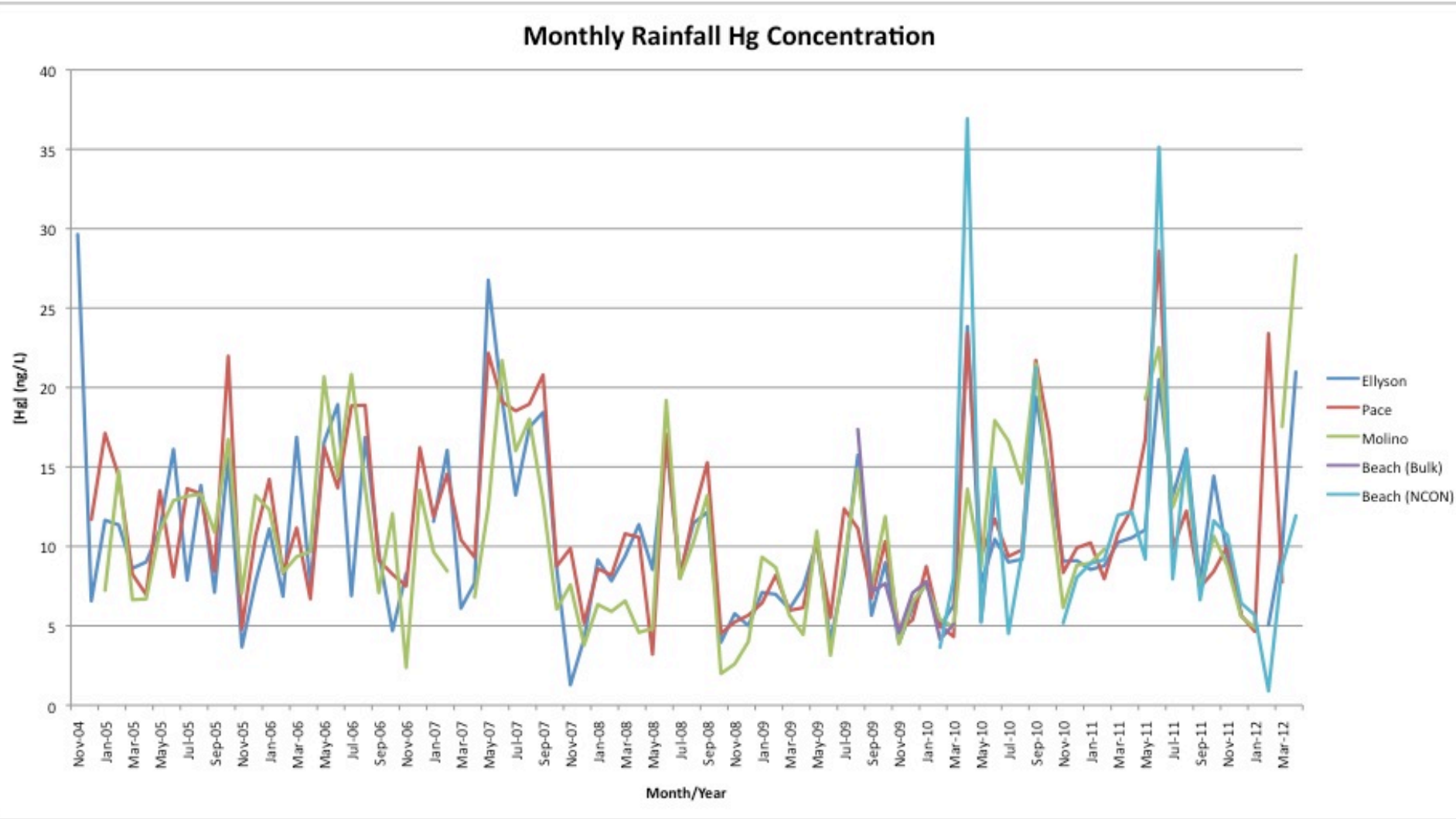
- Samples weighed and acidified to 0.045M HCl + 0.048M HNO₃
- UV-oxidized for at least 24 hours
- Analyzed using Tekran 2600 Series CVAFS Mercury Analyzer



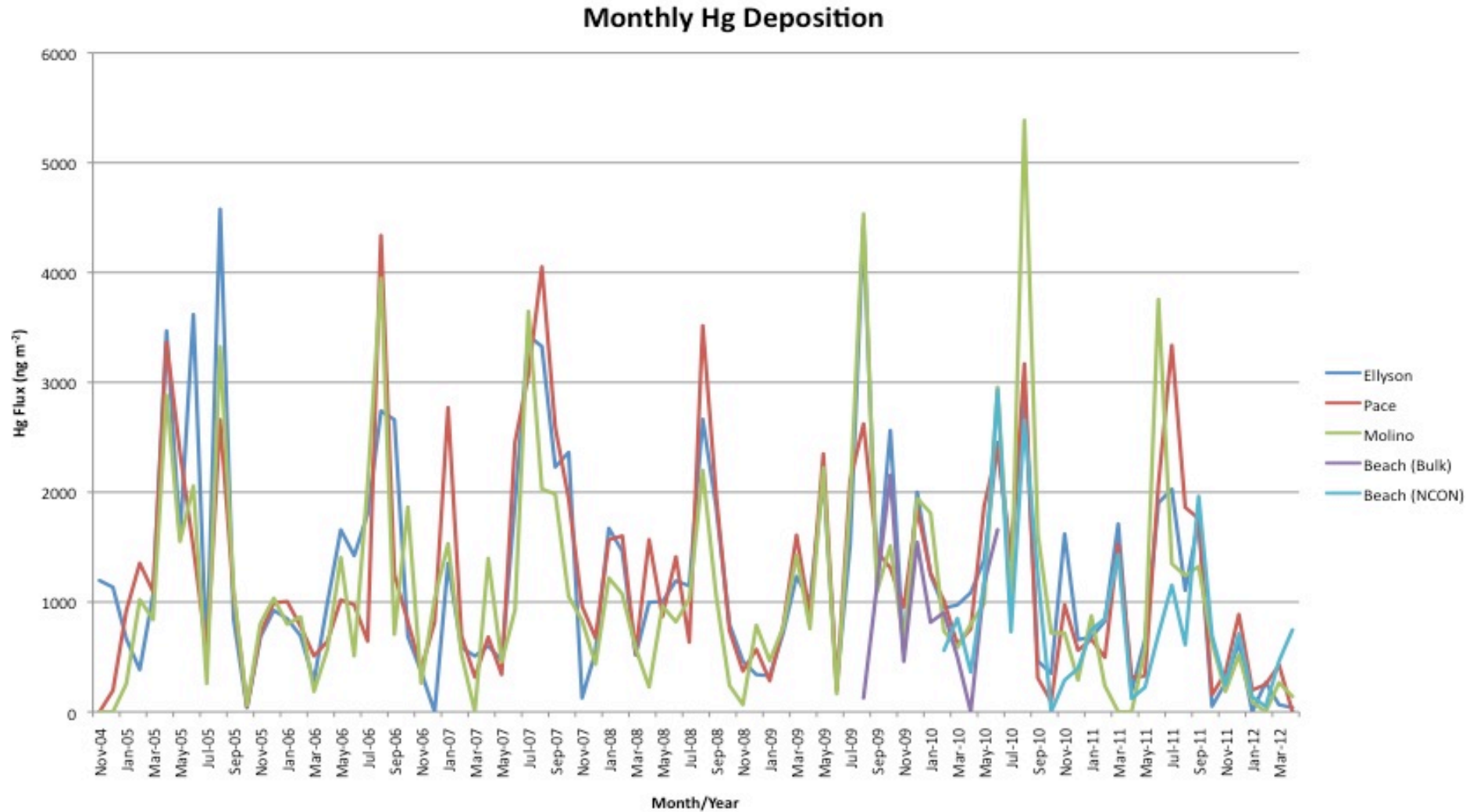
Results: Monthly Rainfall (mL)



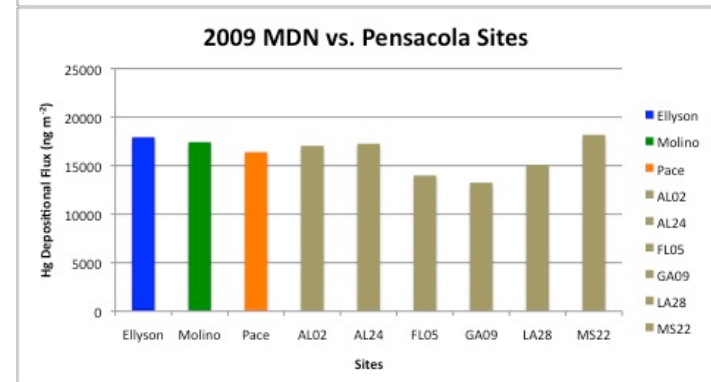
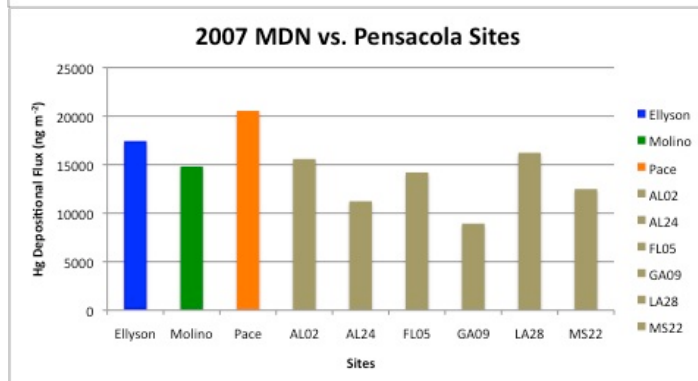
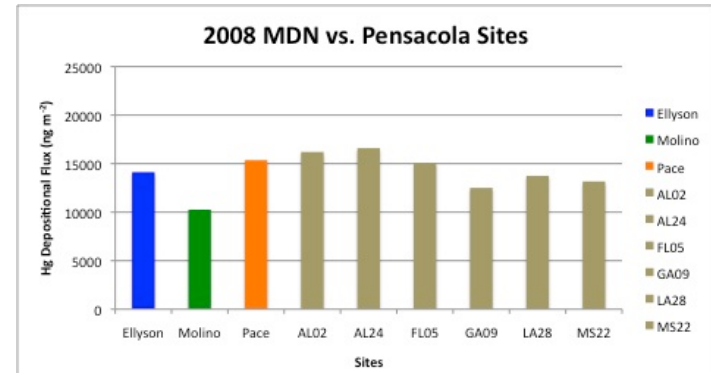
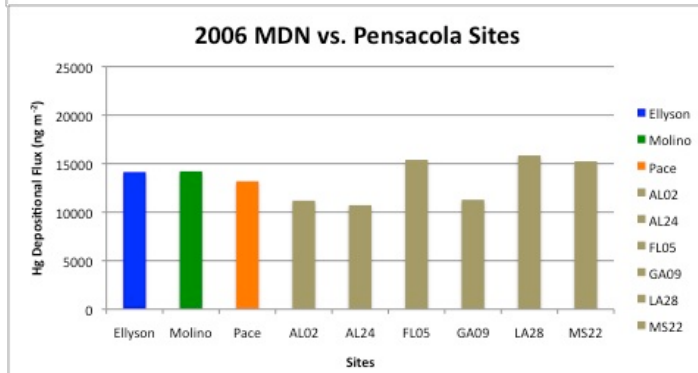
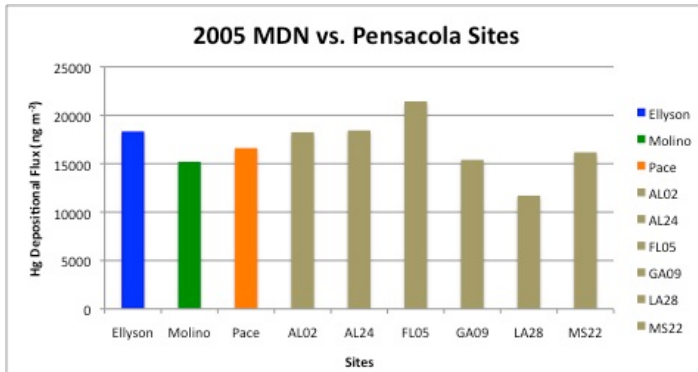
Results: Monthly Hg Concentrations (ng/L)



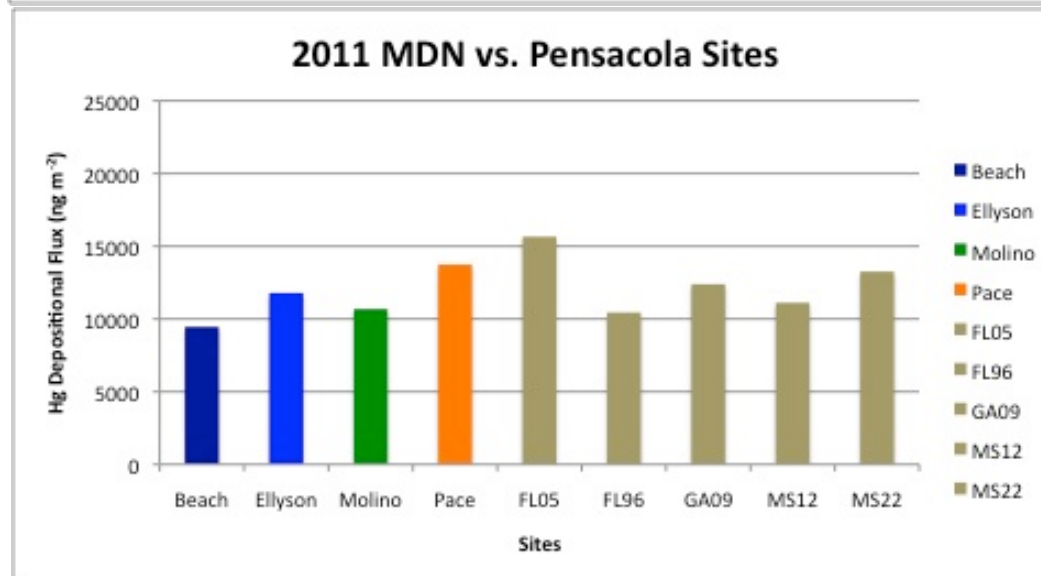
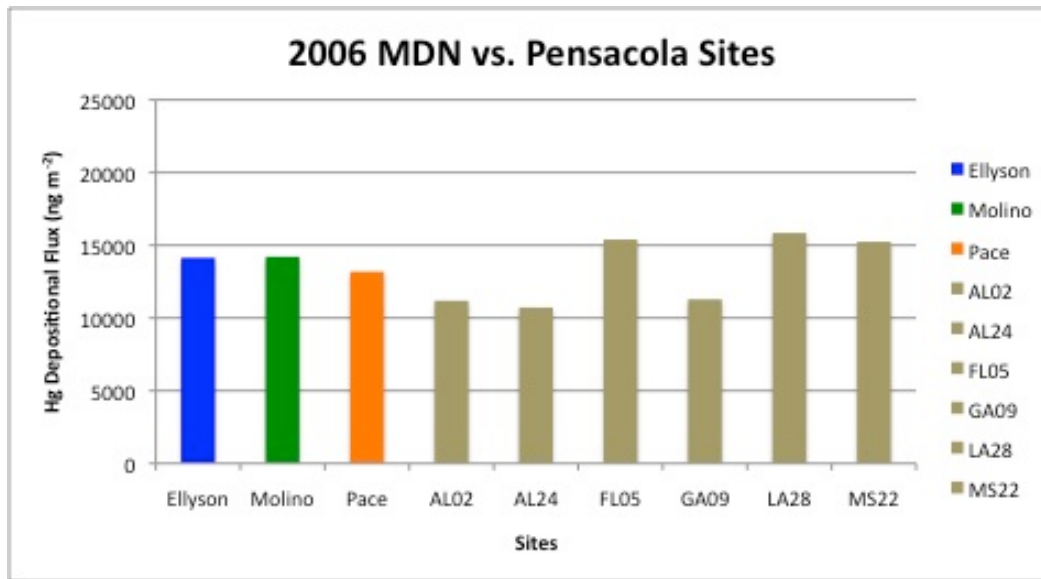
Results: Monthly Hg Deposition (ng/m²)



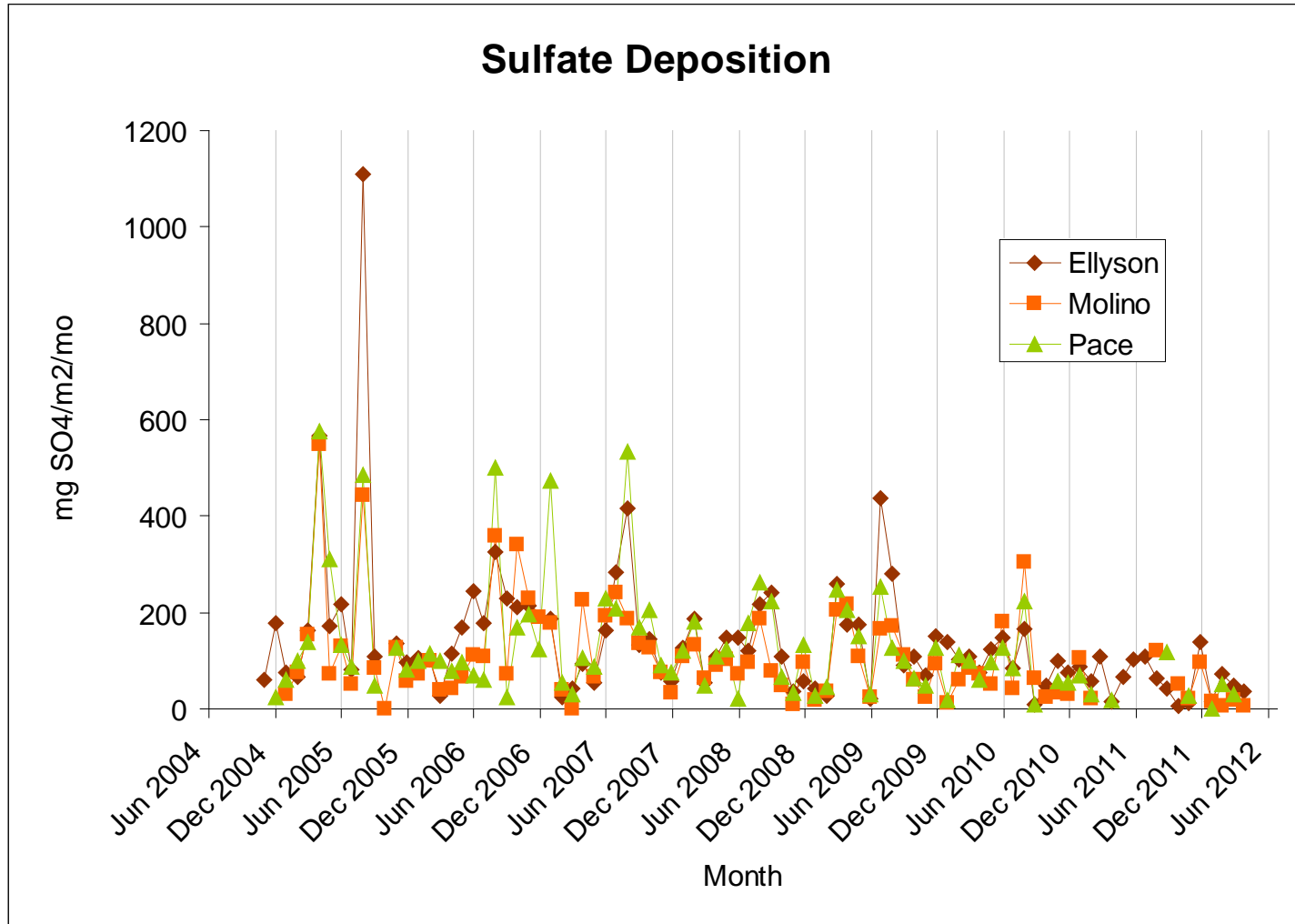
Results: Annual Deposition vs MDN (2005-2009)



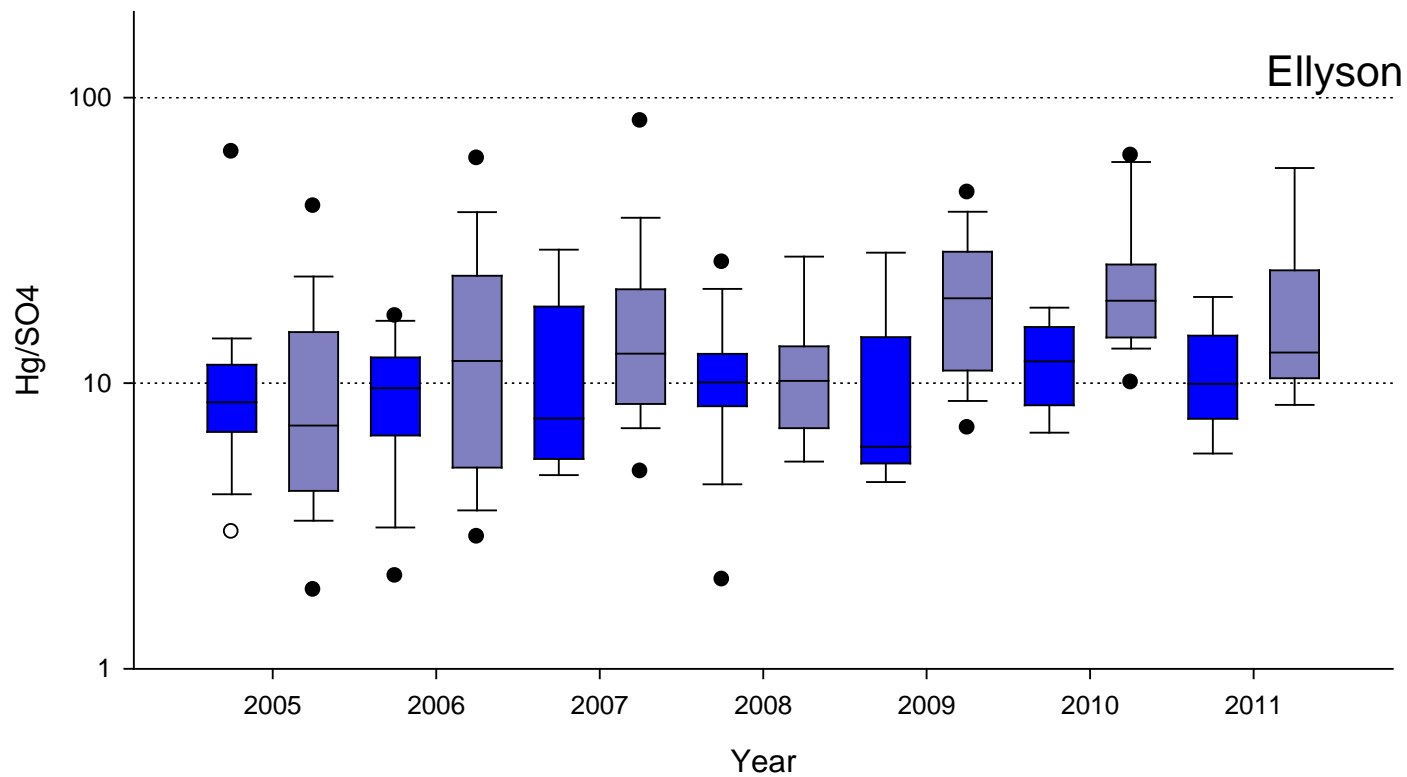
Results: Annual Deposition vs MDN (2010-2011)



Results: Sulfate deposition (mg/m²/month)

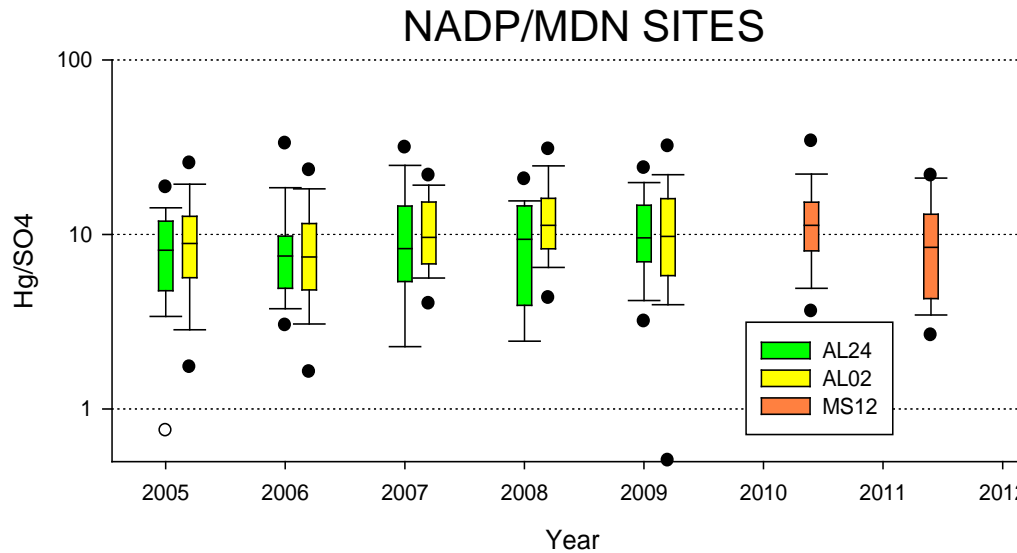
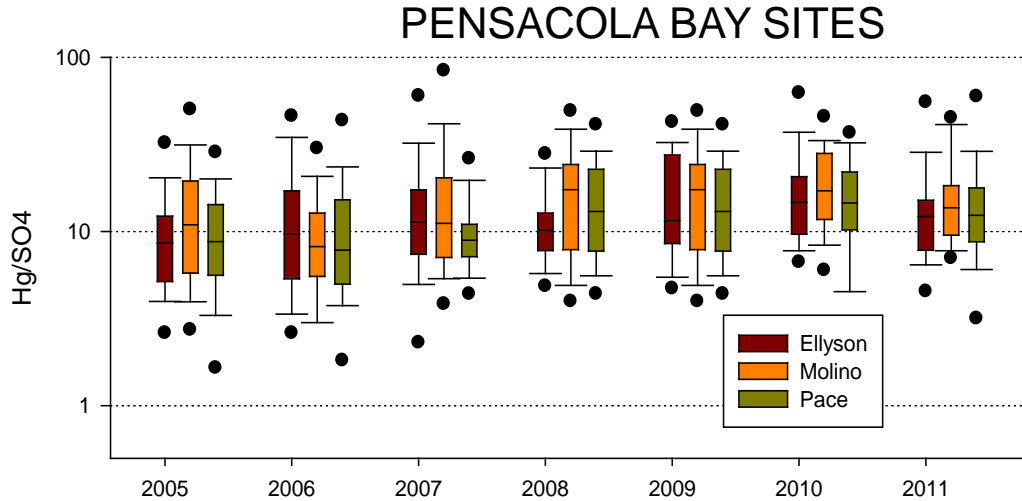


Results: Hg/SO₄ ratio at Ellyson site

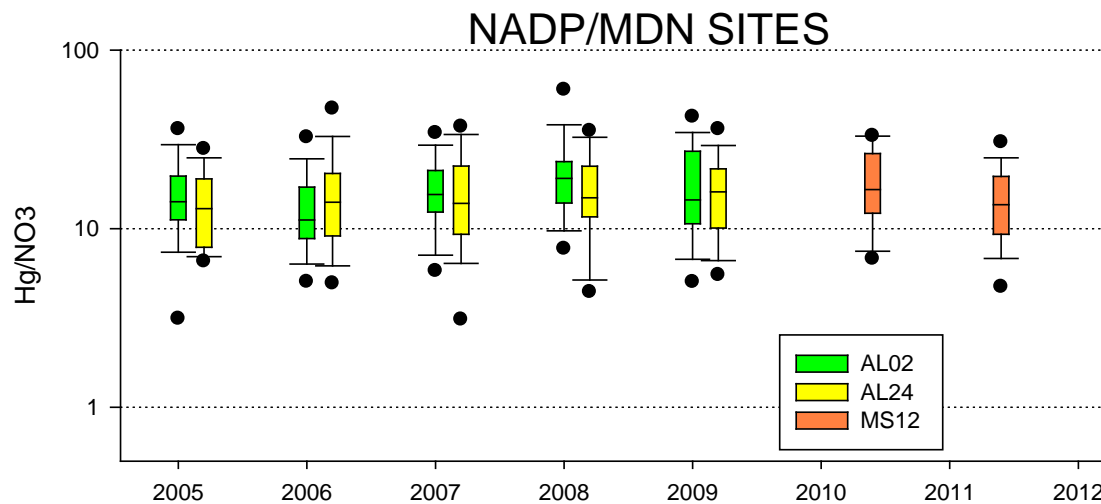
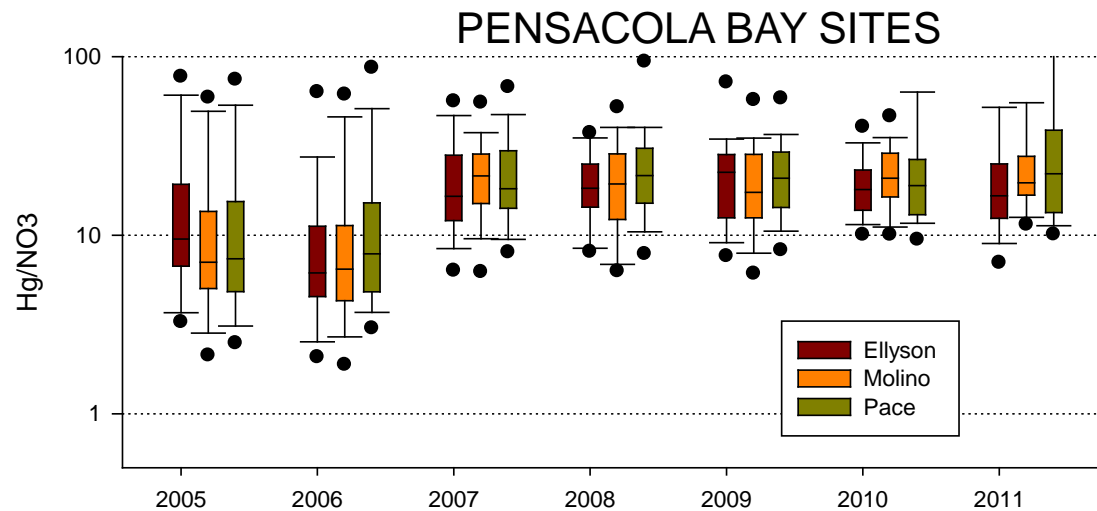


- Dark blue bars: Dec-May
- Light blue bars: June - Nov

Results: Hg/SO₄ Pensacola Bay and nearby MDN & NADP sites



Results: Hg/NO₃ ratios



Summary

- Sulfate deposition has decreased over time at network sites
- Hg deposition has not changed over time at network sites
- Hg deposition highly variable between
 - Seasons
 - Years
- No statistical significant difference in Hg deposition between network sites and between MDN sites (not shown)
- Hg deposition has not changed post-scrubber installation
- Nitrate deposition decreased early on, now steady

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