
EVALUATING MERCURY EXPOSURE AND SOURCE ATTRIBUTION USING GEOS-CHEM

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GEOS-Chem Users' Meeting
8 April 2009



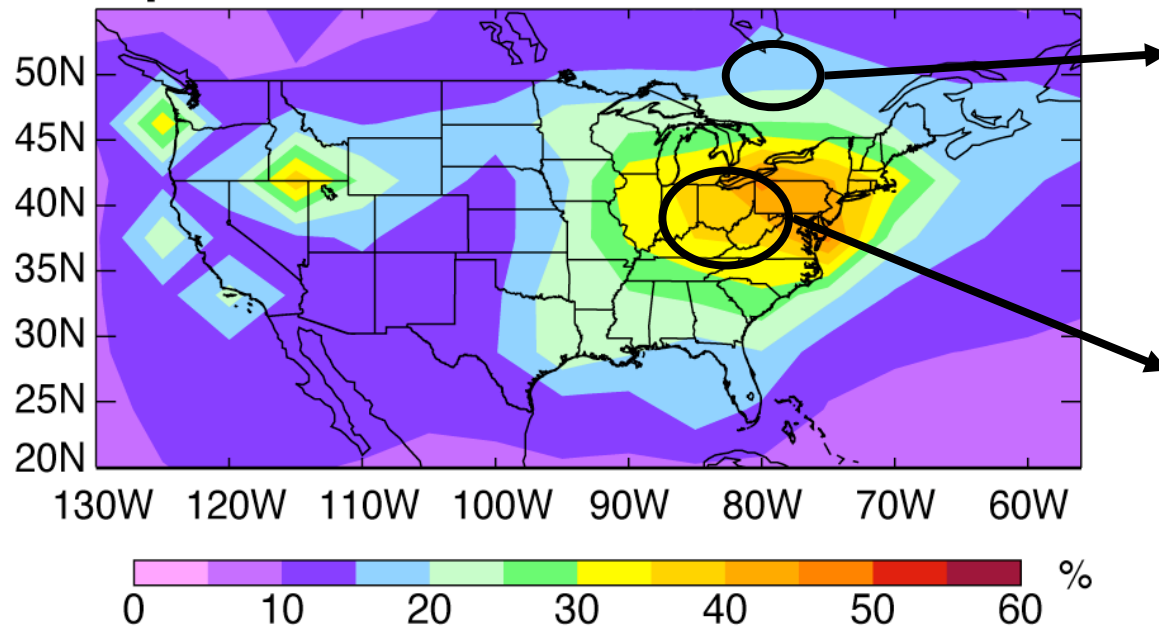
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NORTH AMERICAN VS. INTERNATIONAL DEPOSITION

Results from GEOS-Chem global land-ocean-atmosphere Hg model [Selin et al., 2007, 2008]

% Deposition from North American Sources



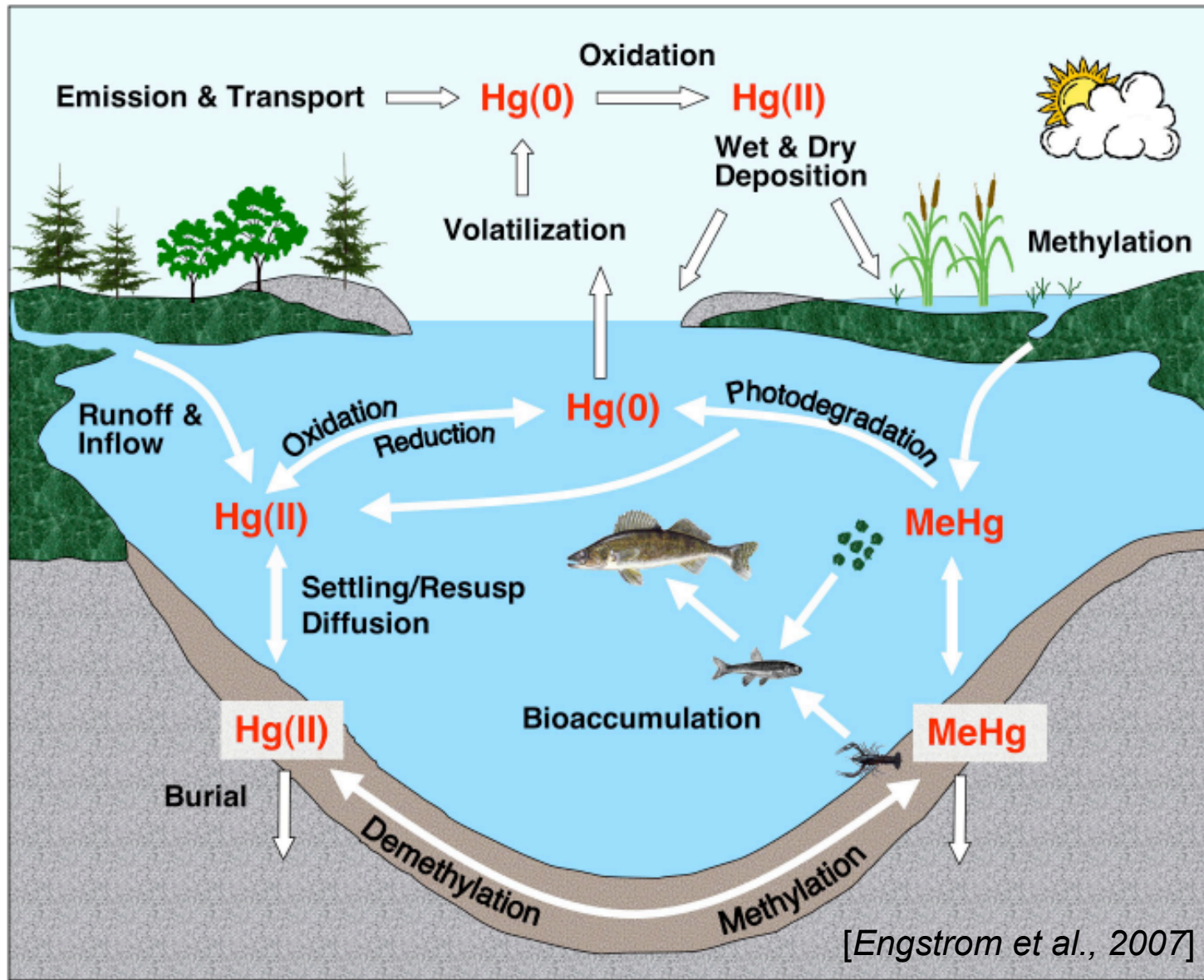
Up to 60% of deposition in Midwest/Northeast is from domestic sources

Florida has highest deposition in the U.S., but mostly from non-US sources

Policy implications: Reducing deposition in both Midwest and Southeast will require policy actions on multiple political scales (national and global)

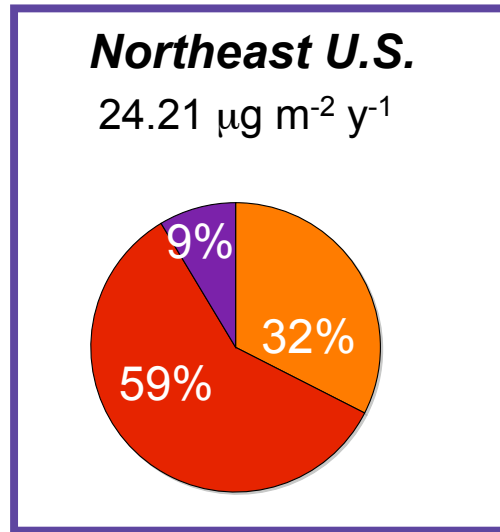
[Selin & Jacob, AE 2008]

FROM DEPOSITION TO FISH METHYLMERCURY

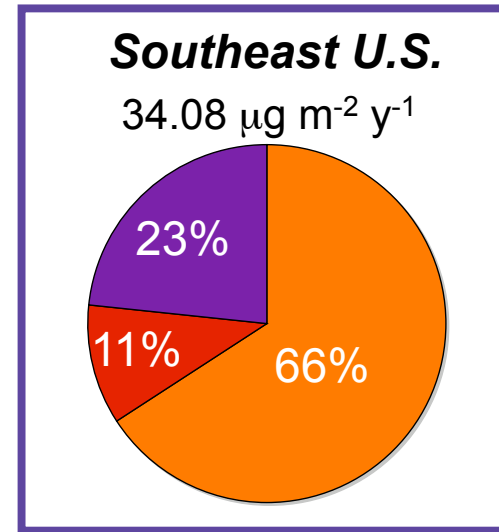


FRESHWATER DEPOSITION AND SOURCE ATTRIBUTION

How do sources affect fish methylmercury, and on what timescales?



International
Anthropogenic
Pre-industrial +
Historical
N. American
Anthropogenic



SERAFM: Lake model **WASP7**: River model **WCS (MLM)**: Watershed loading
BASS: Aquatic food web [Knights et al., 2009]

Policy and Timescale Analysis

[Selin et al., EHP, submitted]

FRESHWATER TIMESCALE ANALYSIS

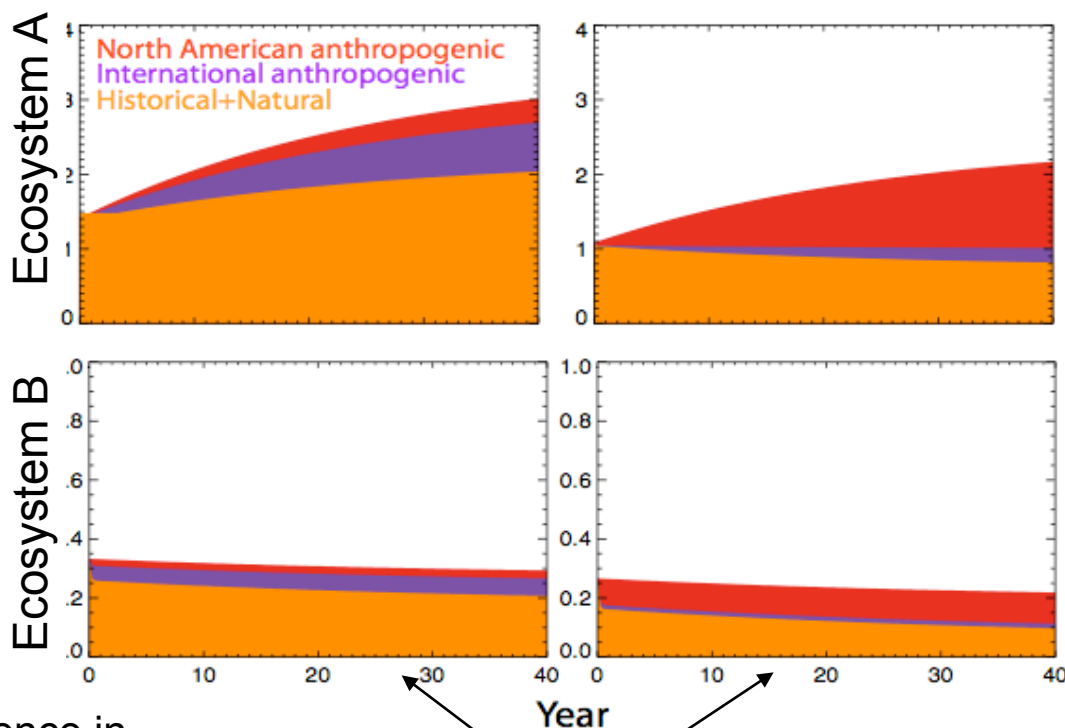
Each ecosystem driven by present-day deposition for 40 years

Policy experiment: All Hg is “historical” at $t=0$. How is anthropogenic signal reflected in fish, and on what timescale?

“Southeast” Deposition

“Northeast” Deposition

Fish MeHg (ppm)



Same deposition, but different ecosystem dynamics lead to very different source attributions (and concentrations) over time

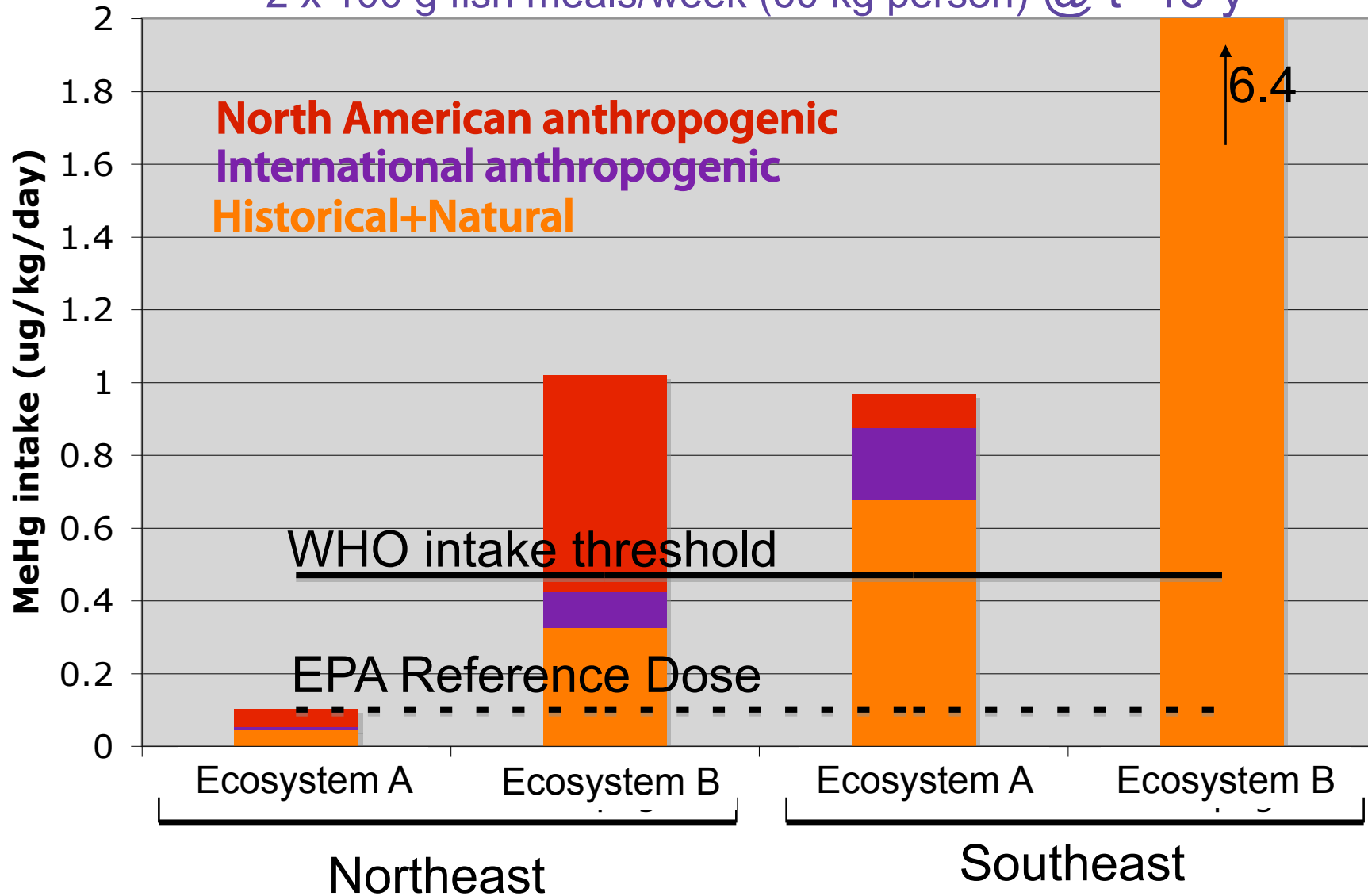
Note difference in scale!

Regional differences in deposition sources lead to different attributions in similar ecosystems

[Selin et al., EHP, submitted]

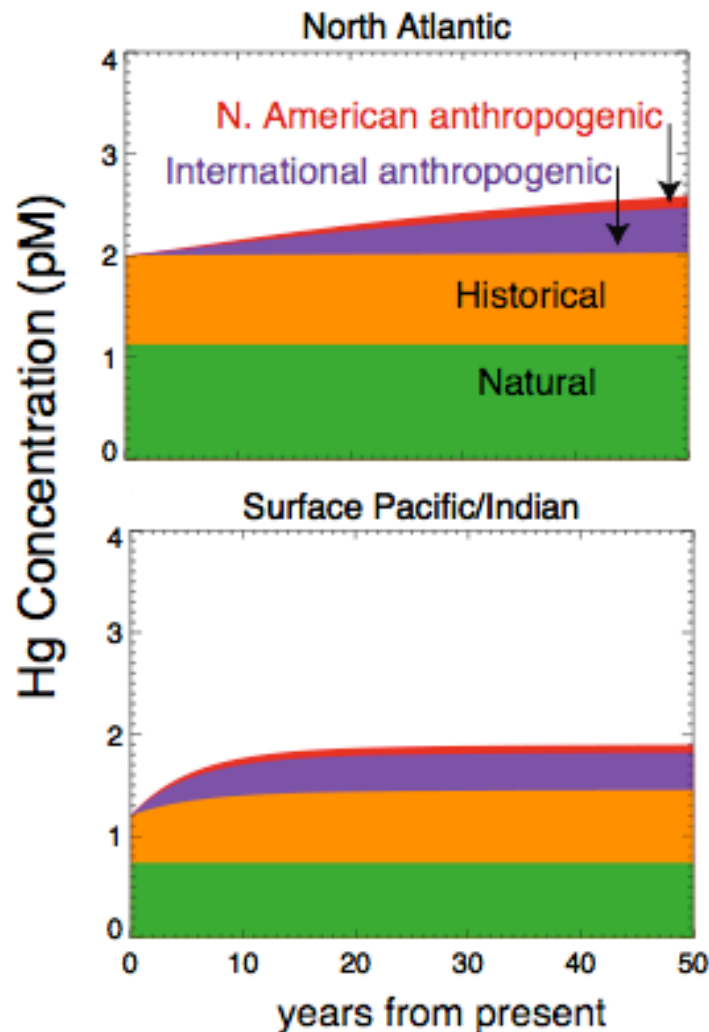
LOCAL EXPOSURE FROM FRESHWATER FISH

2 x 100 g fish meals/week (60 kg person) @ t=40 y



[Selin et al., EHP, submitted]

POPULATION-WIDE EXPOSURE FROM MARINE FISH



No mechanistic link (yet) from oceanic Hg concentration to fish methylmercury

Historical exposure could continue to increase, complicating policy decision-making

Different challenges on different scales (local to global)

Application of economic analysis?

“current emissions” scenario
14-box ocean model: Sunderland
and Mason, 2007

[Selin et al., EHP, submitted]