Mercury in sediment cores, Great Salt Lake, Utah

Collection

Slicing

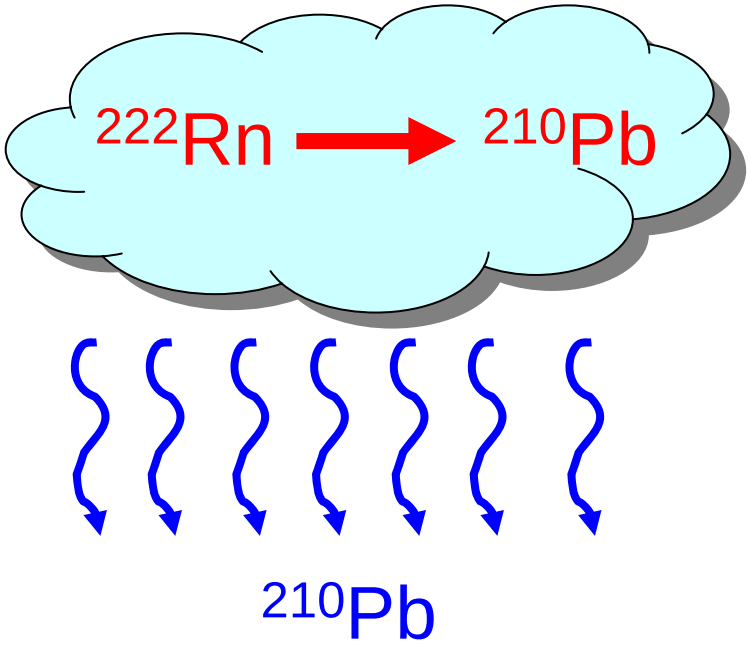
Freeze drying

TOPICS

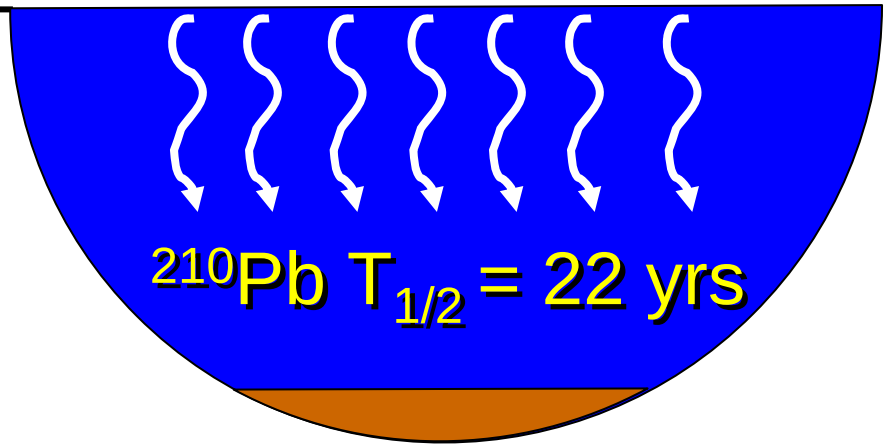
- Sediment core chronology
- Historic Hg concentration/deposition
- Direct deposition vs. riverine influx
- What’s next?

LAKE CORE CHRONOLOGY

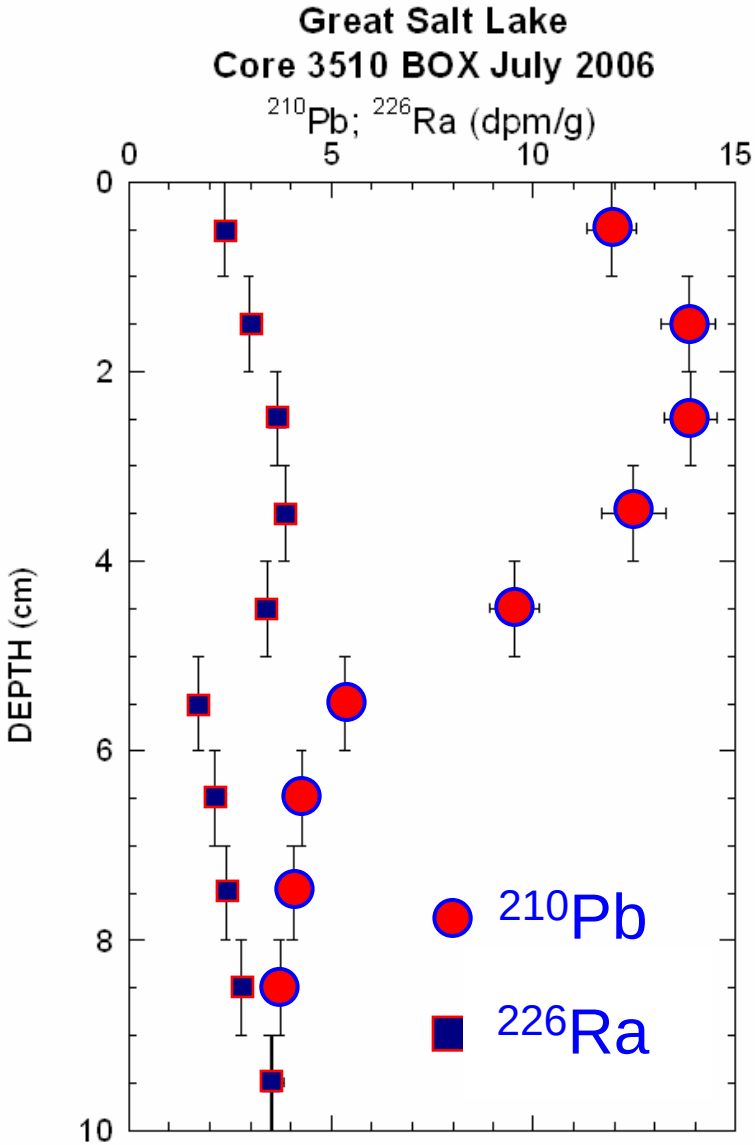
^{210}Pb

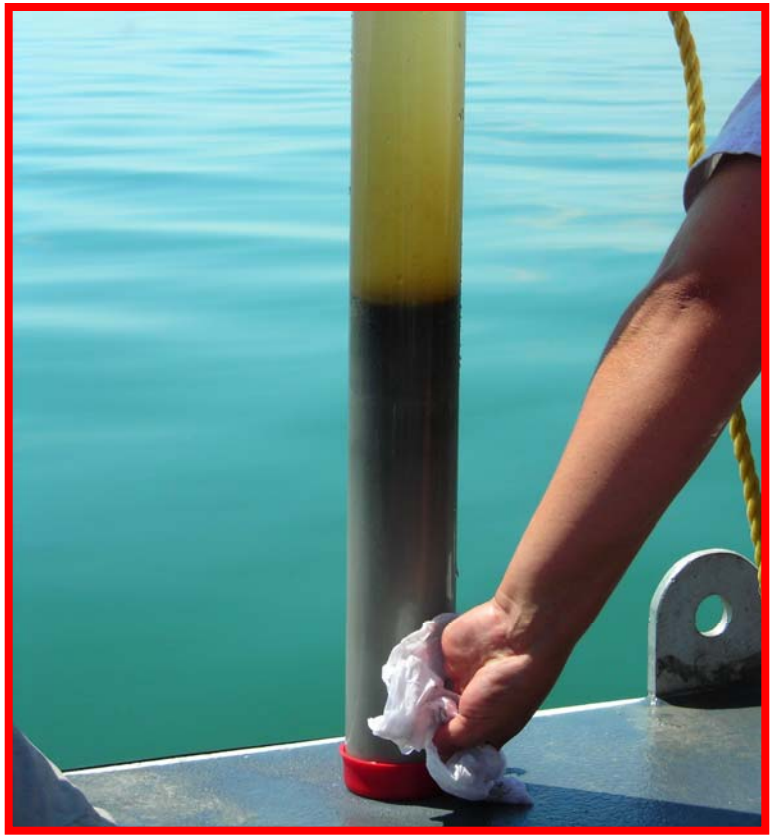


Radon emissions from land surface



LAKE CORE CHRONOLOGY: Unsupported ^{210}Pb

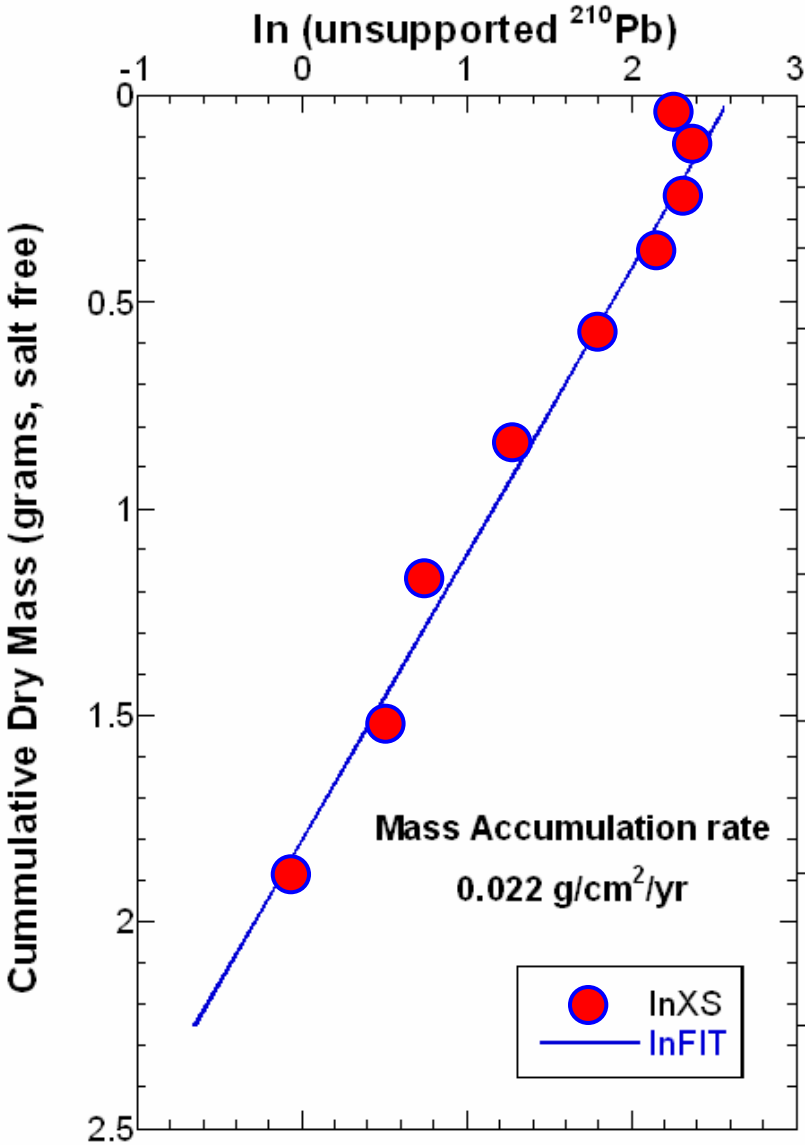




Unsupported ^{210}Pb

$^{210}Pb - {}^{226}Ra$

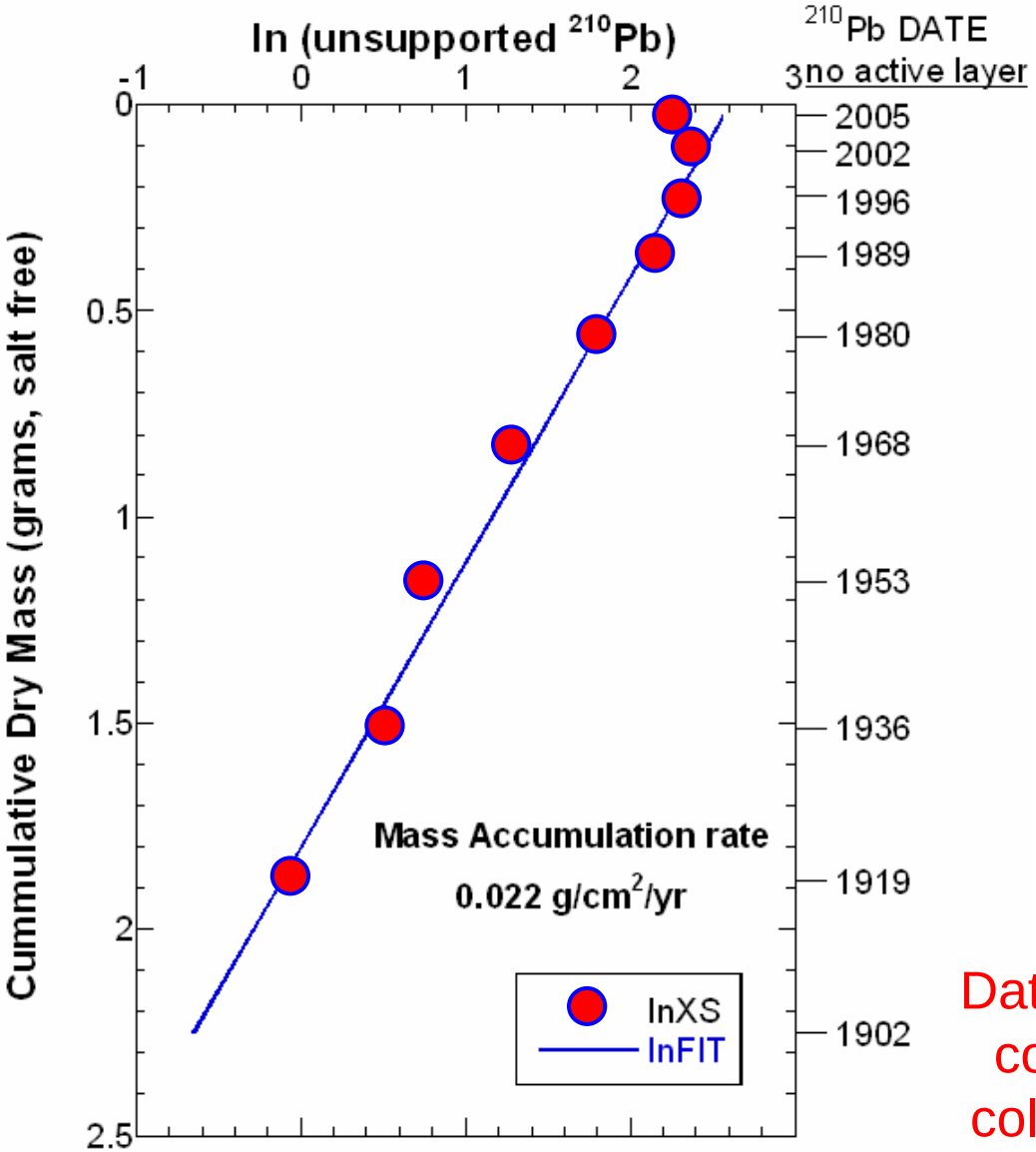
LAKE CORE CHRONOLOGY:
Mass accumulation rate



Mass accumulation rate

^{210}Pb, (dpm/g dry sediment) versus the cumulative dry mass, g/cm^2

LAKE CORE CHRONOLOGY:
Sediment layer date

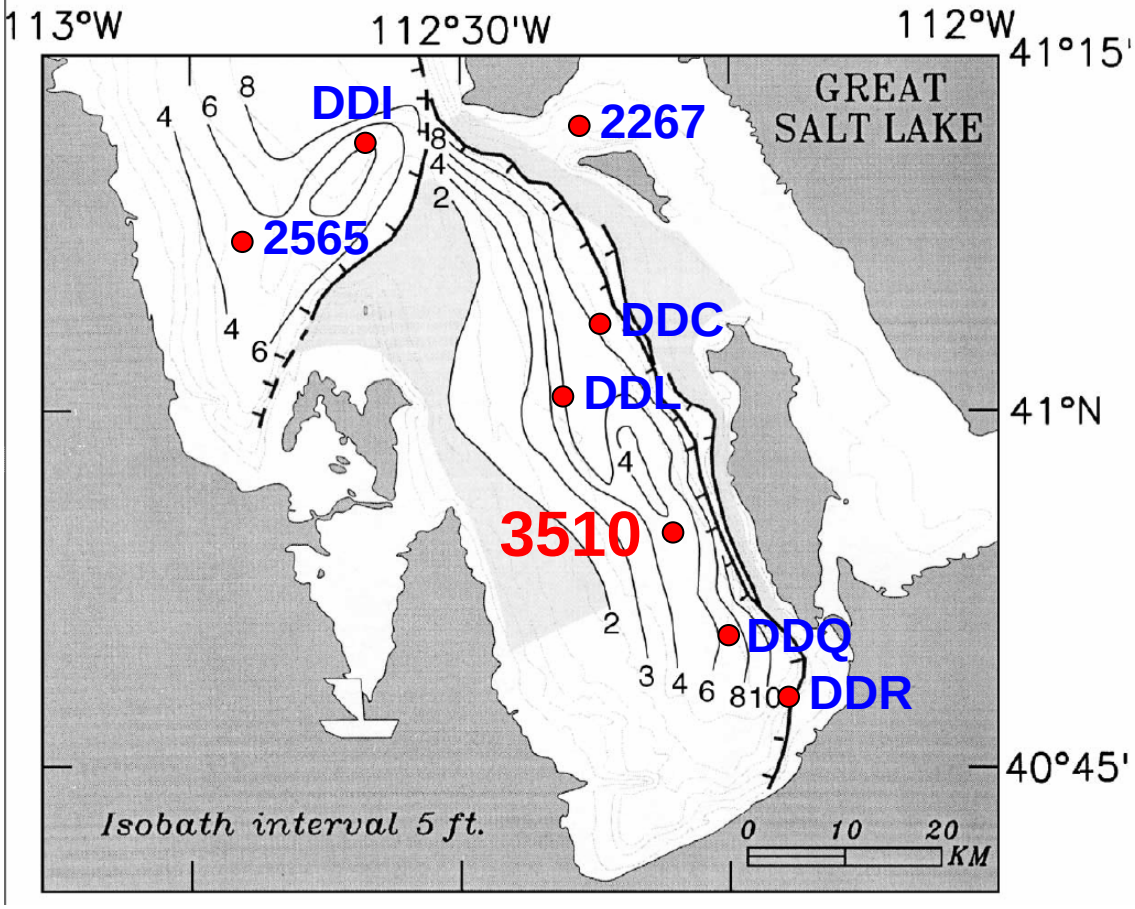


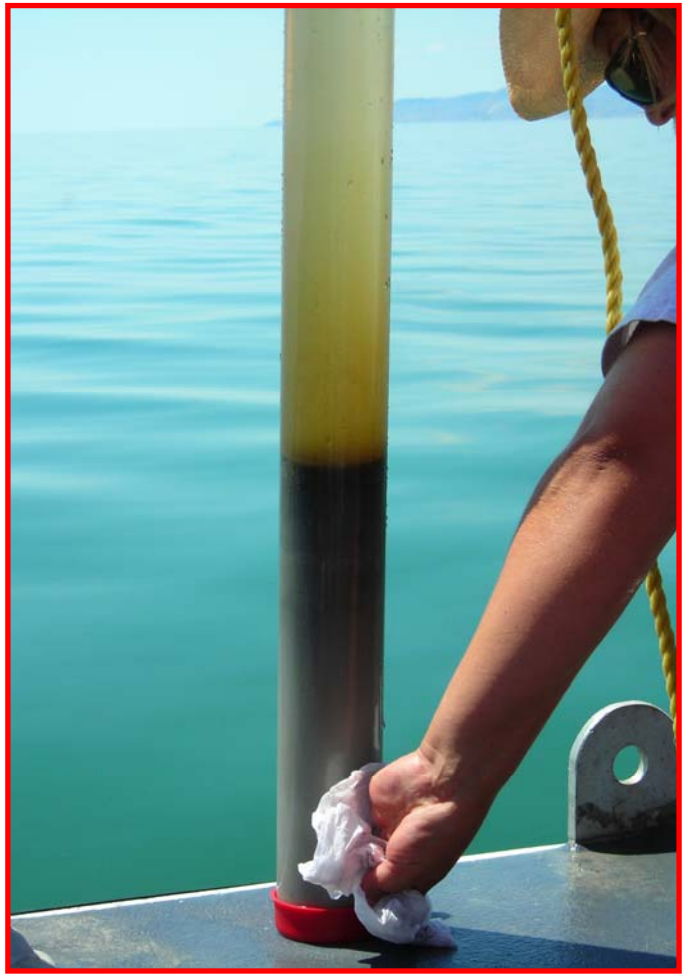
^{210}Pb layer age

Date of core collect − $\frac{\text{cumulative mass (g/cm}^2\text{)}}{\text{mass accumulation rate}}$

EXISTING CORES

Isopach map of post-Bonneville sediments (Colman et al., 2002)

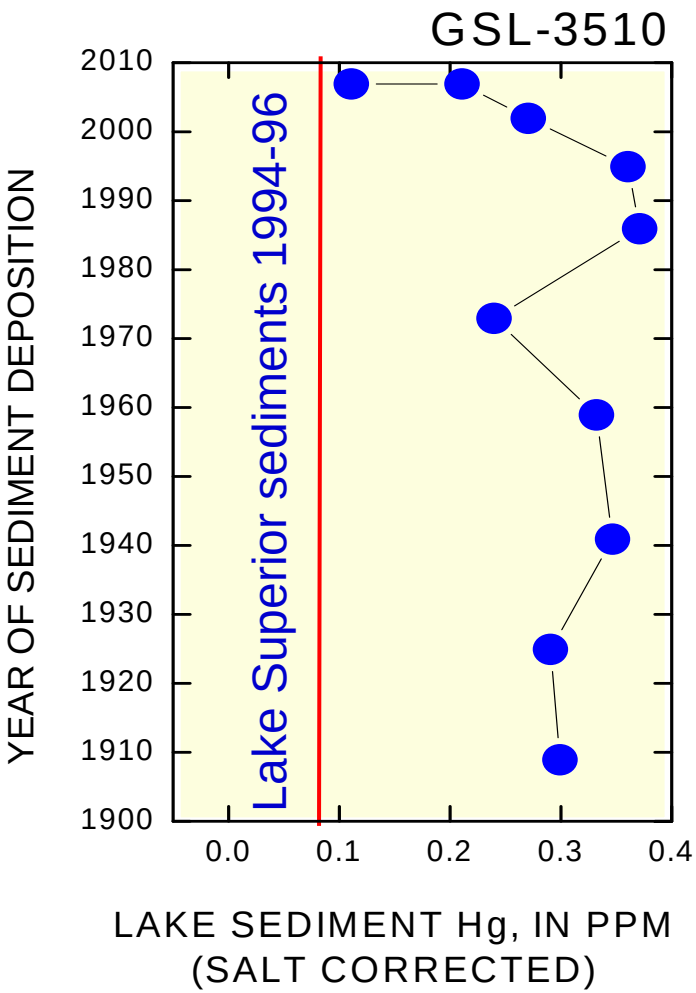




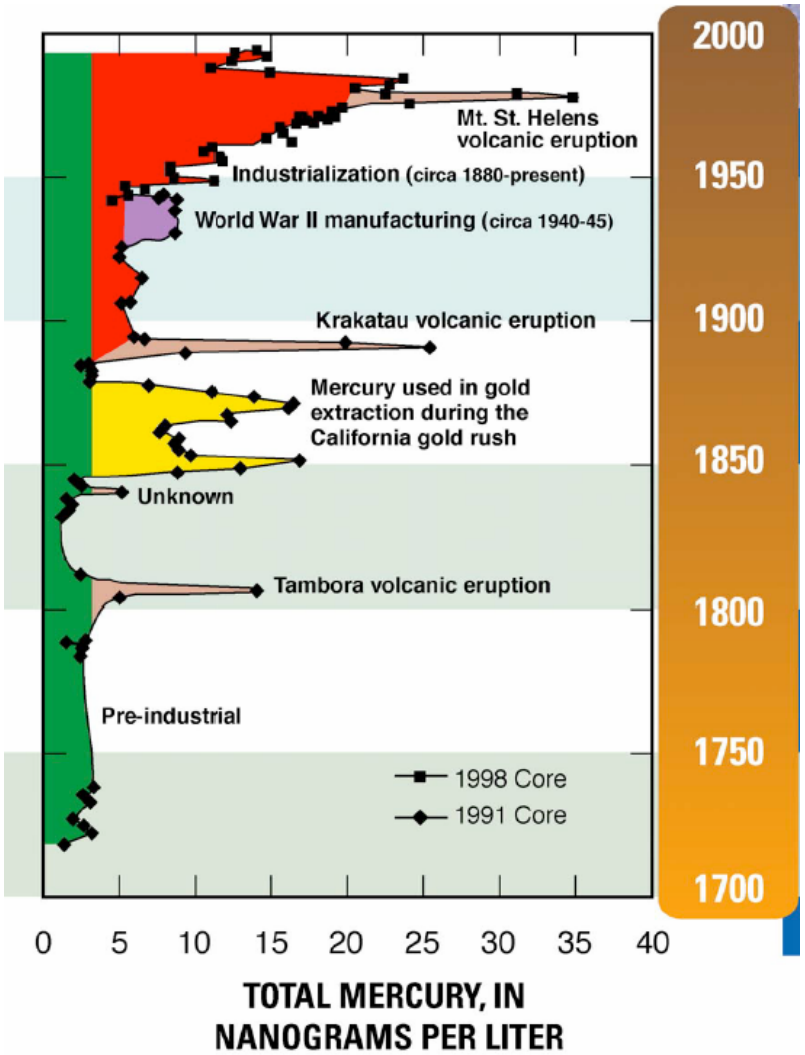
Sediment core from GSL

[Hg] IN GSL SEDIMENT

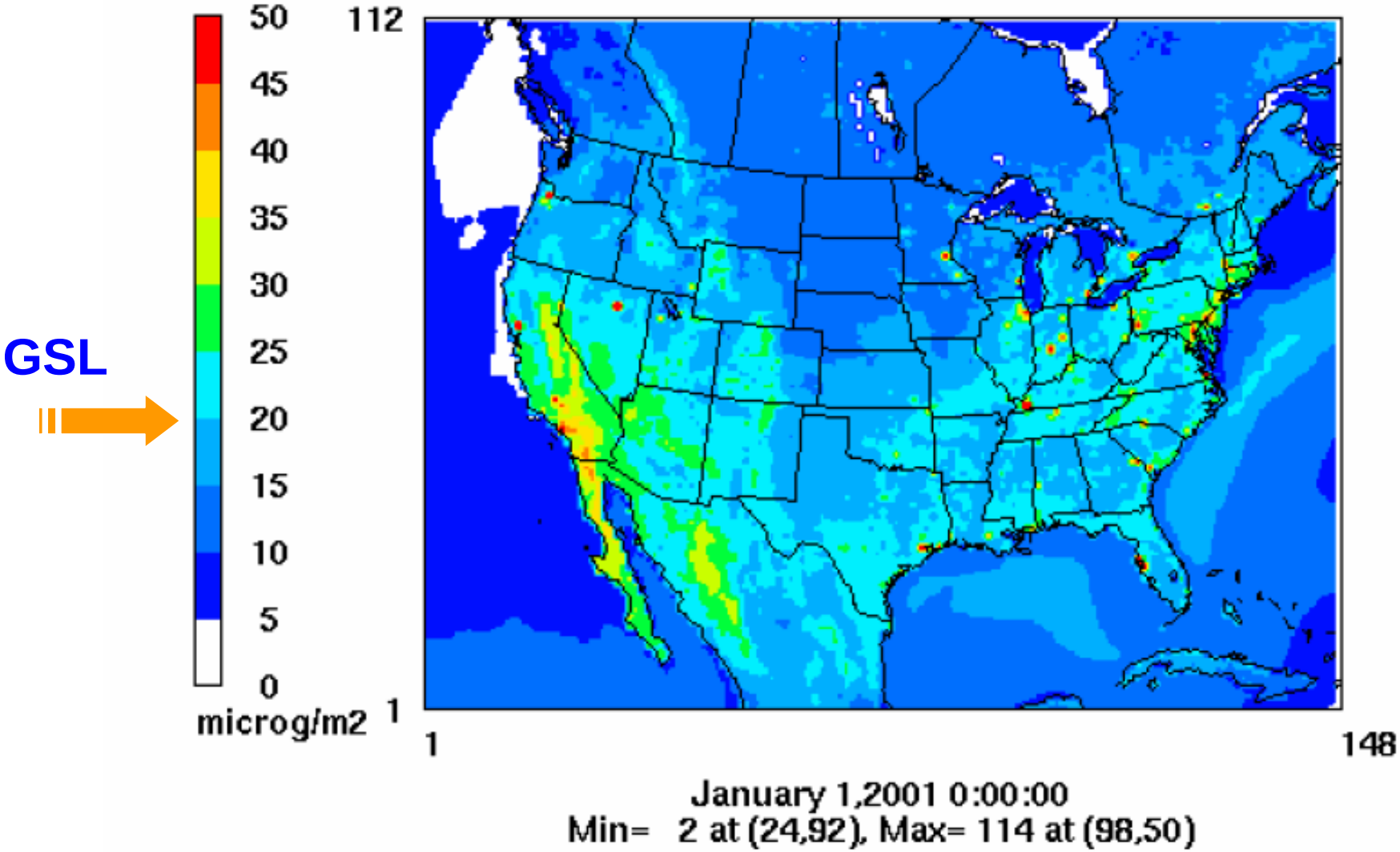
Lake sediment record of Hg



Ice-core record of Hg

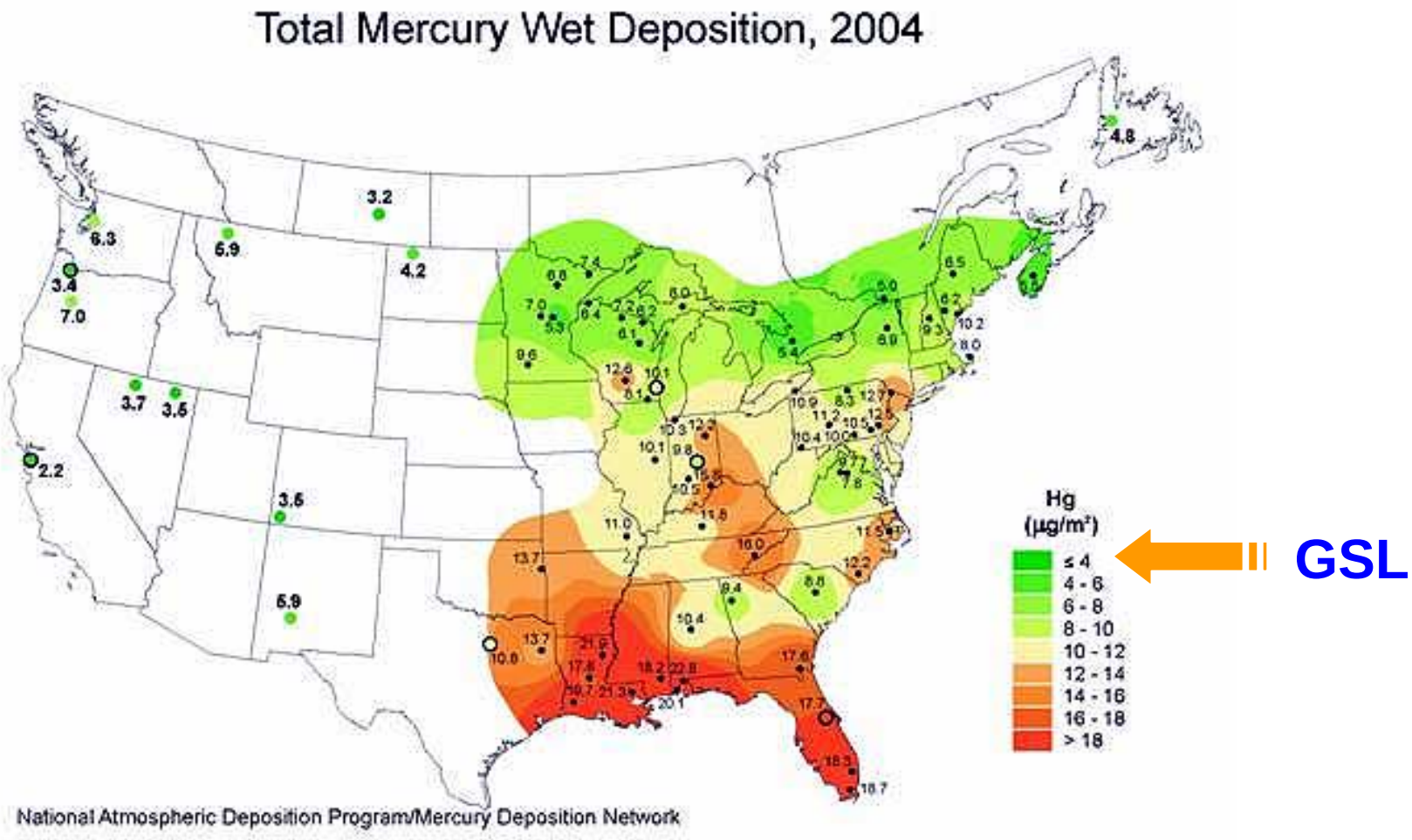


DRY DEPOSITION OF Hg



Lavin and Jansen (2007), http://nadp.sws.uiuc.edu/meetings/fall2007/post/6-mercury/vijayaraghavan.pdf

WET DEPOSITION OF Hg



Total wet + dry deposition = 25 ug/m^2/yr

ANNUAL Hg DEPOSITION

Period of deposition	Mean Hg deposition ($\mu g/m^2/year$)	Non-atmospheric deposition component ($\mu g/m^2/year$)
2003-2006	35 ?	10 (29%)
1998-2003	60	35 (58%)
1990-1998	80	55 (69%)
1978-1990	80	55 (69%)
1965-1978	50	25 (50%)
1949-1965	70	45 (64%)
1932-1949	80	55 (69%)
1916-1932	60	35 (58%)
1900-1916	70	45 (64%)

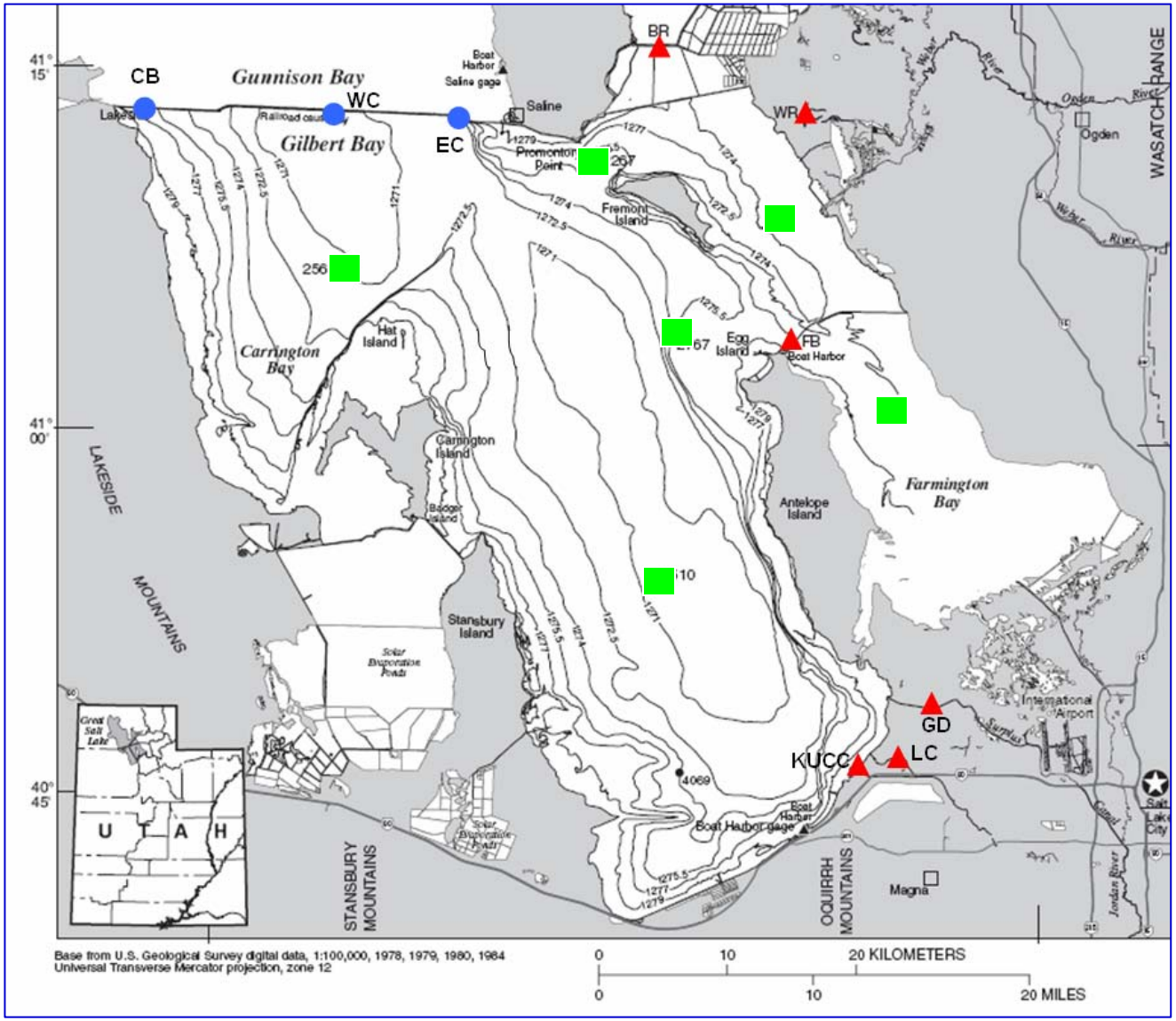
GSL DEPOSITION IS HIGH

TABLE 1. Mercury (Hg) Deposition Measured among Three Sample Media

site	sample media	episode (reference)	year(s) (AD)	average [Hg] (ng/L)	deposition[a] ($\mu g/m^2/year$)	change from preindustrial (fold)
UFG	ice	Clean Air Act	1986–1993	9	11.4	11
UFG	ice	industrial max	1984	20	20.3	20
UFG	ice	Mt. St. Helens	1980	11[b]	12.7§	12
UFG	ice	industrial	1900–1993	10	11.0	11
UFG	ice	WWII	1938–1946	7	4.73	5
UFG	ice	Krakatau	1883	21[c]	18.2§	18
UFG	ice	Gold Rush	1850–1878	8	4.84	5
UFG	ice	Tambora	1815	10[c]	8.60§	8
UFG	ice	preindustrial	1719–1847	3	0.78	na[d]
Minnesota	wet ppt[e]	(*49*)	1997–1999	14	6.99	7
Colorado	wet ppt	(*49*)	1999	10	9.20	9
			<1880	na	80.0	na
Minnesota	lake sed**	(*48*)	>1880	na	170	2[#]
			<1850	na	3.70	na
Minnesota	lake sed	(*45*)	modern	na	12.5	3
			<1750	na	2.00	na
Arctic	lake sed	(*47*)	1980	na	12.5	6
			<1850	na	5.00	na
New York	lake sed	(*46*)	modern	na	8.90	2
			<1850	na	7.60	na
California	lake sed	(*40*)	>1980	na	38.0	5

GSL sediments range from 35 to 80 $\mu g/m^2/yr$

Hg INPUT FROM WATERSHED



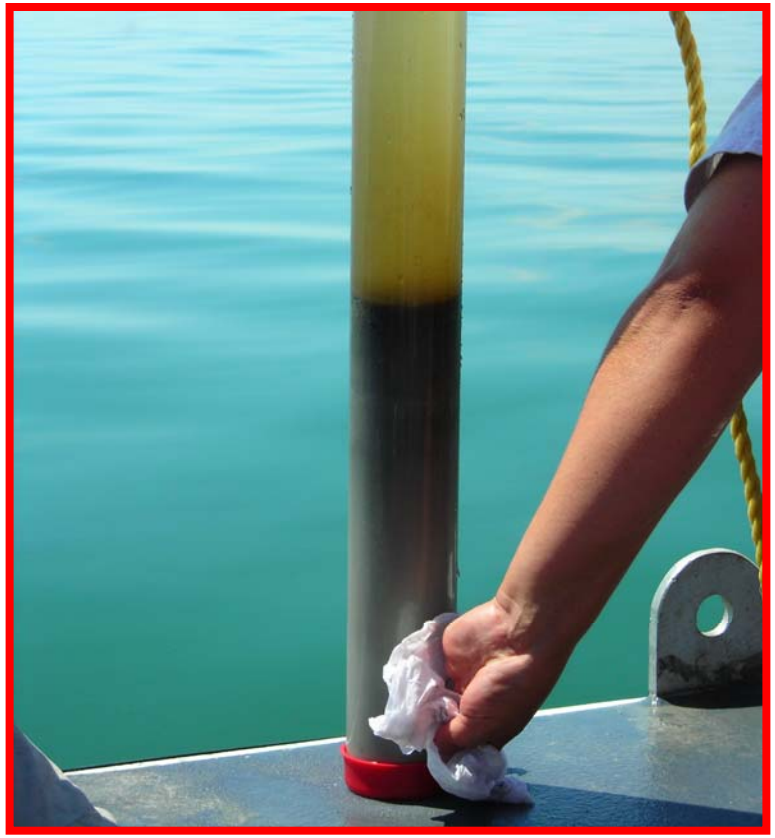
Continuous discharge site

Lake/bay site

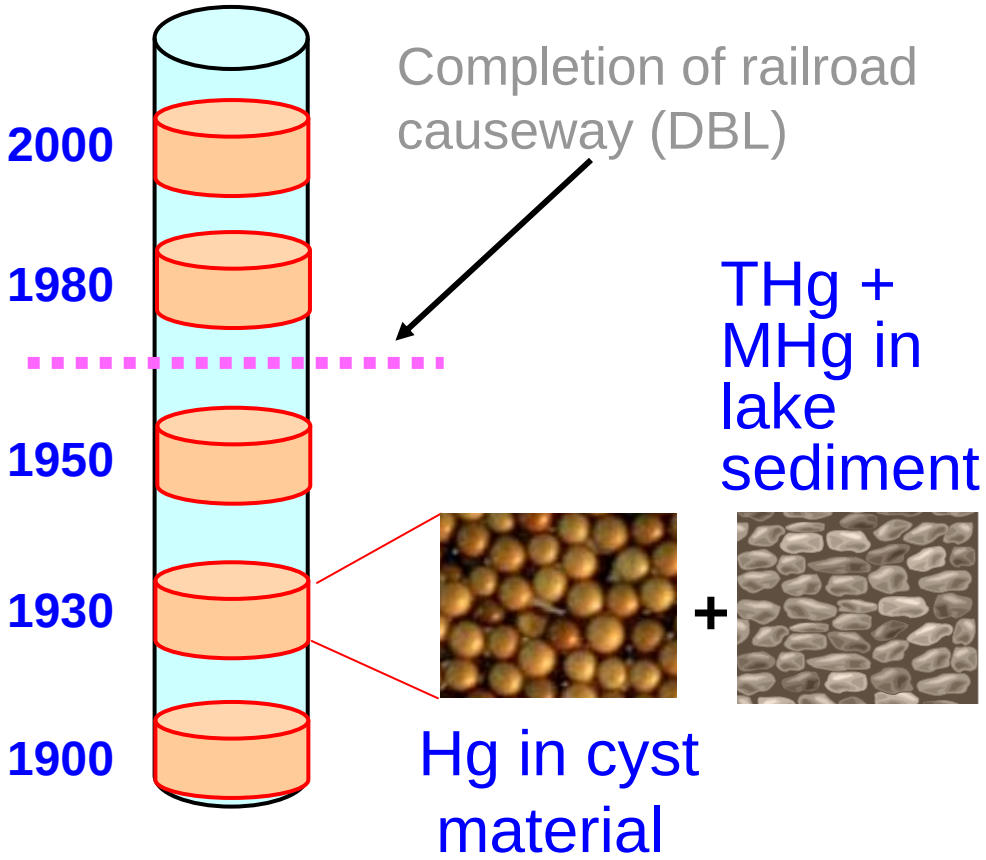
Intermittent discharge site

WHAT'S NEXT?

Has something changed the historic Hg methylation rates in GSL?



GSL Sediment core



WHERE TO FROM HERE?

- Rates of mercury methylation in GSL
- Continue gaging stations/riverine influx
- On-site measurement of Hg deposition