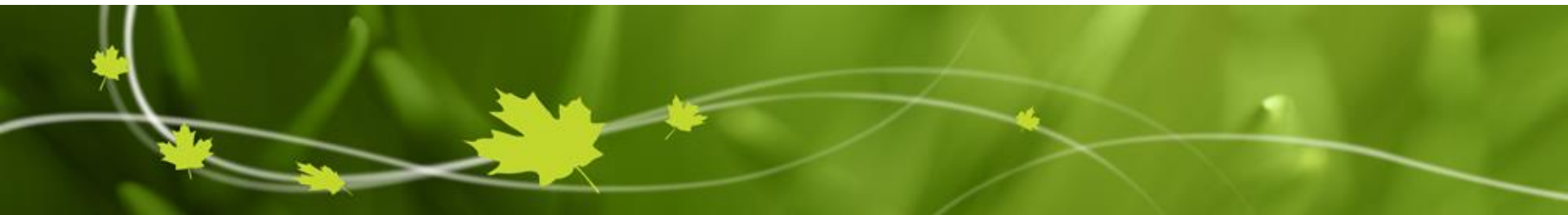




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Atmospheric Mercury Monitoring in Canada

Dr. Pierrette Blanchard
Air Quality Research Division
Environment Canada

Mercury in the Environment

- Mercury (Hg) is a potent neurotoxin and is reported at levels in the Canadian environment that can be toxic to human and ecological health
- Methylmercury (MeHg), the most toxic form, bioaccumulates and biomagnifies through food web
- In Canada, ~ 90% of annual fish consumption advisories posted by provinces/territories are a result of high mercury levels



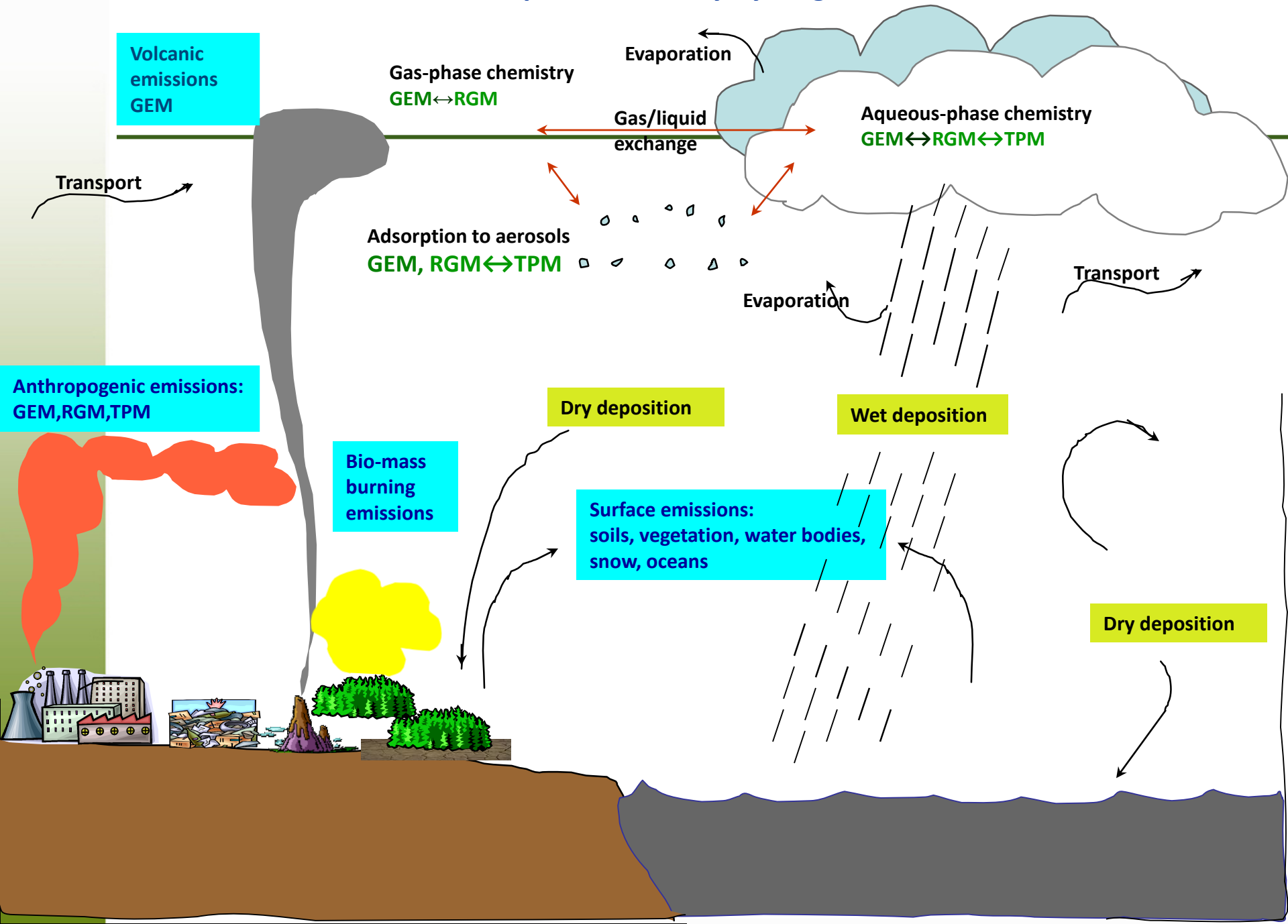
Mercury in the Atmosphere

TGM

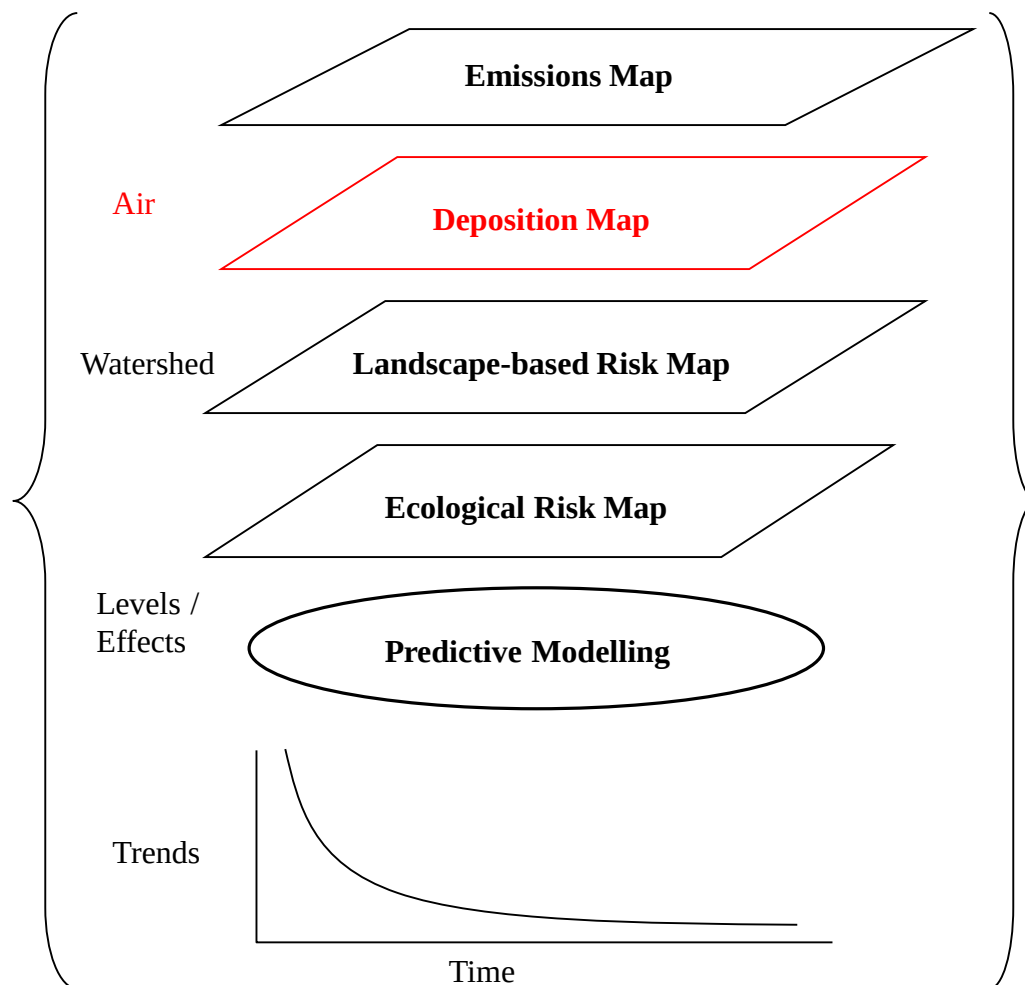
	a.k.a.	Atmospheric lifetime	Units	Sampling interval
GEM	Hg ⁰	6-24 months	ng m ⁻³ (ppt)	5 min
RGM	GOM, Hg ⁺ and Hg ²⁺	hours/days	pg m ⁻³ (ppq)	1-3 hours
TPM	PHg, PBM _{2.5}	days/weeks	pg m ⁻³ (ppq)	1-3 hours
Hg _{tot} in precip	-	-	ng l ⁻¹	1 week



Atmospheric Mercury Cycling



Environment Canada's Program: Enhance and advance on-going and past research and monitoring efforts to develop a cohesive national description of mercury pollution in Canada.



Atmospheric Monitoring Approach

- Utilization of a regional monitoring network (CAPMoN) combined with MDN siting criteria
- Purchase/loan of capital equipment (in-situ) measurements (Tekran 2537)
- Join MDN to ensure consistent analytical approach (one laboratory)
- Collaboration with Academia and other government department
- Strong Quality Assurance program

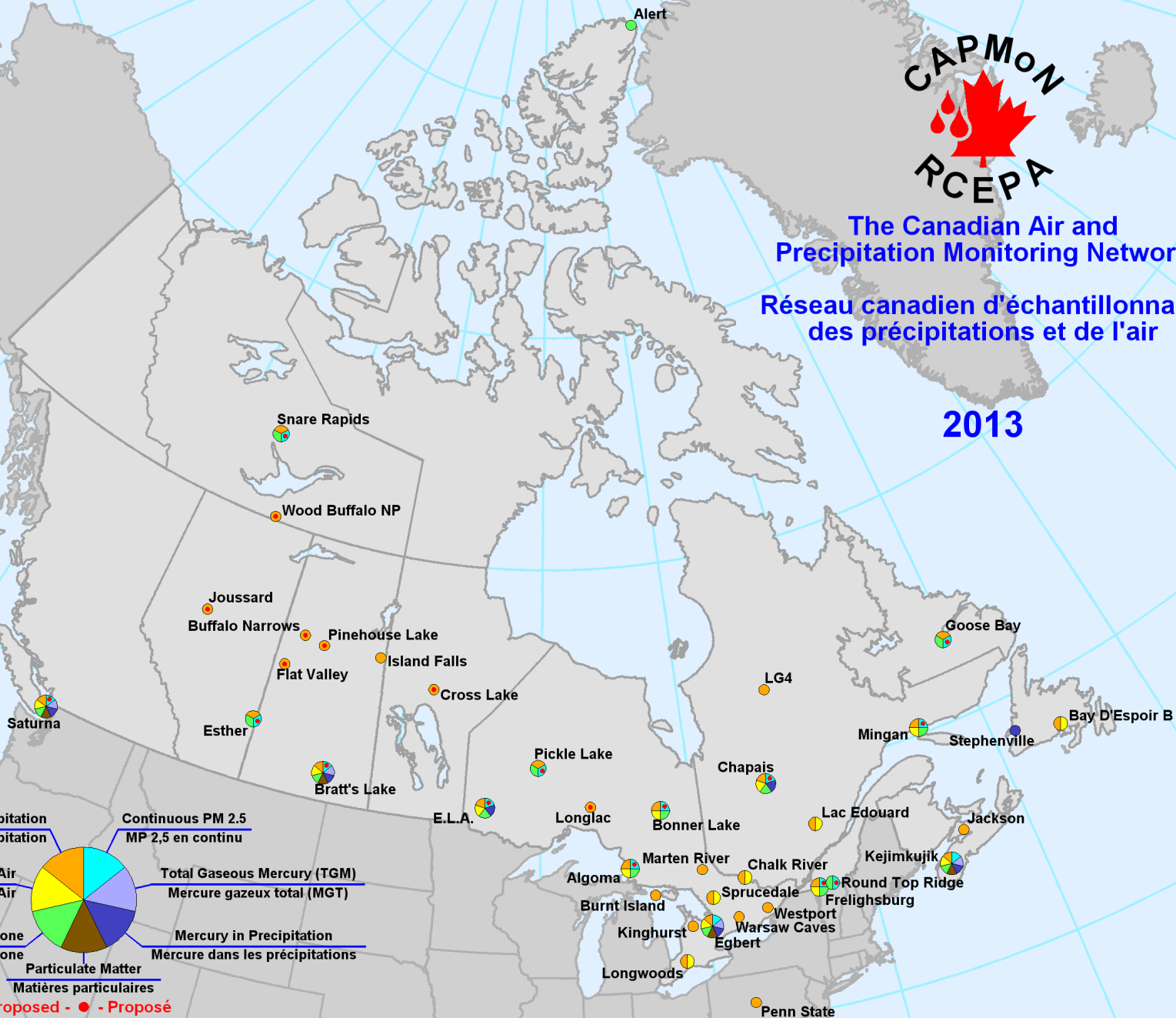
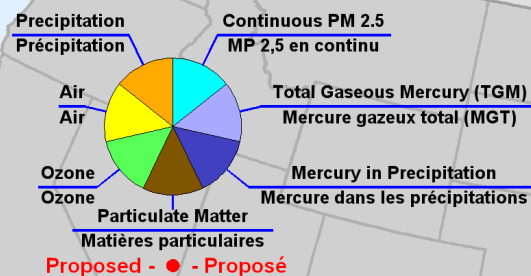


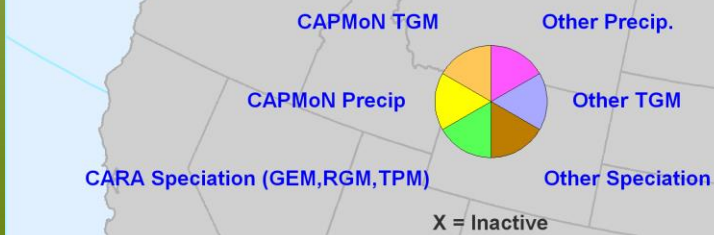


The Canadian Air and
Precipitation Monitoring Network

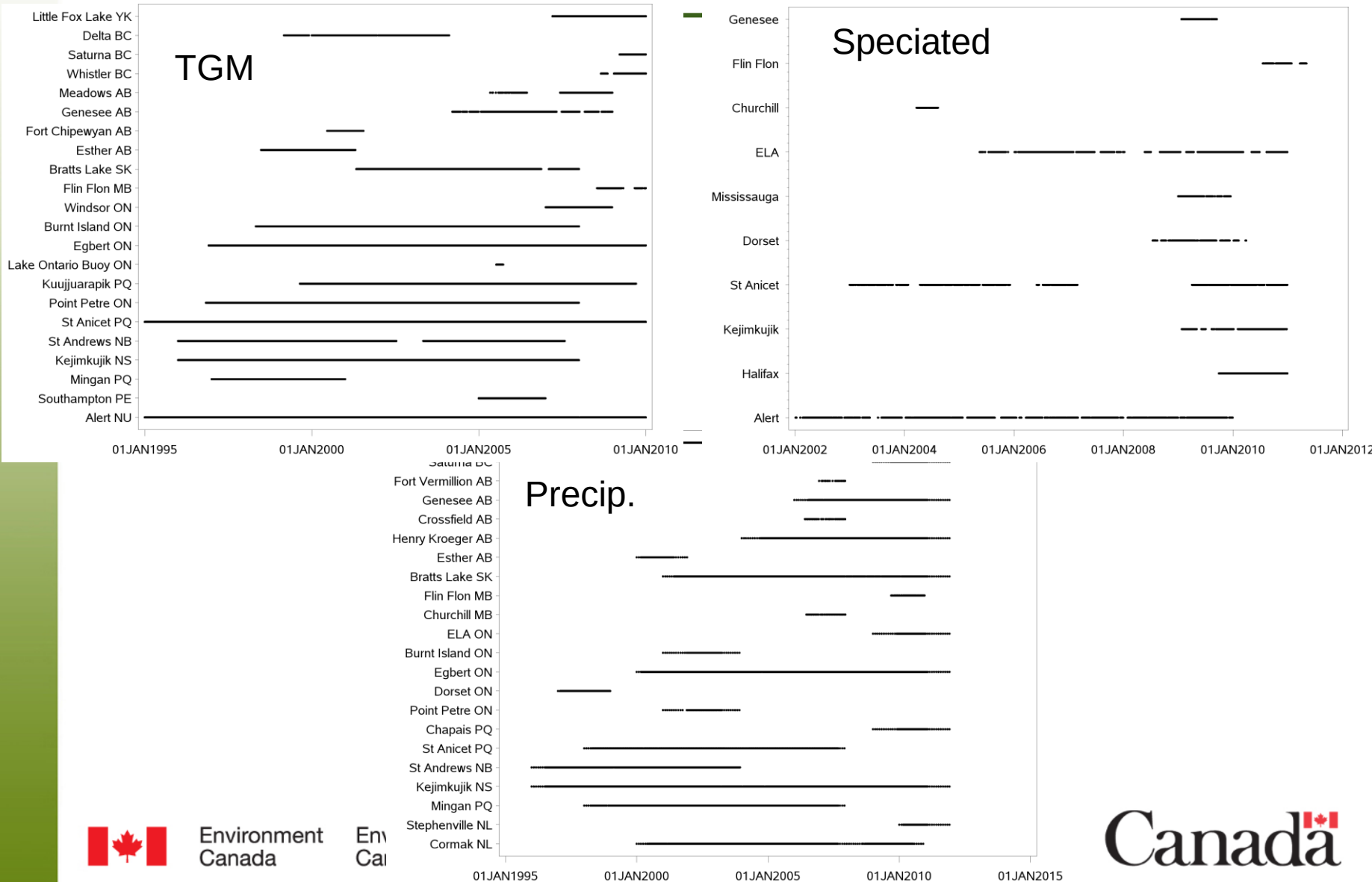
Réseau canadien d'échantillonnage
des précipitations et de l'air

2013





Atmospheric Mercury Data Coverage



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Mercury Measurements QA/QC



**Standard Operating
Procedures Manual
for
Total Gaseous Mercury
Measurements**

*CANADIAN ATMOSPHERIC MERCURY
MEASUREMENT NETWORK
(CAMNet)*

VERSION 4.0 (MARCH 1999)

Journal of Environmental Monitoring

Cutting-Edge Research on Environmental Processes & Impacts

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RSC Publishing

PAPER
Steffen et al.
A comparison of data quality control protocols for atmospheric mercury
speciation measurements

- CAMNet TGM SOP (1999)
 - Set up of instrument, trouble shooting, calibrations, check sheets and minor repairs
 - Widely distributed
- Speciation Instrument SOP
 - Developed for Alert in 2002
 - Changing glassware, shipping samples, troubleshoot problems, look at data, check sheets
 - Can be applied to any station
- QA/QC SOP
 - Steffen, A., Scherz, T., Olson, M.L., Gay, D.A. and Blanchard, P., 2012, A comparison of data quality control protocols for atmospheric mercury speciation measurements



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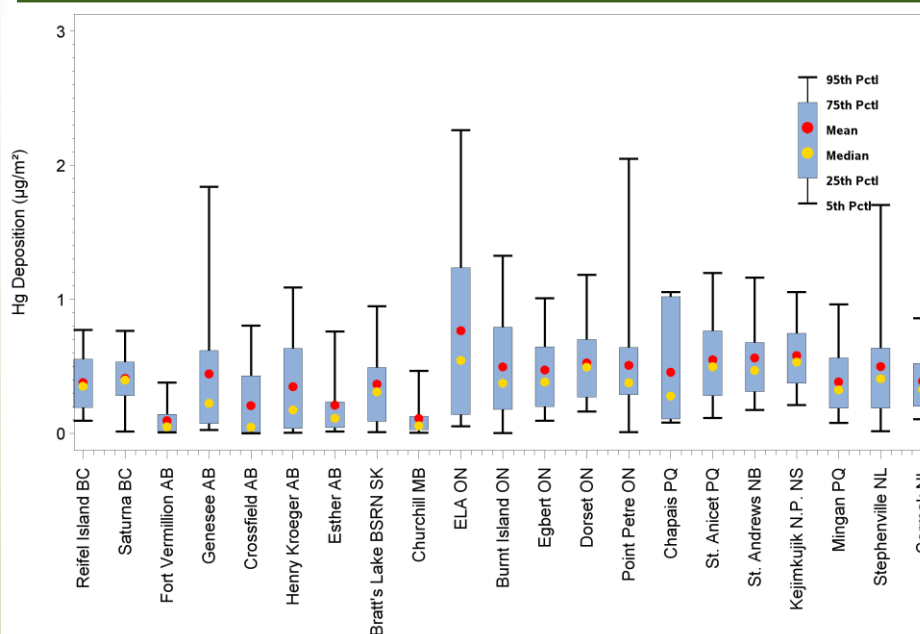
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Canadian Mercury Assessment

- All lead authors have submitted their chapters
- Scientific editing is underway
- Publication fall 2013
- Summary for policy makers

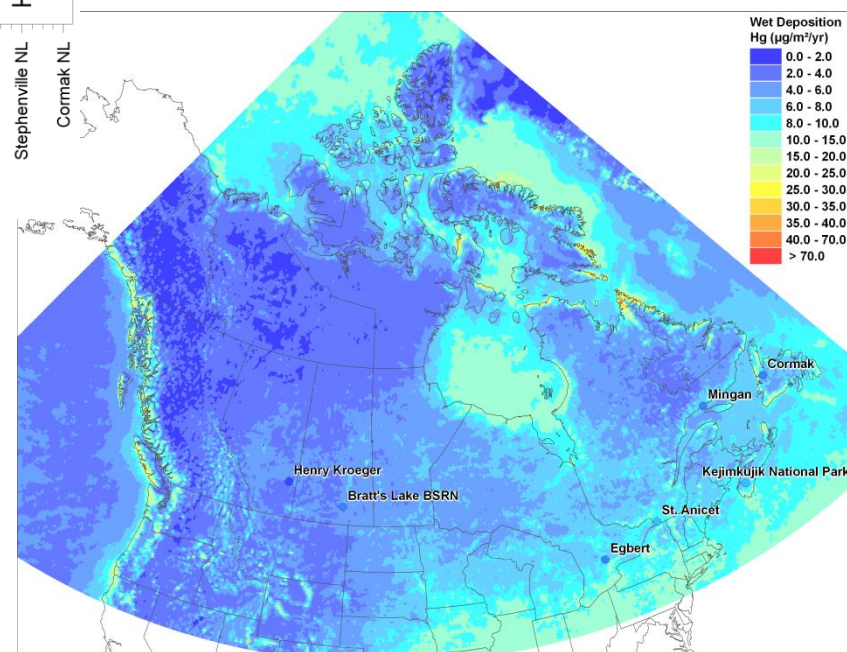


Some Results..



Seasonal patterns in TGM and wet deposition are similar across Canada and are consistent with model

However, seasonal patterns in RGM and TPM are not well represented in model, more work is needed.



Updated TGM trends in Canada

Site	Time period	TGM trend, pg m ⁻³ yr ⁻¹	TGM trend, % yr ⁻¹	Previous: Temme et al., 2007		
				Time period	Trend, pg m ⁻³ yr ⁻¹	Trend, % yr ⁻¹
Reifel Island	1999-2004	-55 (-70 to -40)	-3.3 (-4.2 to -2.4)	1999-2004	-37 ^{ns}	-2.03 ^{ns}
Genesee	2004-2010	-6 (-21 to +1) ^{ns}	-0.4 (-1.4 to +0.1) ^{ns}			
Bratt's Lake	2001-2010	-37 (-48 to -23)	-2.5 (-3.4 to -1.6)	2001-2005	+6 ^{ns}	+0.43 ^{ns}
Burnt Island	1998-2007	-15 (-22 to -7)	-1.0 (-1.4 to -0.4)	1998-2005	-11	-0.67
Egbert	1996-2010	-20 (-27 to -16)	-1.3 (-1.7 to -1.0)	1996-2005	-4	-0.24
Kuujuarapik	1999-2009	-40 (-55 to -23)	-2.4 (-3.4 to -1.4)			
Point Petre	1996-2007	-29 (-38 to -20)	-1.7 (-2.2 to -1.2)	1996-2005	-37	-1.81
St. Anicet	1995-2009	-24 (-29 to -19)	-1.5 (-1.8 to -1.2)	1997-2005	-26	-1.46
St. Andrews	1996-2007	-30 (-42 to -20)	-2.2 (-3.1 to -1.5)	1996-2004	-12	-0.82
Kejimikujik	1996-2010	-14 (-20 to -6)	-1.0 (-1.4 to -0.5)	1996-2004	+5	+0.37
Alert	1995-2009	-11 (-15 to -6)	-0.7 (-1.0 to -0.4)	1995-2005	-5 ^{ns}	-0.31 ^{ns}
RURAL- AFFECTED	St. Anicet, Point Petre, Egbert	-24 (-27 to -20)	-1.5			
RURAL- EAST	Kejimikujik, St. Andrews	-17 (-21 to -10)	-1.2			



Updated TGM trends in Canada

- Decreases in TGM and precipitation concentrations consistent across Canada
 - In contrast to increasing global emissions
 - Possibly due to decline in ocean concentrations, which could slow/reverse
 - Declines in TGM slower and more seasonally variable in Arctic
 - Missing wet deposition in Arctic



Summary

- Canada continues to monitor mercury, utilizes CAPMoN infrastructure, part of MDN.
- Publication of Canadian mercury science assessment planned for fall 2013 including summary for policy makers.
- Atmospheric monitoring can contribute to effectiveness evaluation of Minimata Convention.

