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# Tracking Benzene and VOCs in Ambient Air in Montreal's East End - 1989-2004

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Anne-Marie Carter  
André Germain  
Air Quality  
Environmental Protection Operations - Quebec



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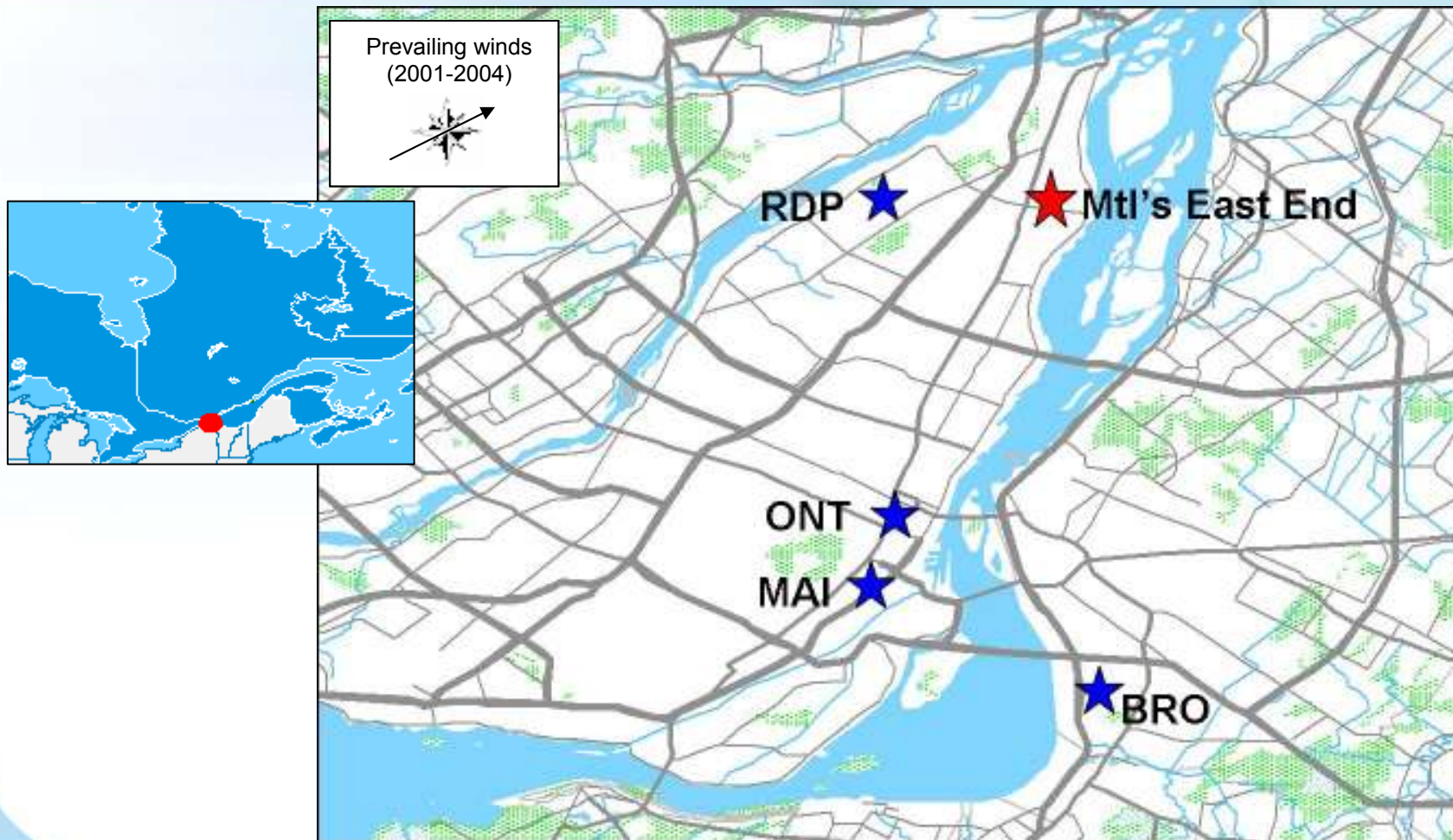


# Background

- Benzene, individual VOCs and VOCs are listed on the Toxic Substances List of the Canadian Environmental Protection Act (CEPA)
- VOCs are  $O_3$  and  $PM_{2.5}$  precursors
- Industrial sector located in Montreal's East End
- Benzene: highest average and maximum values in Canada
- 60% reduction between 1989 and 2000
- In 2003, 2 new petrochemical facilities



# Sampling stations



# Sampling station in Montreal's East End



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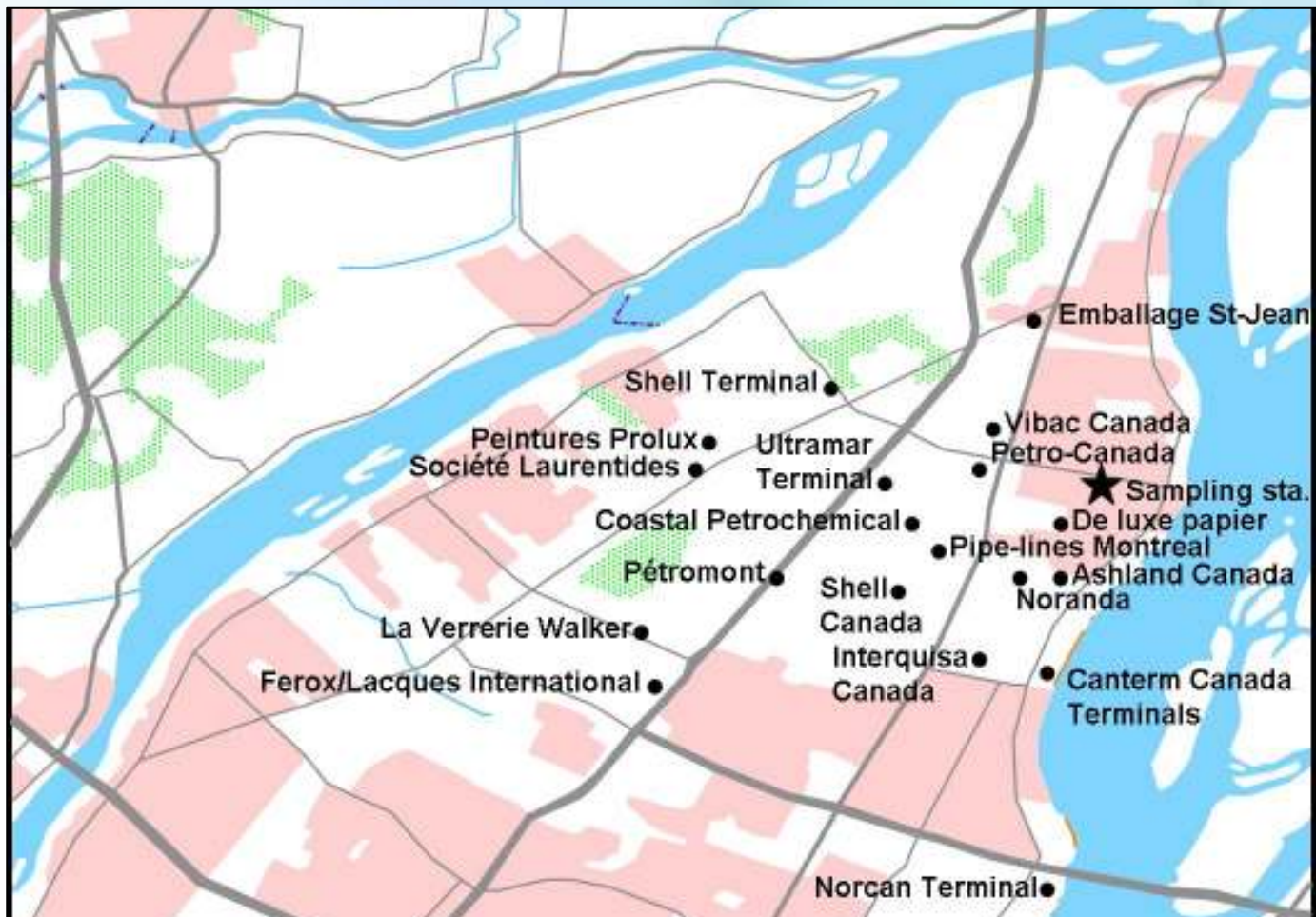
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# Methods

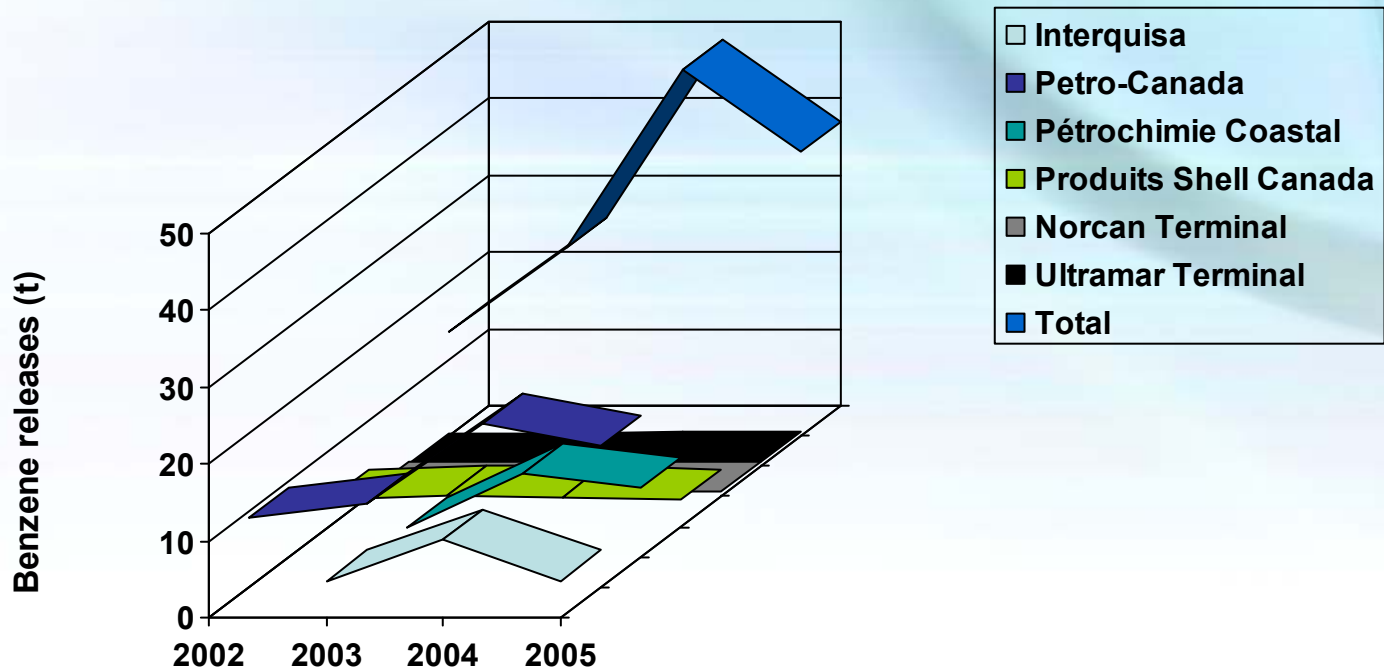
- Sampling every 6 days, on a 24-h period (every 2-3 days in Montreal's East End for 2003)
- EPA's TO-11 and TO-14 methods
- 171 VOCs
  - 46 alkanes, 43 alkenes/alkynes, 25 aromatics, 41 halogenated VOCs, 16 polar VOCs
- Meteorological station



# Facilities reporting VOCs to the NPRI



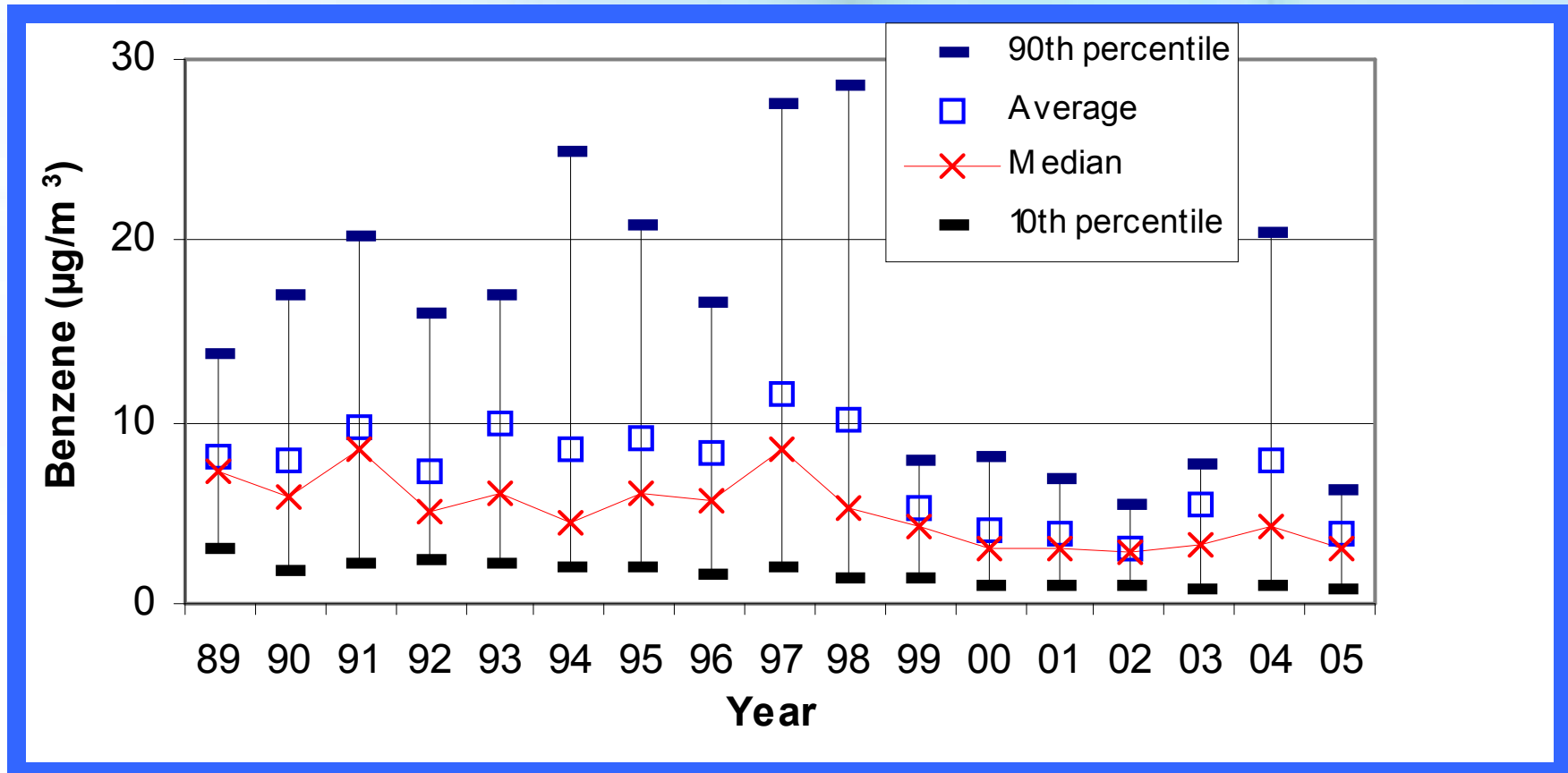
# Benzene releases reported to the NPRI



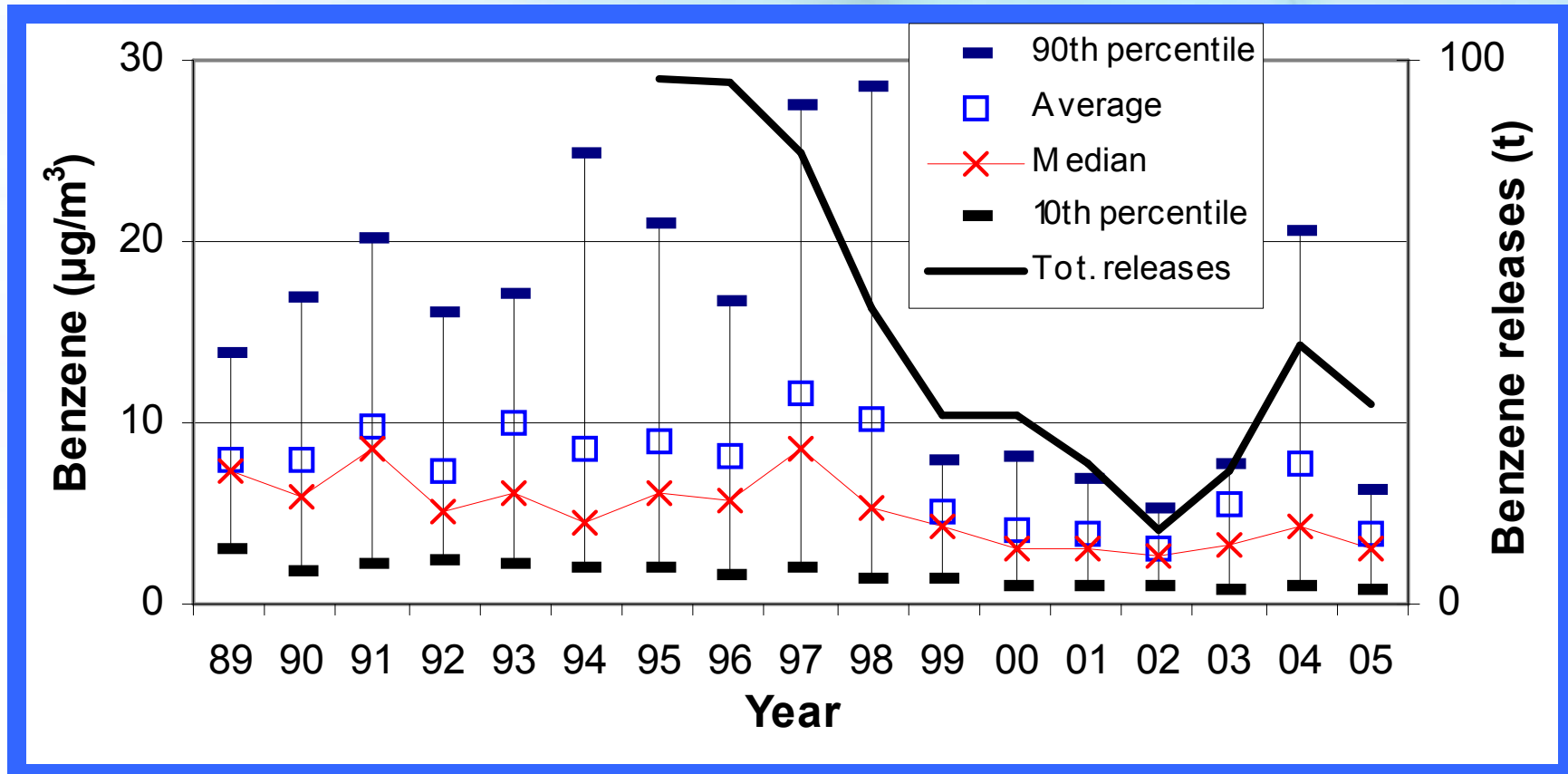
1995-2002: total benzene releases reported declined by 86%  
2002-2004: increase of 250%  
2004-2005: decrease of 33%



# Benzene concentrations - 1989-2005



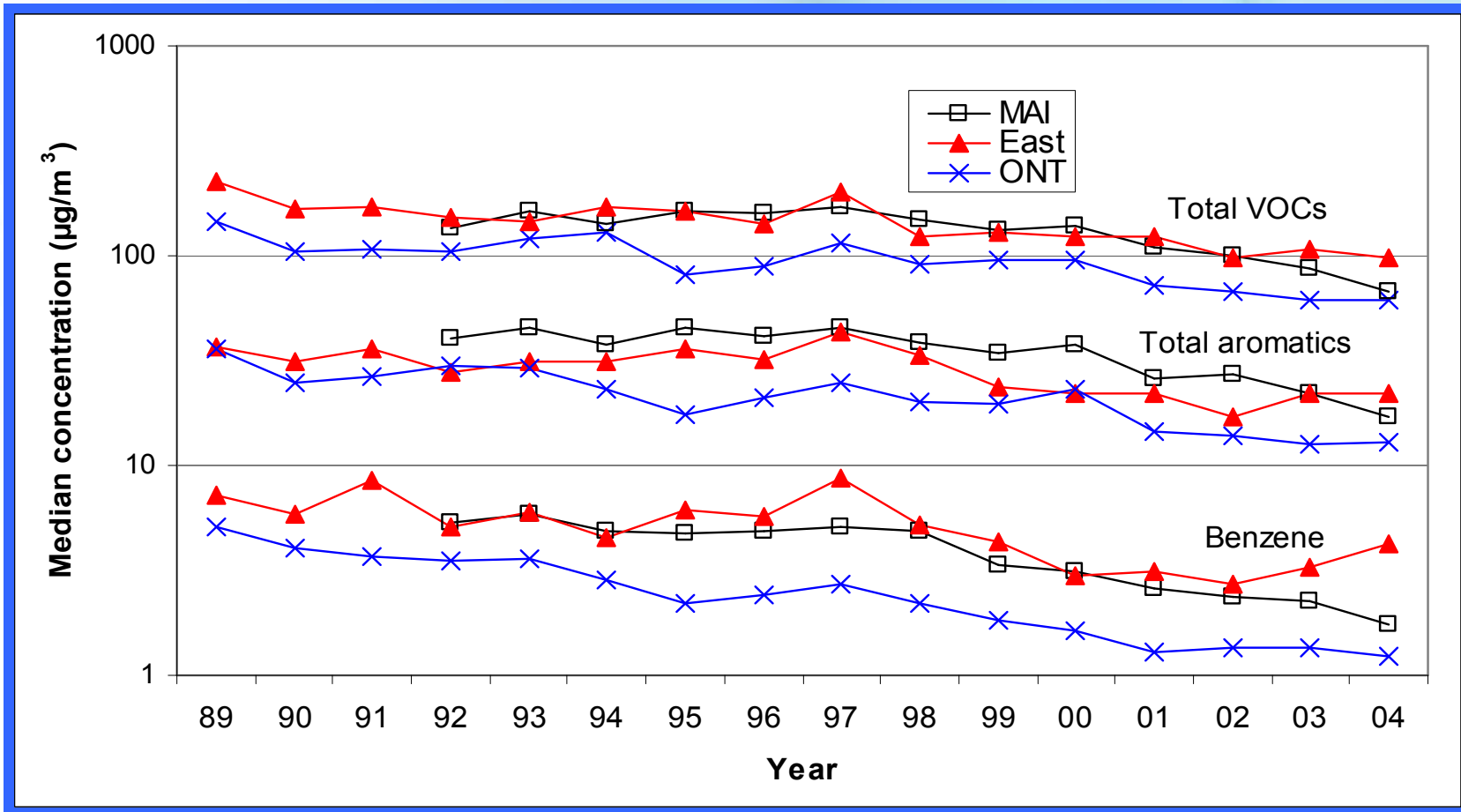
# Benzene concentrations and releases



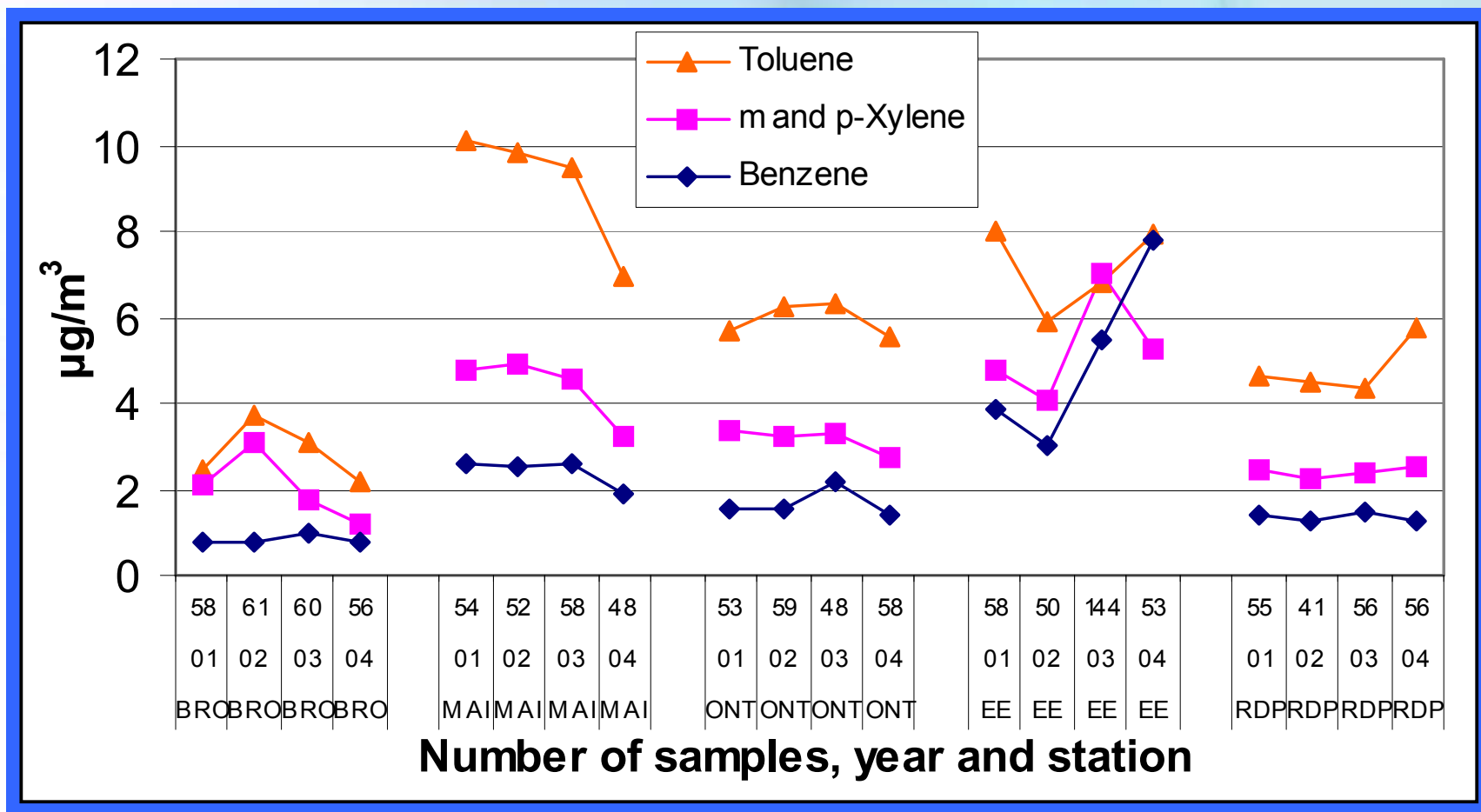
# Reduction of benzene and VOCs in environment

1998	City of Montreal's Bylaw 90-3: recovery of gasoline vapours at terminals and service stations
1999	CEPA's Benzene in Gasoline Reg. prohibits sale with >1.5%
1999	Coastal Petrochemical of Canada Ltd ceases operations
2000	City of Mtl (90-5): emission stds for manuf. org. products by oxidation
2001	City of Mtl (90-6): requirements for petrochem. plants (floating roofs)
2001	CEPA's Gas. Dispensing Flow Rate Reg.: prohibits flow >38 l/min
2004	CEPA's On-Road Vehicle and Engine Emissions Reg.: new stds
2004	City of Mtl identified and corrected new emission sources in sector
2005	CEPA's Off-Road Small Spark-Ignition Reg.: lawn + garden equipment

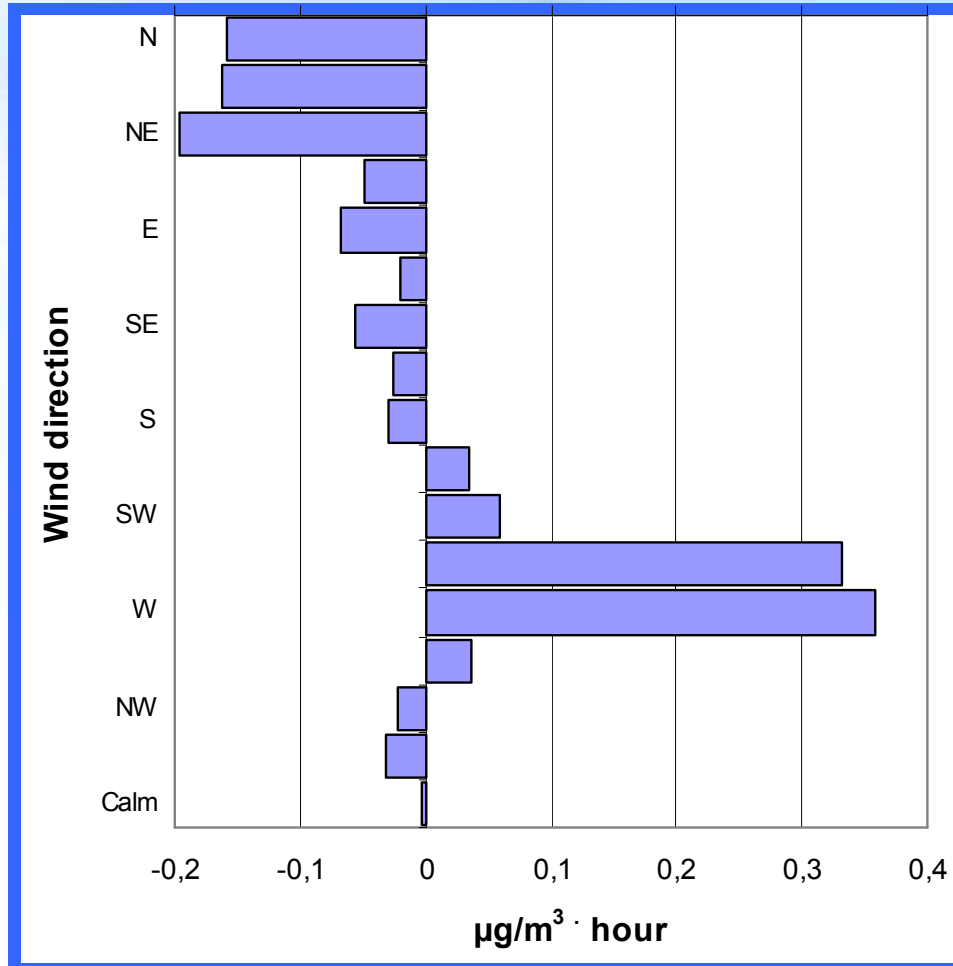
# Concentration history at 3 sampling stations (1989-2004)



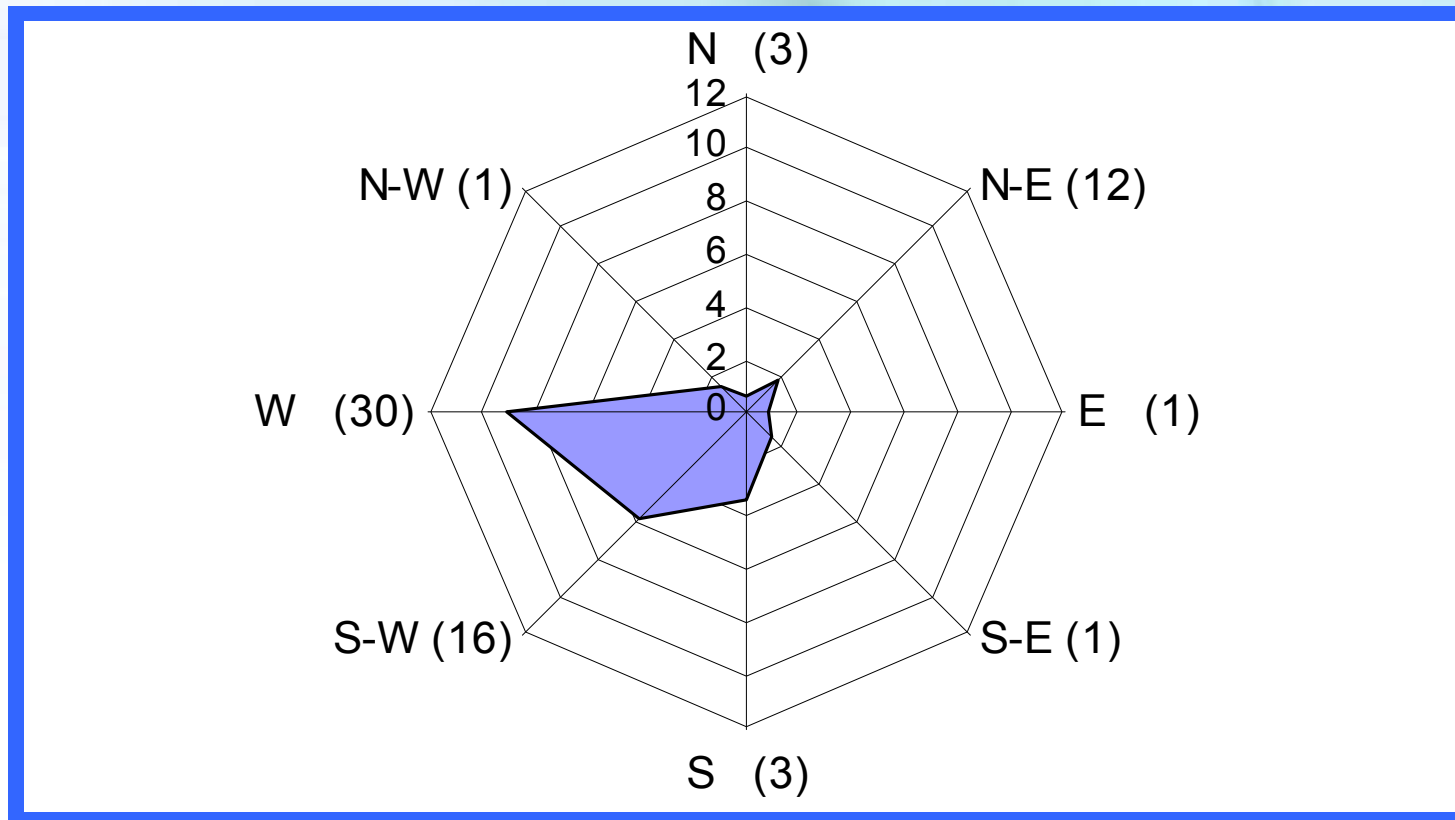
# Benzene, m/p-xylenes, toluene at 5 stations



# Variation in the rate of increase (decrease) in benzene concentration with wind direction



# Benzene concentration when wind blows 15 hours or more per direction



Total of 173 sampling days from May 2003 to December 2004

# Conclusion

Year	NPRI Releases (t)	Concentrations in air ( $\mu\text{g}/\text{m}^3$ )	
		Average	Median
1997	83	12	9
2002	14 (84%↓)	3 (74%↓)	3 (68%↓)
2004	47 (250%↑)	8 (160%↑)	4 (55%↑)
2005	37 (33%↓)	4 (51%↓)	3 (28%↓)

- 6 facilities reported benzene releases
- 2005 concentrations in air down to 2002 levels
- Benzene was 5 and 3 times higher when wind blew from W and SW compared to NE, reflecting the presence of industrial sector



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# Thank you!



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