

# Innovative Approach for Environmental Data Visualization

**Dr. Long Fu, Director  
Standards, Quality and Innovation**

**Alberta Environmental Monitoring, Evaluation  
and Reporting Agency**

2015 CPANS 2015 Conference  
May 26-27, 2015



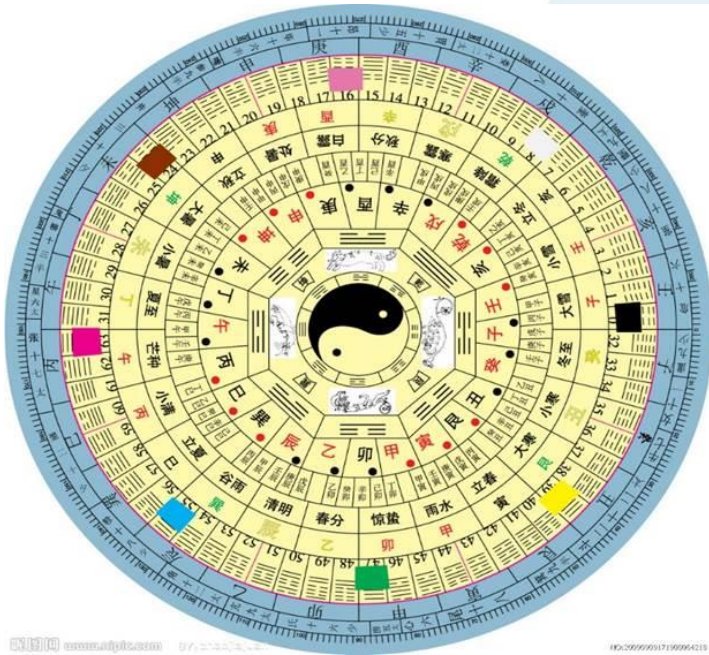




R. BEAU LOTTO

# Eye – Brain Data Transfer Rate: 10 GB/s

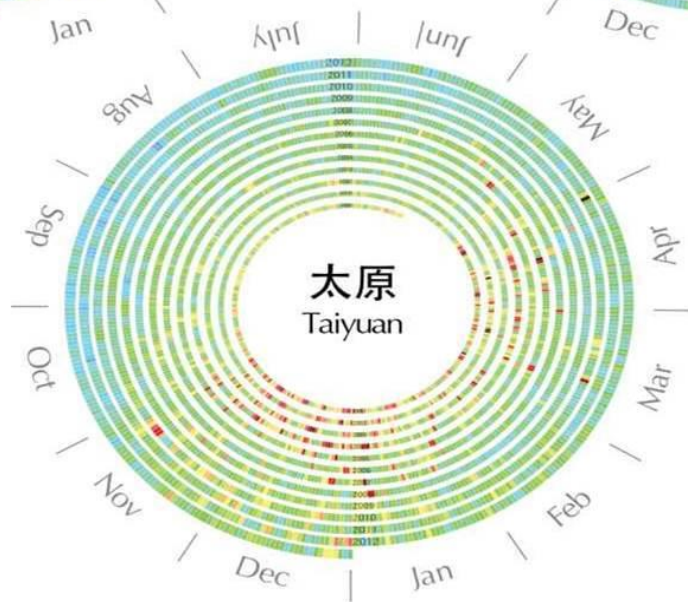
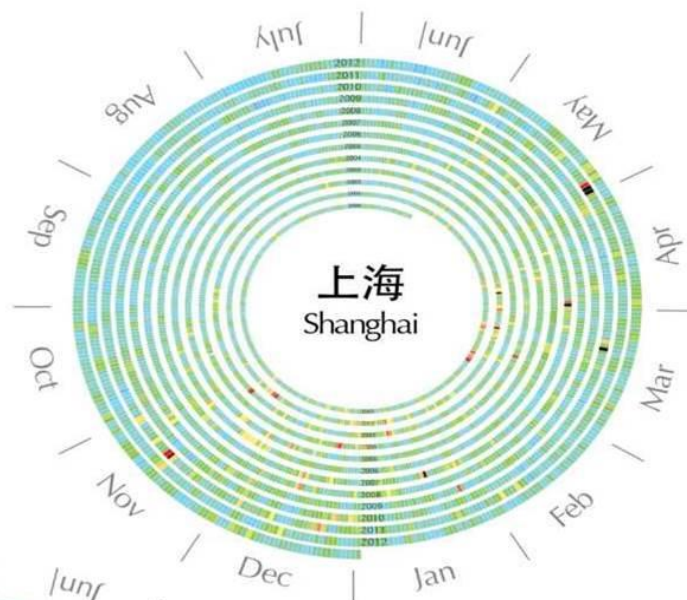
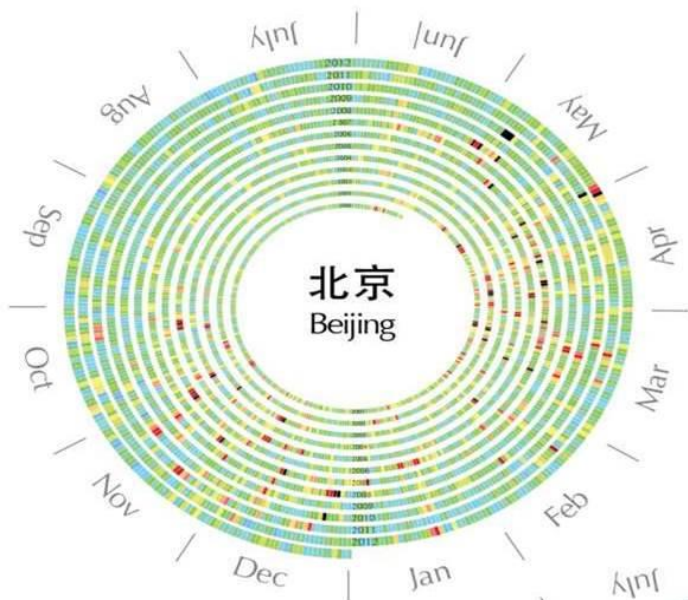




# 苏蕙 SU HUI's palindrome poem



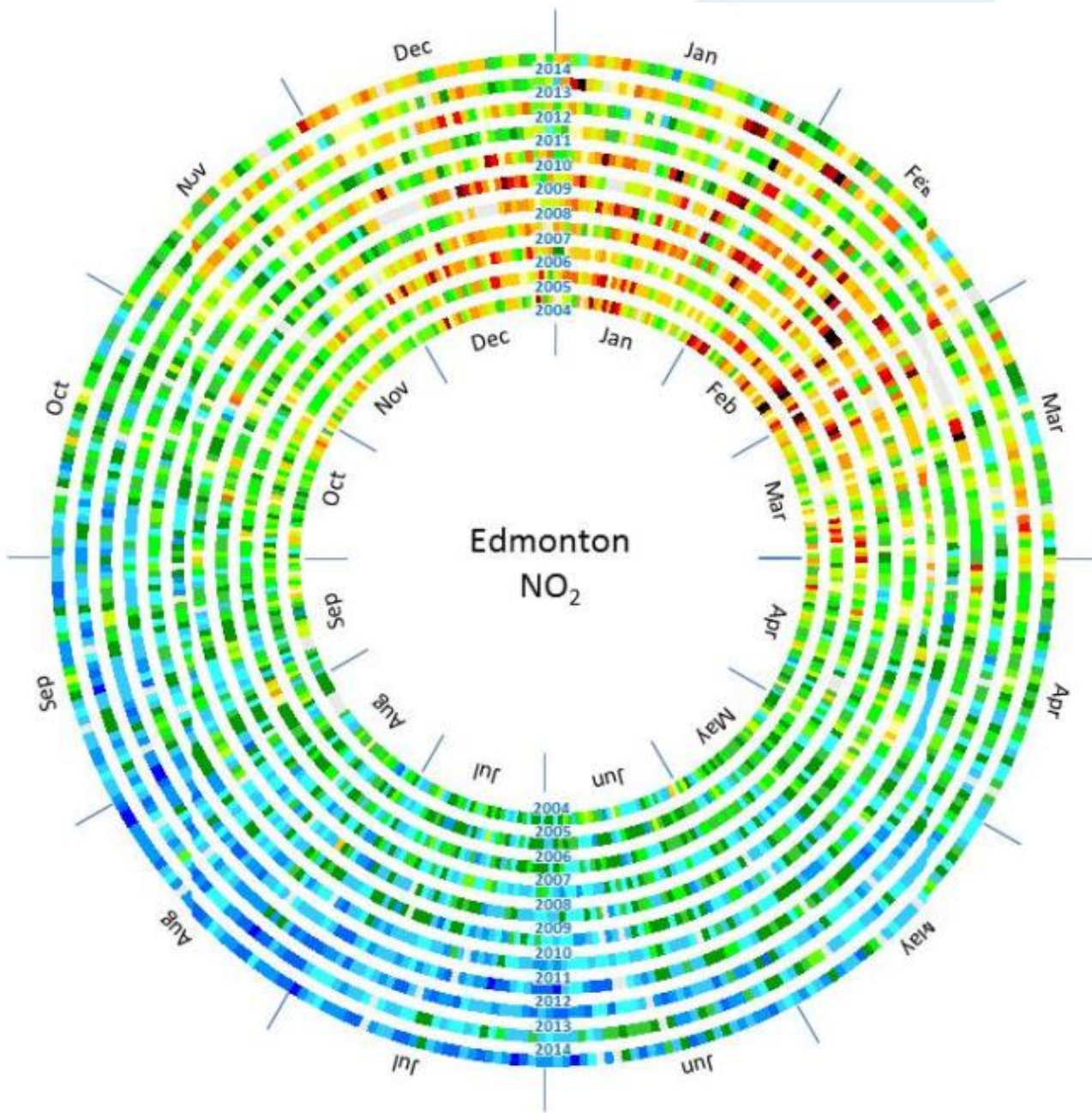
仁智懷德聖虞唐貞妙顯華重榮章臣賢惟聖配英皇倫匹離飄浮江湖津  
傷嗟情家明葩榮志庭闈亂作人讒奸佞凶害我忠貞桑凶慈雍思恭基河  
慘歎中無鏡紛為篤明難受消源禍因所恃恣極驕盈榆頑孝和淑自為隔  
懷懷傷君朗光誰終榮苟不義姬班女婕好辭輦漢成薄漫休家貞記孝塞  
慕所路房容珠感誓城傾在戒后孽嬖趙氏飛燕實生景讒退遠敦貞敬殊  
增離曠幃飾曜思穹焚猶炎盛興漸至大伐用昭青青昭愚謙危節所是山  
憂經遐清華英多蒼形未慎深慮微察遠禍在防萌西滋蒙疑容持從梁  
心荒淫妄想感所欽岑幽巖峻岷峨深淵重涯經網羅林光流電逝推生民  
堂妃闈飛衣誰追何思情時形寒歲識凋松愆居歡如陽移陂施為祇差生  
空后中奮衰為相如感傷在勞貞物知終始舊獨懷何潛西不何誰神無感  
惟自節能我容聲將自孜君夢想顏喪改革容是為女賤曜日激無通者曠  
思興厲不歌治同情寧孜側夢仁賢別行士念誰賤鄙翳白無憤將上採悲  
詠風樊歎發觀羽纏龍旌容衣詩情明顯怨衰情時傾英殊衰殊身節菲路  
和周楚長雙華宮憂虎彫飾繡始璇璣圖義年勞歎奇華年有志飾志葑長  
音南鄭歌商流徵殷繁華觀曜終始心詩興感遠殊浮沉時盛意麗哀遺身  
藏邵衛詠齊曜情多文曜壯觀曜終始心詩興感遠殊浮沉時盛意麗哀遺身  
摧伯女志興榮傷患藻榮麗充端比作麗辭日思慕世異浮惟必心華惟下微  
悲窈河遐碩翠感生嬰漫漫丁冤詩風興鹿鳴懷悲哀誰逝倏無一俯憂作己  
聲窈廣路人桀我艱是漫是何桑醫盛孟宣傷感情者頽然盈體仰情者處  
發淑思透其葳情惟憂何艱生時盛昭業傾思水戚我流若不忠容何成幽  
曲姿歸迤頎蕤悲苦懷思苦我章微恨微元悼歎戚知沙馳虧離儀贊辭房  
秦王懷土眷舊鄉身加兼愁悴少精神遐幽曠遠離鳳麟龍昭德懷聖皇人  
商遊桑鳩揚仇傷榮身我乎集殃愆辜何因備當苦辛當神飛文遣分歸賤  
絃西翳雙激好摧君深日潤浸愆思罪積怨其根難尋所明輕殊孤乖雁為  
激階陰巢水悲容仁均物品育施生天地德貴平均勻專通身桀妾殊翔女  
楚步林燕清思發離濱漢之步飄飄高微隔喬木誰陰一感寄筋散聲應有  
流東桃飛泉君歎殊心改者惑曜親聞遠離殊我同衾志精浮光離哀傷柔  
清廊休翔流長愁方禽伯在誠故遺舊廢故君子惟新貞微雲輝群悲春剛  
琴芳蘭凋茂熙陽春牆面殊意感故新霜水齊潔志清純望誰思想懷所親



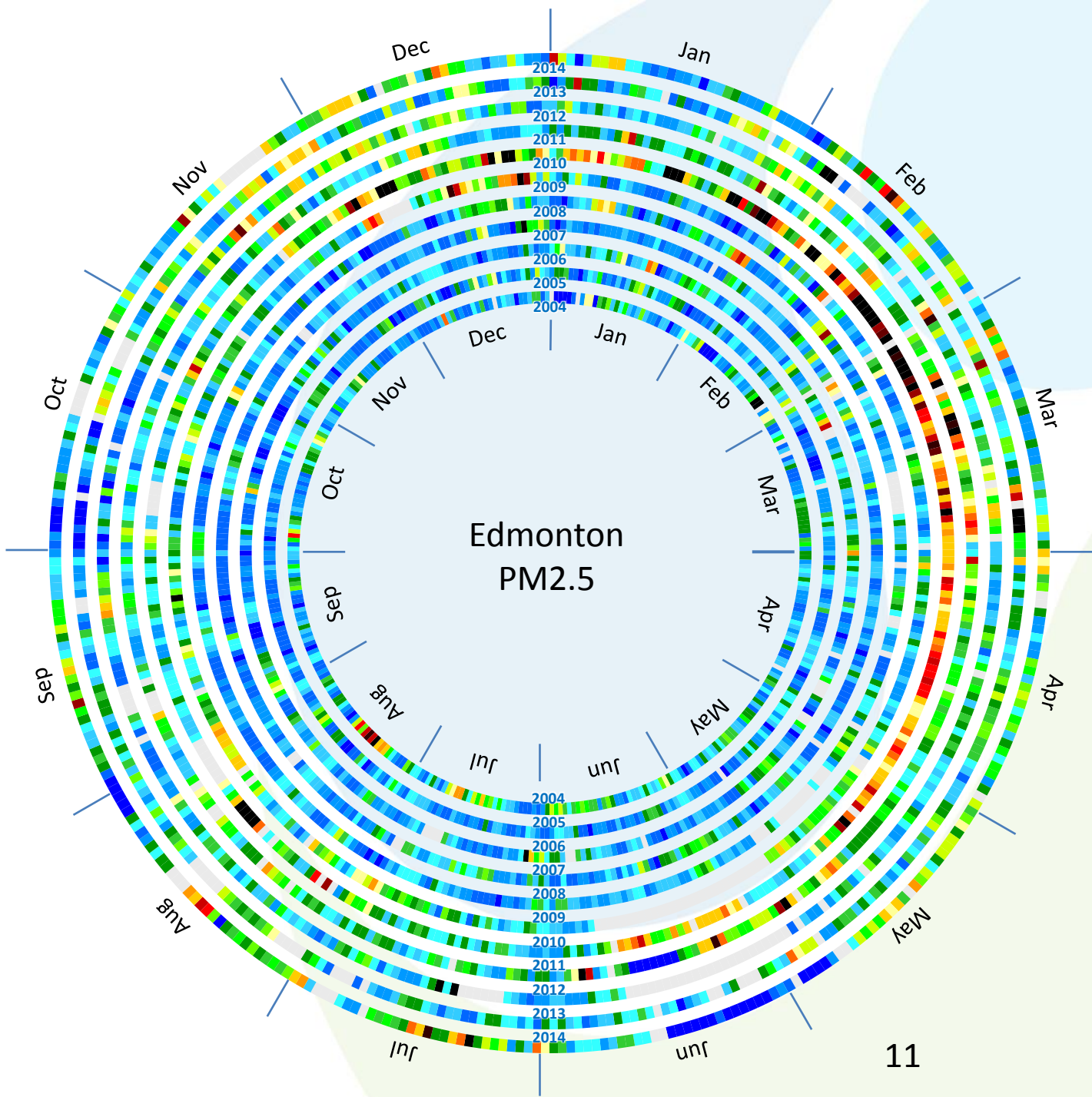


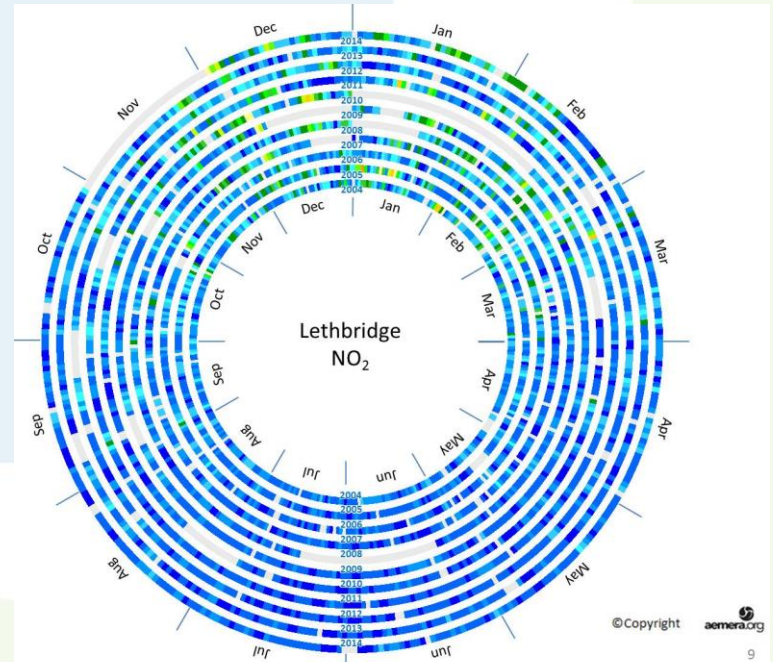
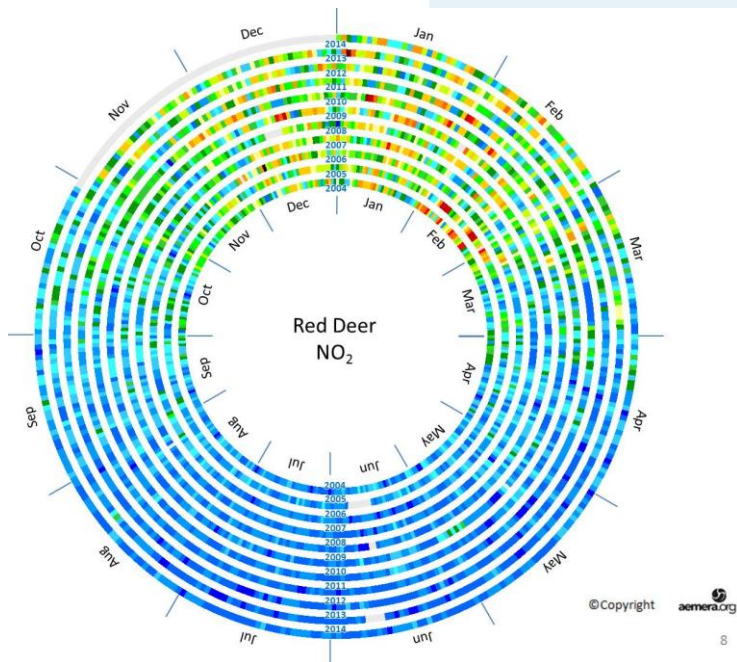
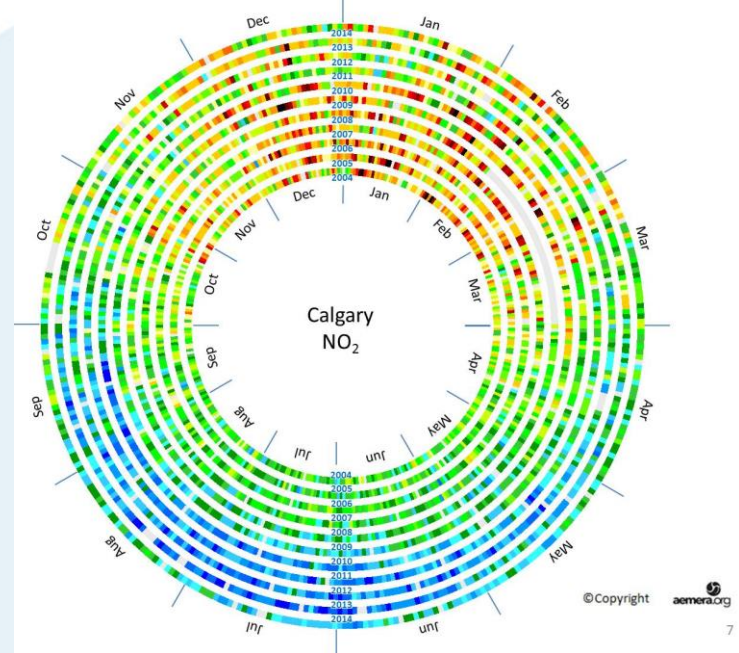
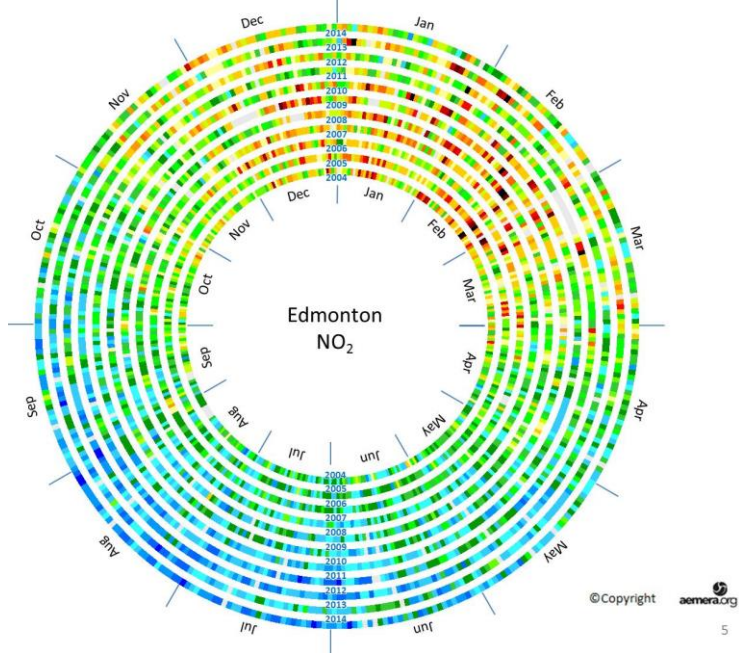
# Conceptual Design

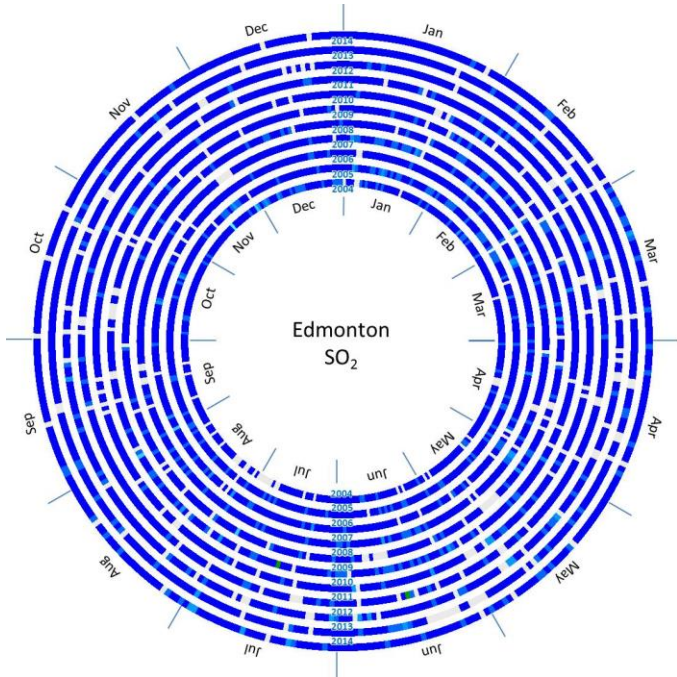
- Use individual air quality parameter over 10 years
- Location and parameter are presented in the middle of the inner circle
- Daily average data for each year are grouped in bins using air quality index cut off values
- Data from each year are arranged in a complete circle
- Consistent color scale is applied for the entire region



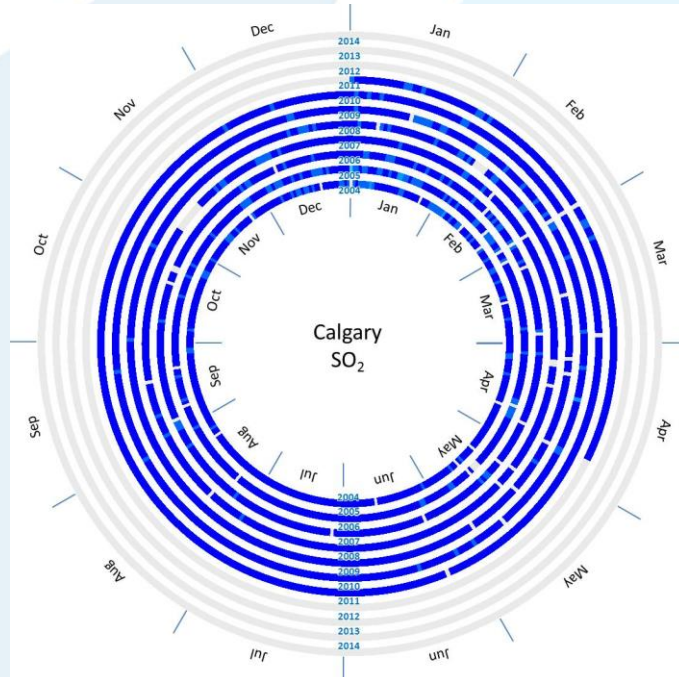
	NA or 0
	> 0 and < 12.8
	>= 12.8 and < 25.5
	>= 25.5 and < 38.3
	>= 38.3 and < 51
	>= 51 and < 63
	>= 63 and < 75
	>= 75 and < 87
	>= 87 and < 99
	>= 99 and < 111
	>= 111 ppb



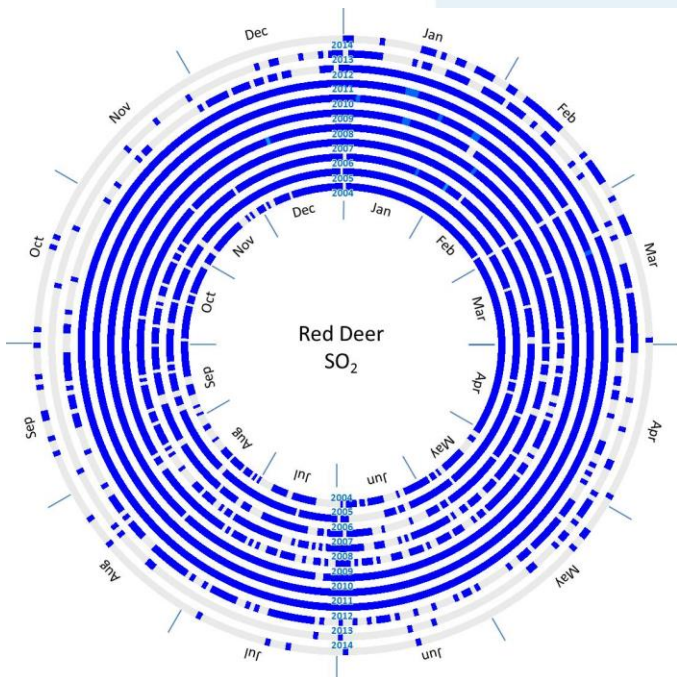




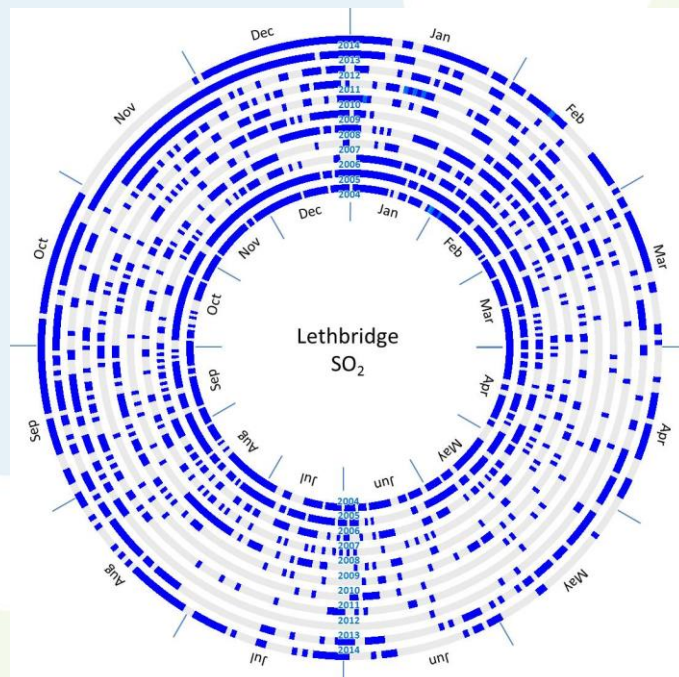
18



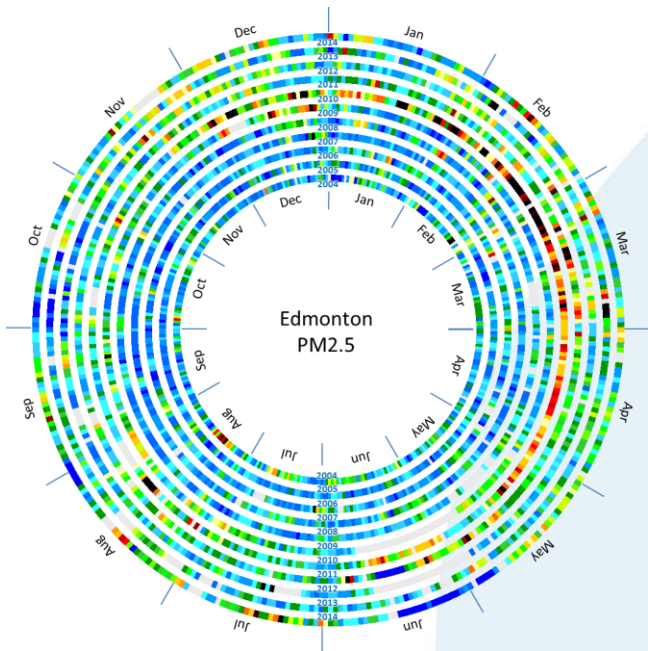
19



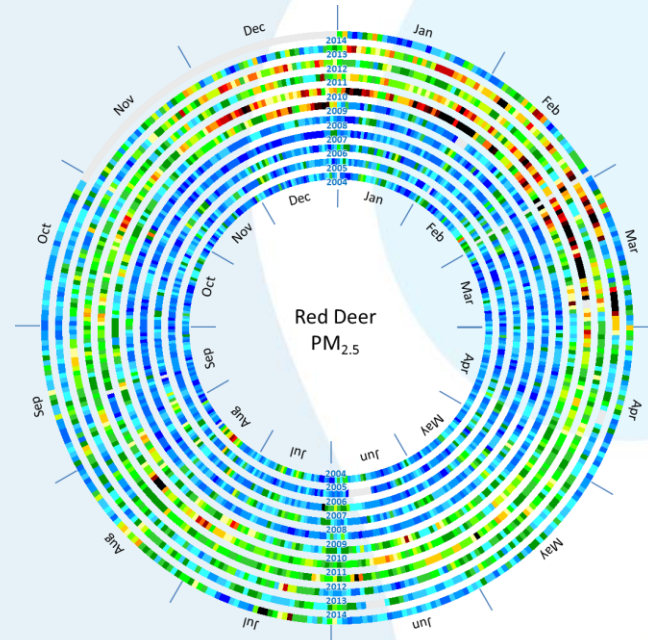
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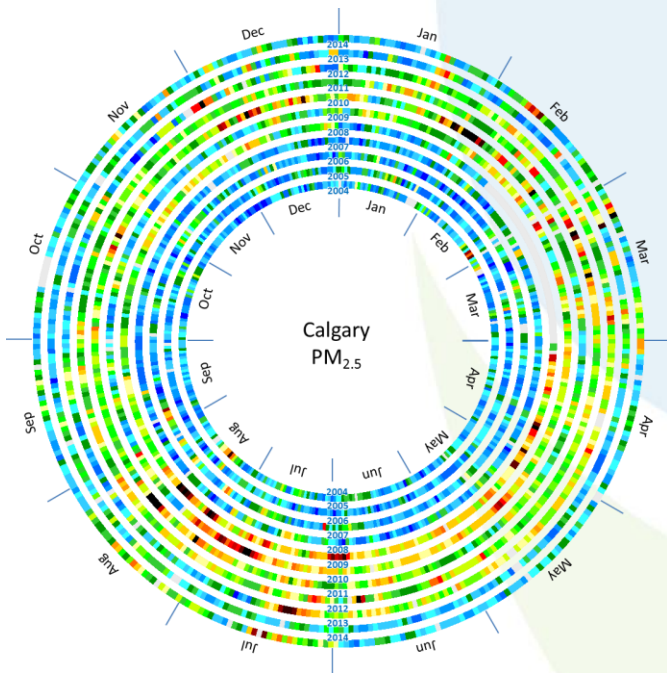
21



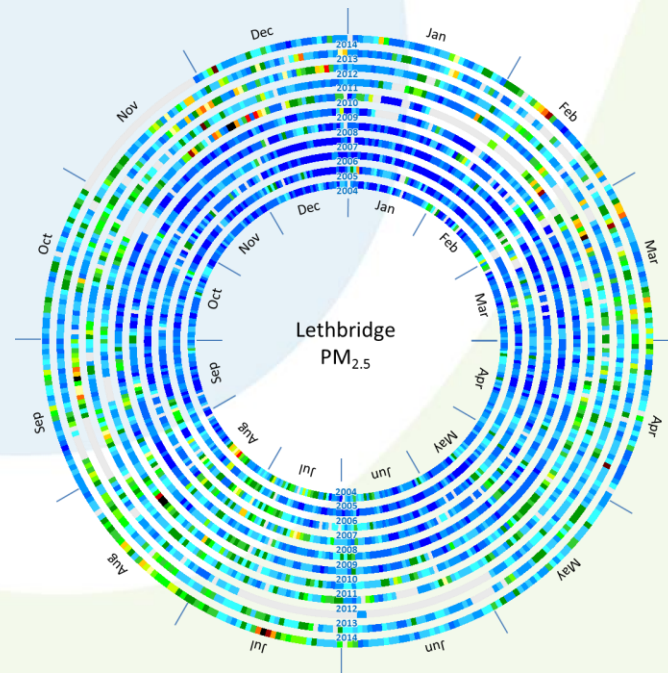
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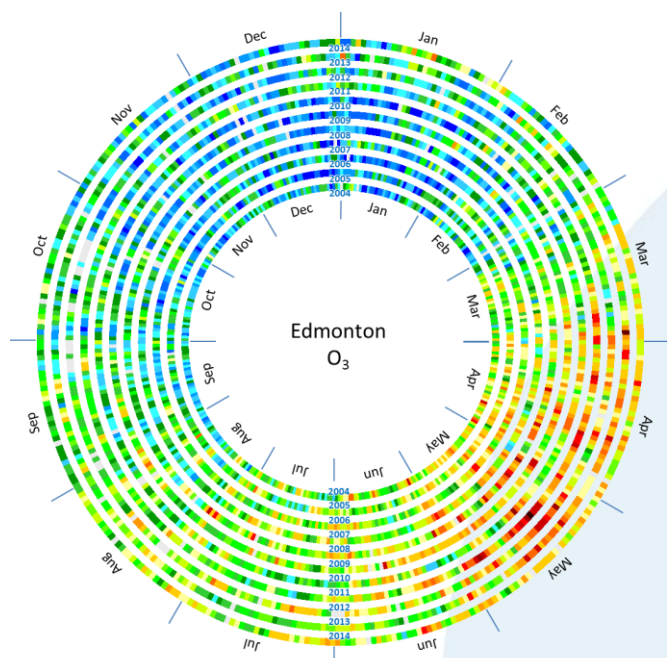
9



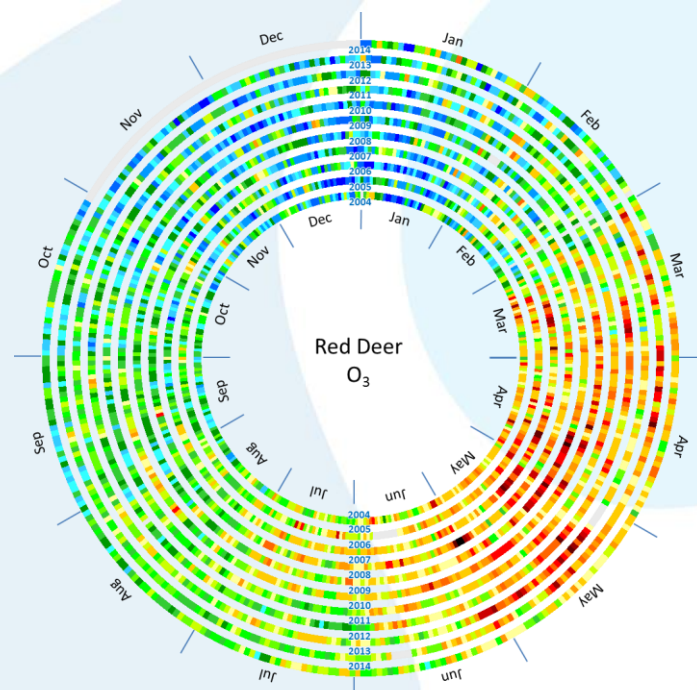
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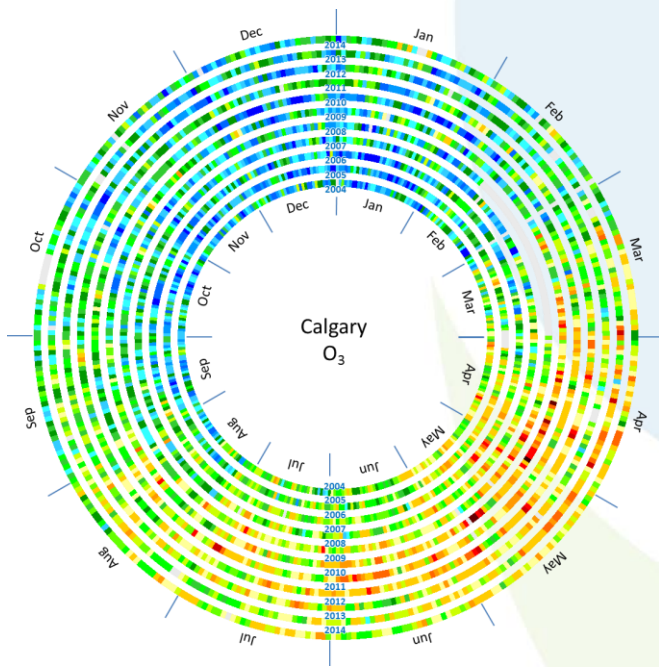
17



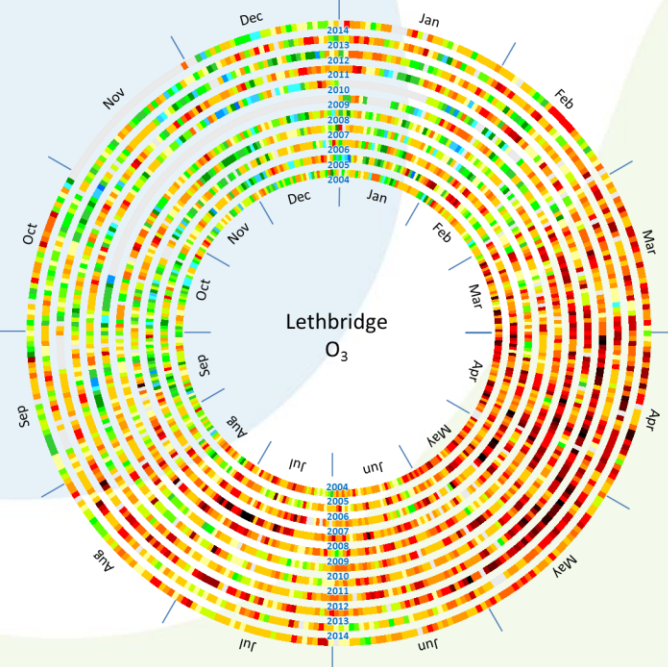
4



8



12



16

# Contributors

- Vadim Uritsky;
- Harpreet Singh;
- Jason Ye;
- Yichen Tian;
- Longdong Zhang;
- Prabal Roy

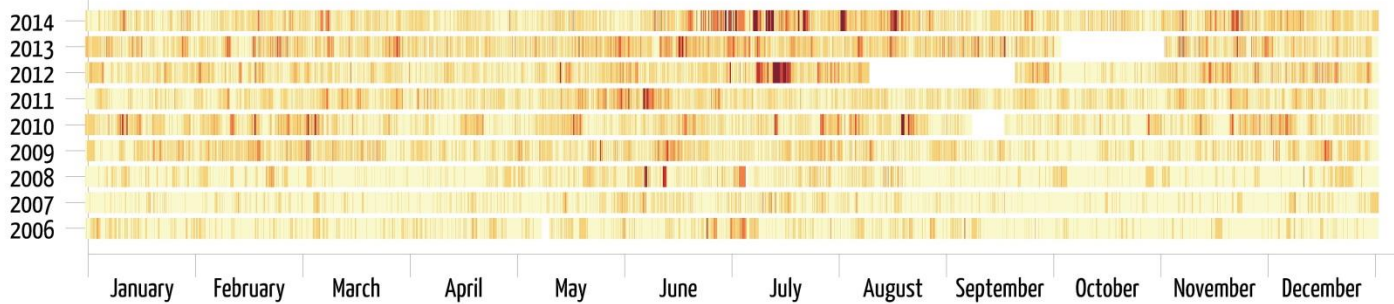




# Lakeland Industry and Community Association Airshed Zone

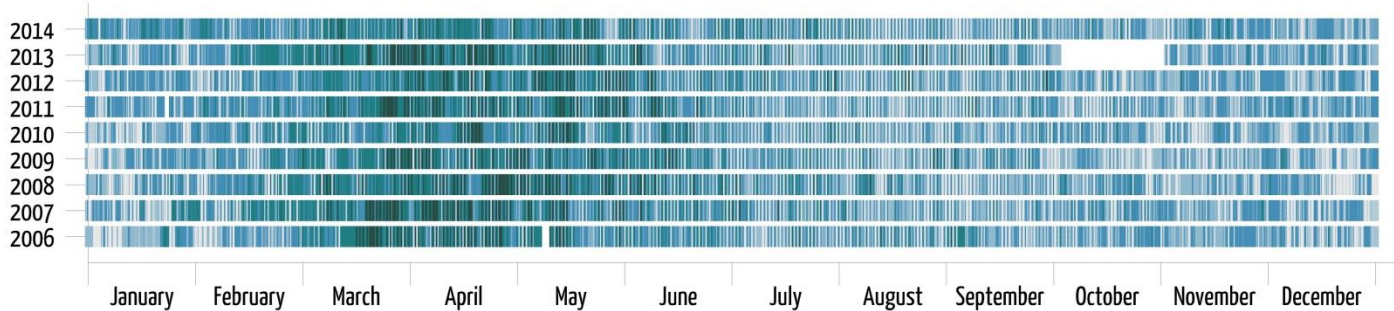
## "Air Quality DNA" Data Visualization: Selected Parameters at Cold Lake, Alberta

Michael Bisaga  
 Manager, Environmental Monitoring Programs  
 lica2@lca.ca, 780 812-2182  
 Version 1: March 2, 2015



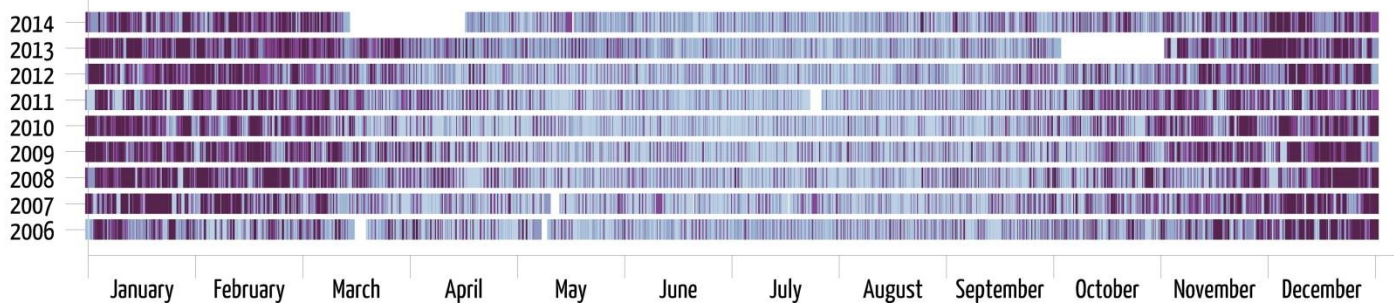
**Particulate Matter ( $\mu\text{g}/\text{m}^3$ )**  
 1-hour Average Measurements  
 2006-2014, n=74,775

- <5
- 5 to <15
- 15 to <25
- 25 to <30
- >30



**Ozone (ppm)**  
 1-hour Average Measurements  
 2006-2014, n=75,039

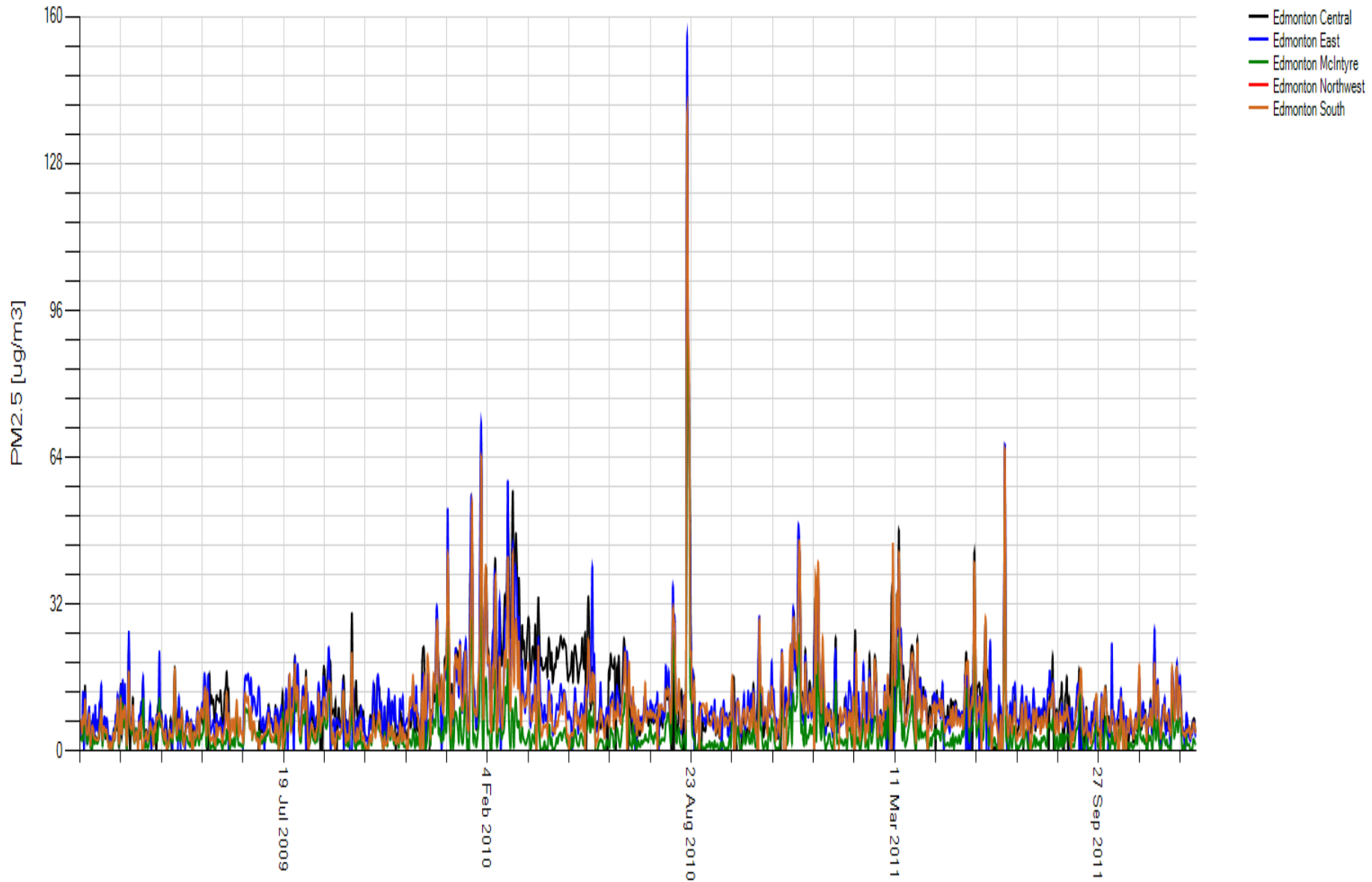
- <0.012
- 0.012 to <0.024
- 0.024 to <0.036
- 0.036 to <0.048
- >0.048



**Nitrogen Dioxide (ppm)**  
 1-hour Average Measurements  
 2006-2014, n=73,720

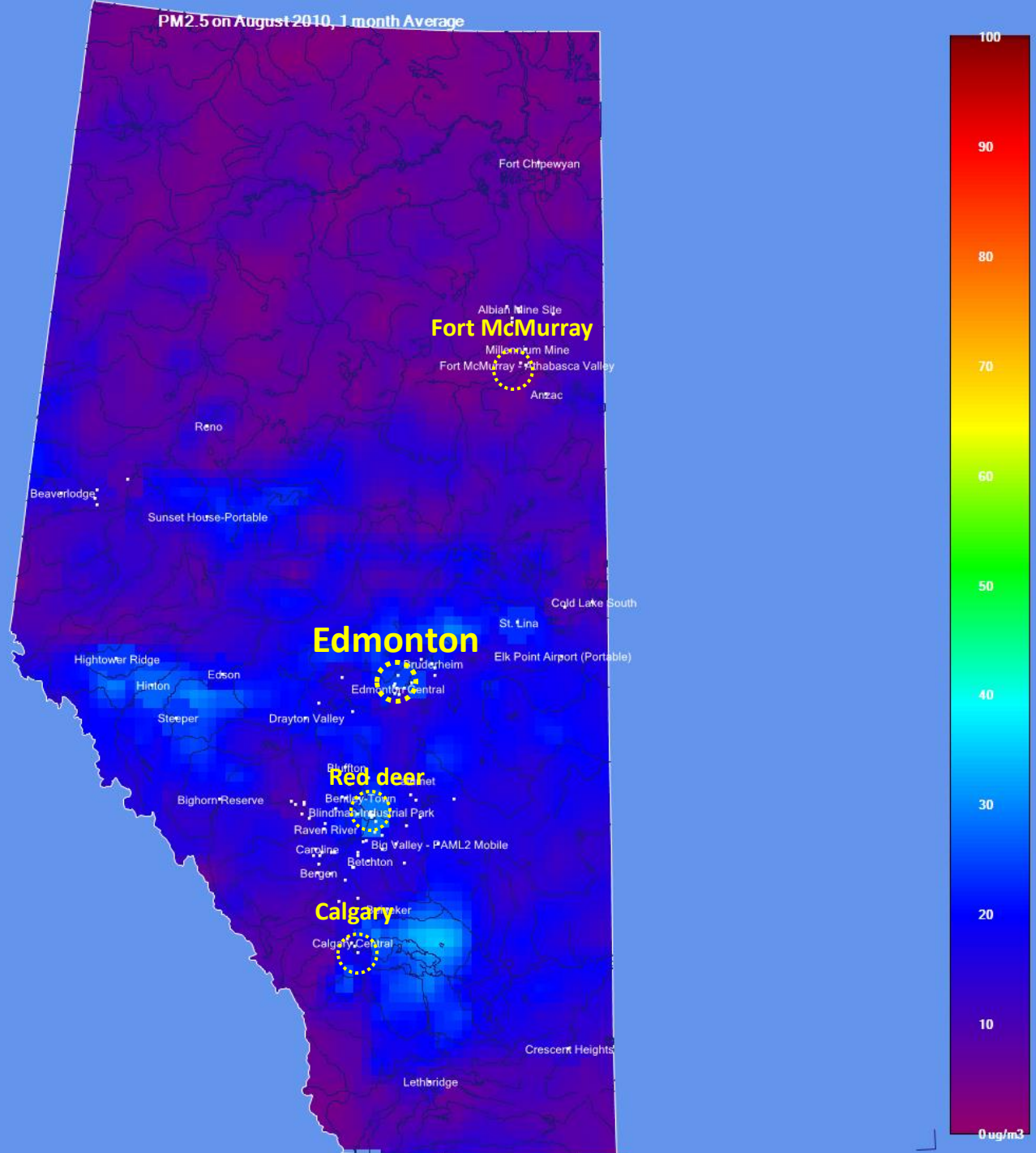
- <0.0011
- 0.0011 to <0.0021
- 0.0021 to <0.0040
- 0.0040 to <0.0071
- >0.0071

1 Day Average PM2.5 Values for Selected Points from 1 Jan 2009 to 31 Dec 2011



# PM 2.5 in Aug 2010 Monthly Average

PM2.5 on August 2010, 1 month Average



100

90

80

70

60

50

40

30

20

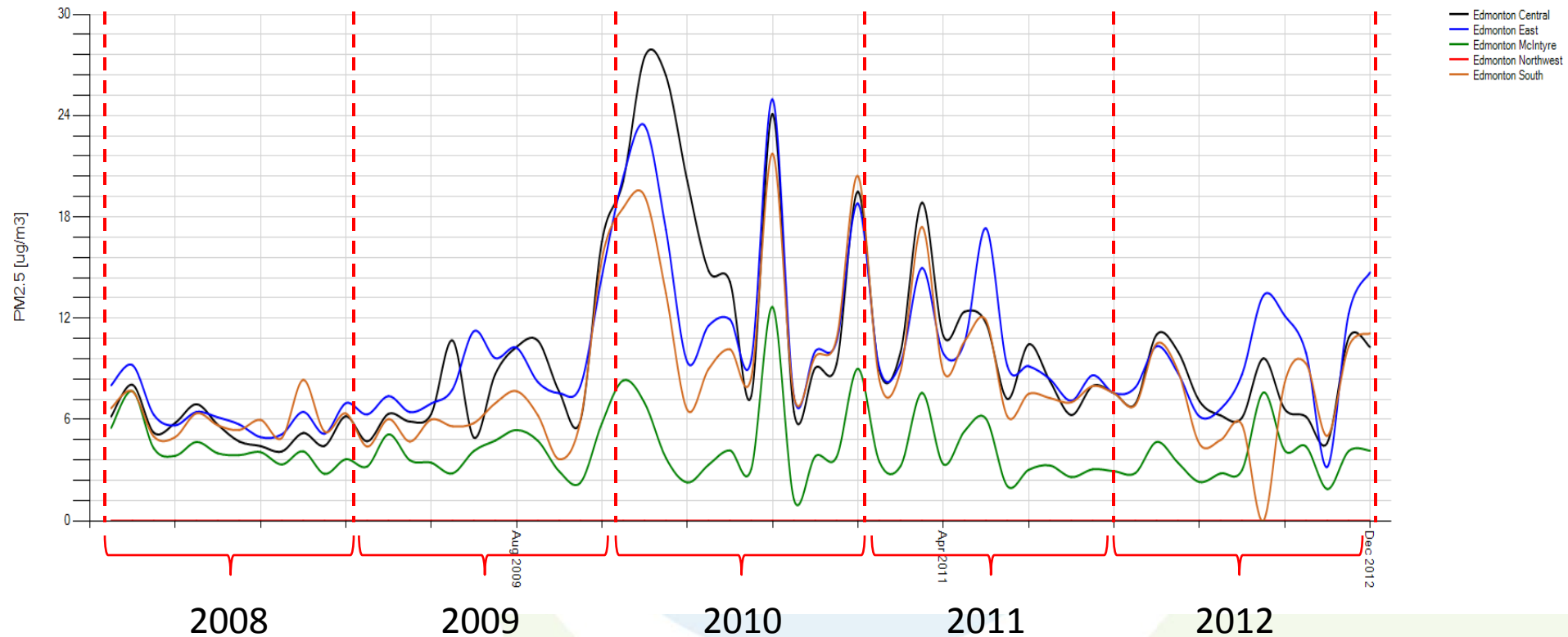
10

0 ug/m3

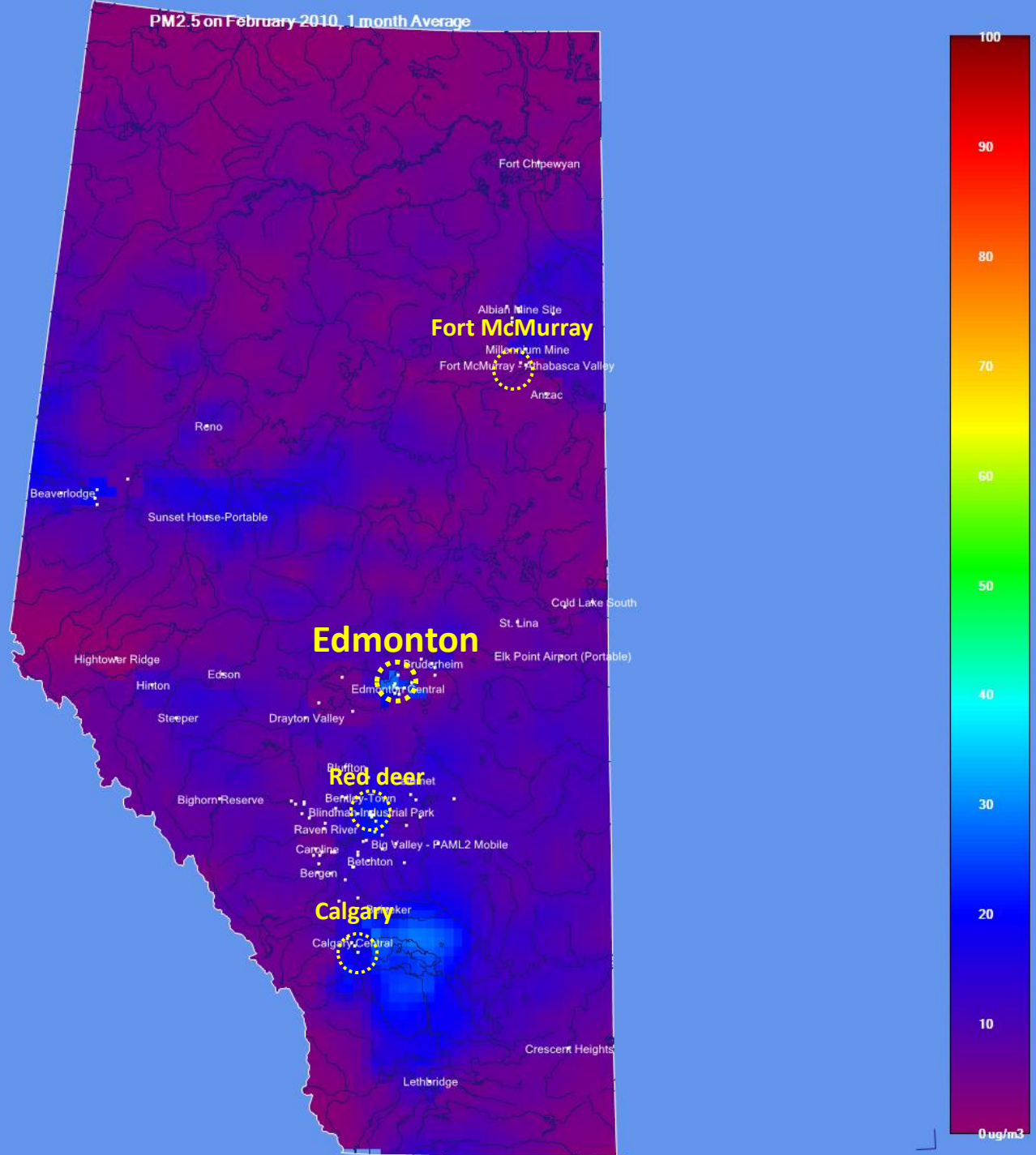


Error: 1.93 ug/m3

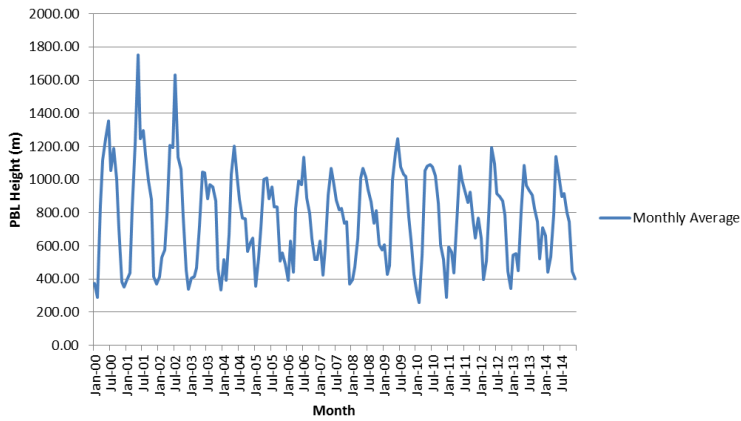
# 1 month average PM2.5 values at Edmonton monitoring stations 2008-2012



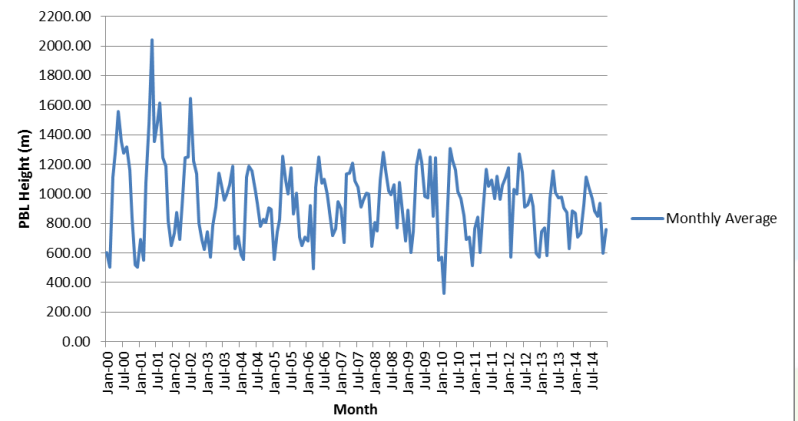
# PM 2.5 in Feb 2010 Monthly Average



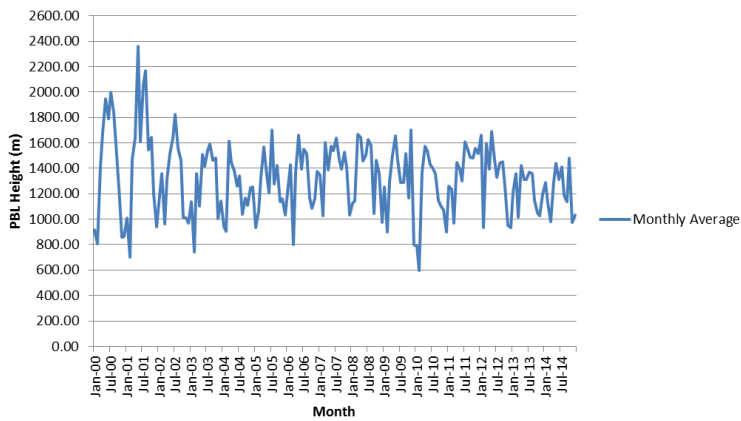
### Edmonton - Monthly Average PBL Height



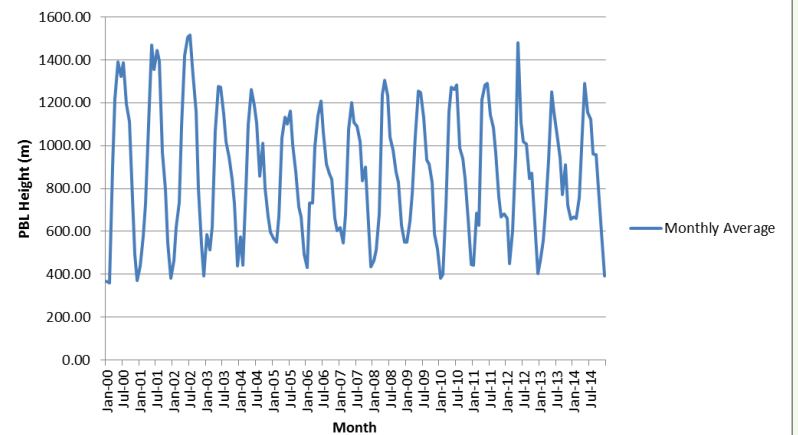
### Red Deer - Monthly Average PBL Height

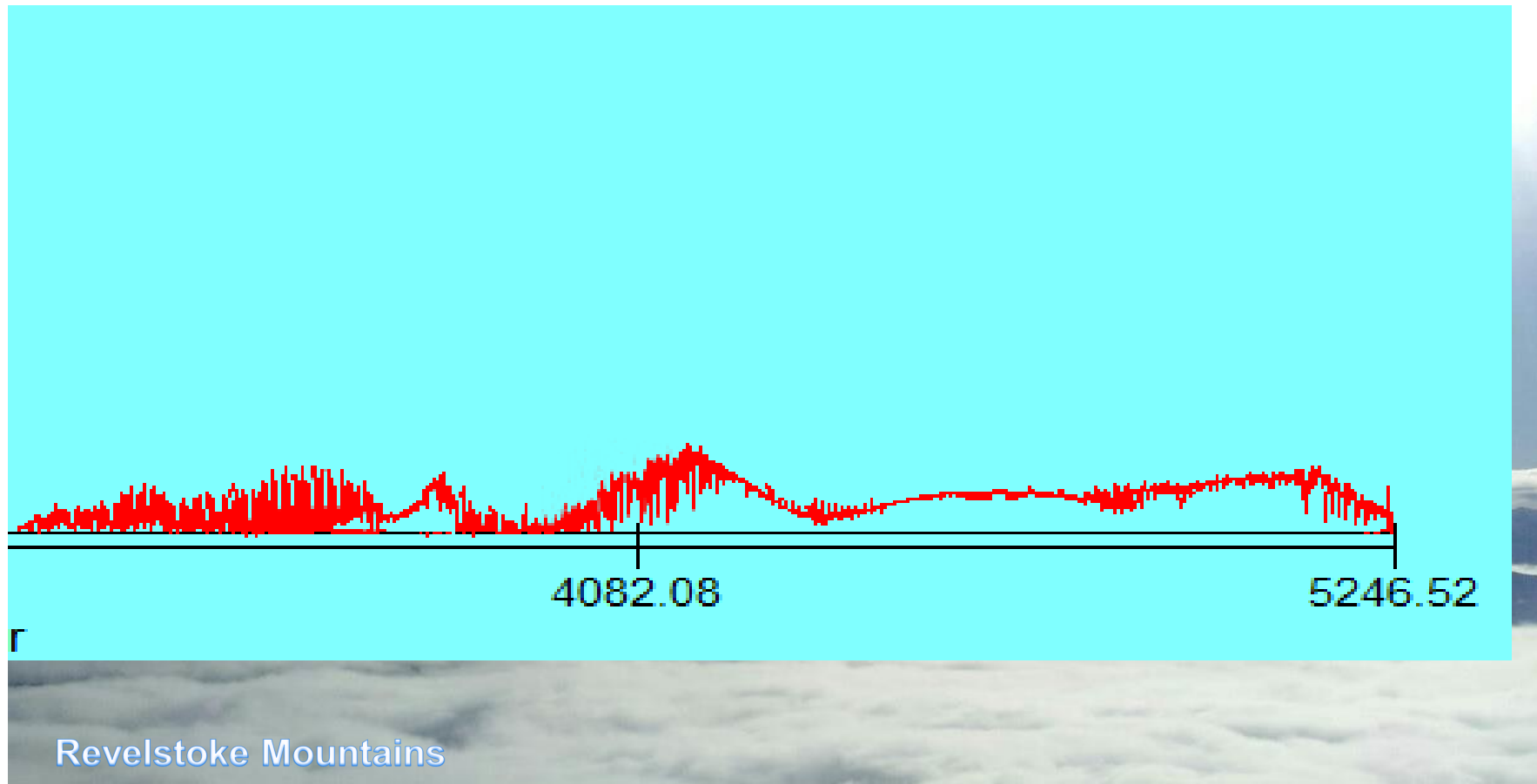


### Calgary - Monthly Average PBL Height

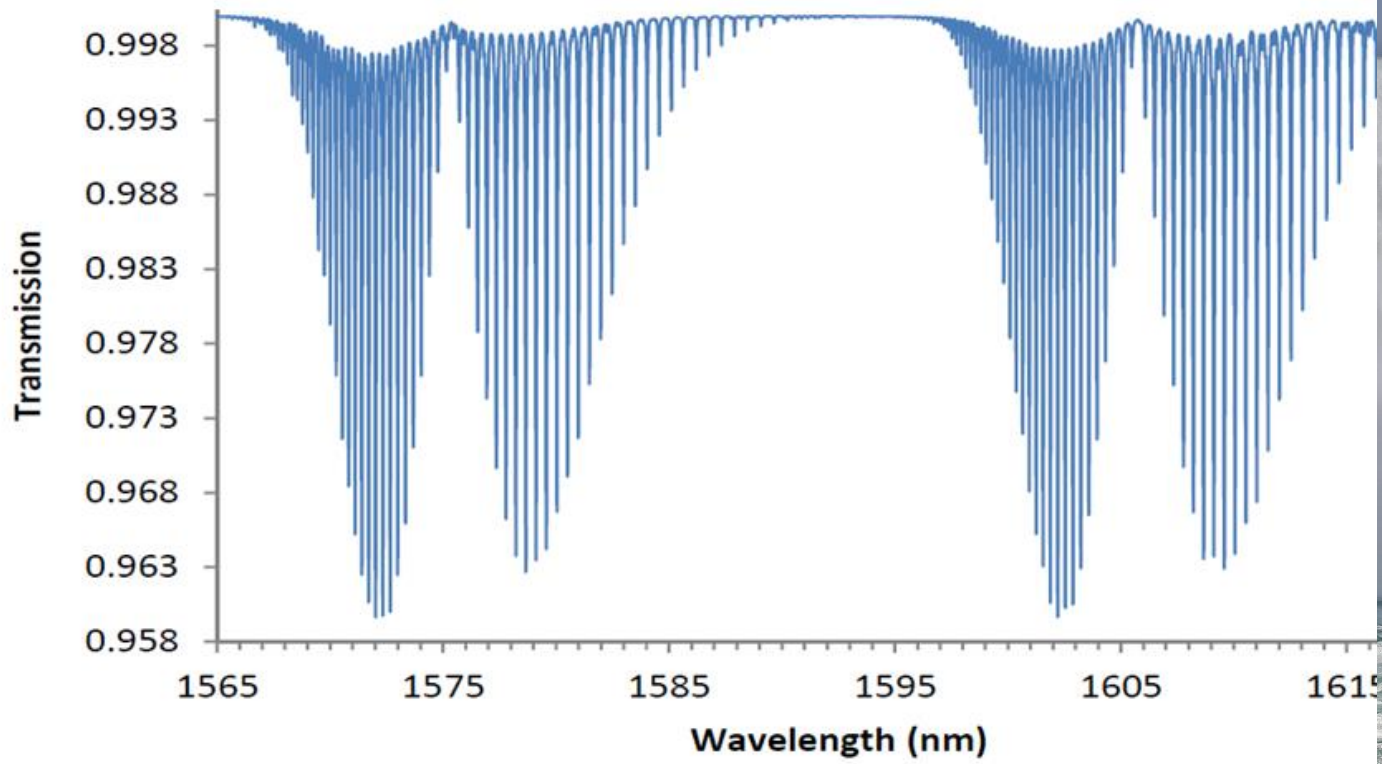


### Fort McMurray - Monthly Average PBL Height



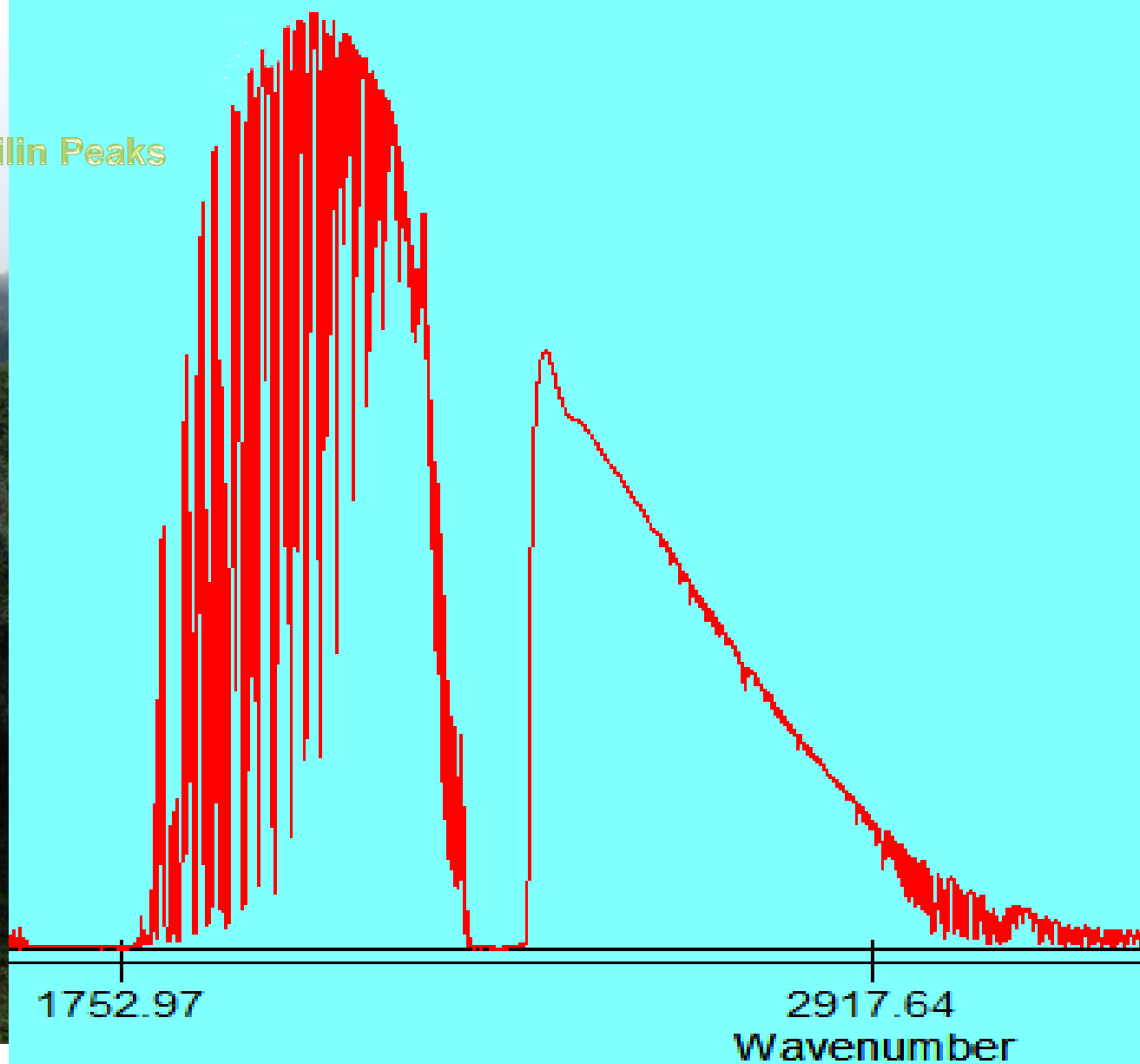


# Niagara Falls





Guilin Peaks



communities evaluation stakeholders mechanisms  
operational multi-stakeholder  
including execution aboriginal Appendix relevant  
design data priorities reporting  
groups time system sands AEMERA  
Data JOSM work ensure core members engagement based  
monitoring external  
analysis  
First Nations public specific air oil MER known identified  
education Table best various GROUPS Aboriginal legitimacy  
decision influence information conduct regulatory  
scientific program government expectations  
management watershed desire research knowledge  
Deliverables participation  
recommendations Monitoring development  
organizations facilitates policy credibility  
Single-purpose Mtis Organizations

# Over 100 years ago

One of these days when the mischief is fully done, when our once pellucid and crystalline atmosphere is transformed into Chicago reek, and Pittsburgh smoke and London fog, men will begin to realize what they have lost, and will hold conventions, and pass resolutions, and enact laws, and spend great sums of money for the undoing of the mischief and the restoration of our atmosphere to its original state.

Editorial, New York Tribune, May 11, 1899

# Kardashev scale

by Former Soviet Astronomer Nikolai Kardashev

- Type One Civilization – harnessing the power of a planet
- Type Two Civilization - harnessing the power of a star
- Type Three Civilization - harnessing the power of a galaxy