



Atmospheric Background Station in Taiwan

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Asian Dust

Air Pollutants

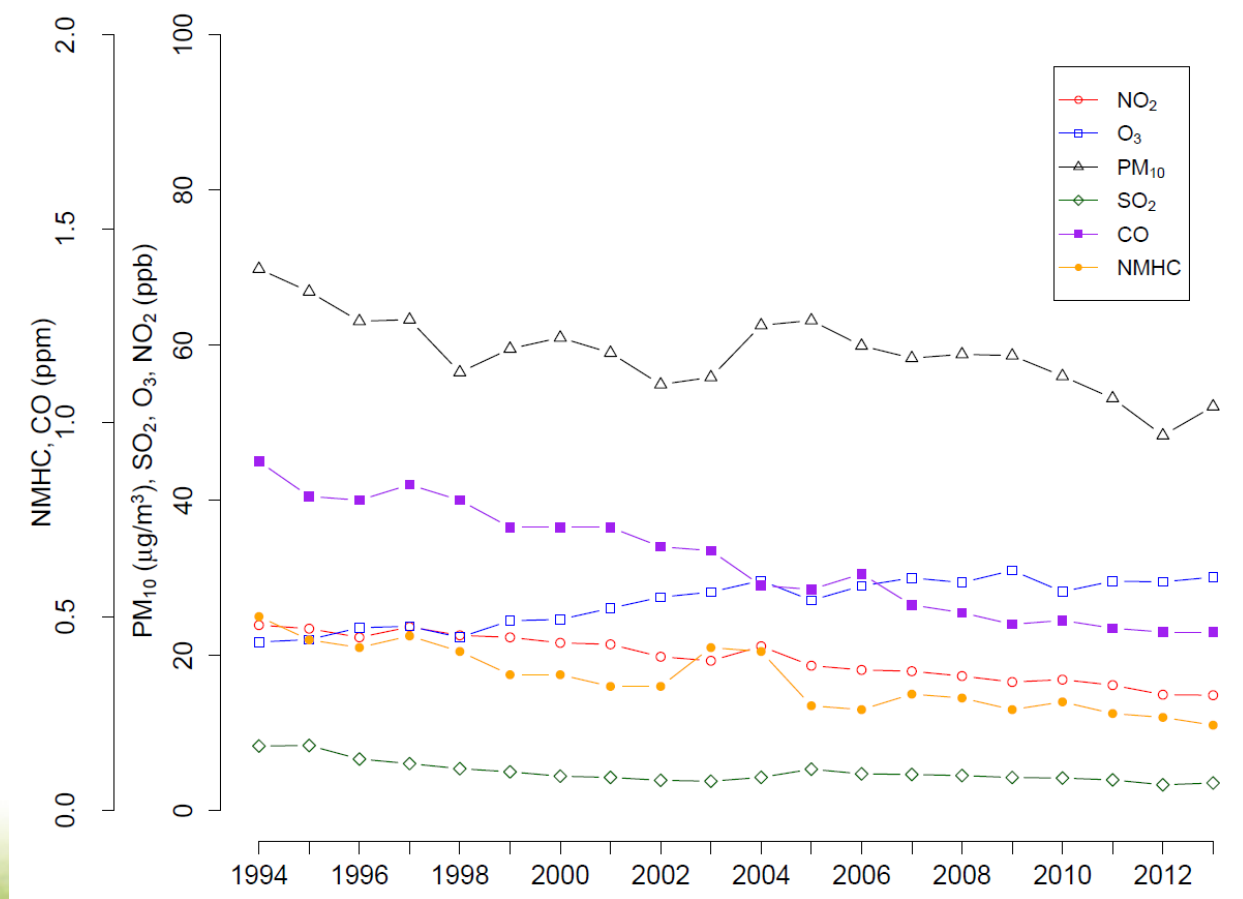
Biomass Burning

Studies for regional/inter-continental transport of air pollutants, mixing aerosols, etc.



Introduction

- In these years, the air quality in Taiwan is better now.
- The ratio of long-range transportation air pollutant is higher than before.



行政院環境保護署

Environmental Protection Administration
Executive Yuan, R.O.C. (Taiwan)

*particulate matter
composition stations*



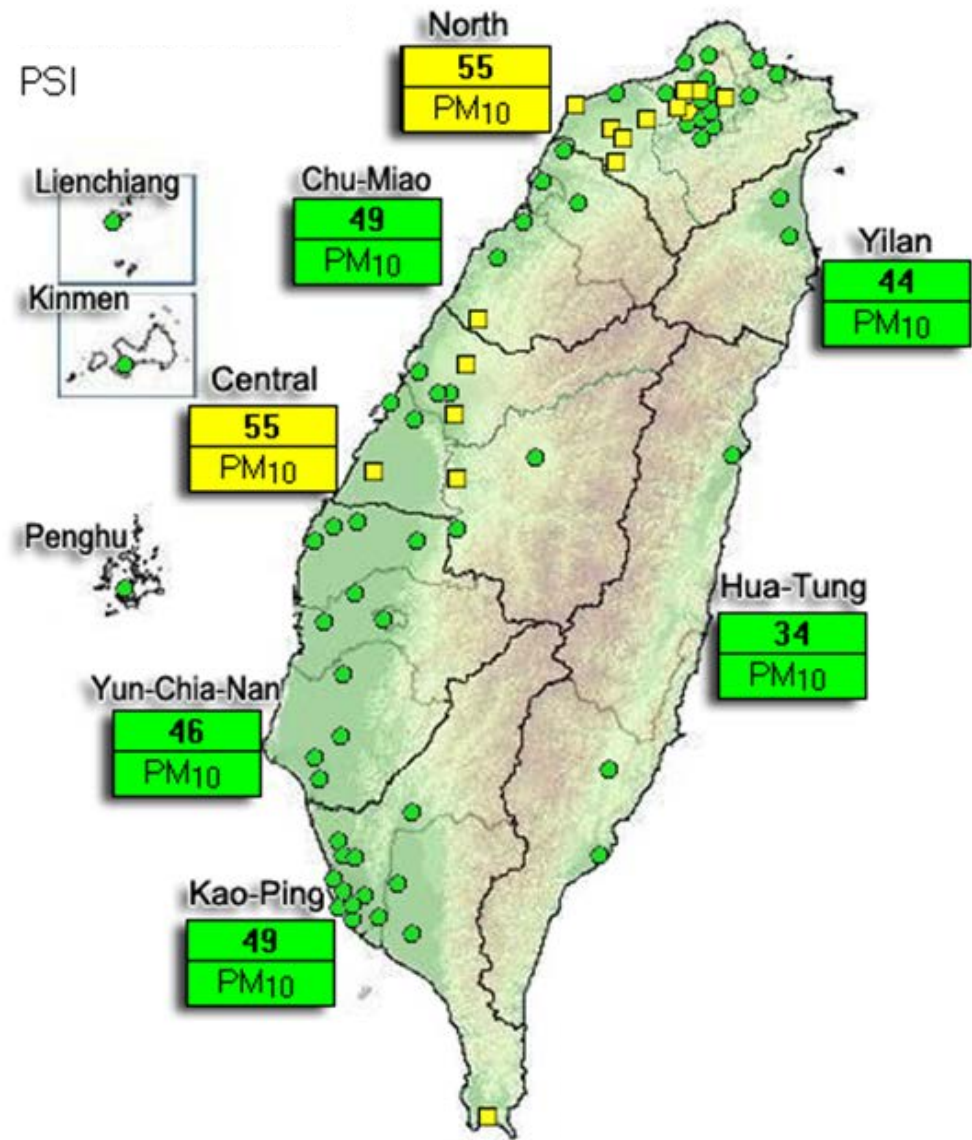
The photo chemical stations



The mobile stations



The Air Quality in Taiwan



Briefing the Lulin station

23.51 N, 120.92 E ; 2862 m



The New Platform





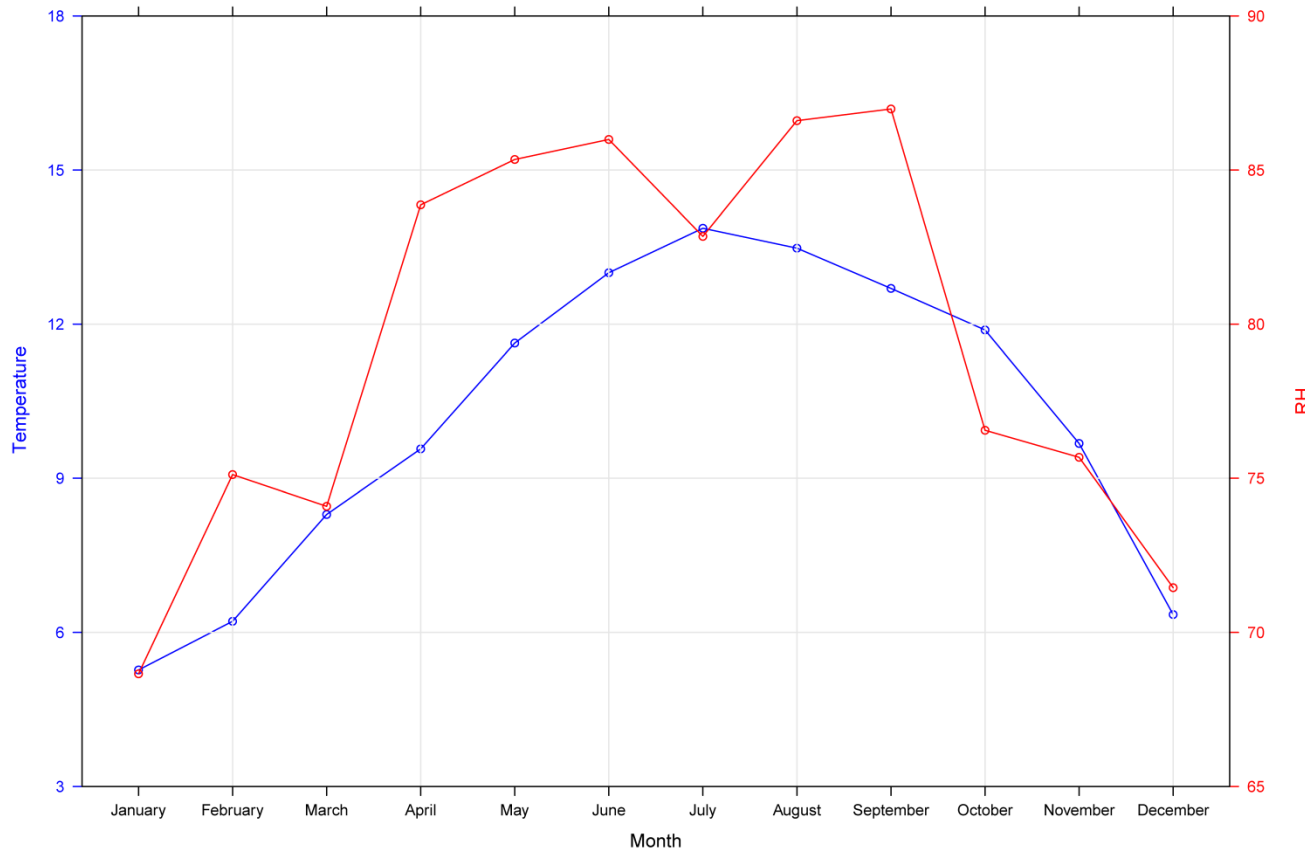
OPERATING UNDER WMO-GAW/NOAA PROTOCOLS



Instrument, Manufacturer, Model	
Aerosols	Model
Particle mass concentration	TEOM Particulate mass monitor, R&P 1400 (PM ₁₀ , PM _{2.5})
aerosol chemical components	Aerosol sampling, R&P, 3500
	Aerosol sampling, R&P, 2025D
NOAA CPD aerosol system	PSAP, TSI 3010 CPC, TSI 3563 integrating nephelometer
Radiation	Model
7 spectral channels	Sunphotometer, Cimel, CE-318
6 spectral channels	Shadow band, Yankee, MFR-7
UVA	UVA, Solar Light, MODEL 501
UVB	UV-Biometer, Solar Light,
Total flux	Solar radiation sensor, MetOne, 96-1
	Kipp&Zonen CMP-21 pyranometer
	Kipp&Zonen CGR-4 pyrgeometer
Direct sun radiation	Kipp&Zonen CH-1 pyrheliometer
Gas	Model
O ₃	Ozone analyzer, Ecotech, ML9810B
CO	CO monitor, TraceAnalytical, TA-3000R
	CO monitor, Horiba, APMA-360
CO ₂	CO ₂ analyzer, LI-COR, LI-7000
Oxides of Nitrogen	Oxides of Nitrogen analyzer family, ECOTECH, EC9841T (NO _x), EC9842 (NH ₃), EC9843 (NO _y)
SO ₂	Trace SO2 analyzer, ECOTECH, EC9850T
CFCs	Gas Chromatography, Agilent, HP6890N
Air sampling	NOAA/ESRL/GMD CCGG flask sampler
Mercury	Model
Gaseous Elemental Mercury	Cold Vapor Atomic Fluorescence Spectrometry, Tekran ,
Reactive Gaseous Mercury	Mercury Speciation Unit, Tekran , 1130
Particulate Mercury	Particulate Mercury Unit, Tekran , 1135
Precipitation chemistry	Model
Rainwater sample	Rain sampler
Met.	Model
Visibility	Present Weather Detector, VAISALA, PWD22
Meteorological Monitoring System	MetOne (Temp., Humidity, Press., Rain, Wind)

Meteorology : Temperature, RH

Temperature & RH

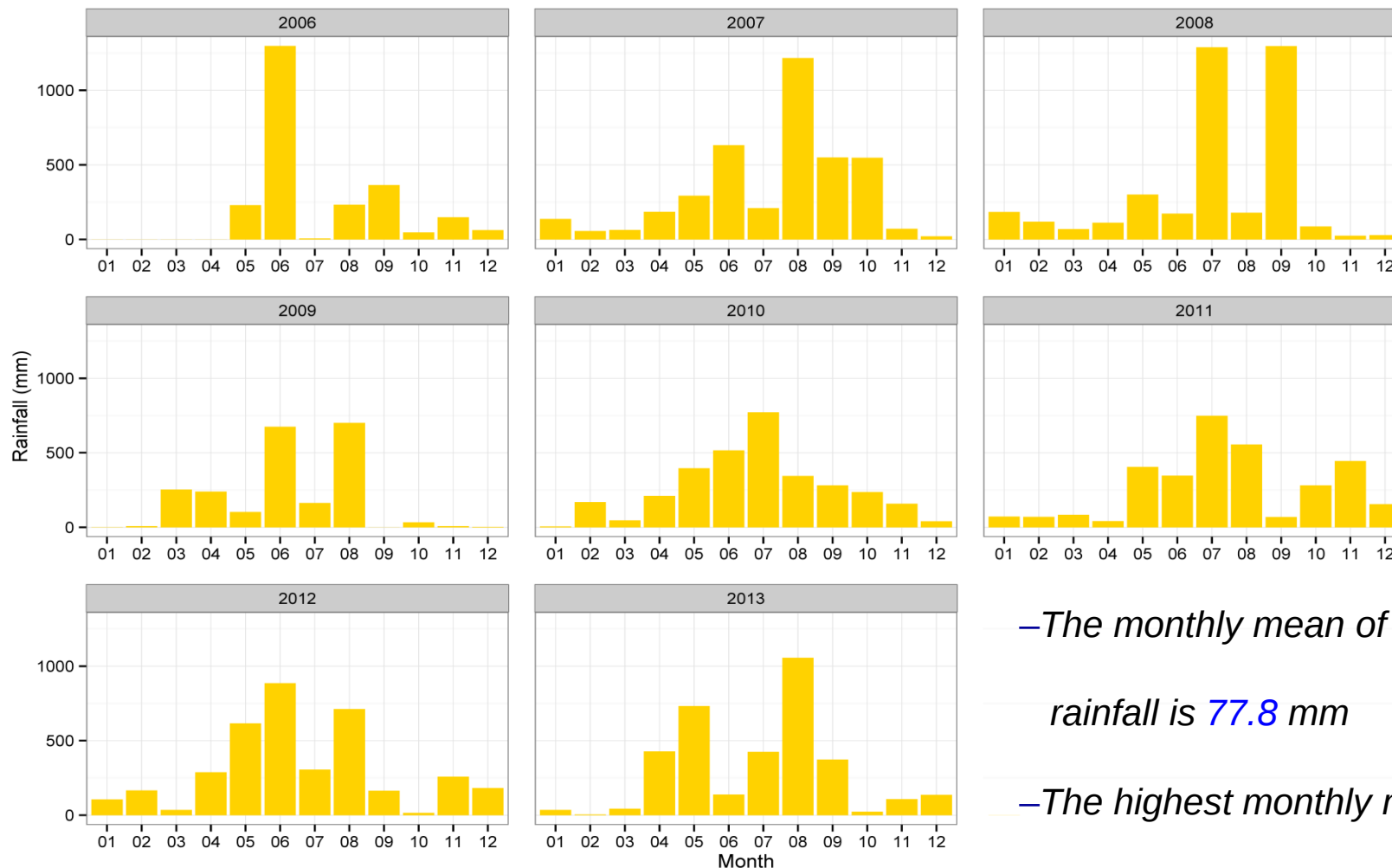


- The monthly mean of Temperature **10.1 °C**
- Relative Humidity **78 %**



Meteorology – Rainfall

Monthly Rainfall at LABS

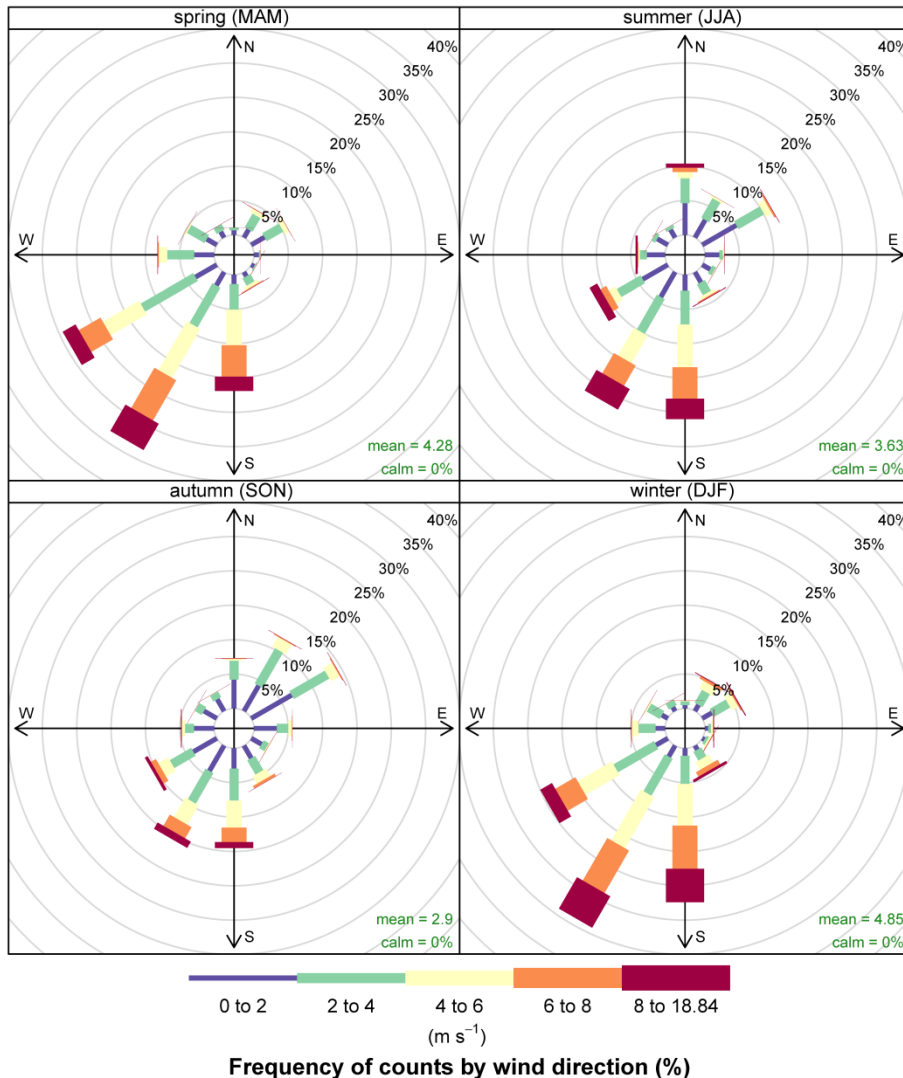


- The monthly mean of rainfall is 77.8 mm
- The highest monthly mean of rainfall 1300 mm



Meteorology – WS,WD in four seasons

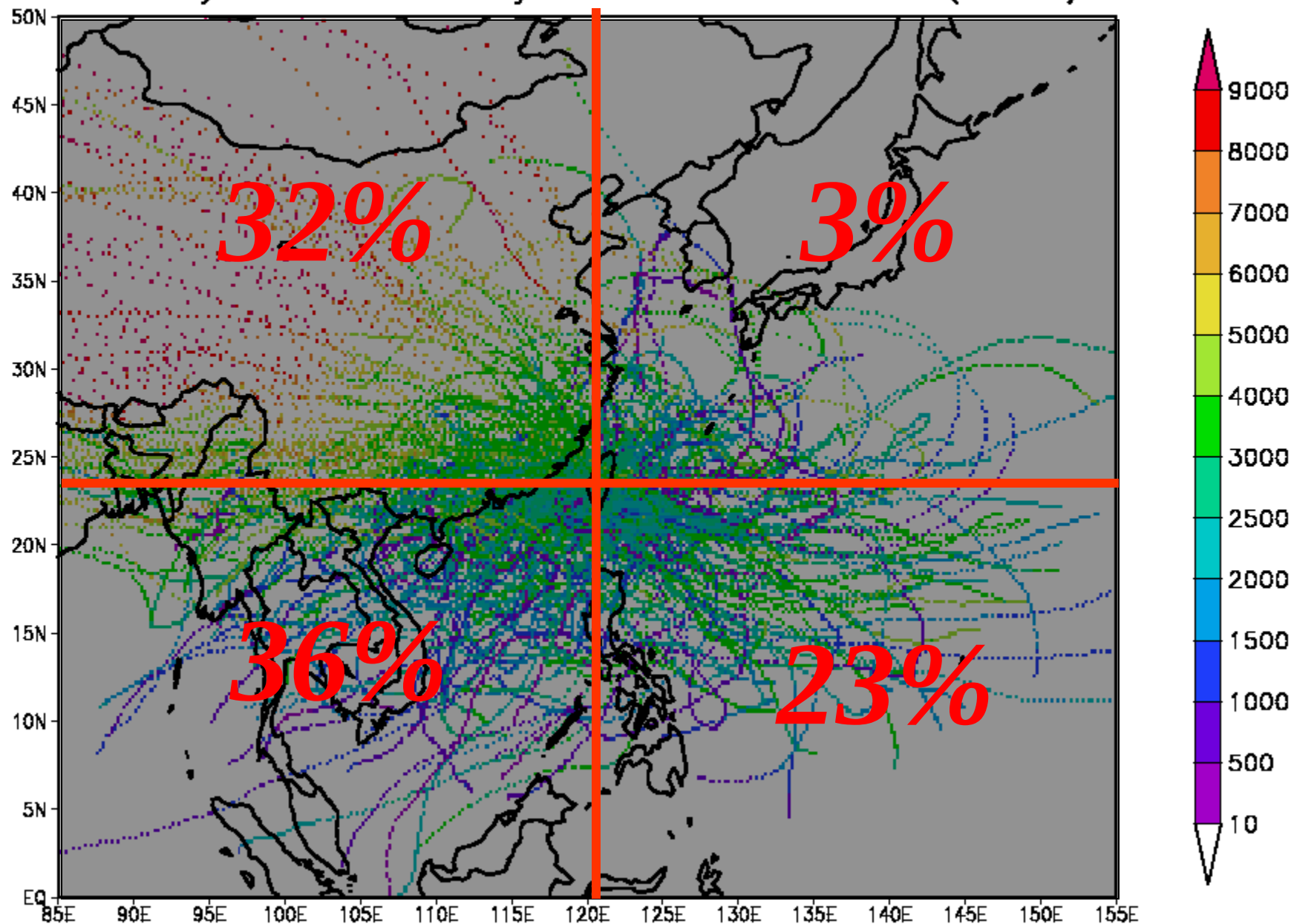
Seasonally Wind Rose Diagram at LABS



- *Prevailing winds are from SW and NE.*

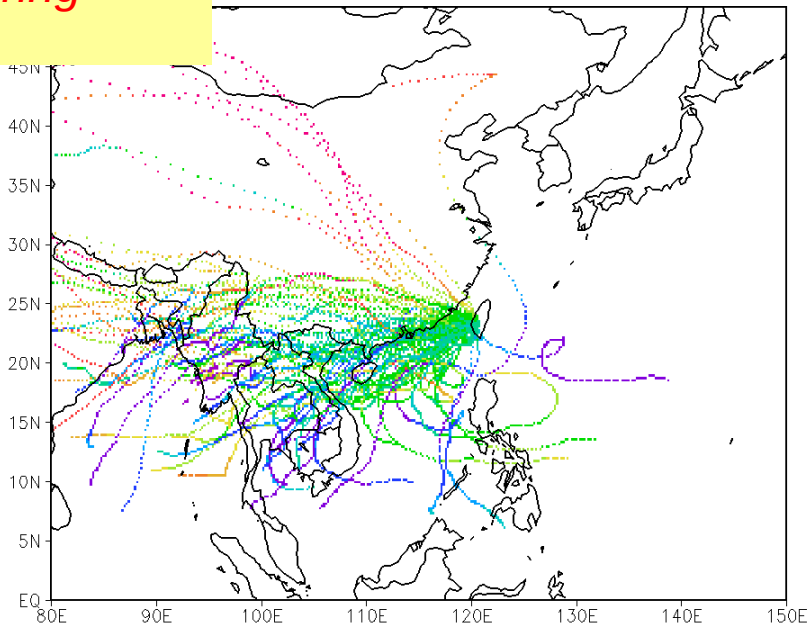


5-day backward trajectories in Mt. Lulin(2862)



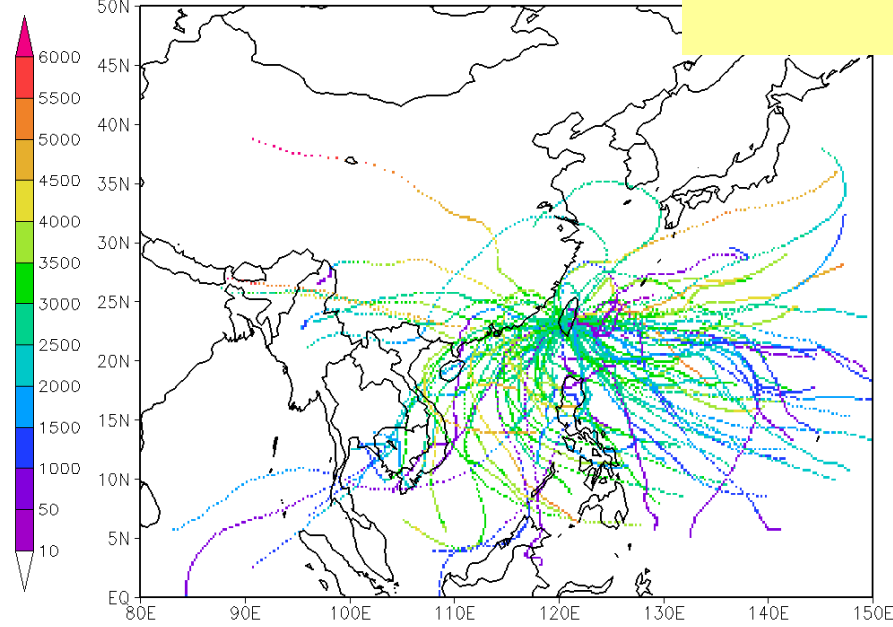
Spring

Backward trajectory at Mt. Lulin
in 2010 spring

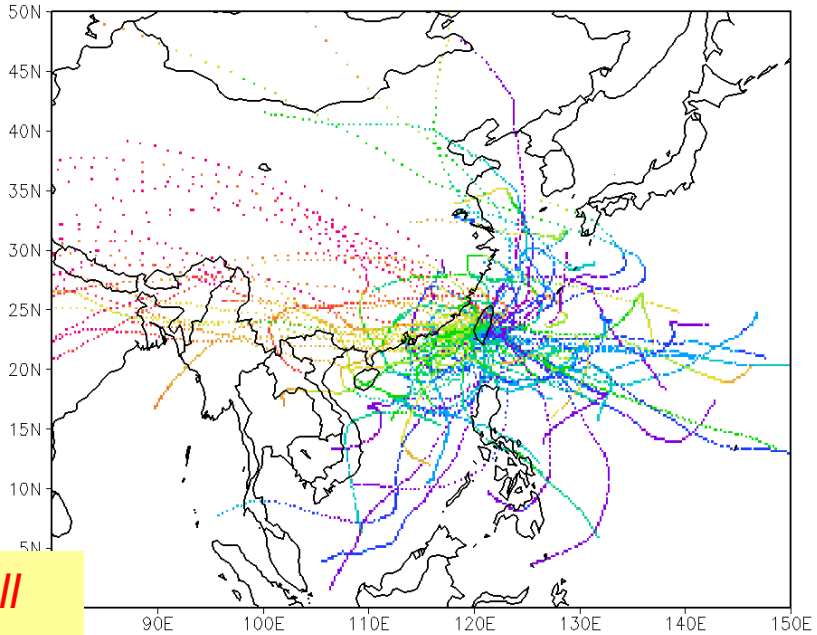


Backward trajectory at Mt. Lu
in 2010 summer

Summer

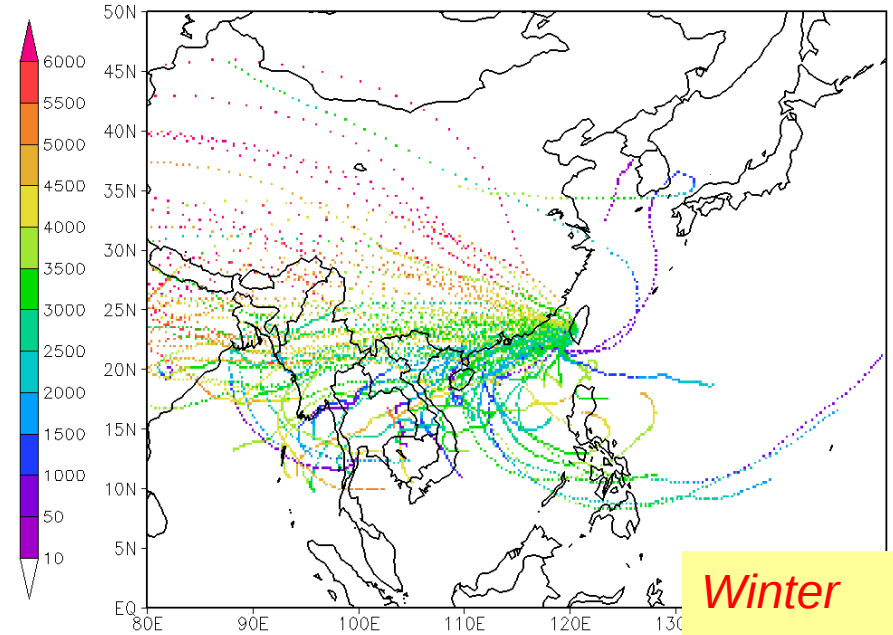


Backward trajectory at Mt. Lulin
in 2010 fall



Backward trajectory at Mt. Lulin
in 2010

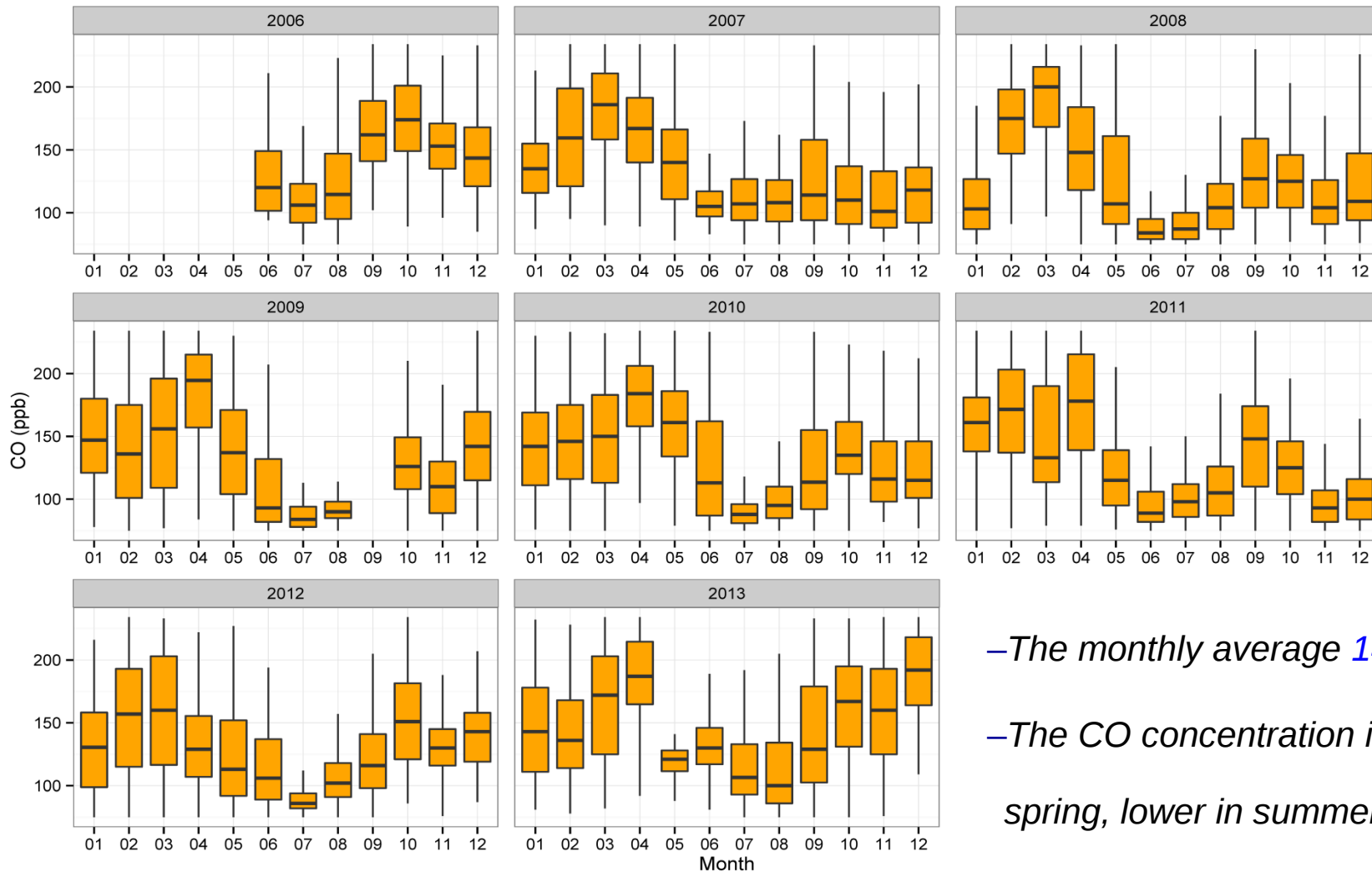
Winter



Fall

Seasonal Variation of CO at LABS

Monthly Variation of CO at LABS

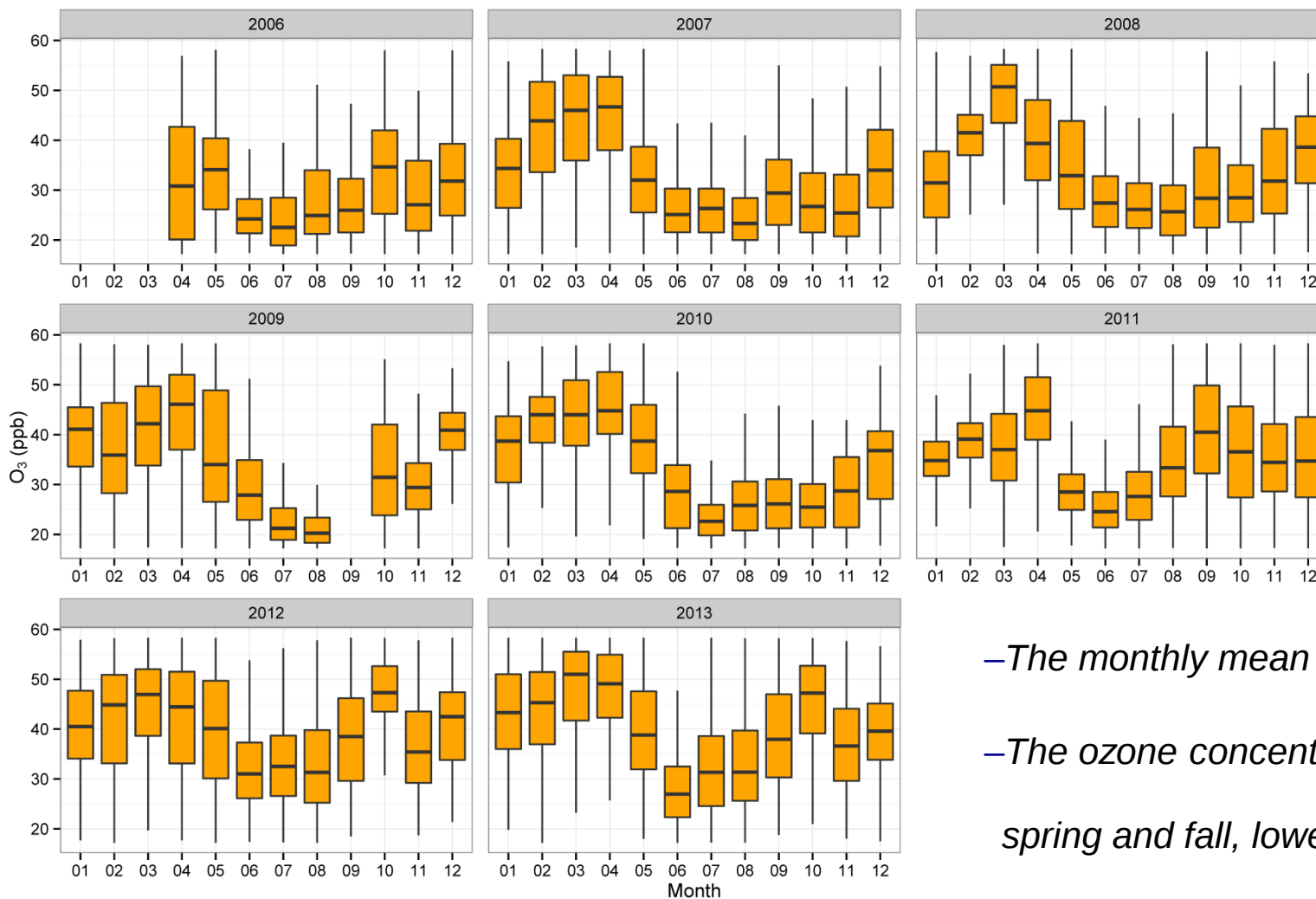


- The monthly average 142 ppb
- The CO concentration is higher in spring, lower in summer.



Seasonal Variation of O₃ at LABS

Monthly Variation of O₃ at LABS

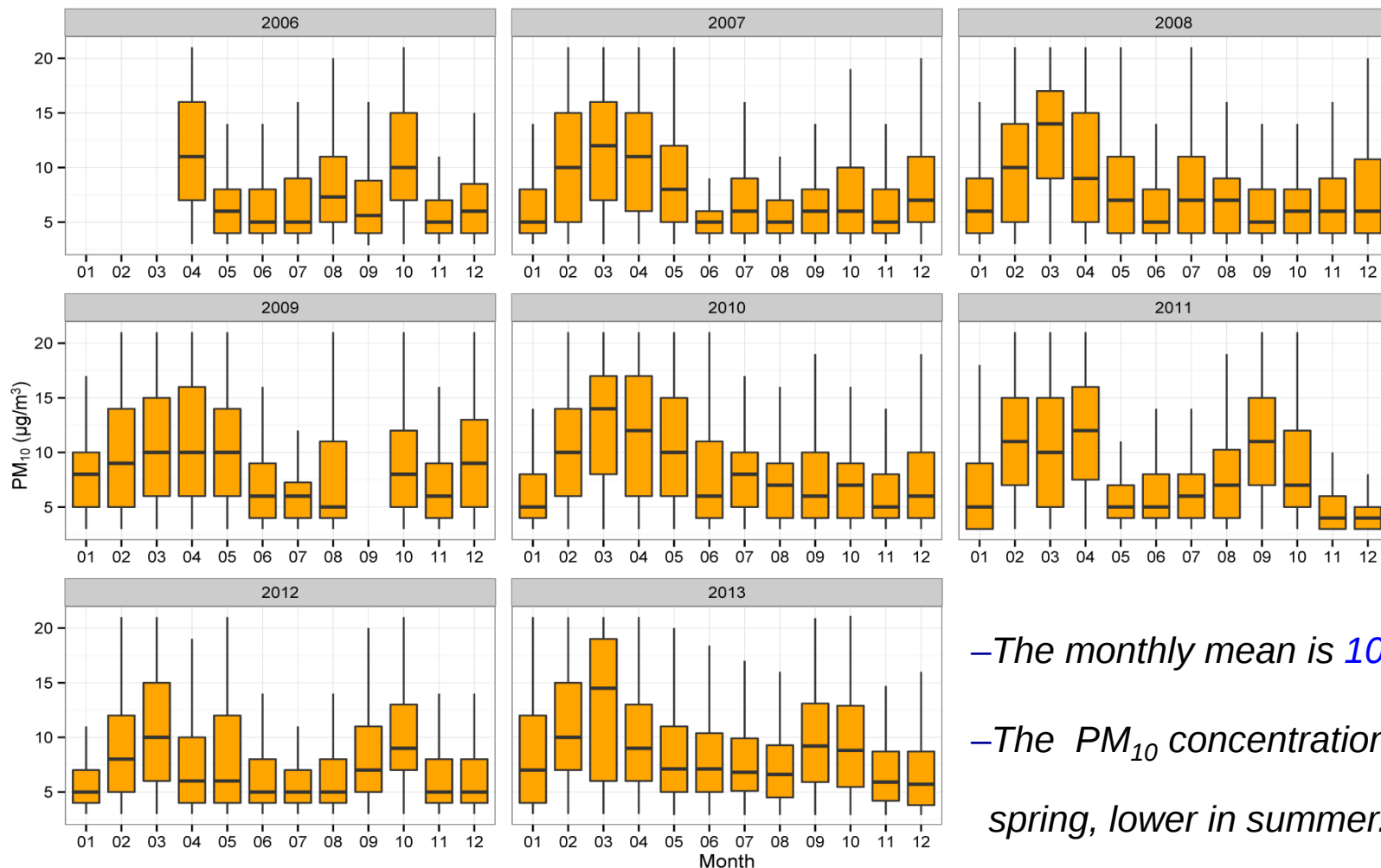


- The monthly mean is 33 ppb
- The ozone concentration is higher in spring and fall, lower in summer.



Seasonal Variation of PM₁₀ at LABS

Monthly Variation of PM₁₀ at LABS

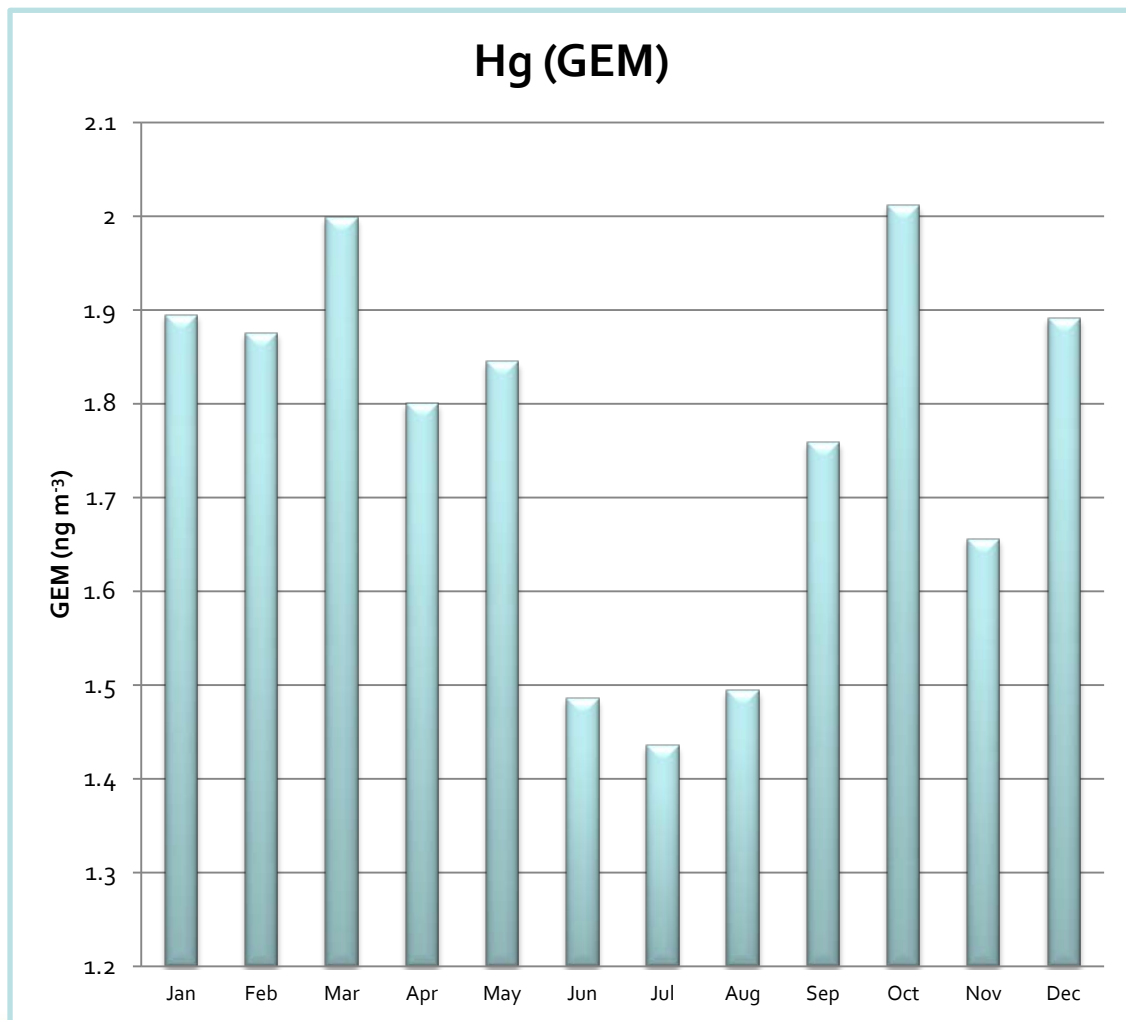


–The monthly mean is 10 µg/m³

–The PM₁₀ concentration is higher in spring, lower in summer.



Seasonal Variation of GEM at LABS



- The mean concentration of GEM is 1.69 ng / m³
- The GEM concentration is higher in spring and fall, lower in summer.

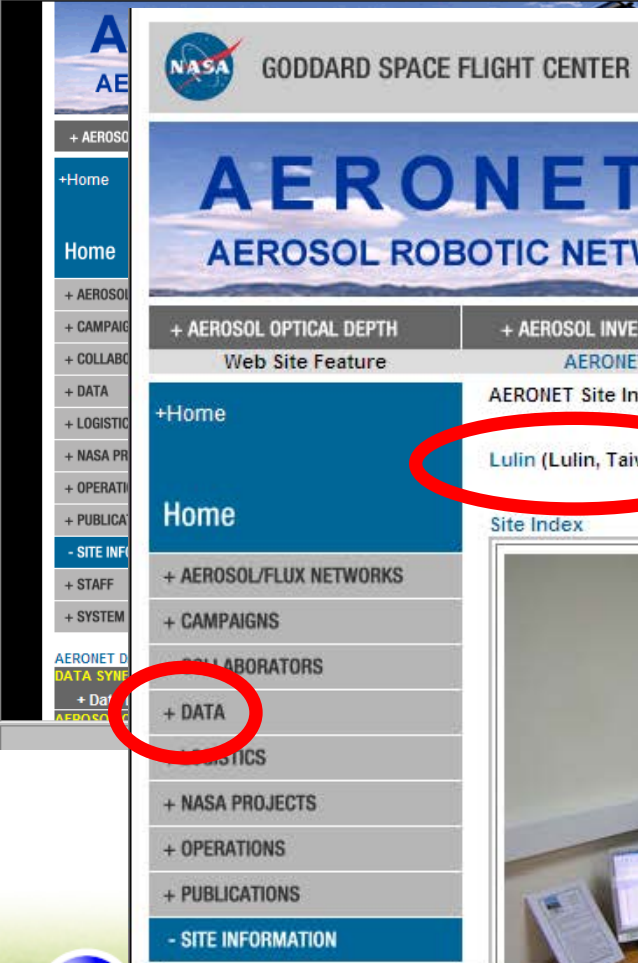
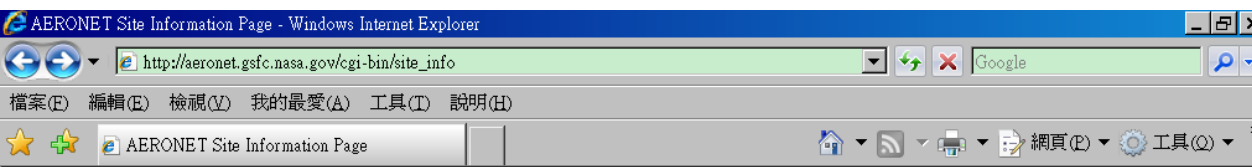


International Collaborations

- *NASA* (National Aeronautics and Space Administration)
 - *AERONET*
 - *MPLNET*
- *NOAA* (National Oceanic and Atmospheric Administration of the United States)
 - *Trace gas-Carbon Cycle Greenhouse Gases Group (CCGG)*
- *USEPA*
 - *Mercury Monitoring (NADP-AMNET)*

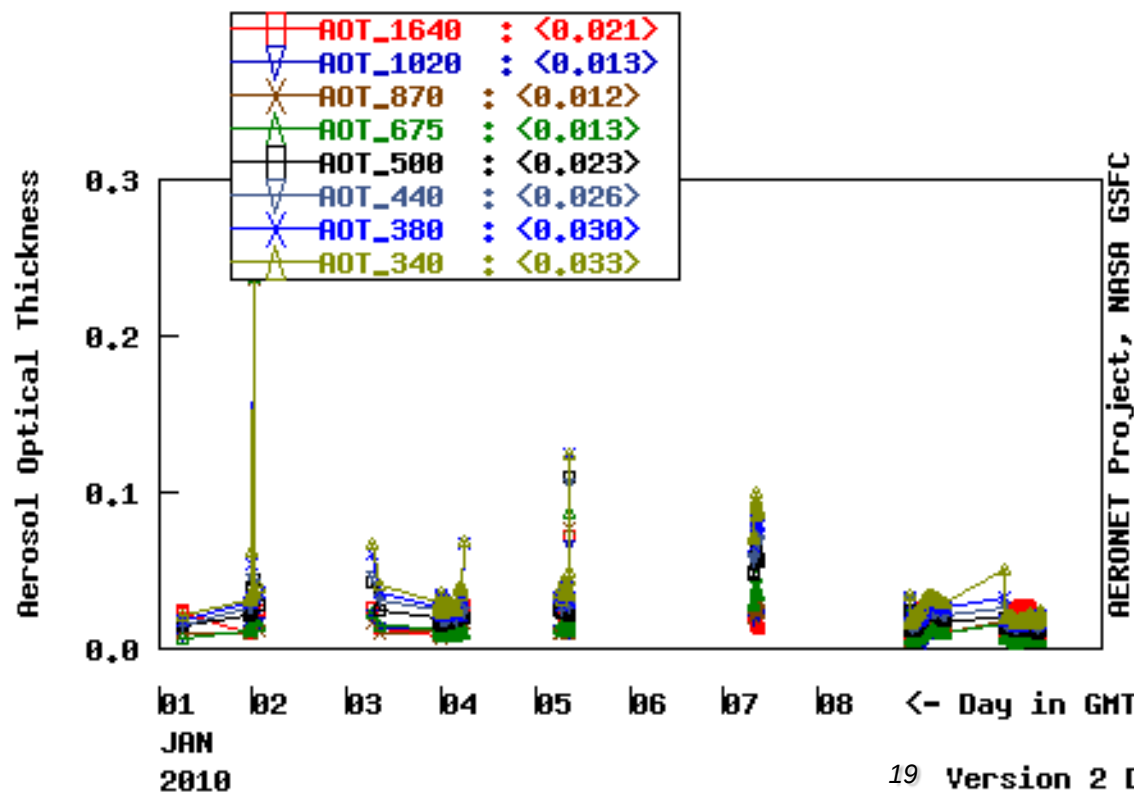


NASA-AERONET



AOD Level 1.0 data from JAN of 2010

Lulin , N 23°28'08", E 120°52'26", Alt 2868 m,
PI : Neng-Huei_(George)_Lin, nhlin@cc.ncu.edu.tw
Level 1.0 AOT; Data from JAN 2010



Carbon Cycle Greenhouse Gases Group (CCGG)

Lulin, Taiwan [LUL]



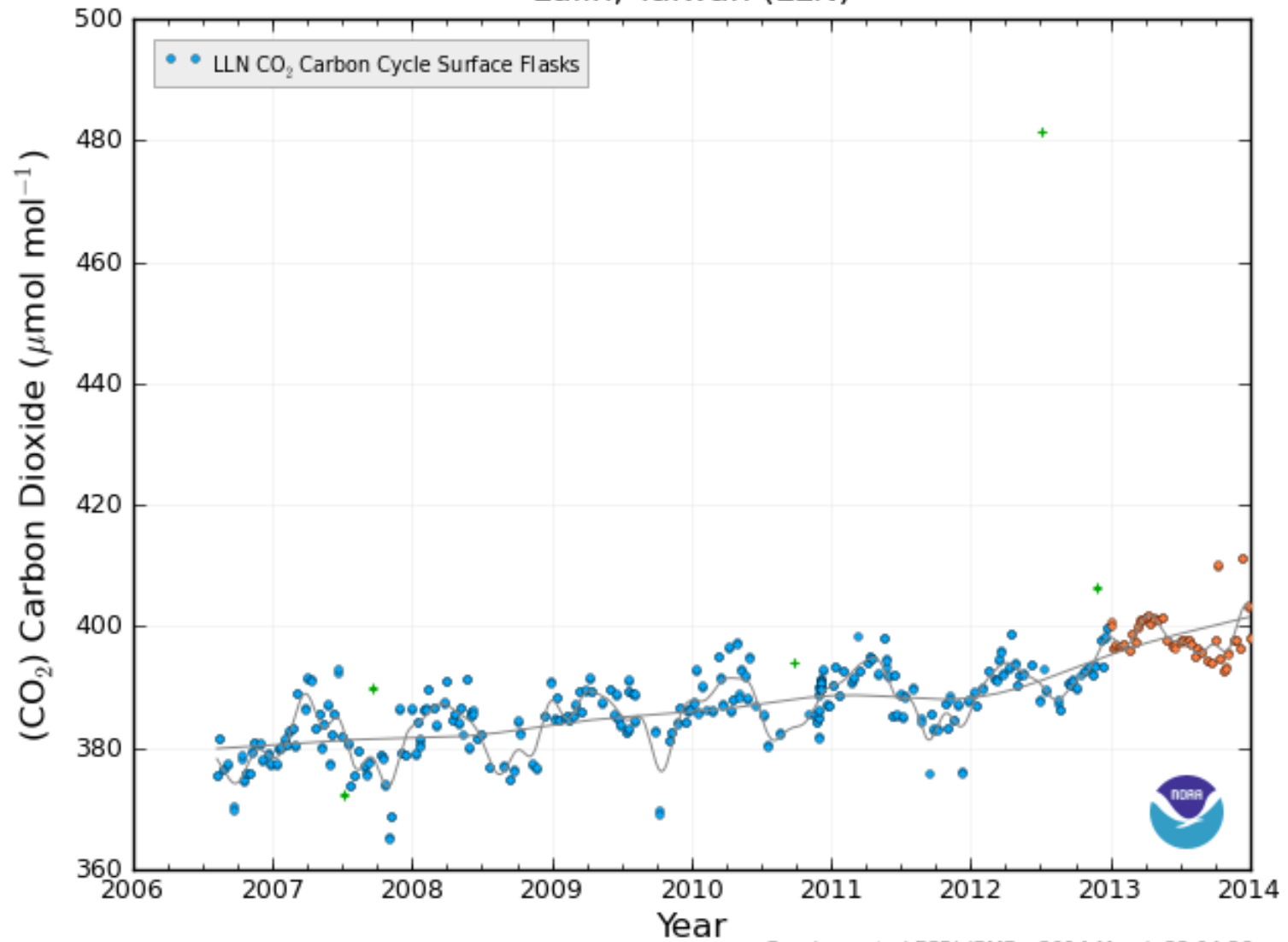
Country	 Taiwan
Latitude:	23.47° North
Longitude:	120.87° East
Elevation:	2862.00 masl
Time Zone:	Local Time + -8 hour(s) = UTC



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<http://www.esri.hoaa.gov/gmd/dv/site/LUL.html>

Lulin, Taiwan (LLN)

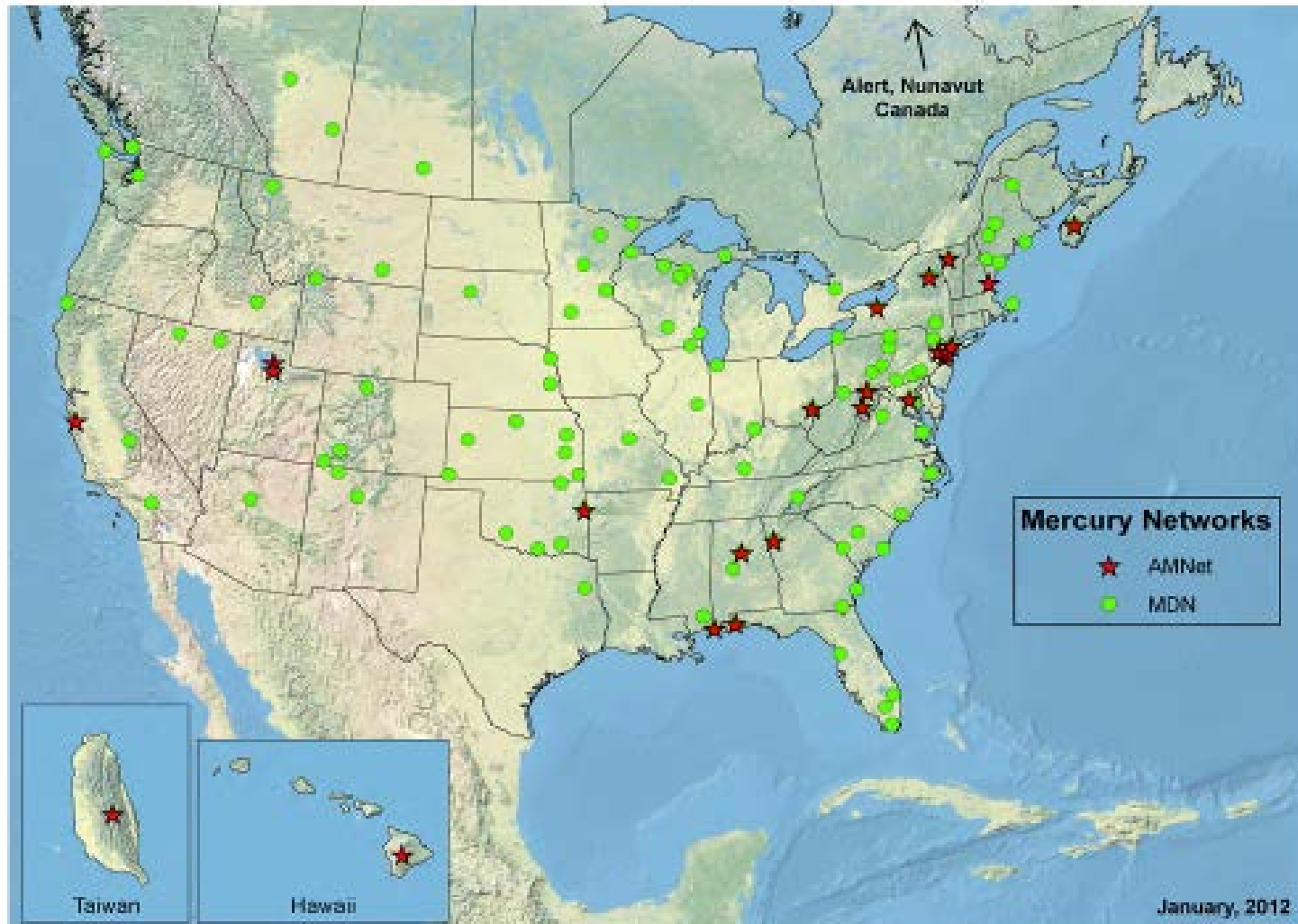


Graph created ESRL/GMD - 2014-March-22 04:36 am



Mercury Monitoring (AMNET)

NADP Mercury Networks



Summery

Building up the air quality baseline in Taiwan

Understanding the long –range transport of air pollutants effect Taiwan

Cooperating with neighboring countries to exchange air pollutants data

