BMKG

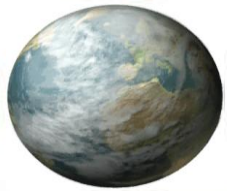
Current Status GAW Activities in Indonesia

HERIZAL

Bukit Kototabang Global GAW Station

Sumatera Barat - Indonesia

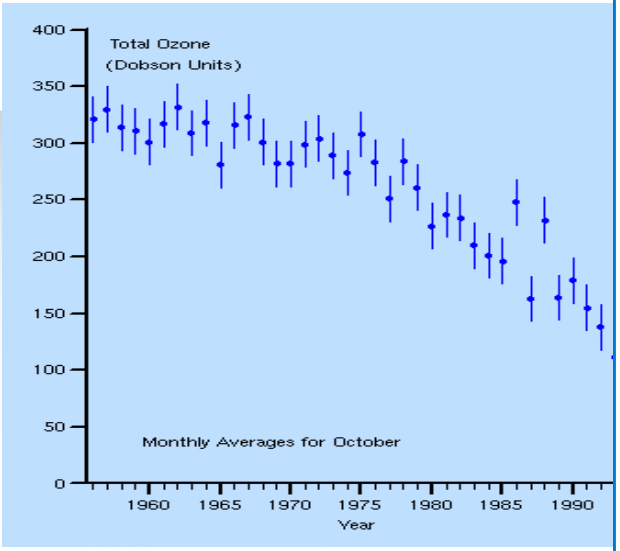
Outline

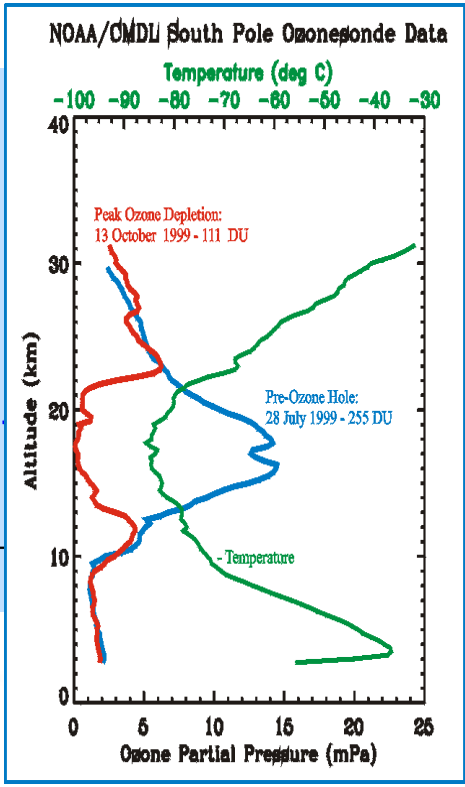


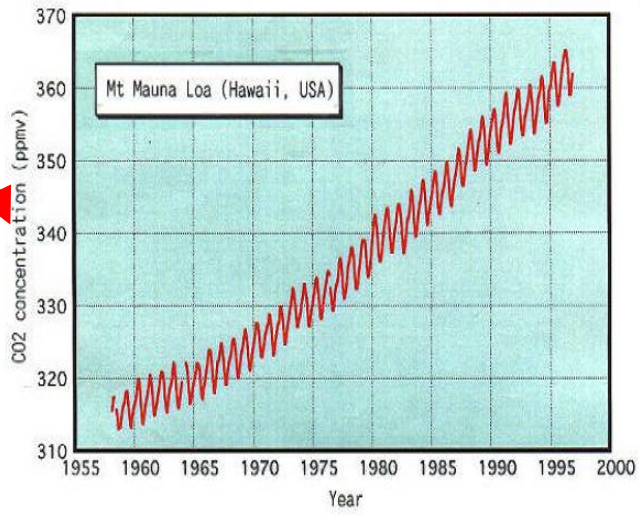
- History
- Site Description
- Organization
- Progress of the Program
- GHG Program
- International meeting
- Contribution
- Closing

History :

1. GO3OS (Global Ozone Observing System) in 1950s
2. BAPMON (Background Air Pollution Monitoring Network) in 1960s
3. GAW (Global Atmosphere Watch) in 1989



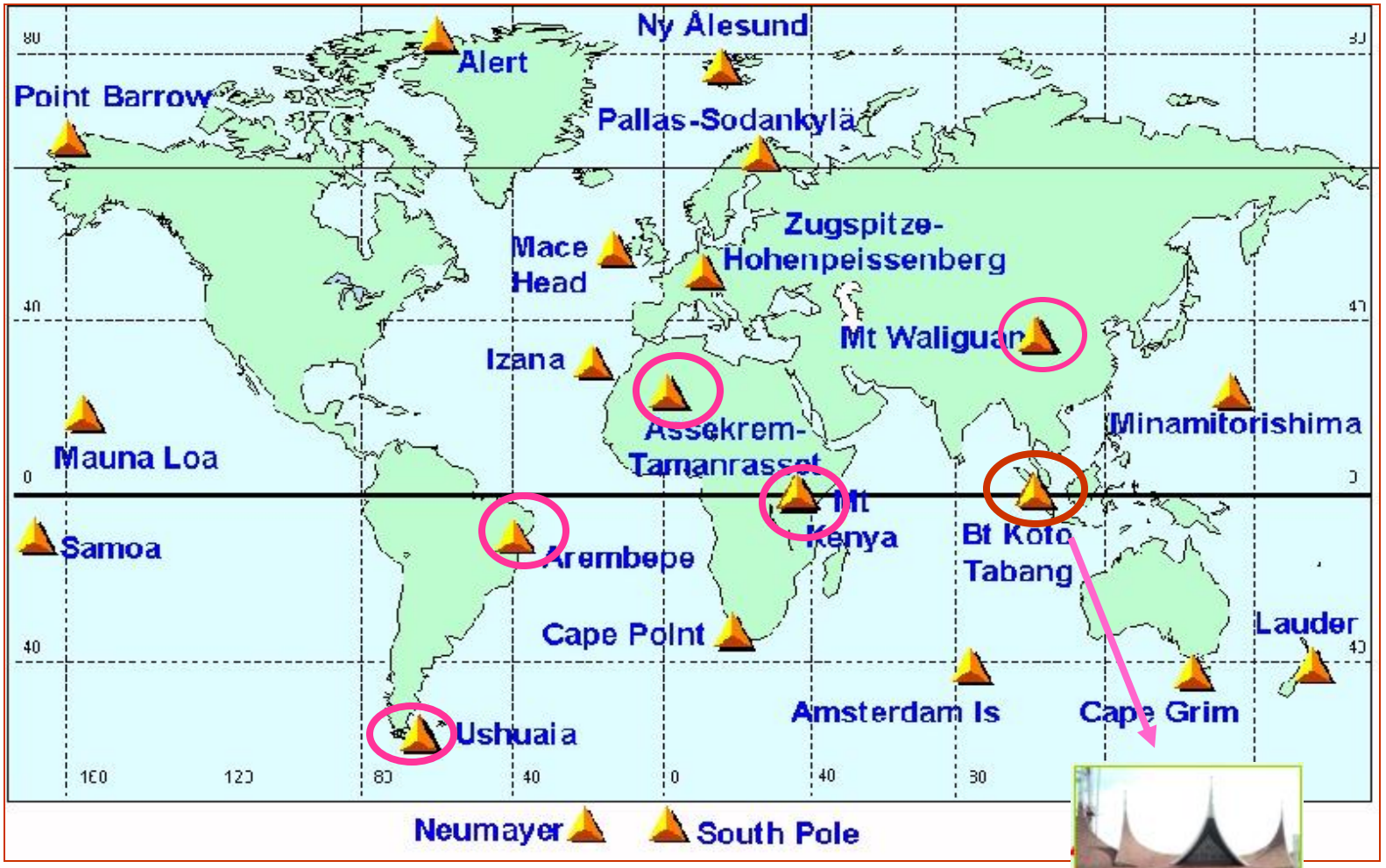




Background of establishment :

- Although baseline stations like : Mauna Loa, Hawai; Cape Grim, Australia; Izana,Spain etc have contributed much to our understanding about our atmosphere and its long term changes but there are still gaps when we talk about our atmosphere in global perspective
- need new baseline station in order existing network more complete
- Bukit Kototabang is one of the six new gaw station at that time (1996)

Global GAW stations (as of December 1996)



Red Circle : New GAW stations in 1996

Global GAW stations (as of November 2009)

: New gaw stations

Site Description

★ Bukit Kototabang (100.32 deg E, 0.20 deg S, 865 meter asl)

Site Description

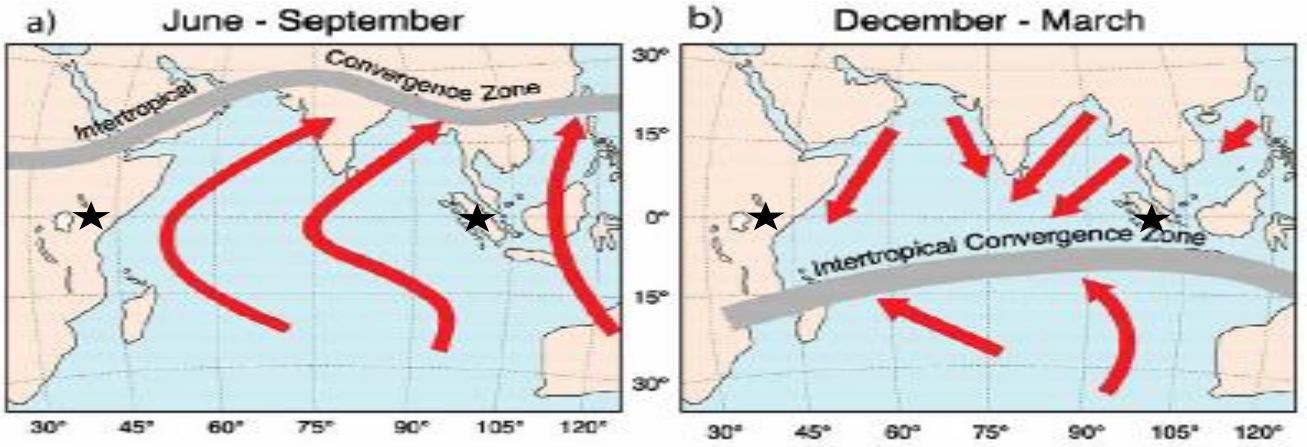
Environment :

Bukit Kototabang Global GAW Station

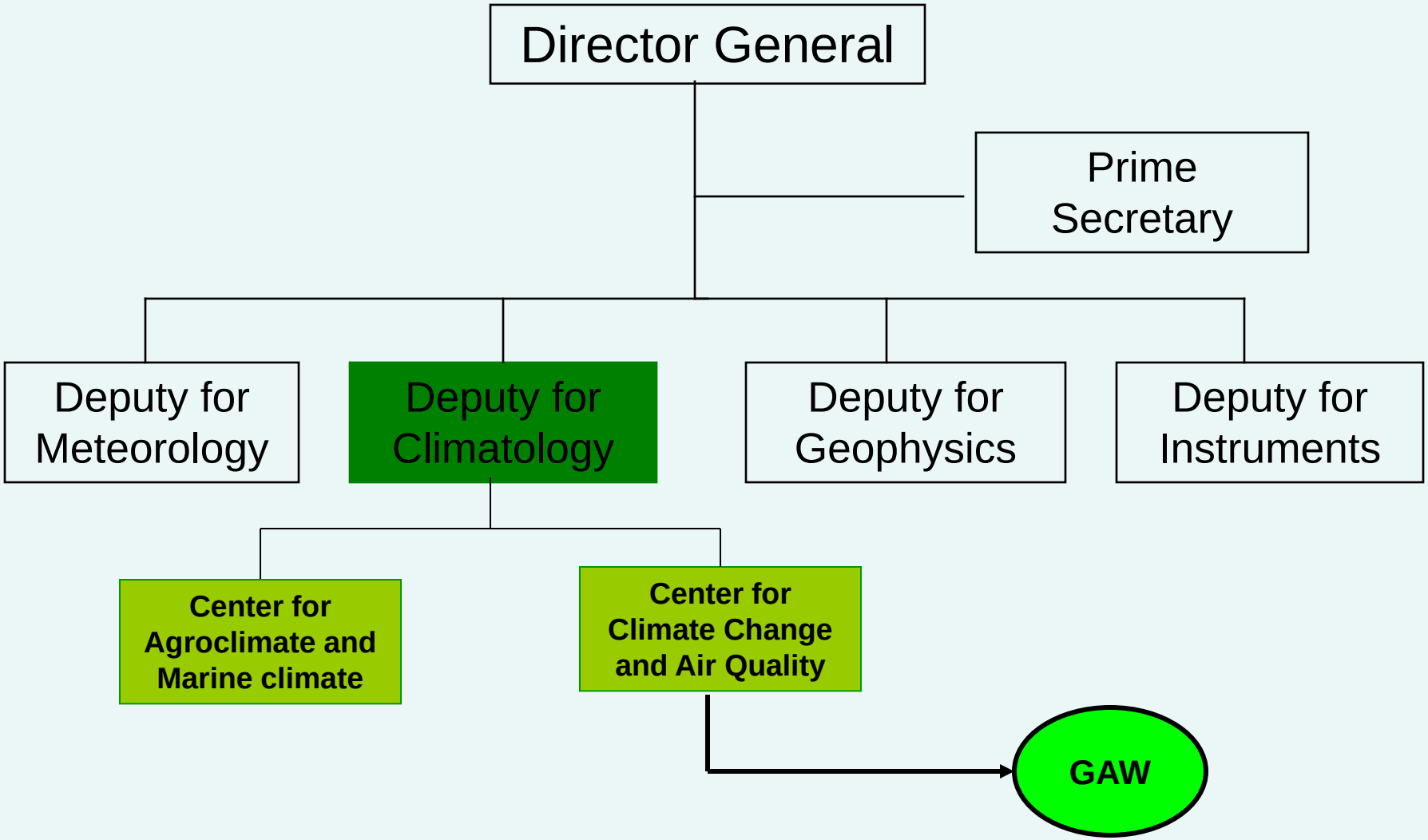
Site Description

Station Climatology :

- Annual Rainfall : 2440 mm
- Daily Temperature : 21.6 C
- Daily Humidity : 88 %
- Daily air pressure : 916.6 hPa
- Wind pattern



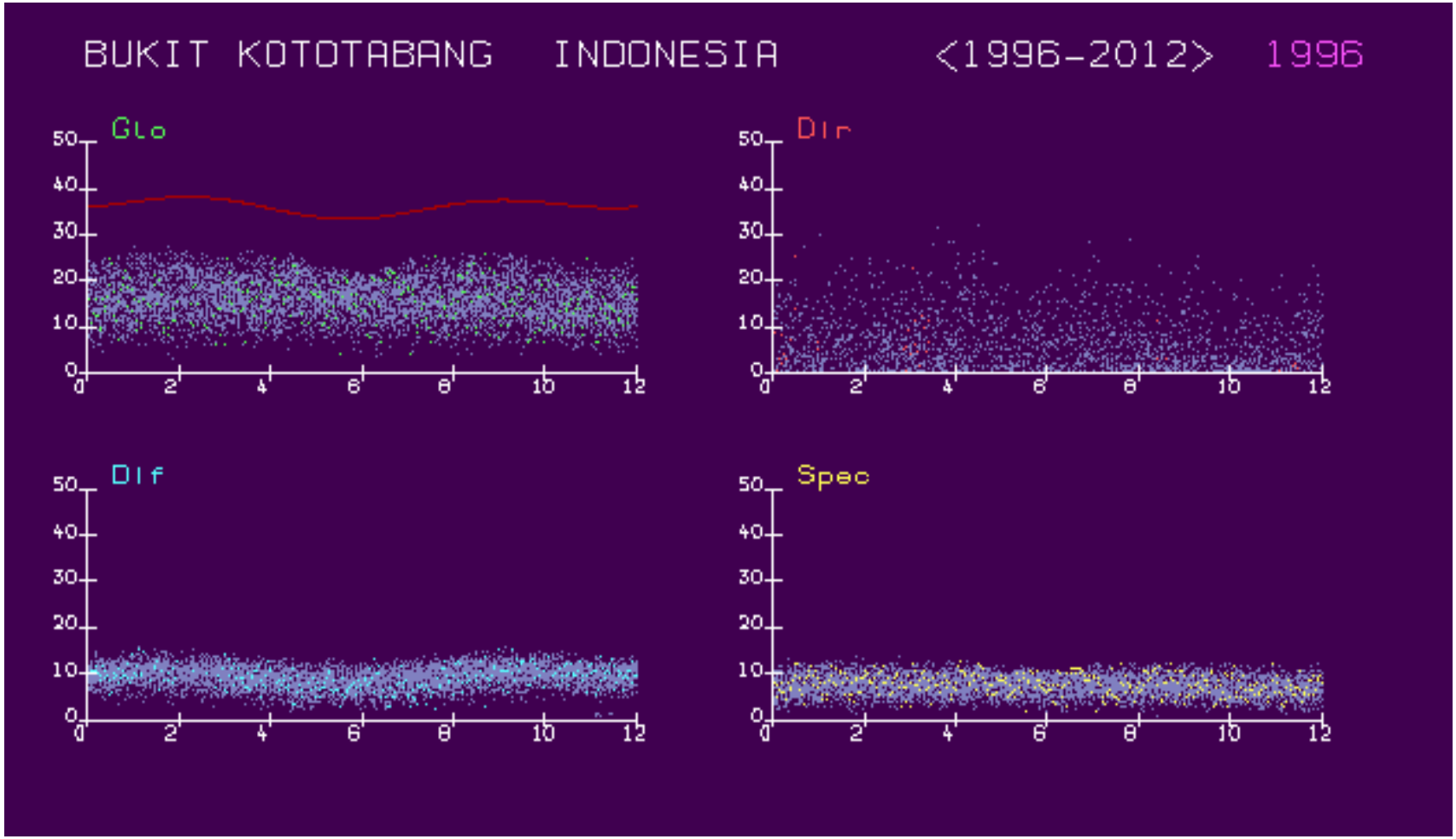
BMKG Organization :



Progress of the program

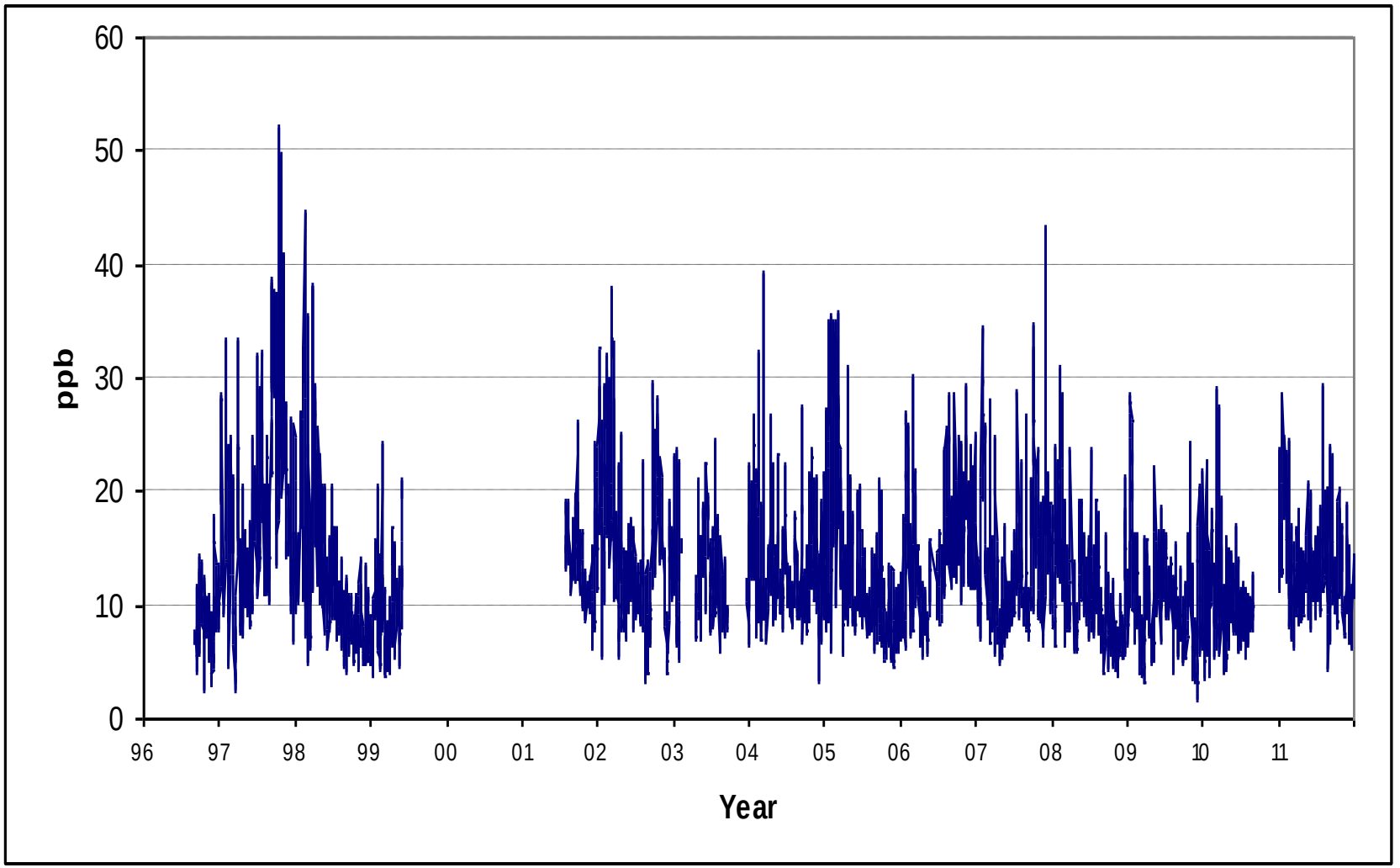
1996	1999	2001	2004	2008	2012
HVAS RWS Radiometer Ozone Anal. Met. Garden Passive Gas	HVAS RWS Radiometer Ozone Anal. Met. Garden Passive Gas MAWS	HVAS RWS Radiometer Ozone Anal. Met. Garden Passive Gas MAWS CO Analyzer	HVAS RWS Radiometer Ozone Anal. Met. Garden Passive Gas MAWS CO Analyzer PM_{10} Monitoring **Flask Sampler**	HVAS RWS Radiometer Ozone Analyzer Met. Garden Passive Gas MAWS CO Analyzer PM_{10} Monitoring Flask Sampler GAPS SO_2 Analyzer NO_2 Analyzer pH meter Cond. meter	HVAS RWS Radiometer Ozone Analyzer Met. Garden Passive Gas MAWS CO Analyzer PM_{10} Monitoring GAPS SO_2 Analyzer NO_2 Analyzer Infrared Rad. pH meter Cond. Meter **Piccaro Anal.** TUV Rad. Aurora Nephlo. Aethalometer

Daily Solar Radiation Since 1996

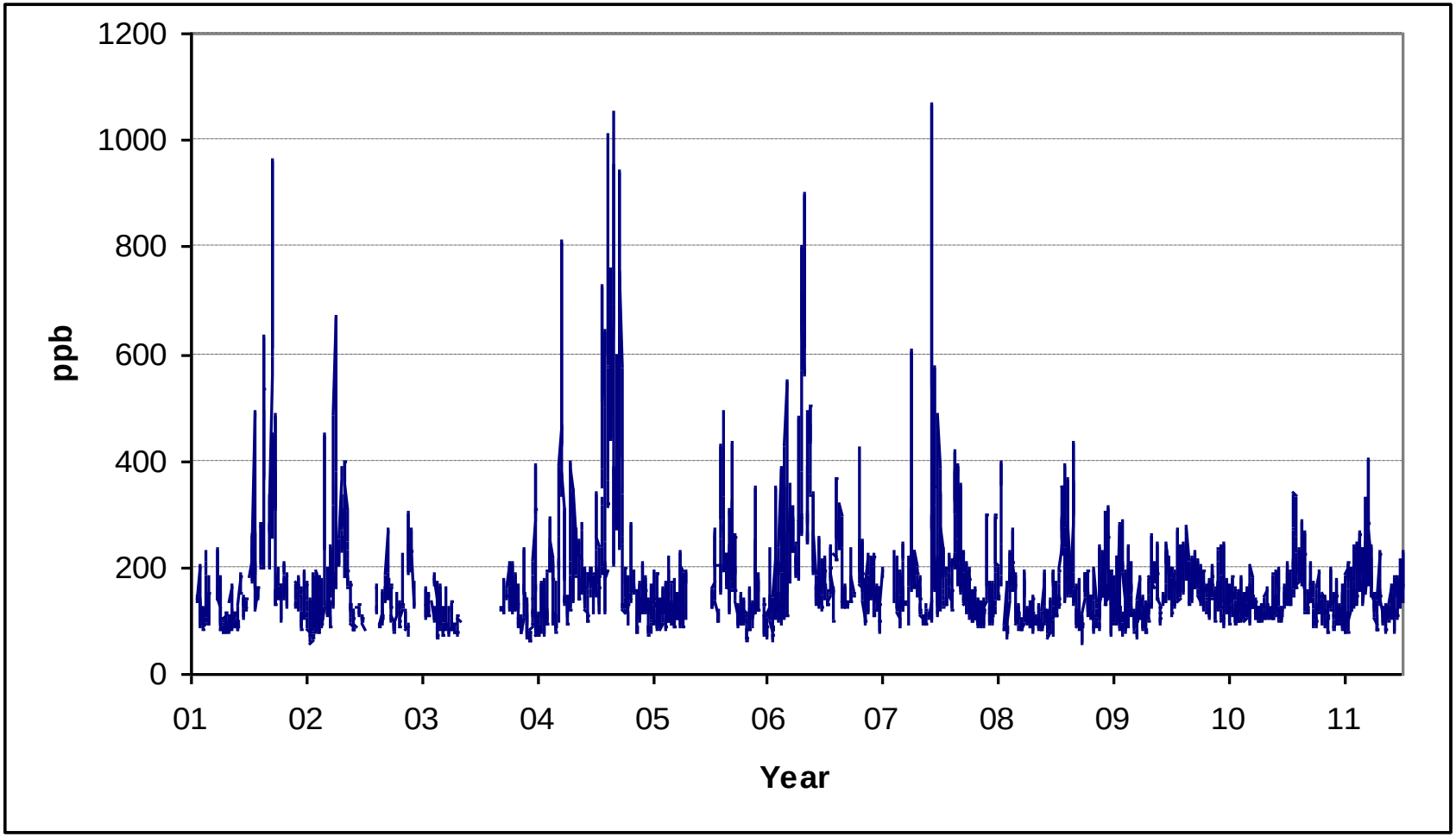


Source : WRDC

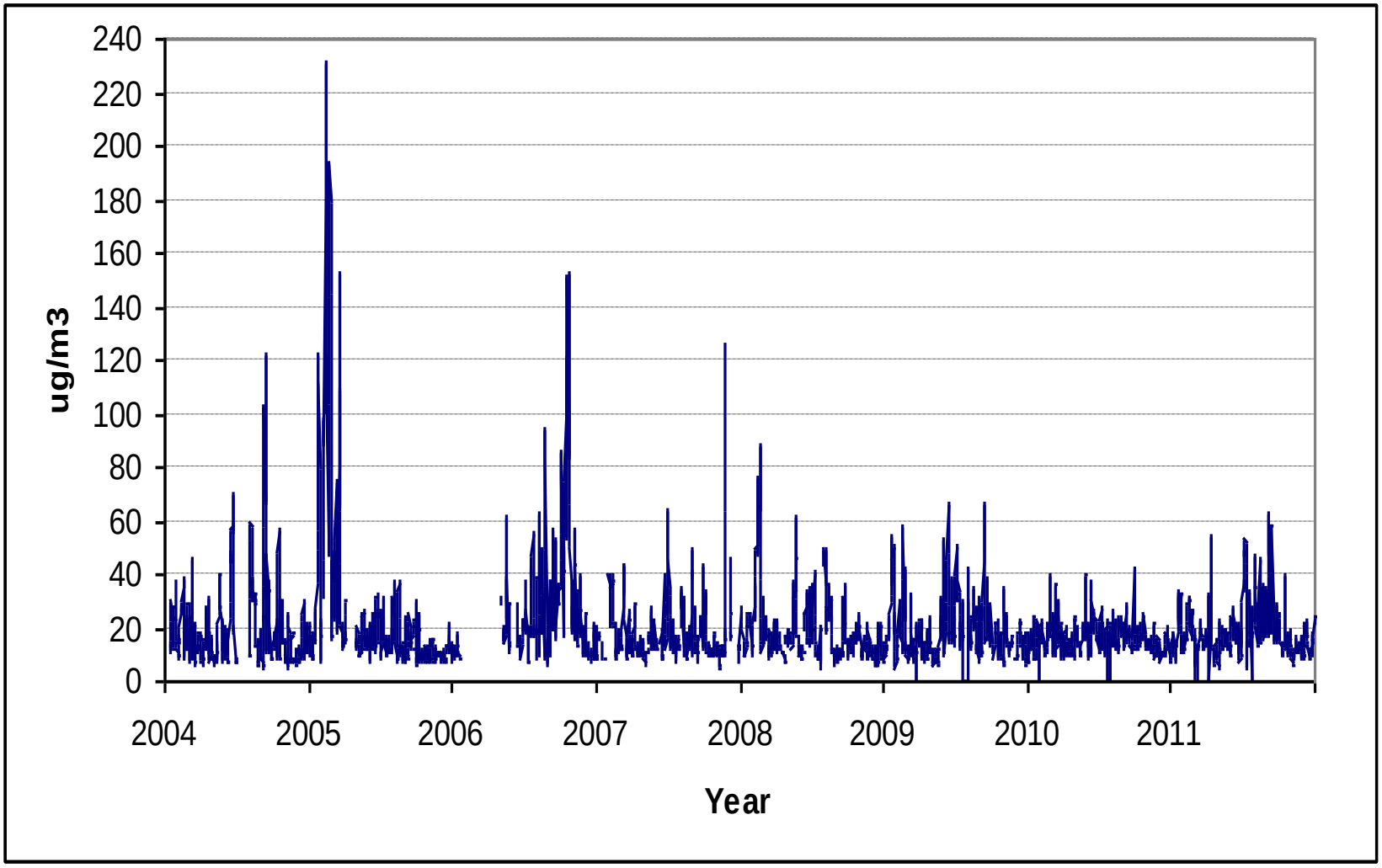
Daily Ground Level Ozone at Bukit Kototabang



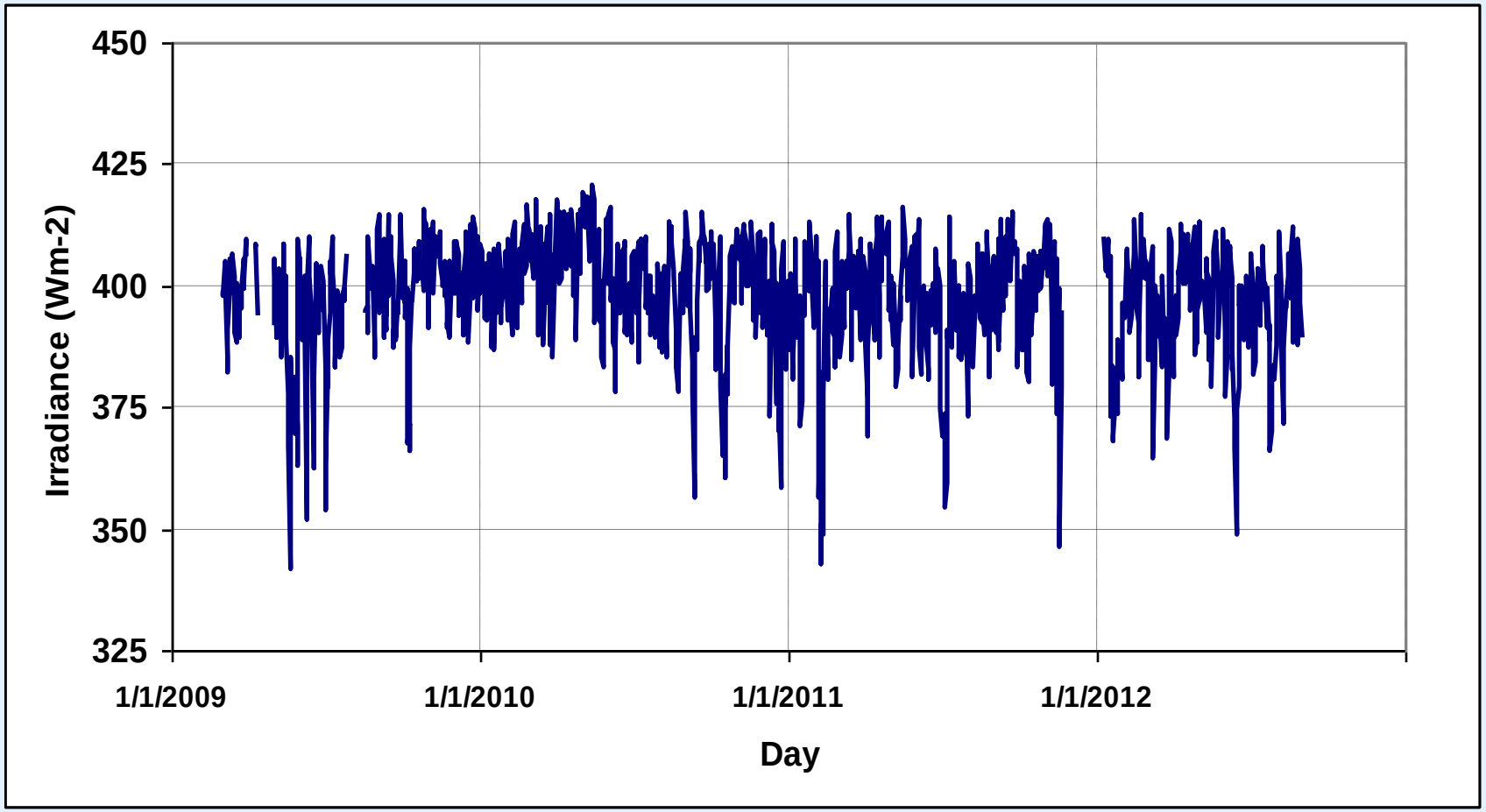
Carbon Monoxide (CO) Level at Bukit Kototabang



Daily PM_{10} at Bukit Kototabang



Daily Downward Long wave Irradiance



GHG Observation Program

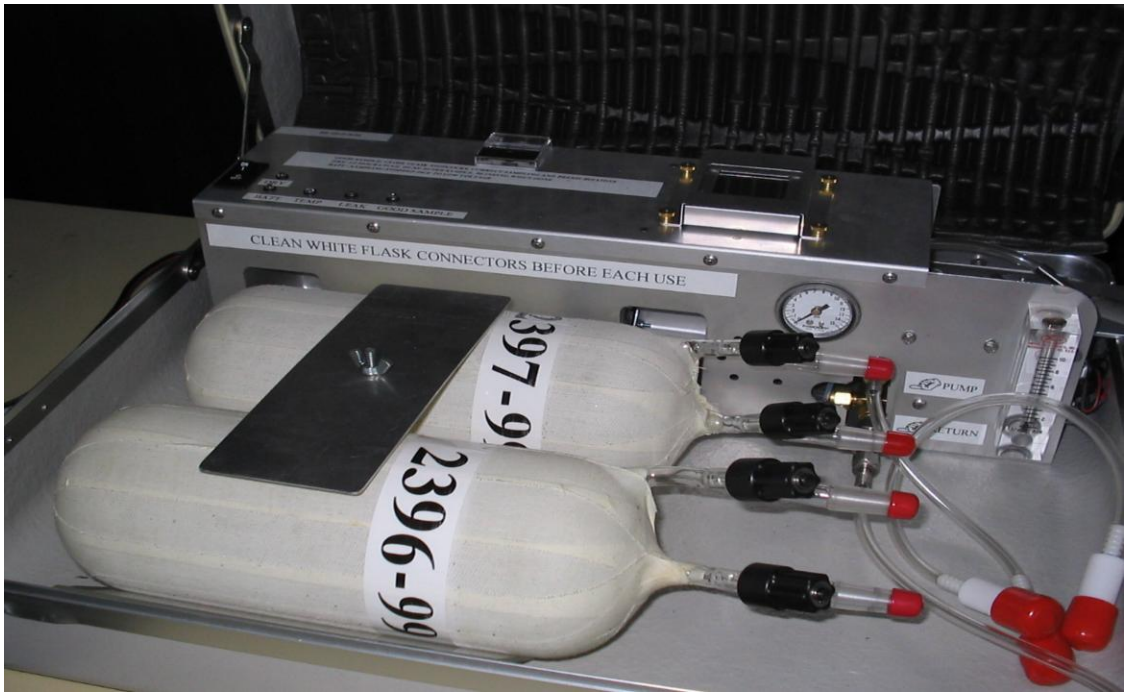
Flask Sampling : 2004 – 2011 (BMKG-NOAA)

- Air inlet at 35 meter a.g.l
- Weekly sampling on Tuesday at 07 UTC
- Parameters : CO_2, CH_4, N_2O and SF_6
- Stop operation on March 2011

Piccaro Analyzer : 2011 - now (BMKG-EMPA)

- Air inlet at : 10, 20 and 35 meter a.g.l
- Continues monitoring
- Data frequency : < 5 seconds
- Parameters : CO_2 and CH_4

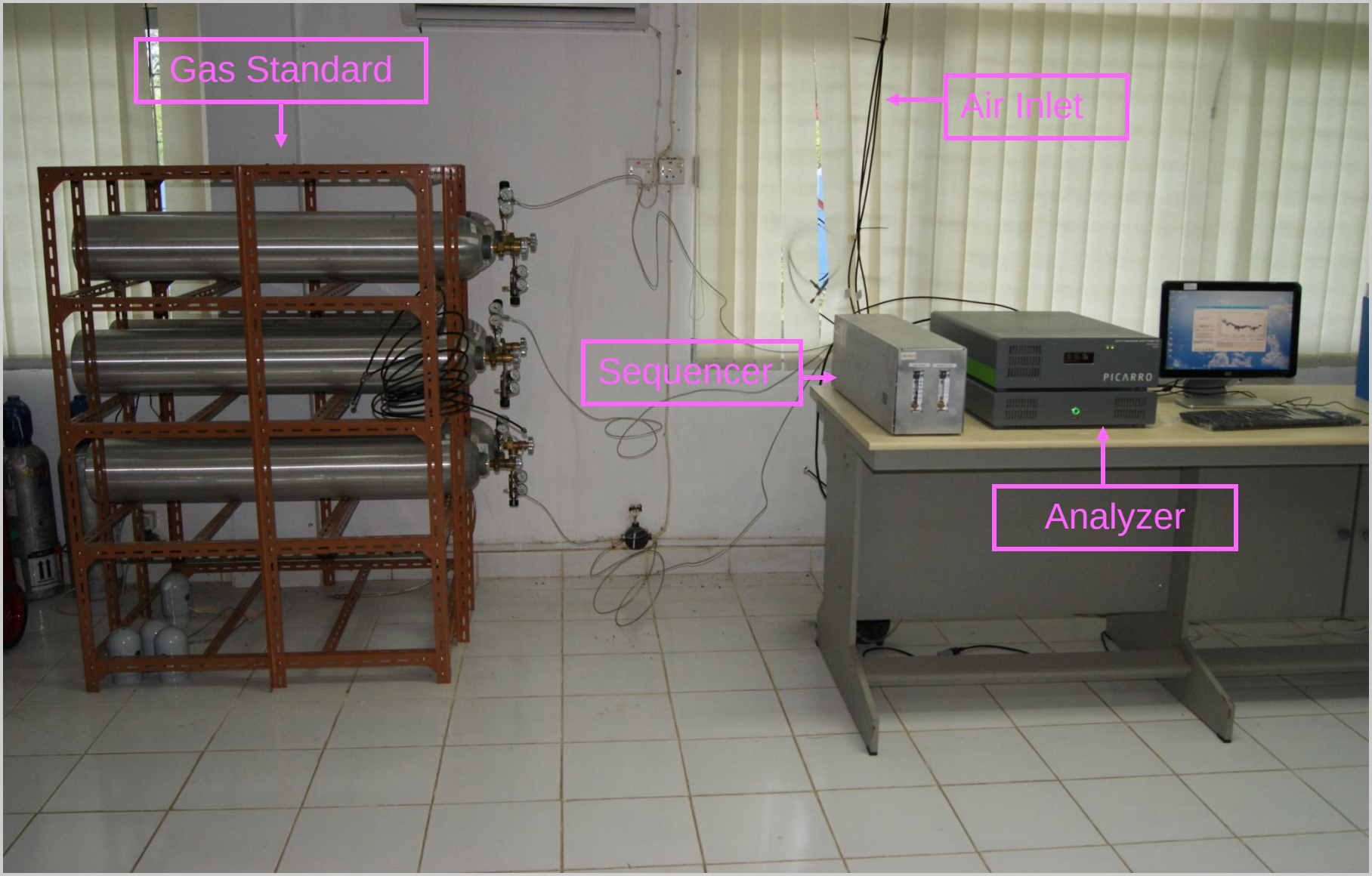
Flask Sampling (2004-2011)



Airkit Flask Sampler

Air Inlet

Piccaro CO2 / CH4 Monitoring : 2011 - now



New Air Inlet

1. 32 meter agl
2. 20 meter agl
3. 10 meter agl

Output Data From Piccaro

Height 10 m

```
2012   3   2   2 20 45.9 10 390.38 1842.92
2012   3   2   2 20 47.3 10 390.38 1842.16
2012   3   2   2 20 50.2 10 390.65 1842.13
2012   3   2   2 20 51.7 10 390.65 1844.13
2012   3   2   2 20 54.7 10 391.32 1844.14
2012   3   2   2 20 56.1 10 391.32 1849.64
2012   3   2   2 20 59.1 10 391.89 1849.63
2012   3   2   2 21  0.5 10 391.89 1853.78
2012   3   2   2 21  3.3 10 391.98 1853.79
2012   3   2   2 21  4.8 10 391.98 1856.43
2012   3   2   2 21  7.8 10 390.85 1856.43
2012   3   2   2 21  9.2 10 3
2012   3   2   2 21 12.2 10 3
2012   3   2   2 21 13.5 10 3
2012   3   2   2 21 16.5 10 3
2012   3   2   2 21 18.0 10 3
2012   3   2   2 21 20.9 10 3
2012   3   2   2 21 22.2 10 3
2012   3   2   2 21 25.1 10 3
2012   3   2   2 21 26.5 10 3
2012   3   2   2 21 29.5 10 3
2012   3   2   2 21 30.9 10 3
2012   3   2   2 21 33.8 10 3
2012   3   2   2 21 35.3 10 3
2012   3   2   2 21 38.3 10 3
2012   3   2   2 21 39.6 10 3
```

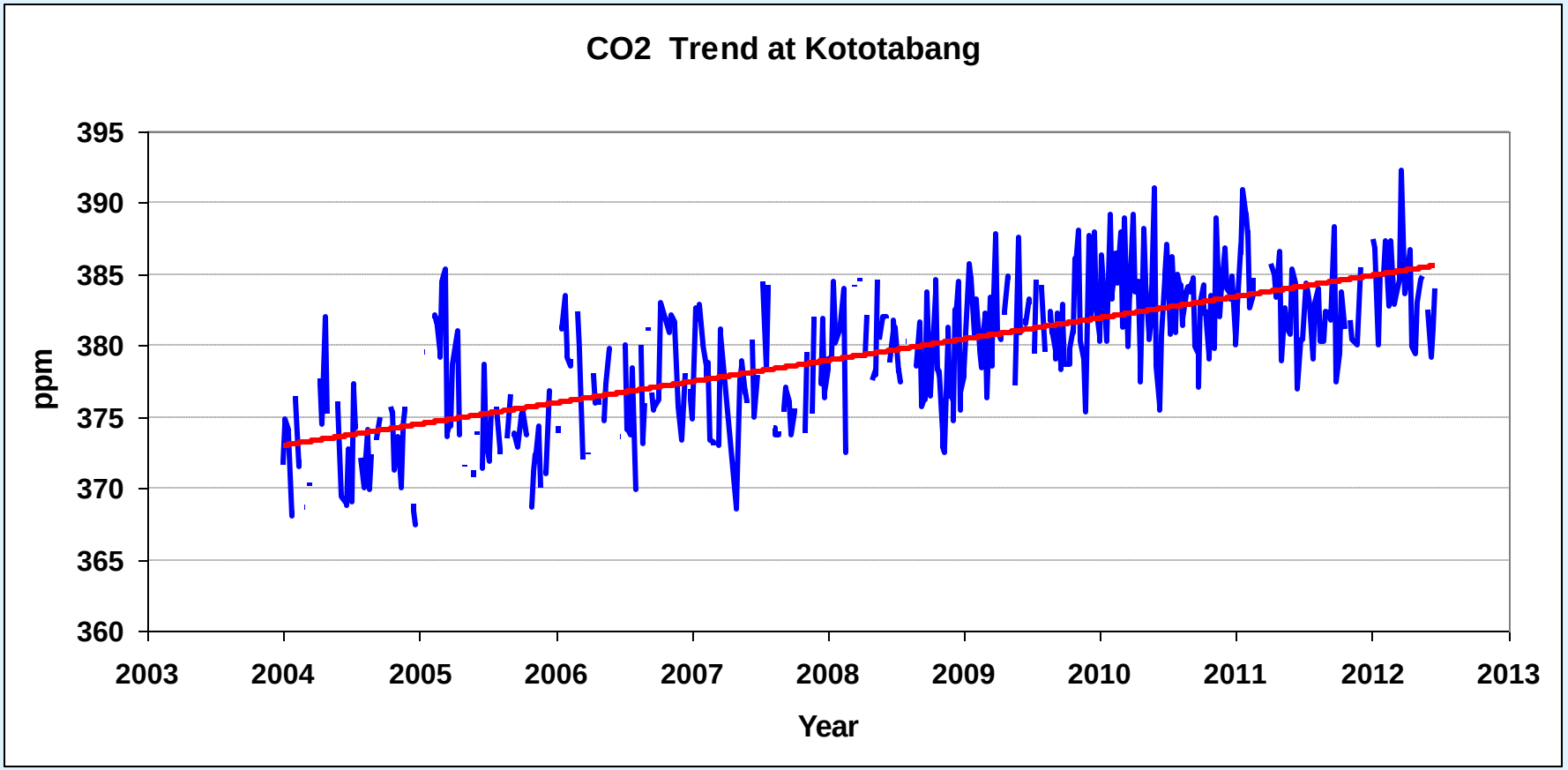
Height 20 m

```
2012   3   2   2 35 30.2 20 390.50 1858.84
2012   3   2   2 35 31.5 20 390.50 1858.32
2012   3   2   2 35 34.5 20 390.97 1858.32
2012   3   2   2 35 35.9 20 390.97 1863.73
2012   3   2   2 35 38.9 20 390.85 1863.68
2012   3   2   2 35 40.3 20 390.85 1864.24
2012   3   2   2 35 43.3 20 390.30 1864.18
2012   3   2   2 35 44.7 20 390.30 1852.39
2012   3   2   2 35 47.8 20 390.68 1852.38
2012   3   2   2 35 49.1 20
2012   3   2   2 35 52.0 20
2012   3   2   2 35 53.4 20
2012   3   2   2 35 56.3 20
2012   3   2   2 35 57.7 20
2012   3   2   2 36  0.6 20
2012   3   2   2 36  2.0 20
2012   3   2   2 36  5.1 20
2012   3   2   2 36  6.5 20
2012   3   2   2 36  9.5 20
2012   3   2   2 36 10.8 20
2012   3   2   2 36 13.8 20
2012   3   2   2 36 15.2 20
2012   3   2   2 36 18.3 20
2012   3   2   2 36 19.6 20
2012   3   2   2 36 22.6 20
2012   3   2   2 36 24.0 20
```

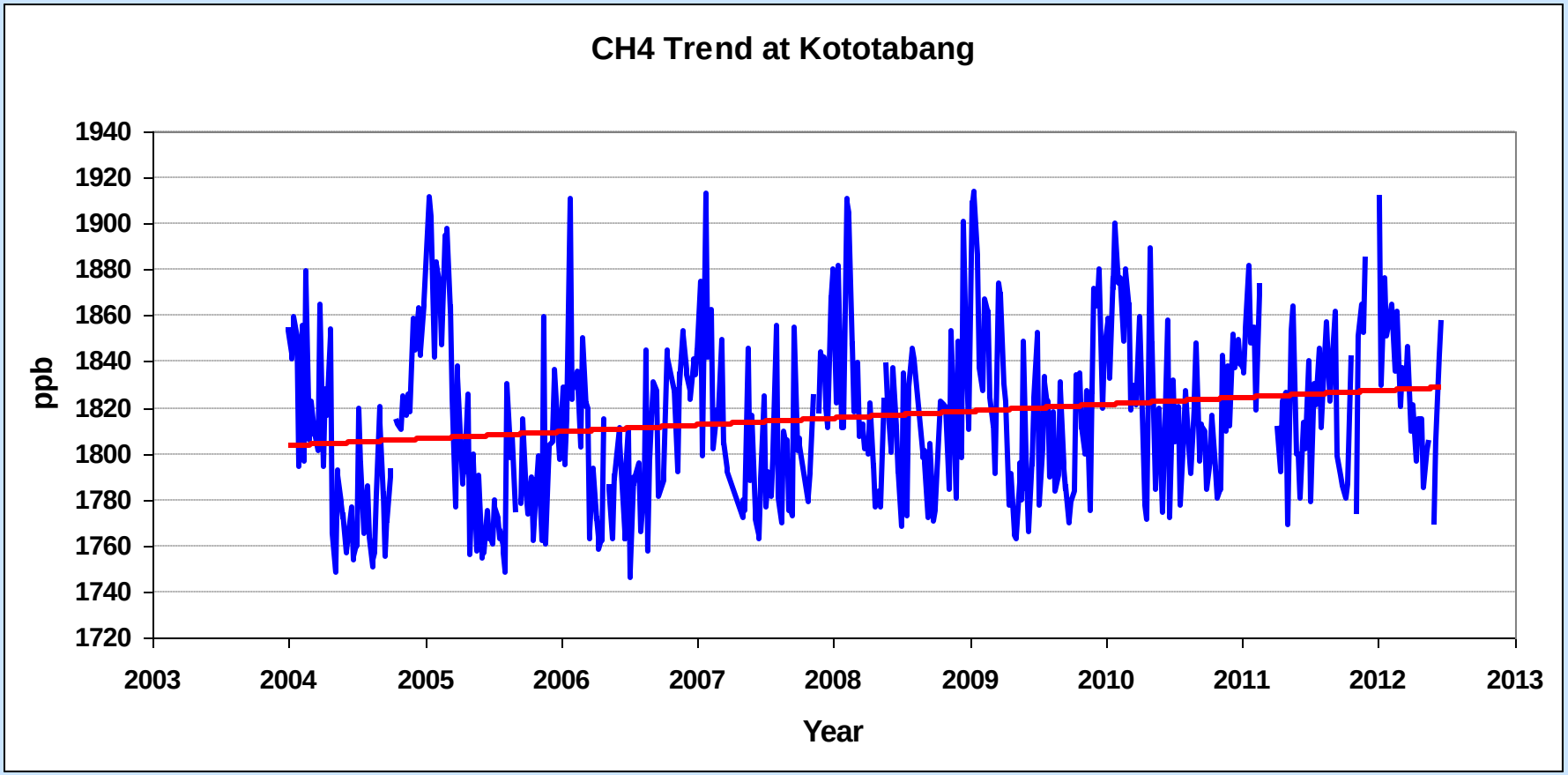
Height 32 m

```
2012   3   2   2 55 30.0 32 388.41 1858.21
2012   3   2   2 55 31.4 32 388.41 1861.11
2012   3   2   2 55 34.4 32 388.63 1861.09
2012   3   2   2 55 35.8 32 388.63 1858.97
2012   3   2   2 55 38.8 32 389.01 1858.96
2012   3   2   2 55 40.2 32 389.01 1855.46
2012   3   2   2 55 43.0 32 388.86 1855.40
2012   3   2   2 55 44.5 32 388.86 1851.53
2012   3   2   2 55 47.5 32 390.83 1851.54
2012   3   2   2 55 48.9 32 390.83 1845.99
2012   3   2   2 55 51.8 32 391.54 1845.99
2012   3   2   2 55 53.0 32 391.54 1846.93
2012   3   2   2 55 56.1 32 391.56 1846.91
2012   3   2   2 55 57.3 32 391.56 1851.64
2012   3   2   2 56  0.3 32 391.72 1851.65
2012   3   2   2 56  1.7 32 391.72 1859.10
2012   3   2   2 56  4.6 32 391.80 1859.09
2012   3   2   2 56  6.1 32 391.80 1853.83
2012   3   2   2 56  9.1 32 391.84 1853.82
2012   3   2   2 56 10.4 32 391.84 1851.58
2012   3   2   2 56 13.5 32 391.98 1851.58
2012   3   2   2 56 14.9 32 391.98 1853.05
2012   3   2   2 56 17.9 32 391.81 1853.04
2012   3   2   2 56 19.2 32 391.81 1853.19
2012   3   2   2 56 22.3 32 392.05 1853.20
2012   3   2   2 56 23.8 32 392.05 1850.47
```

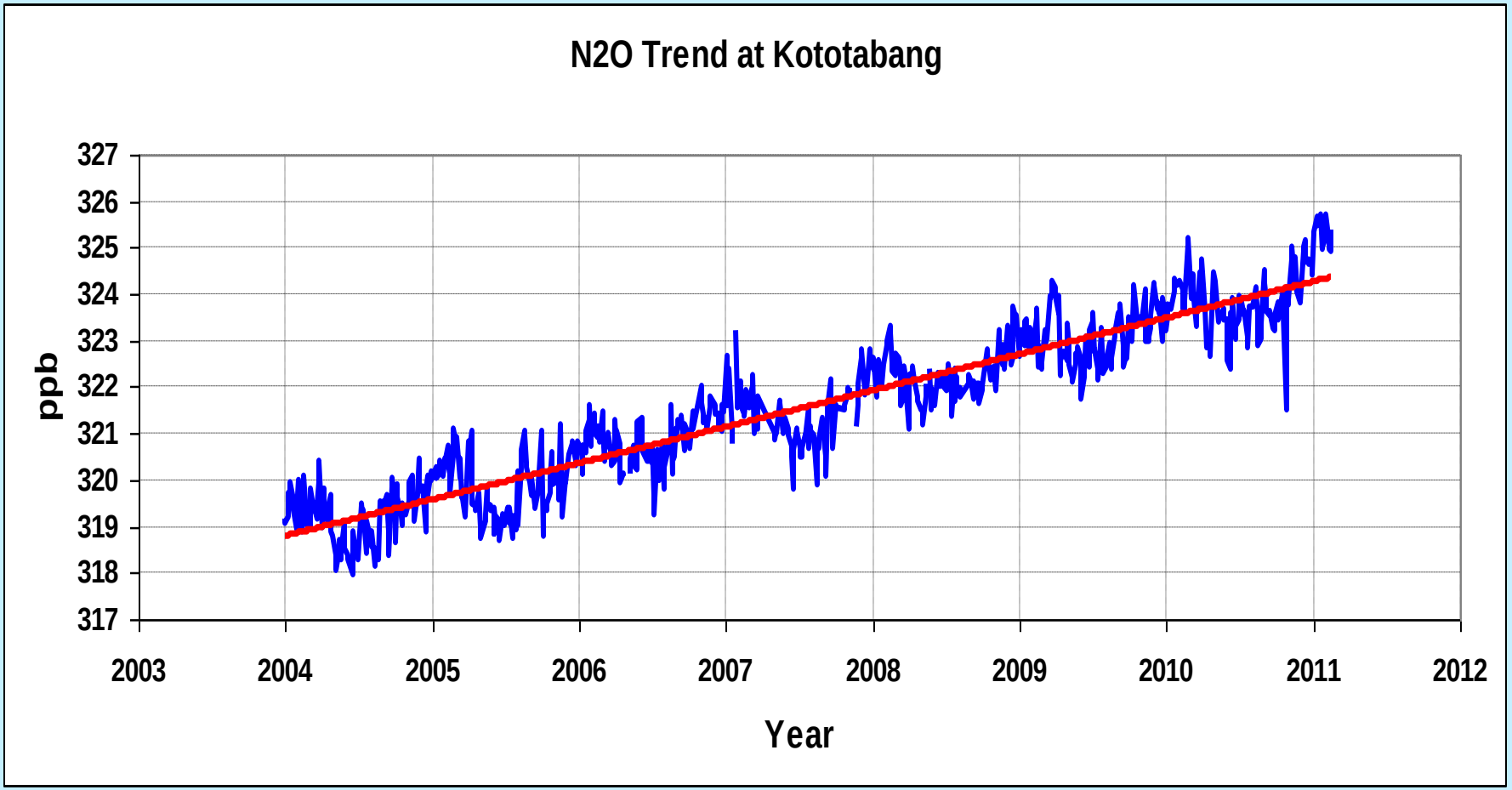
Result of GHG Observation



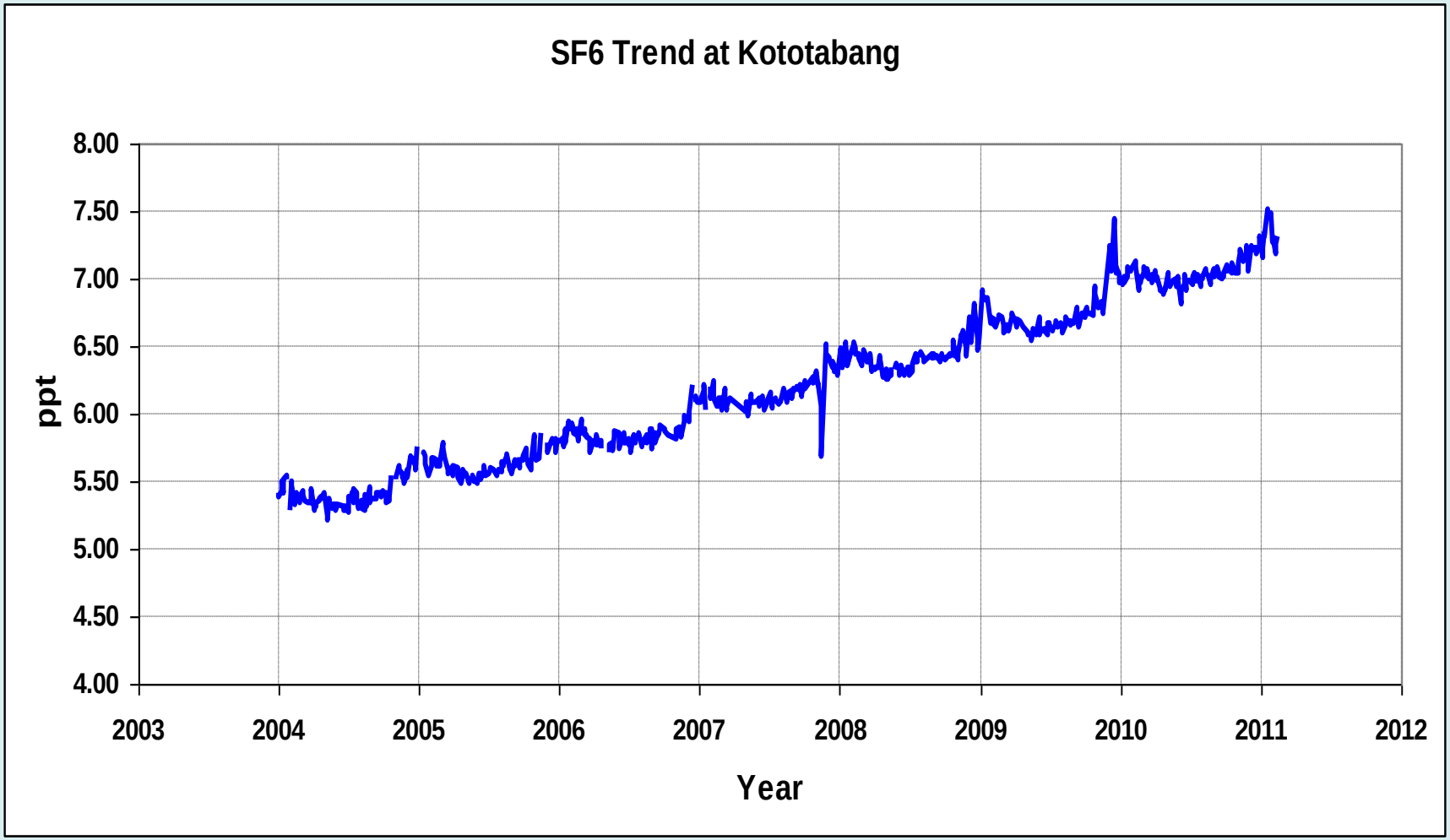
Result of GHG Observation



Result of GHG Observation



Result of GHG Observation



GHG Levels at Bukit Kototabang

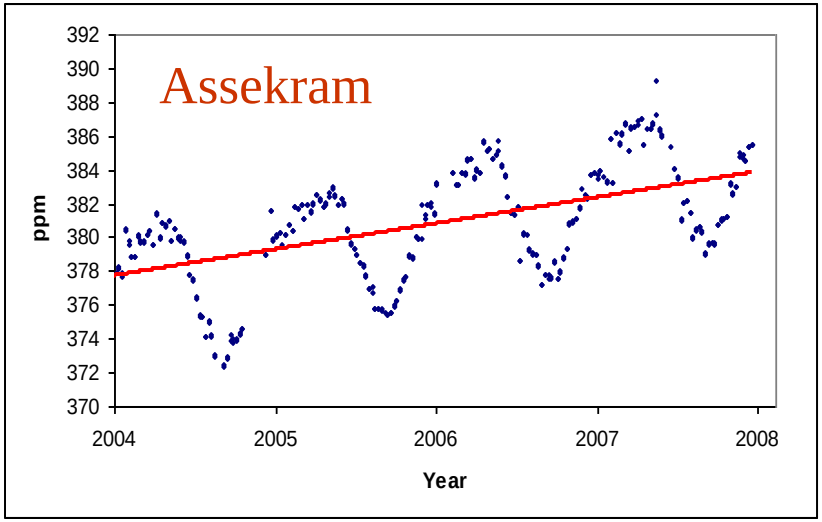
Year	CO_2 (ppm)	CH_4 (ppb)	N_20 (ppb)	SF_6 (ppt)
2004	**373.0**	**1806.1**	**319.2**	**5.41**
2005	**375.0**	**1804.5**	**319.9**	**5.63**
2006	**377.2**	**1806.8**	**320.8**	**5.85**
2007	**377.0**	**1806.5**	**321.3**	**6.14**
2008	**380.9**	**1820.9**	**322.2**	**6.42**
2009	**381.5**	**1818.2**	**323.1**	**6.72**
2010	**383.9**	**1827.3**	**323.8**	**7.02**
2011	**383.1**	**1823.8**	**NA**	**NA**

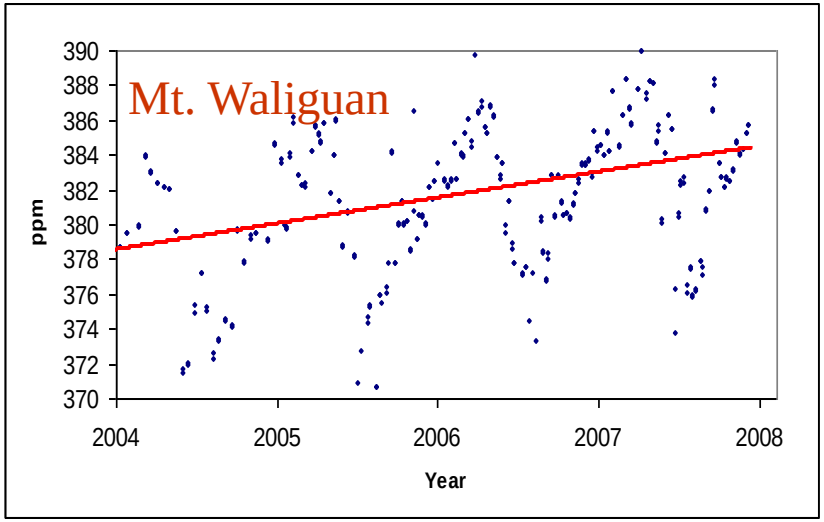
NA = not available

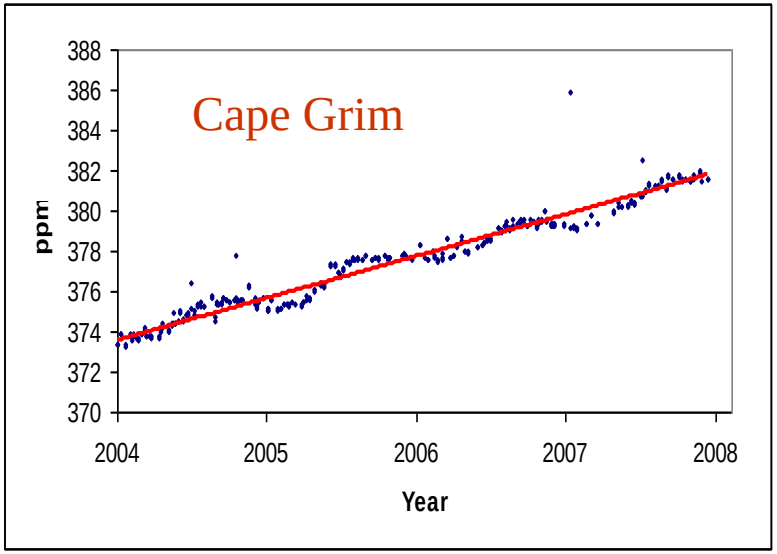
GHG Level Comparisons

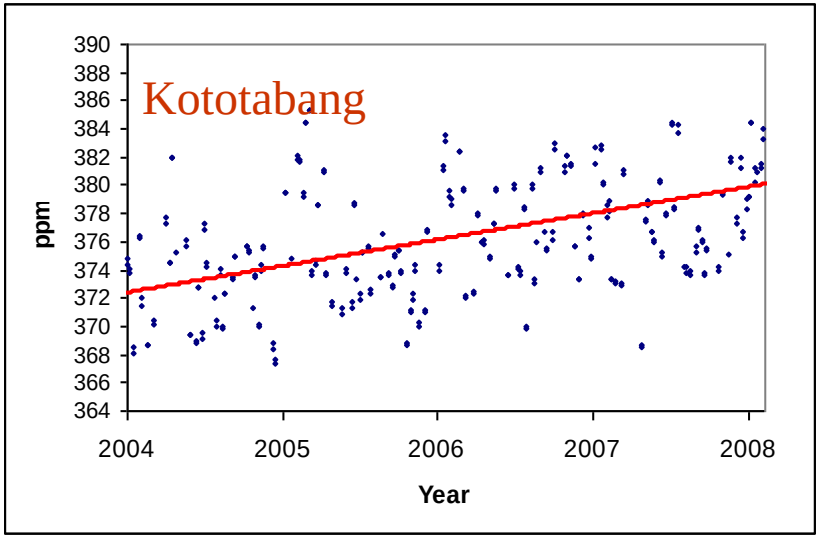
Time	CO_2 (ppm)		CH_4 (ppb)		N_2O (ppt)	
	Global	Indo.	Global	Indo.	Global	Indo.
Rev. Ind	280		715		270	
2004	377.1	373.0	1774	1806.1	318.6	319.2
2005	379.0	375.0	1774	1804.5	319.2	319.9
2006	381.2	377.2	1783	1806.8	320.1	320.8
2007	383.1	377.0	1789	1806.5	320.9	321.3
2008	385.2	380.5	1797	1820.9	321.8	322.2
2009	386.8	381.5	1803	1818.2	322.5	323.1
2010	389.0	383.9	1808	1827.3	323.2	323.8

CO_2 Levels at Some Global GAW Station





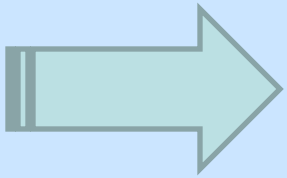




New Observation Program

1. Aerosol Scattering

2. Aerosol Absorption

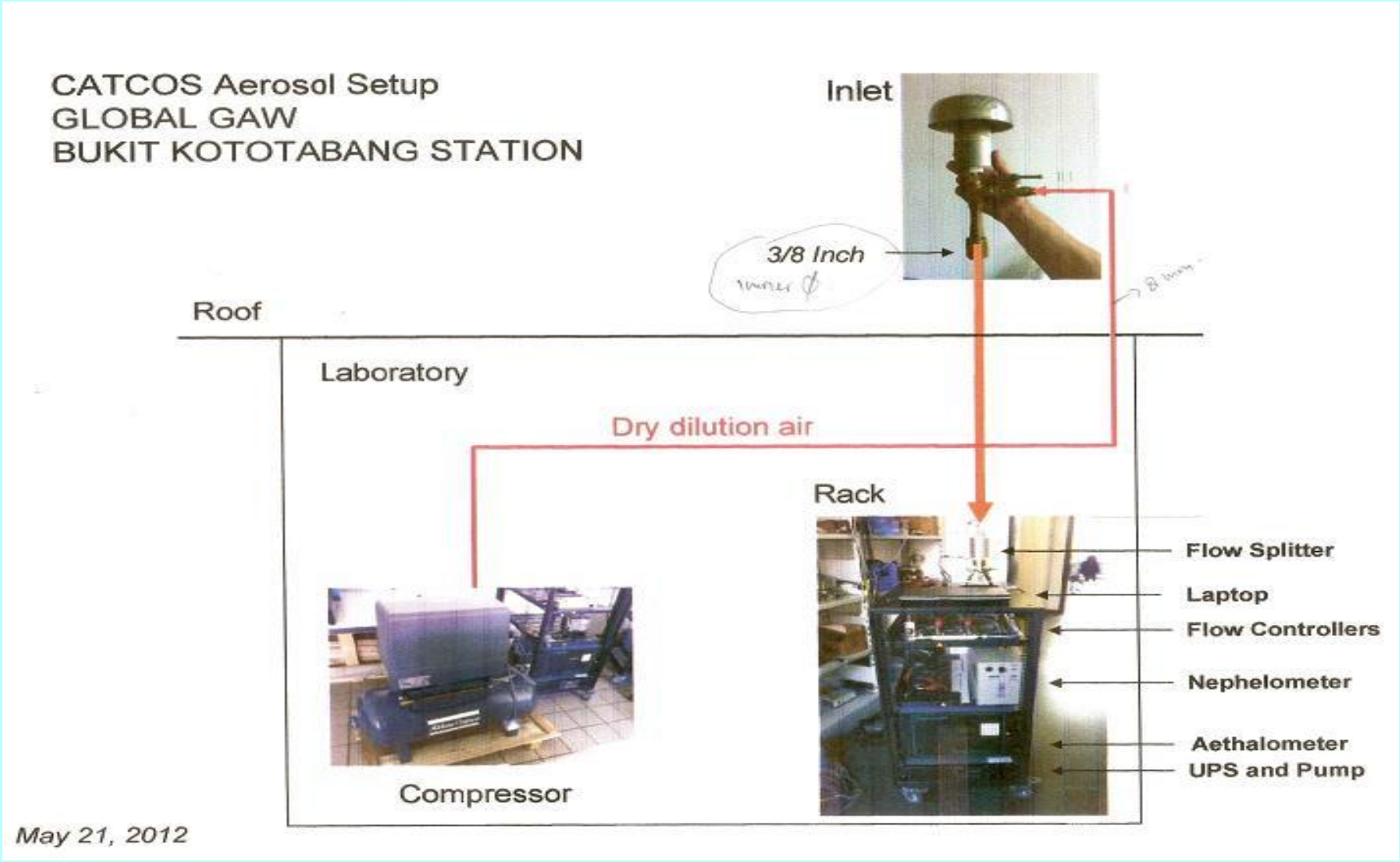


CATCOS Project

Catcos (Capacity Building and Twinning for Climate Observing System) :

- Indonesia (Bukit Kototabang Global GAW Station)
- Chile
- Kenya
- Vietnam

Design of new aerosol monitoring program

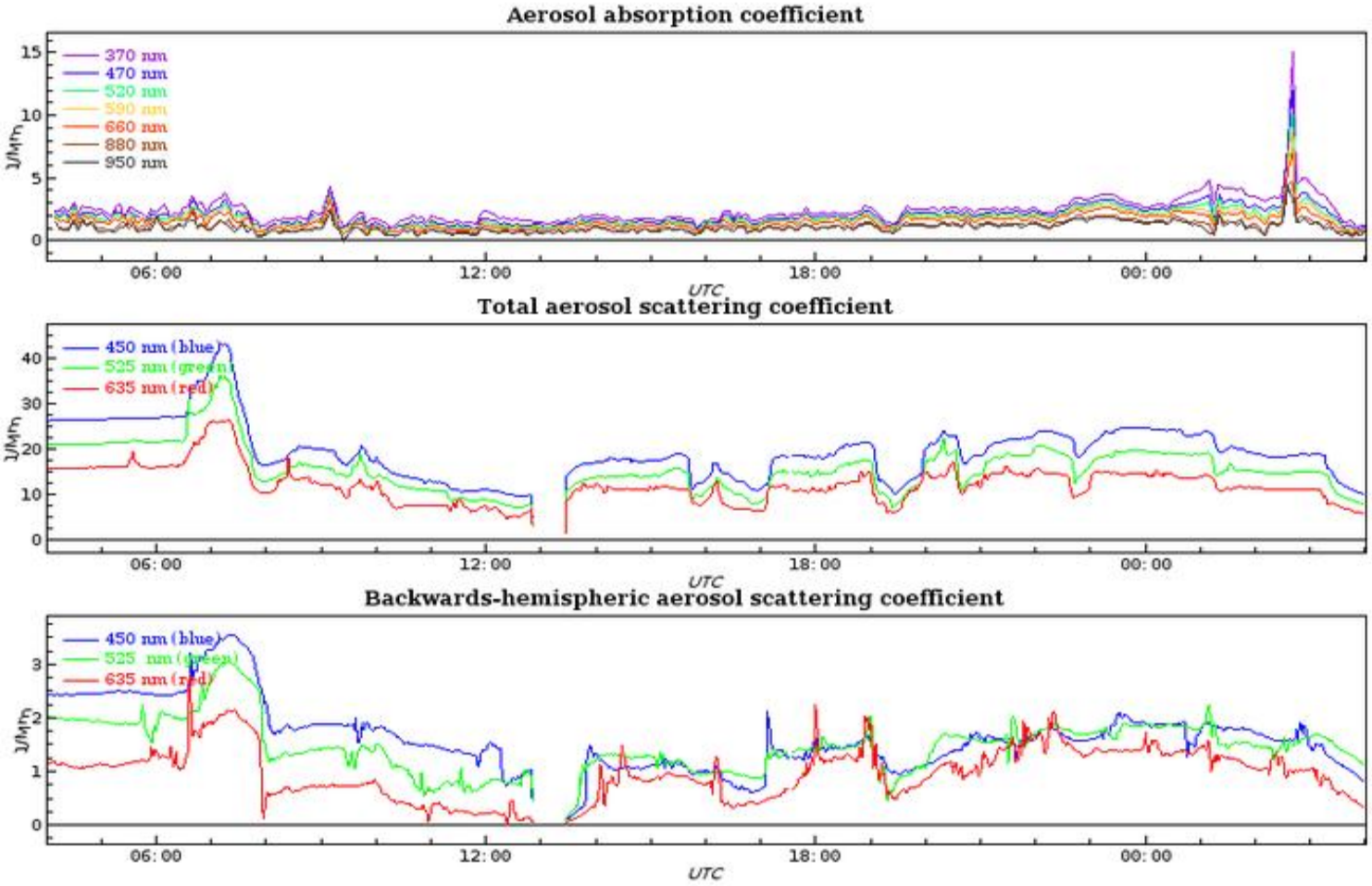


New Aerosol Monitoring Instruments

(Aurora Nephlometer and Aethalometer)

Preliminary Result Catcos Program

(Visit >>> http://www.psi.ch/lac/sdc-catcos)



International Meeting

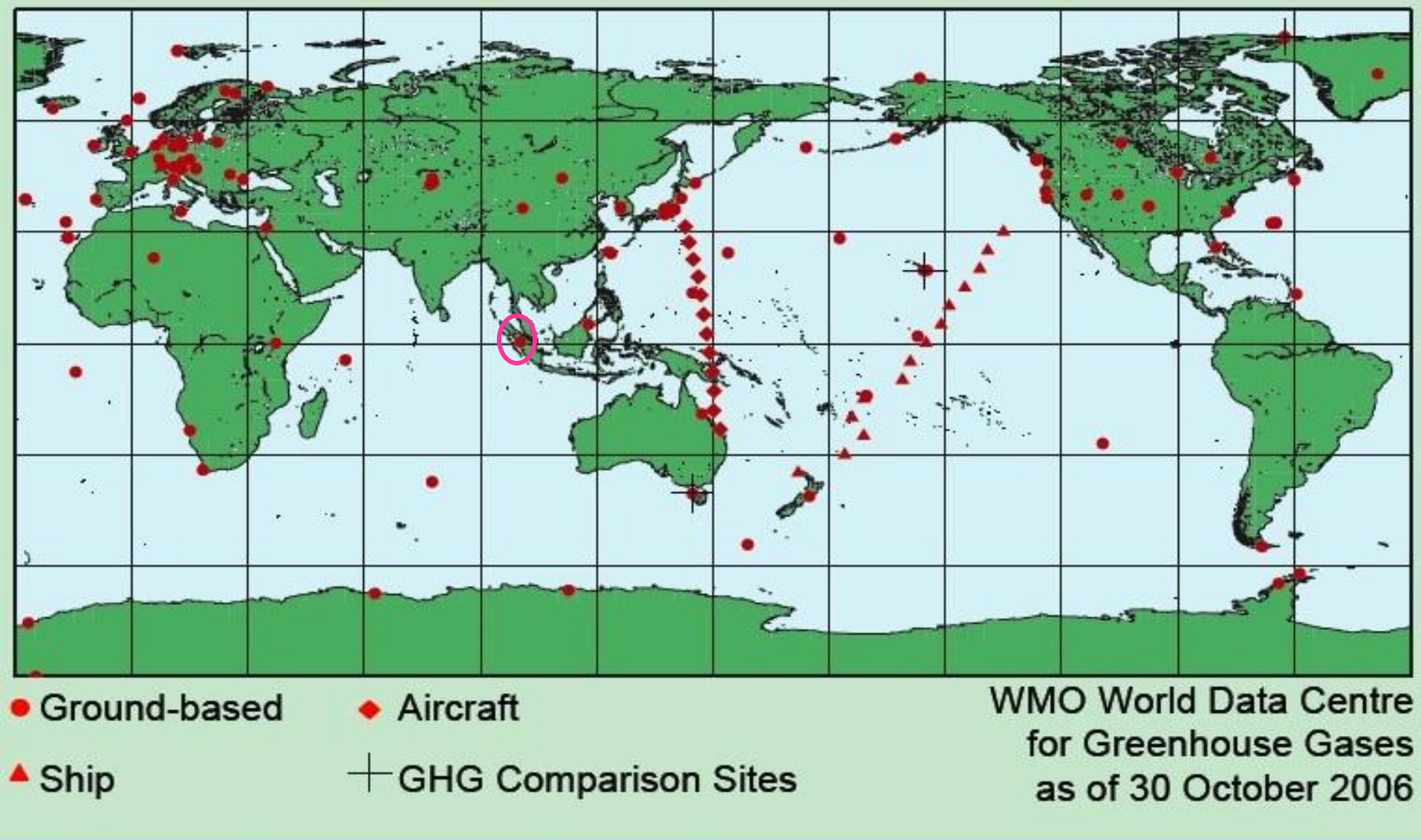
- International Pyrheliometer Comparison, Golden USA (1999)
- Australian Aerosol Workshop, Melbourne Australia (2007)
- Symposium on GAW Related Activities, Jakarta Indonesia (2007)
- International Workshop on GAW, Jakarta Indonesia (2010)
- The 2nd Asean GAW Workshop on Greenhouse Gases, Jeju South Korea (2010)
- International Pyrheliometer Comparison, Golden USA (2011)
- The 3rd Asean GAW Workshop on Greenhouse Gases, jeju South Korea (2011)
- Workshop on Aerosol Database, Norway (2011)

Contribution :

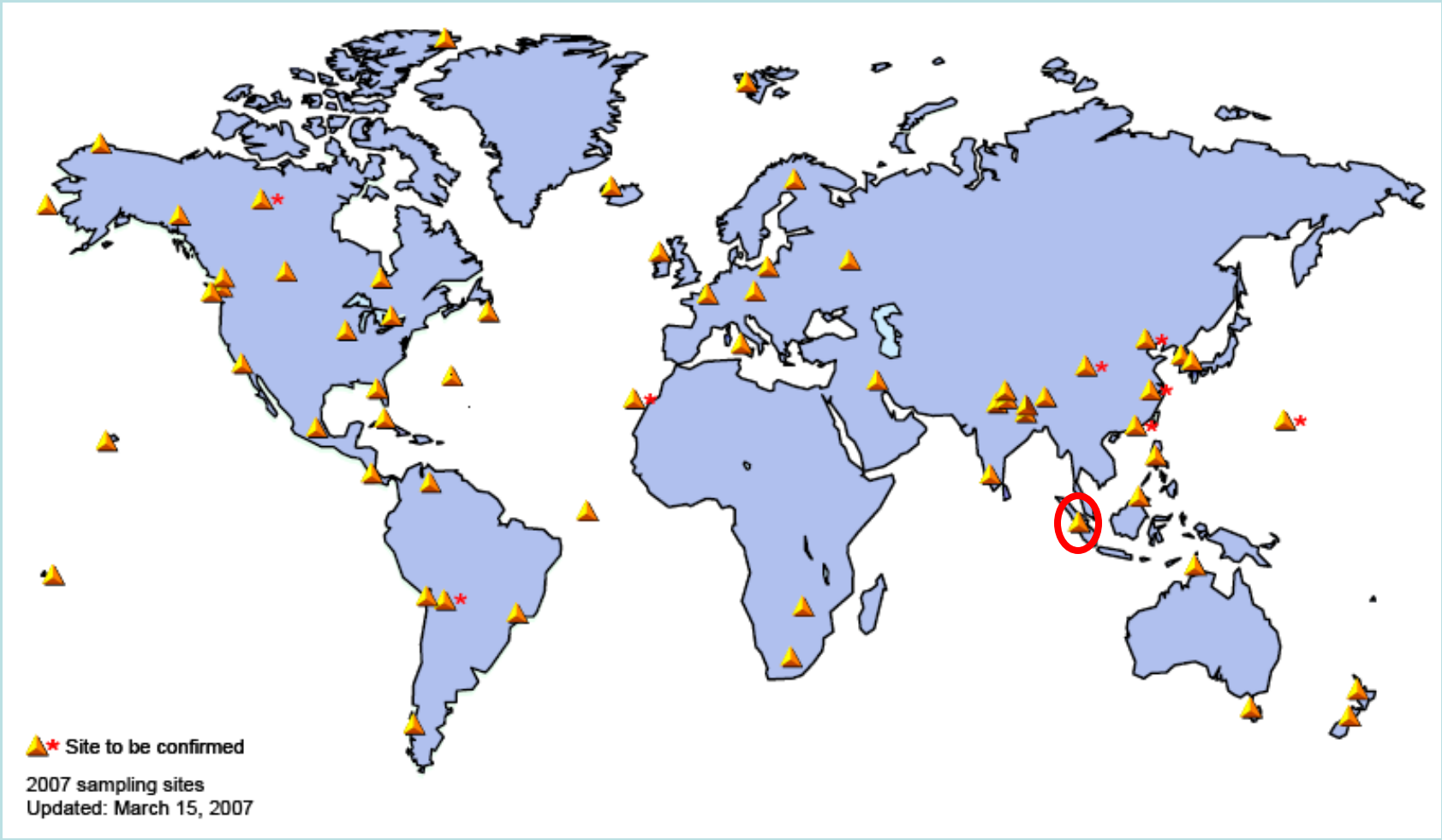
Int'l Community :

- WRDC for Solar Radiation data
- WDCGG for Surface Ozone and CO data
- WDCGG for CO_2 and CH_4 data
- NCDC for wet chemistry data
- WCDA for Aerosol (under processing)
- Research Area for some Japanese Universites
- Ground Base CCGG network
- Ground Base GAPS Network

CCGG Network



GAPS : Global Air Passive Sampling



Summer School Kyoto Univ.

Contributions

Domestic Contribution

- Higher Education
- Basic Education
- Teacher Community
- Center Government
- Local Governement

Contributions

Acknowledgements

BMKG