Greenhouse Gases Monitoring Activities of Korea Global Atmosphere Watch Center (KGAWC) in 2011

September 24, 2012
Haeyoung Lee
KGAWC / KMA

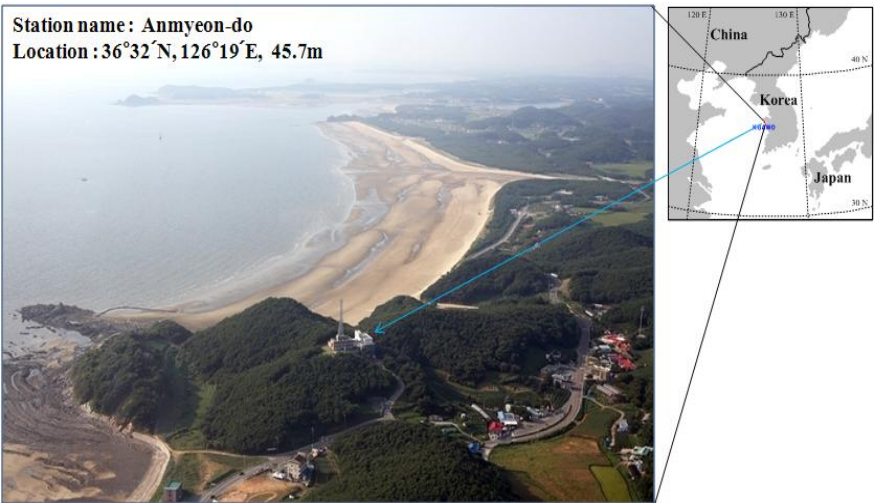
Contents

Introduction about KGAWC

Organization :

Korea Meteorological Administration(KMA)/
Climate Science Bureau/
Climate Policy Division
Climate Prediction Division
Korean Peninsula Weather and Climate Division
Korea Global Atmosphere Watch Center (KGAWC)

KGAWC is one of the WMO/GAW regional stations (station name : Anmyeon-do)



Geographical location :

The center of west coast of Korea Peninsula
Latitude is 36 N, Longitude 126 E
Height station baseline is 47 m

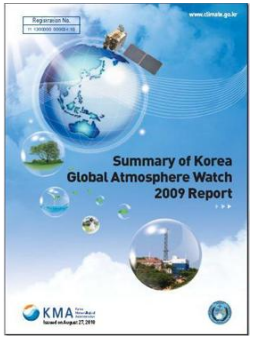
Recent contribution of KGAWC to WMO/GAW program

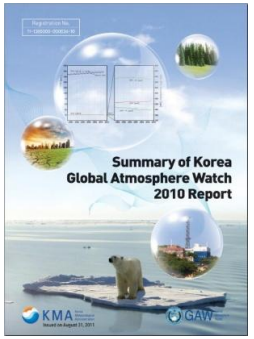
1. 4th International Workshop: *the Asian GAW Workshop on Greenhouse Gases*
2. Publication, *Summary of Korea Global Atmosphere Watch 2011 Report*
3. Contribution to GAW
   - *Asian GAW Greenhouse Gases Newsletter*
   - Data sharing to WDCGG

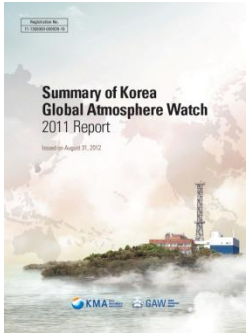
The 1st Asian GAW workshop in 2009

The 2nd Asian GAW workshop in 2010

The 3rd Asian GAW workshop in 2011







Climate Change Information Center(CCIC):

http://www.climate.go.kr/home/Eng/htmls/ggwg/sub1.html

Asian GAW Greenhouse Gases Working Group

Introduction about GGWG

Participants

Publication

GAW Reports or Technical Guidances

Meeting and Workshop Schedule

Introduction about GGWG

HOME > GGWG > Introduction about GGWG

History

Six countries (Australia, China, Indonesia, Japan, South Korea, Malaysia in alphabetical order) from WMO RA2(Asia) and RA4(South West Pacific), are made a decision to organize the Asian GAW Greenhouse Gases Working Group in discussion session of the 3rd Asian GAW Workshop on Greenhouse Gases held in Seoul, Korea on 29-30 Sep. 2011.

All participants in the discussion session empathized emergencies of the steady increase of carbon dioxides (CO_2) and global environmental risks of climate change, and highlighted cooperations between countries involved in GAW program for global atmosphere watch.

So, all participants in the discussion session agreed to make working group, named the Asian GAW Greenhouse Gases Working Group.

Mission

The missions of the Working Group are

KGAWC's GHGs and system!

CO_2, CH_4, N_2O, CFCs(-11, -12, -113), SF_6

KGAWC's Systems for Measuring 7 GHGs

1. Air Sampling Systems

-40m Toll tower
-inlet system

2. Dehumidification Systems

- Cooler system(0℃)
- Nafion drier
- Chemical trap system

3. Measuring Systems
Gas analyzer

- NDIR (Non-dispersive infrared sensor)
- GC (Gas Chromatography)
- CRDS (On testing)

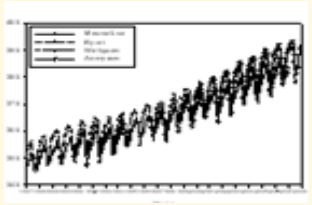
Standard Gas

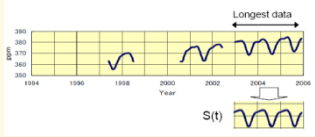
- WMO Scale (CO_2)
- KRISS Standard scale (others)

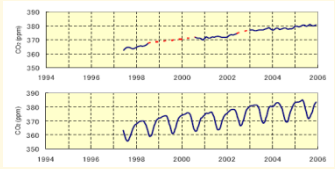
NDIR(CO_2) GC (CH_4, N_2O, CFCs)

CRDS(CO_2) GC (SF_6)

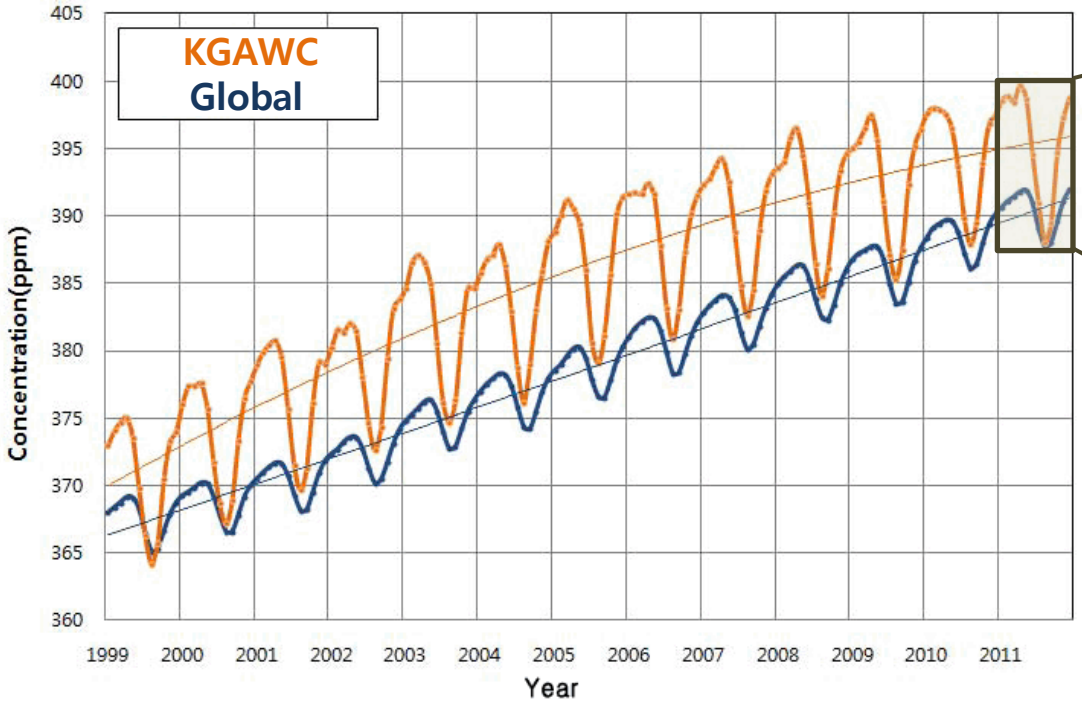
4. QA/QC Systems
Based on GAW report No. 184

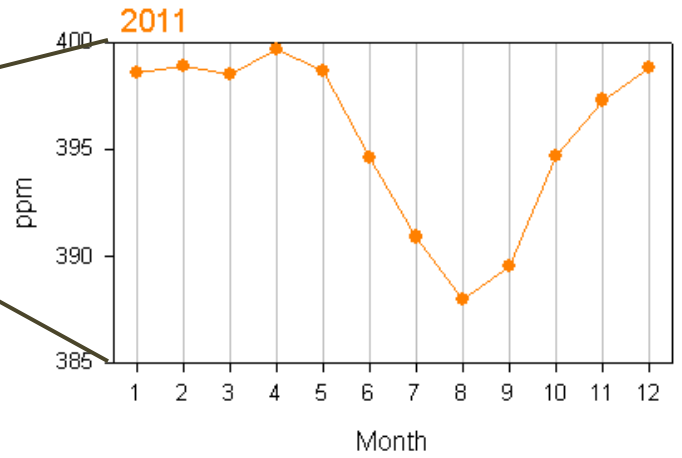






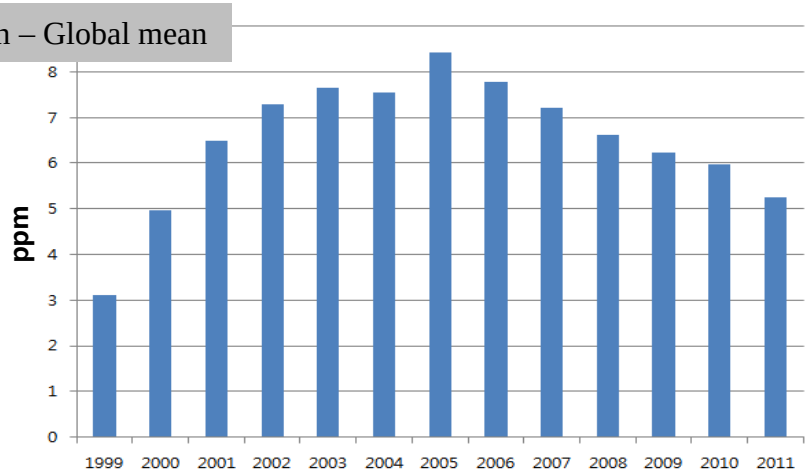
Results of Greenhouse Gases Monitoring : CO_2





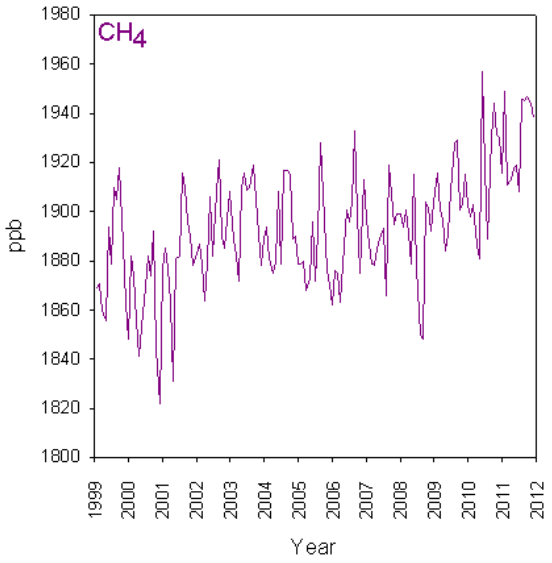
-The average CO_2 concentration recorded 395.7 ppm in 2011.
-An increase of 25 ppm was showed compared to 1999 (370.7)
- 5.2 ppm higher than the global average for the same year as documented by NOAA/GMD
-Differences between KGAWC and Global mean value decreased.

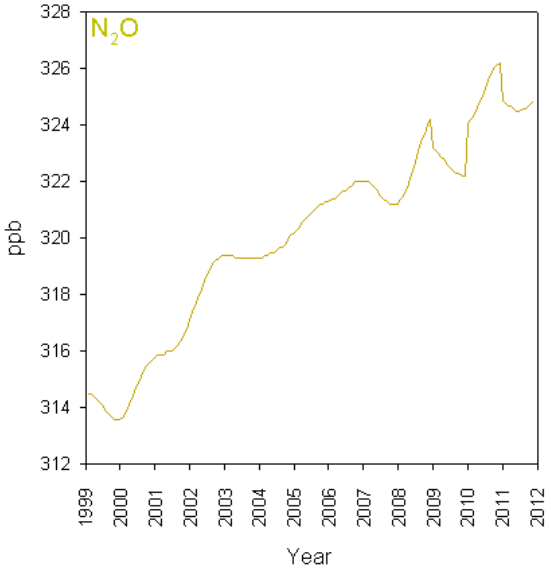
KGAWC mean – Global mean



-Monthly, April showed the highest level of CO_2 while August had lowest level of it.
-long range transported air mass in April, photosynthesis, plant respiration and rise of fuel combustion in Winter

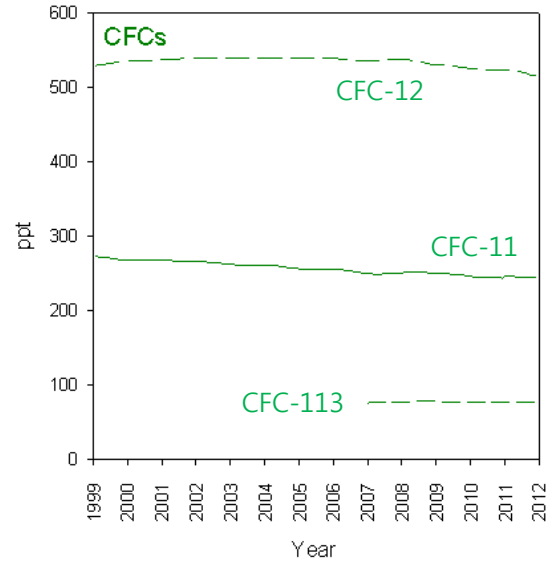
Results of Greenhouse Gases Monitoring : CH_4, N_2O, CFCs, SF_6

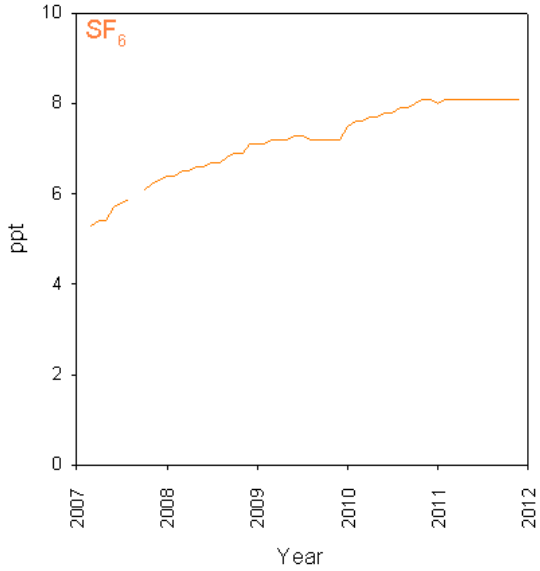




-The methane (CH_4) concentration in 2011 was 1,929 ppb, an increase of 46 ppb (2.4 %) over 1999 (1,883 ppb).

-The N_2O concentration for 2011 was 324.7 ppb, an increase of 10.7 ppb (3.4 %) over the value recorded in 1999 (314.0 ppb).





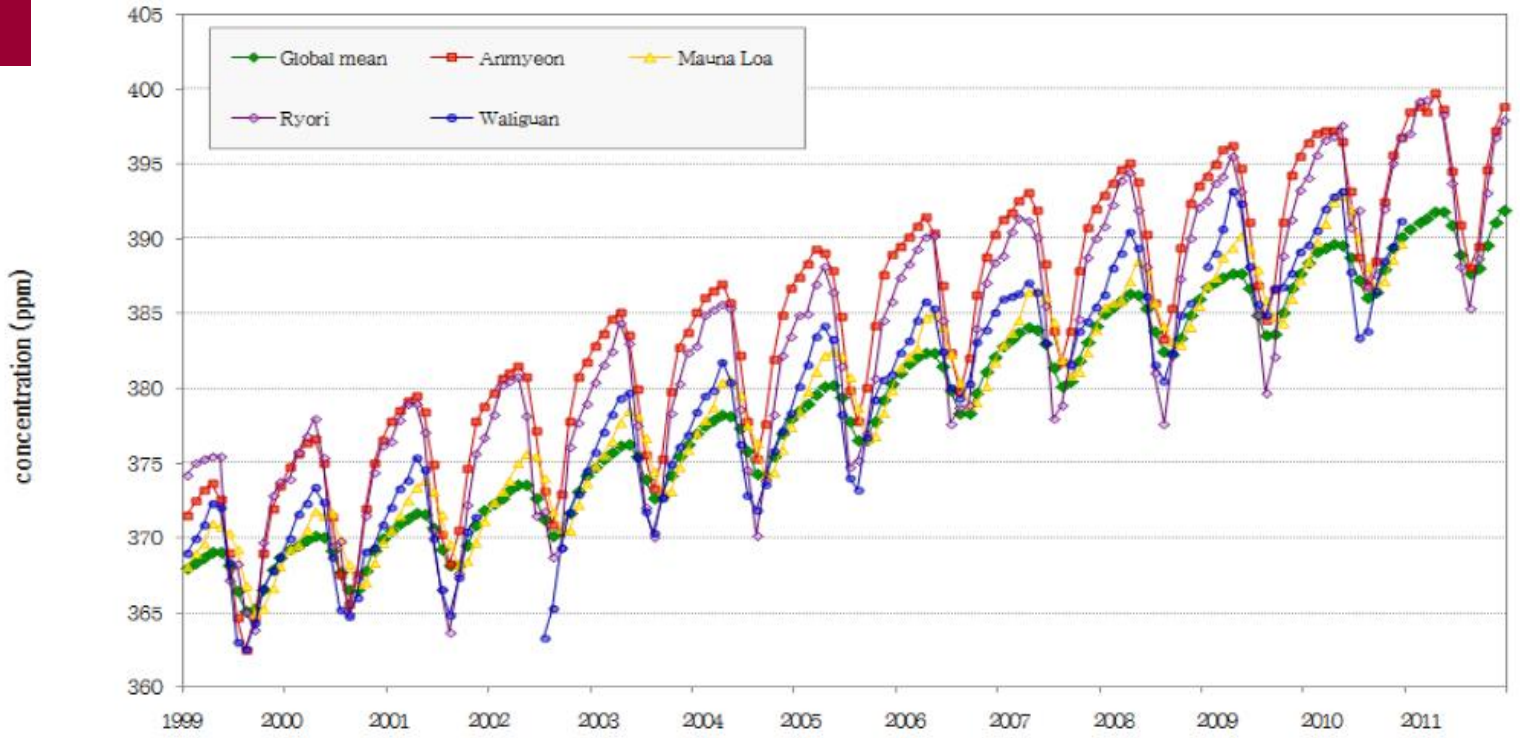
- All three species of CFCs (CFC-11, CFC-12, and CFC-113) are on the declining trend

-Sulfur hexafluoride (SF_6) is a potent long-lived greenhouse gas controlled by the Kyoto Protocal.
-The concentration of sulfur hexafluoride in 2011(8.1ppt) is 0.3 ppt higher than that of 2007.

Comparison of CO_2 to the other sites

Station name	Height(m)	Location	GAW Category
Anmyeondo (KGAWC)	**47**	**36.53N, 126.32E**	**Regional**
Ryori(Japan)	**260**	**39.03N, 141.82E**	**Regional**
Waliguan(China)	**3810**	**36.28N, 100.90E**	**Global**
Mauna Loa	**3397**	**19.54N, 155.58W**	**Global**

Comparison of CO_2 to the other sites



- KGAWC > Ryori > Waliguan > Mauna Loa > Global mean (Data from WDCGG)

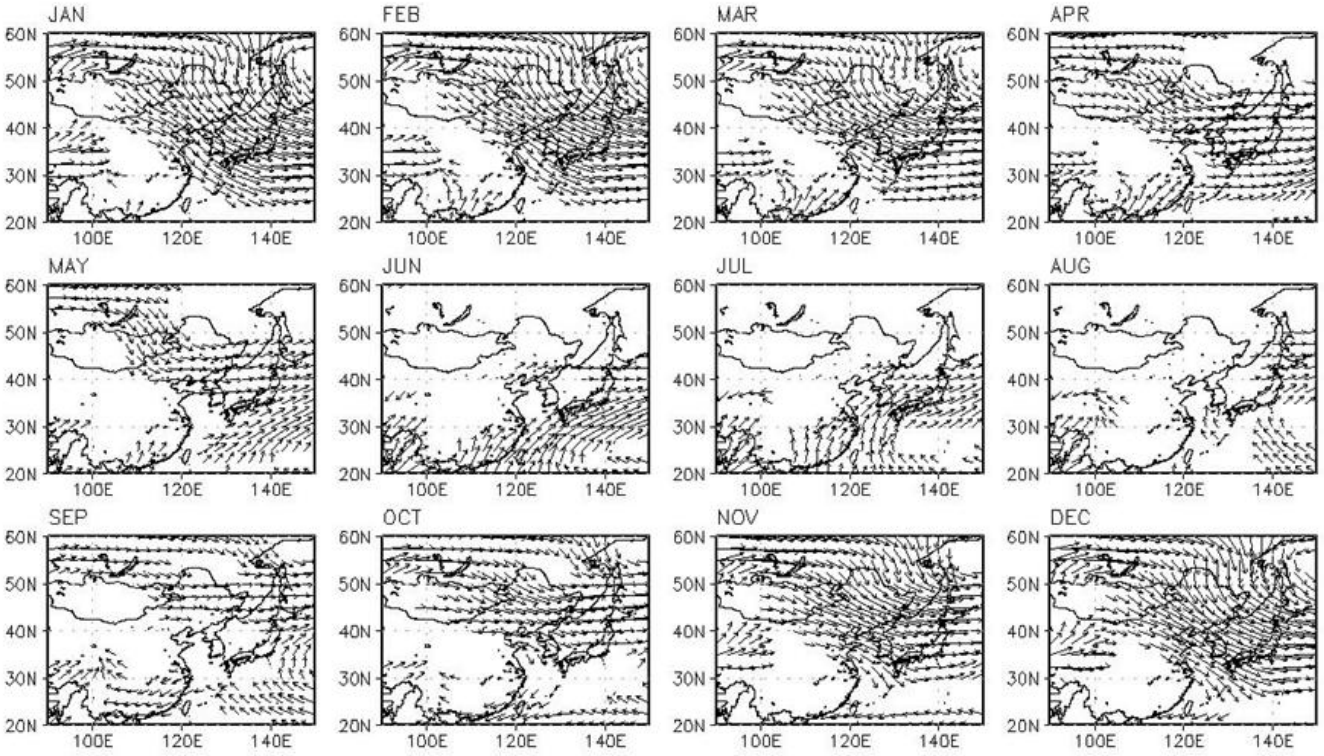
Regional Global

- Comparison between the regional stations, the concentration of CO_2 in KGAWC is higher than Ryori
- Comparison between the global stations, the concentration of CO_2 in Waliguan is higher than Mauna Loa
- Three Asia stations showed higher concentration than global mean value

The Network for GHGs in Korea

Seasonal wind streams over the Korean Peninsula

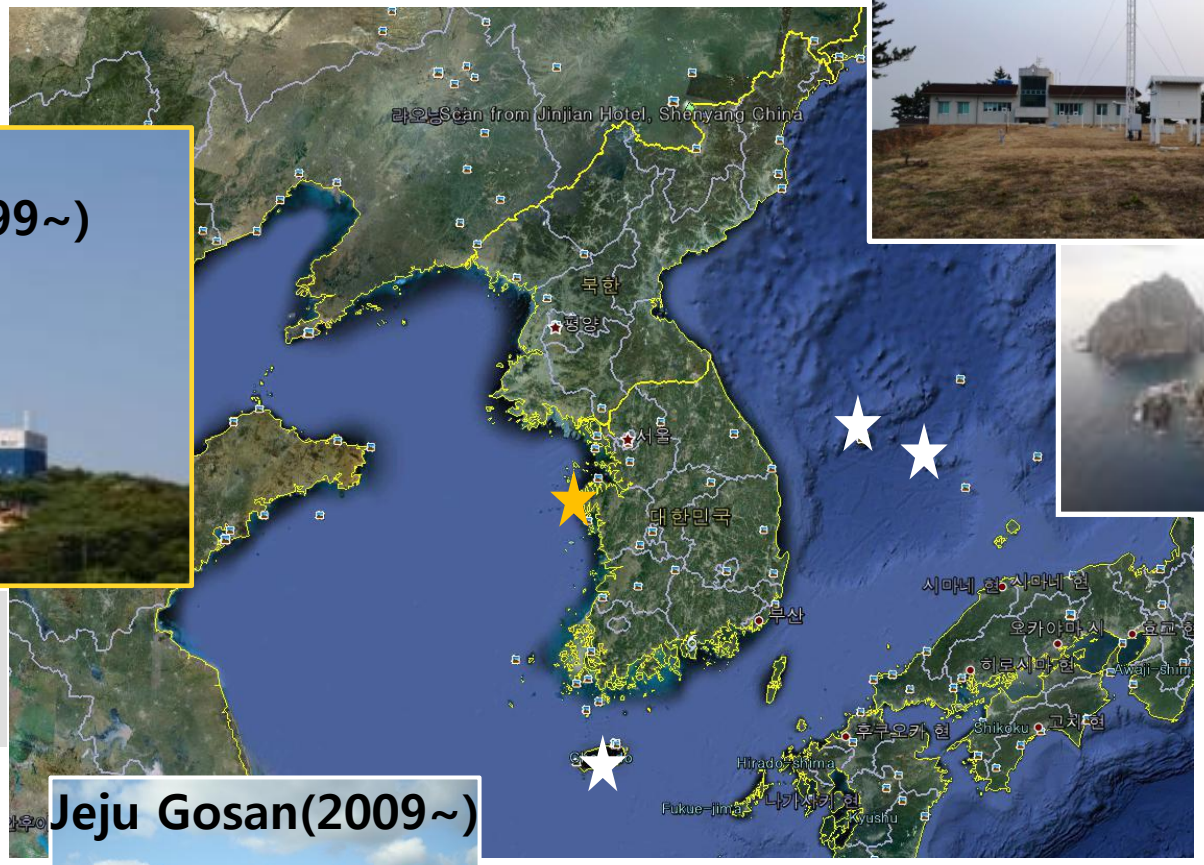
1. Winter : **northwest** wind stream
2. Summer : **southwest** wind stream
3. Spring and Autumn : **west and east** wind stream
4. Wind depended on synaptic weather pattern : **Westerlies** (West wind stream)



Introduction about KGAWC with new network

Remote control !

- Meteorological Location : West, East, and South part of Korea



KGAWC Amyeondo(1999~)

CO_2, CH_4, N_2O, CFC-11, -12,-113, SF_6,

Ulleungdo Dokdo (2012~)

CO_2
CH_4
N_2O

CO_2
CH_4

Jeju Gosan(2009~)

CO_2
N_2O

New instruments for improved system

New system installed in KGAWC and Ulleungdo Dokdo

1999-2011: Three steps Dehumidification system

2012: one step
2. Dehumidification

1999-2011:
NDIR for CO_2

2012
3. Measurement

Sample in >  >  > **Data**

Cooler system

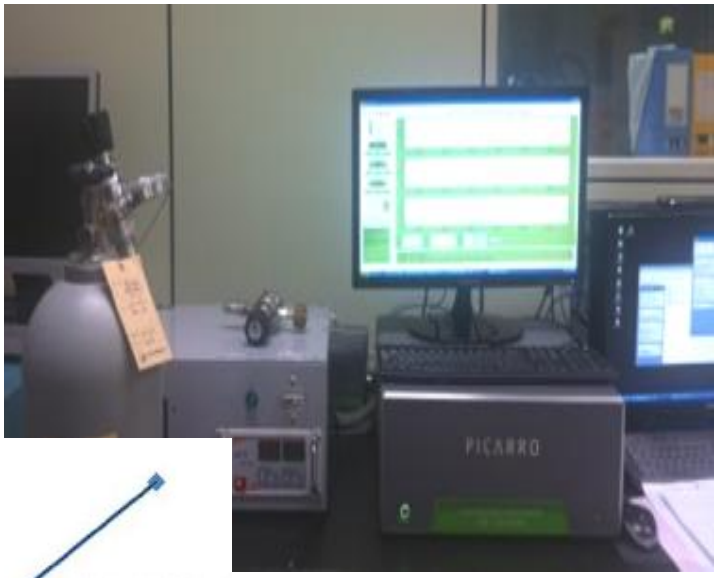
CRDS for CO_2

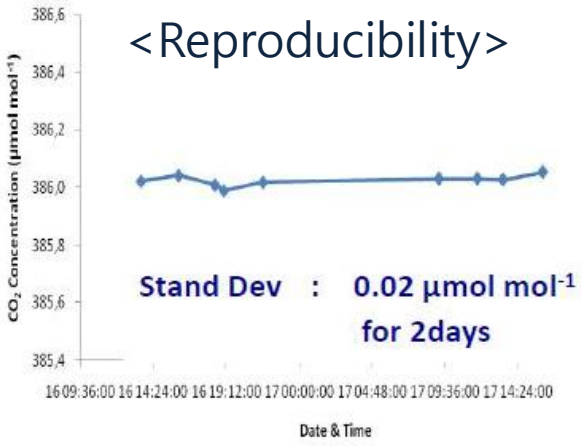
Remote control is possible !

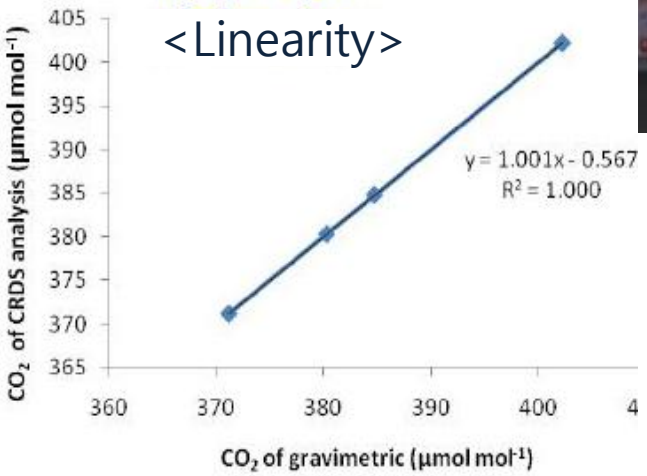
New instruments for improved system

CRDS for CO_2 and CH_4

-CRDS : Cavity Ringdown Spectrometer
-Linear
-CO_2 reproducibility < ± 0.02 μmol/mol







However, how to get the data continuity?

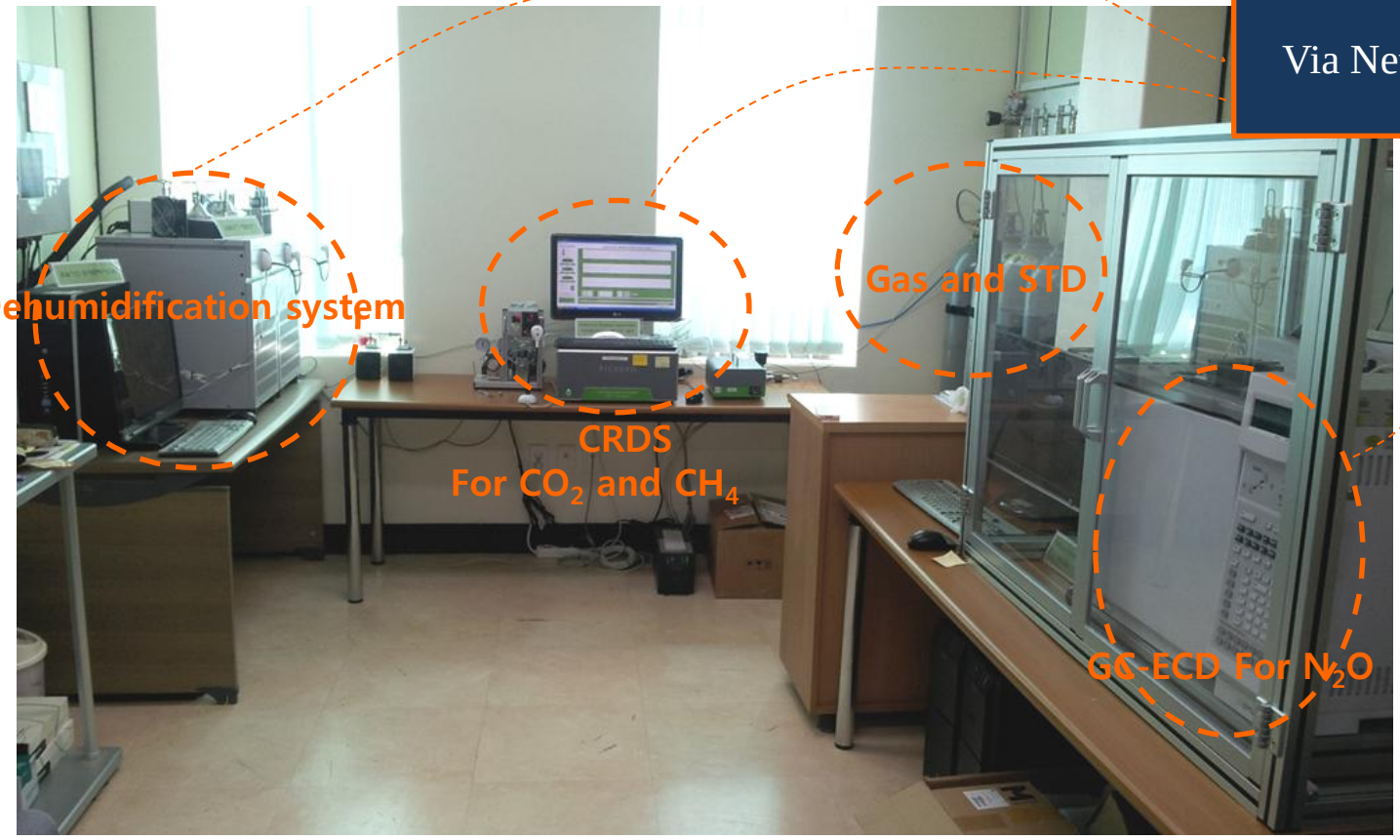
Introduction the new network

- Sites in Ulleungdo Dokdo

At KGAWC

Remote control

Via Network Server



Summary

- The KGAWC belongs to the WMO GAW regional station, and the Center has been actively engaged in international activities such as participating in organizing international workshops, and sharing data from WDCGG

- The KGAWC has been monitoring major greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFC-11, CFC-12 and CFC-113), and sulfur hexafluoride (SF_6) showing an increase in 2011 without CFCs.

- All Three Asia sites, KGAWC, Ryori, and Waliguan, had higher concentration than global mean value and KGAWC showed the highest level among them.

- The KGAWC designed new network for monitoring GHGs in Korea with remote control system and improved instruments. And It also is expected to support for not only Korea Peninsula but also East Asia.


Thank you :-D