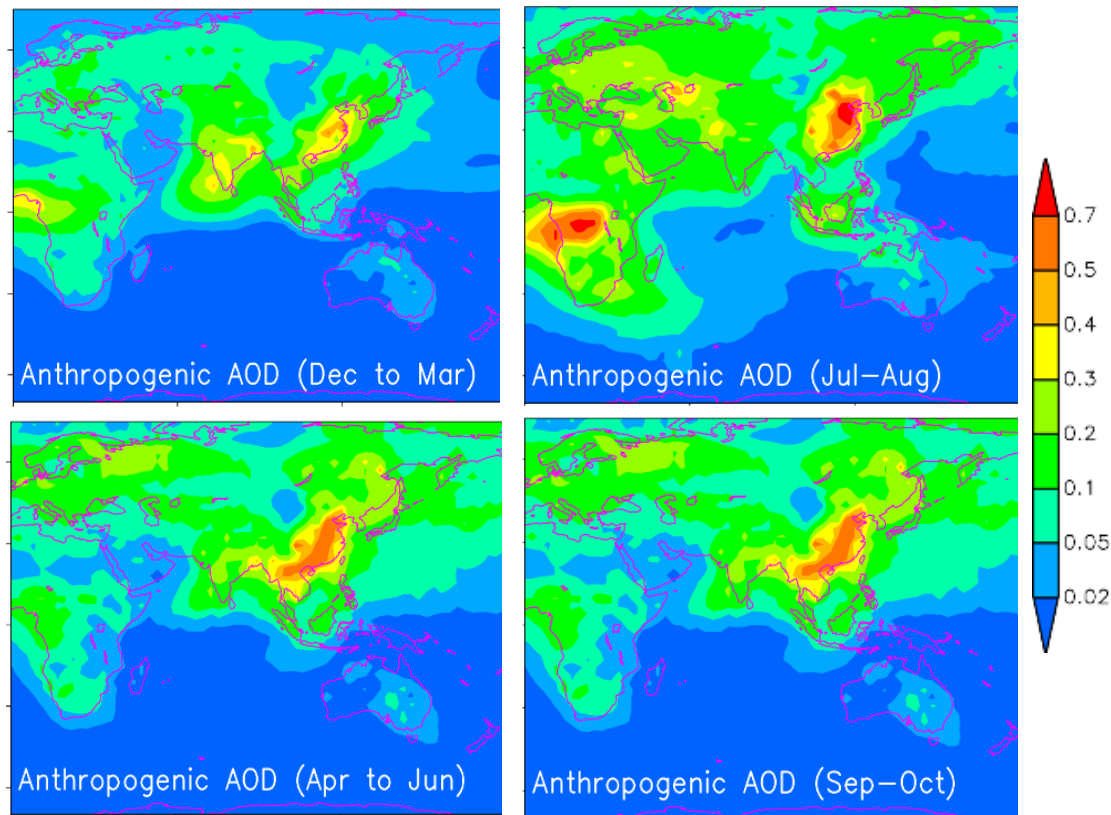


# Ground-based Reference Measurements Covering Asia



**Sang-Woo Kim**

School of Earth and Environmental Sciences, Seoul National University

# Ground-based Aerosol Observation Activities in Asia

✓ Vertical:

Lidar Network: **AD-NET (including KALION)**, MPL-NET

✓ Column-integrated:

Sky Radiometer Network: **SKYNET**, AERONET



✓ Near-surface:

**UNEP Atmospheric Brown Cloud – Asia Network**

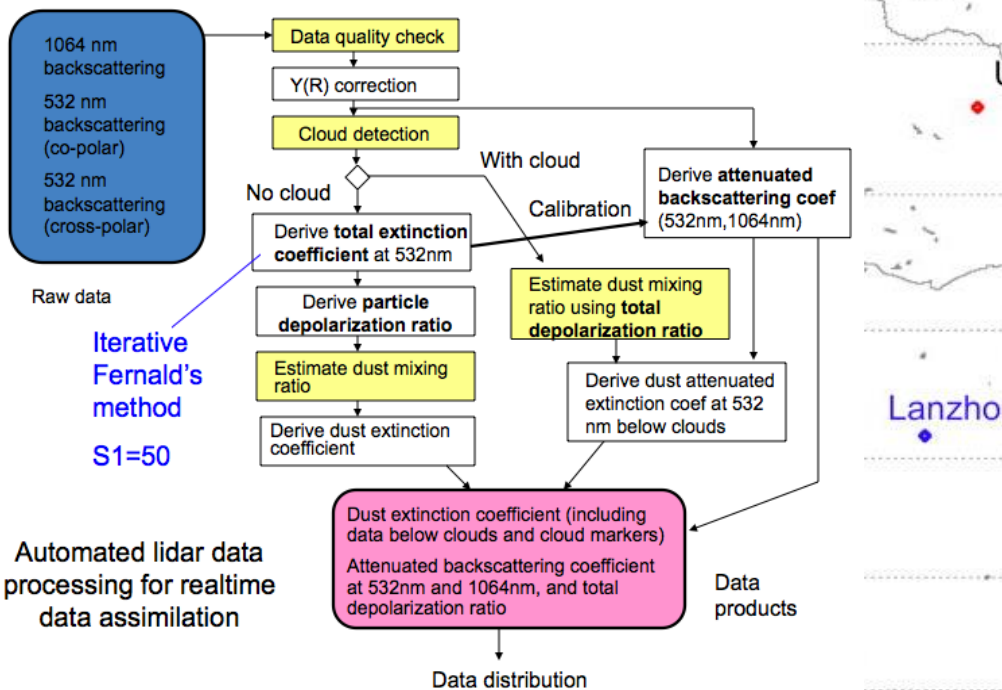
**WMO/GAW & NOAA/ESRL Federal Aerosol Network**

# AD-Net

## Asian dust and aerosol lidar observation network

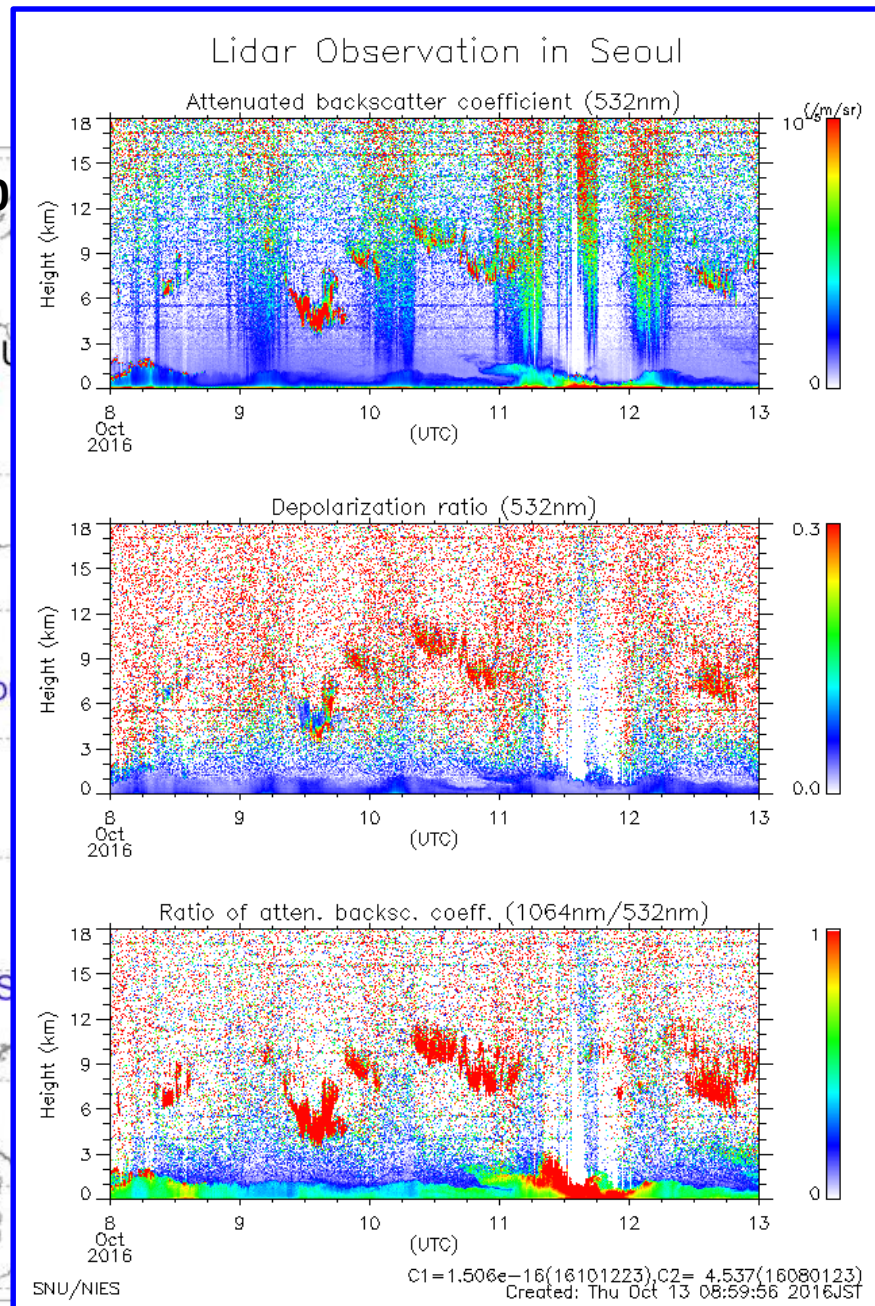
<http://www-lidar.nies.go.jp/AD-Net/>

### NRT Data Processing



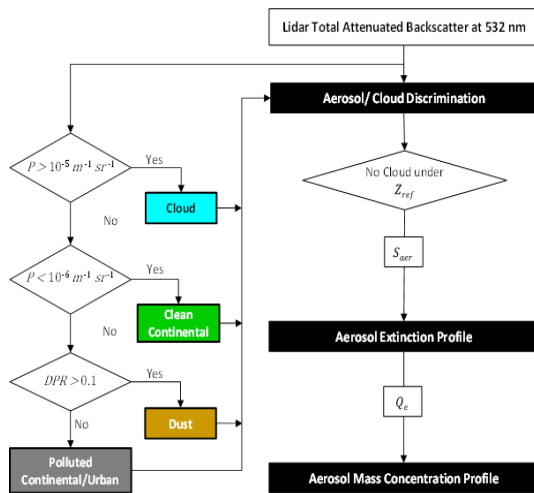
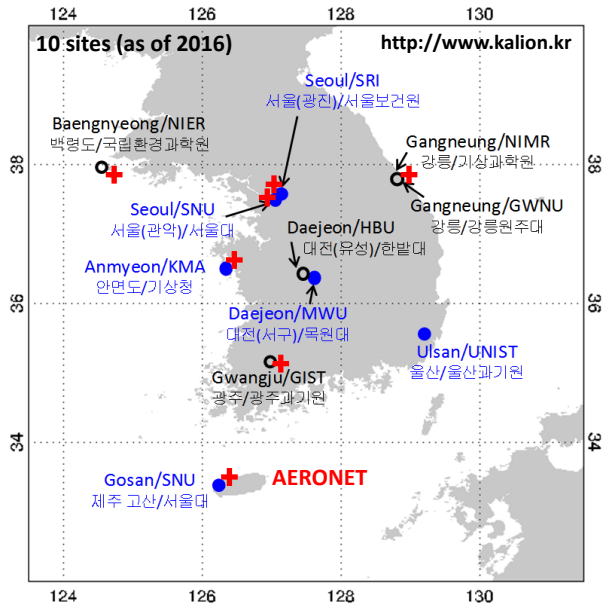
### Products :

- Backscatter cross-section
- Depolarization ratio
- Extinction
- Aerosol Optical depth
- 1064/532 aerosol backscatter ratio

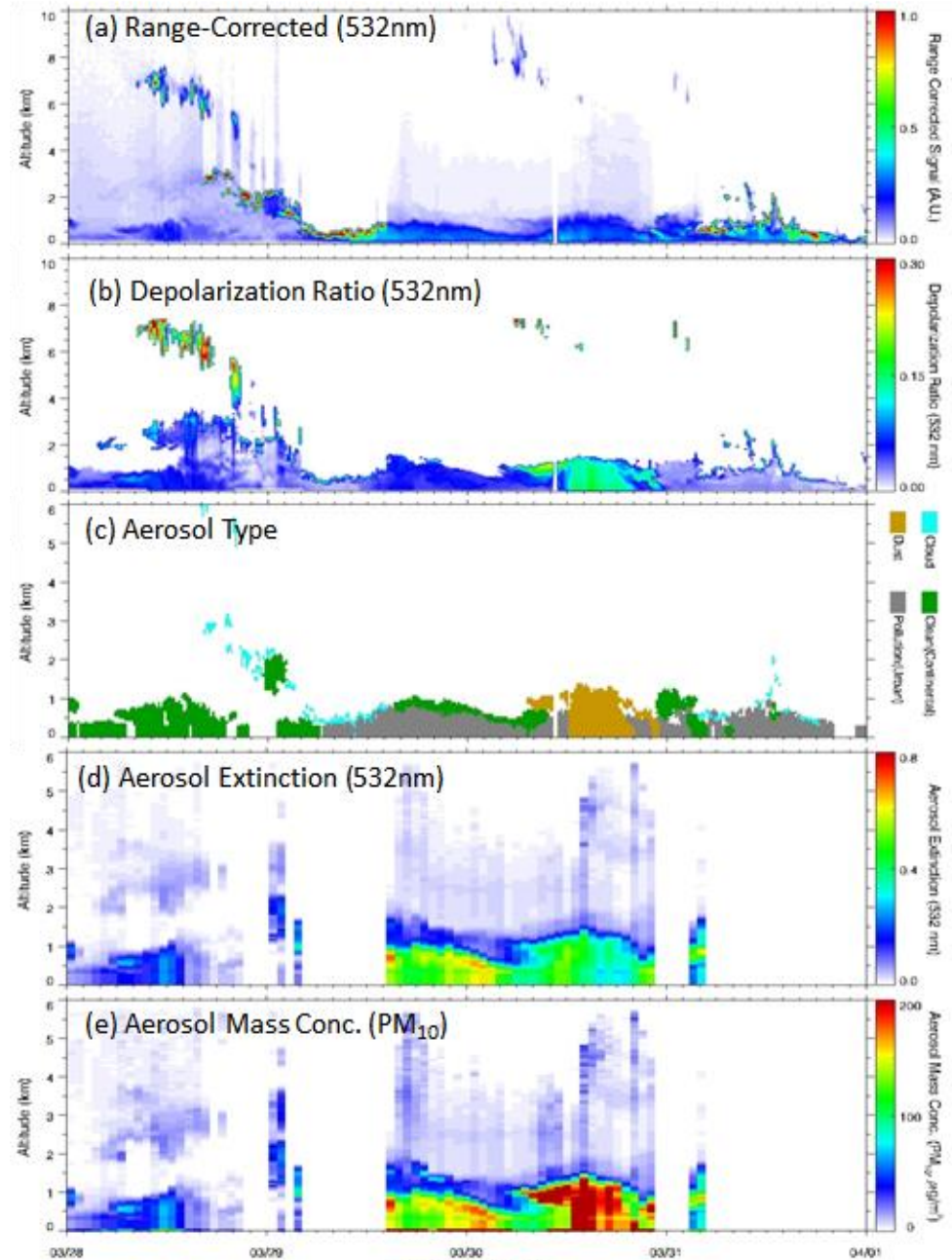


# KALION

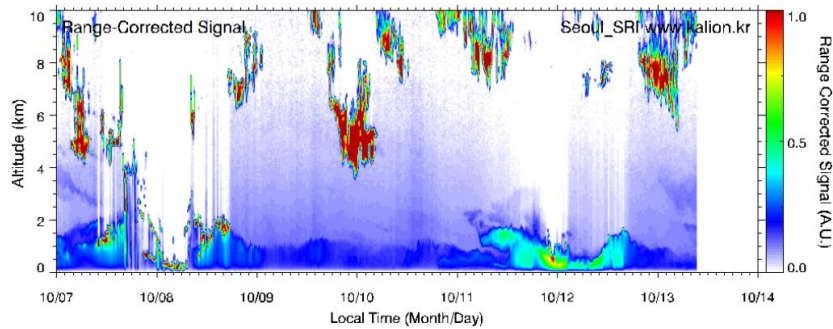
## Korea aerosol lidar observation network



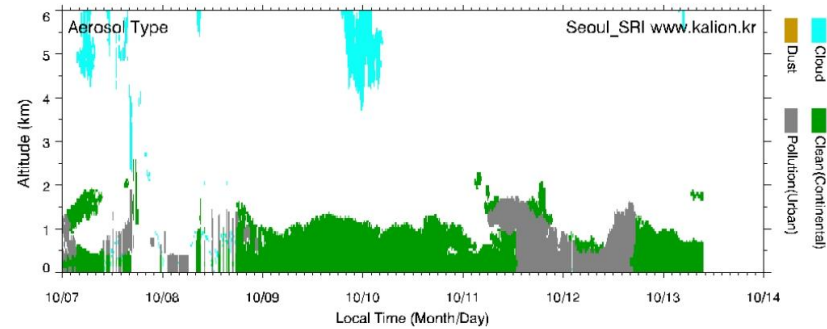
$P$  = Attenuated backscatter  
 $DPR$  = Depolarization ratio  
 $Z_{ref}$  = Reference Height  
 $S_{aer}$  = Lidar Ratio  
 $Q_e$  = Mass Extinction Efficiency



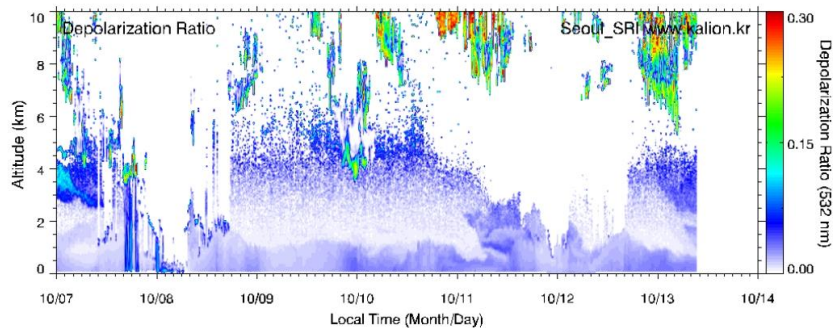
## Range-corrected signal



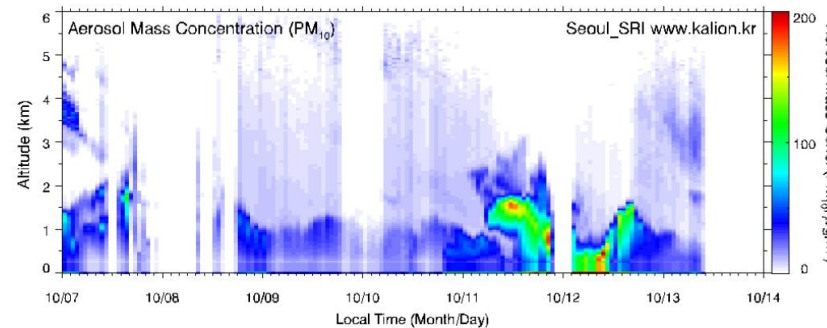
## Aerosol Type



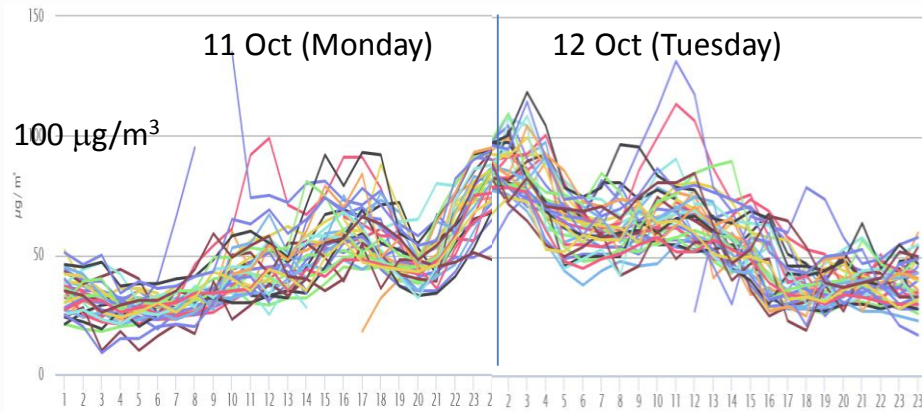
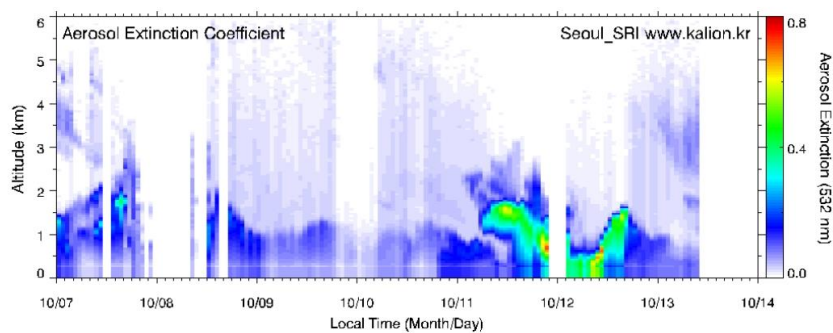
## Depolarization ratio



## Aerosol Mass Concentration



## Aerosol Extinction Coeff.



# SKYNET

GAW Contributing Network

April 2016

Red : Data available (38)

Yellow: Data available  
in the future (28)

Black: Data can not be  
published (7)

 Skyradiometer

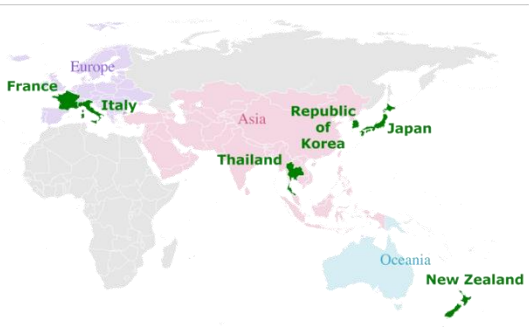
 Skyradiometer,  
pyranometer, Lidar,  
microwave

<http://atmos2.cr.chiba-u.jp/skyenet/>  
<http://www-lidar.nies.go.jp/skyenet/index.php>

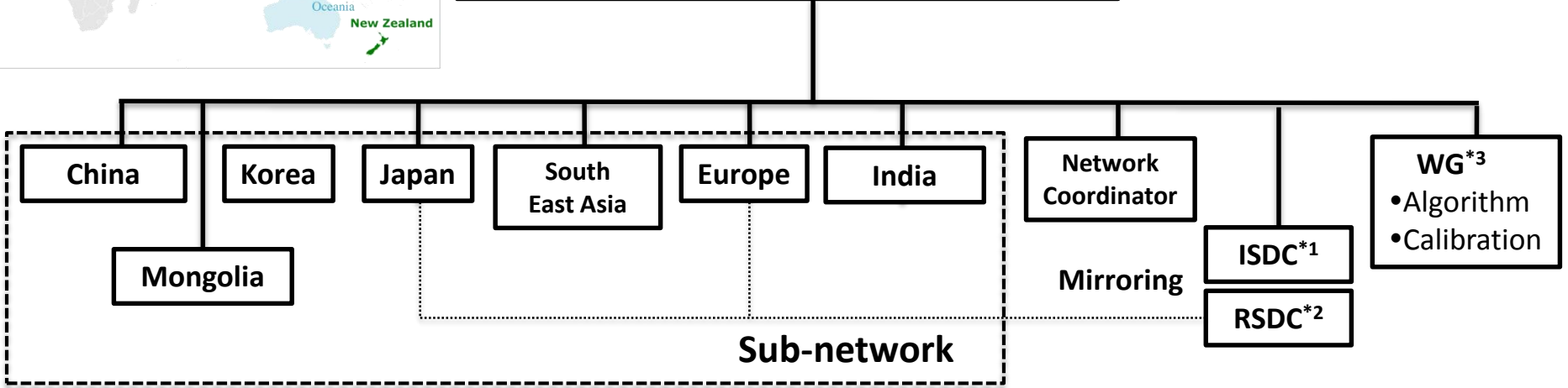
Courtesy of Prof. Terry Nakajima



Okinawa



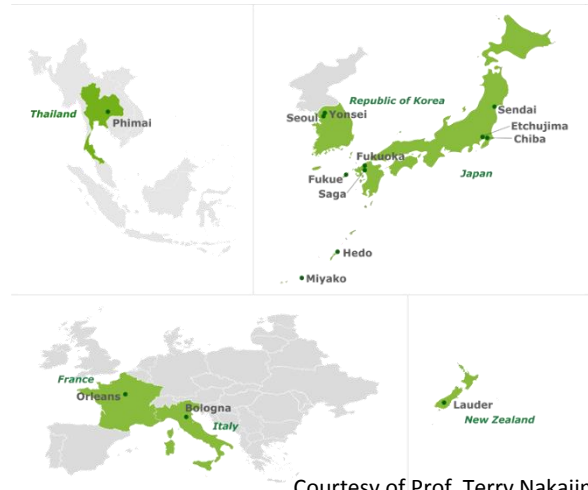
# SKYNET international committee



\*1 ISDC: International SKYNET Data Center \*2 RSDC: Regional SKYNET Data Center \*3 WG: Working Group

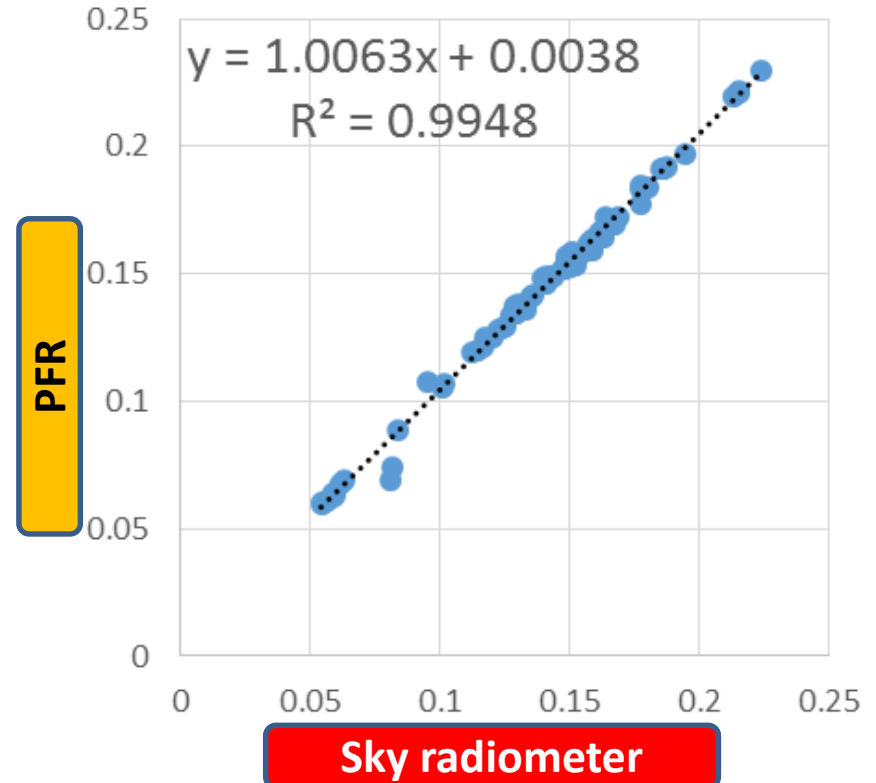
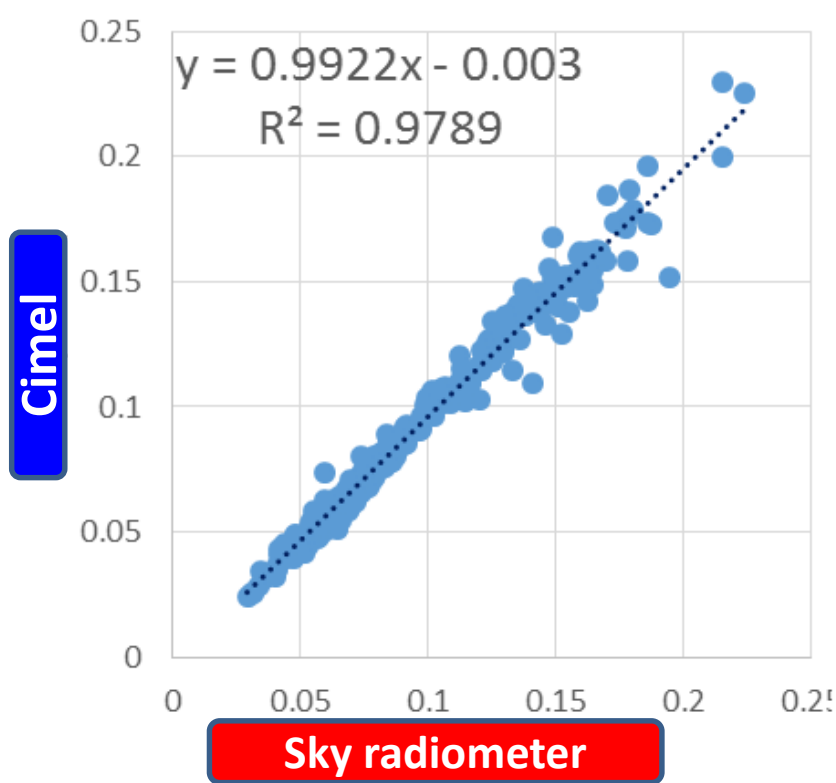
- Chair: T. Nakajima
- Vice: M. Campanelli, G. Pandithurai
- China: H. Che, L. Dong
- Korea (KSNET): S.-W. Kim, J. Kim
- Japan: H. Irie, T. Nishizawa
- South East: B. Thana
- Europe (ESR): M. Campanelli, V. Estelles
- India: V.K. Soni, G. Pandithurai
- Mongolia: T. Nas-urt

- Network Coordinator: K. Aoki
- ISDC: Nisizawa@NIES
- Calibration WG: Che
- Algorithm WG: Irie



# Correlation analysis

## Aerosol Optical Depth at 500 nm



**PFR > Sky radiometer > Cimel**

- ※ Difference is less than **0.01** and small enough for applied researches.
- ※ FO calibration by Improved Langley method for skyradiometer.



# Comparison of SSA with AERONET values

- Cloud screening
- SVA(solid view angles)
- Skyrad.pack v4, 5

P. Khatri (JGR'15)

F0, SVA (angle not significant)

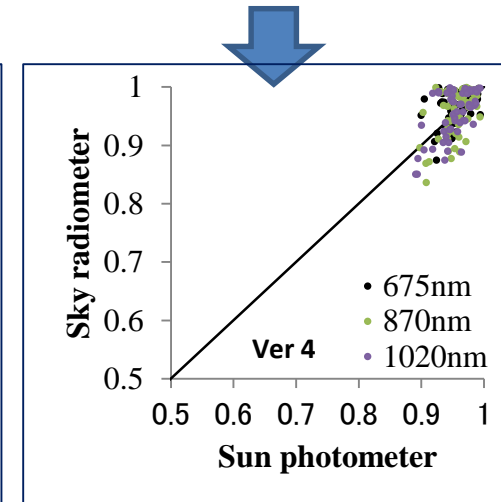
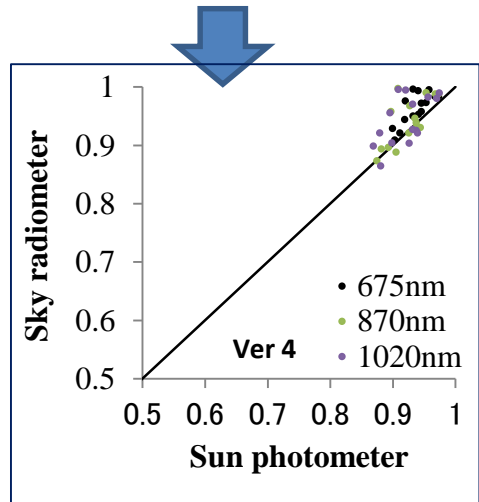
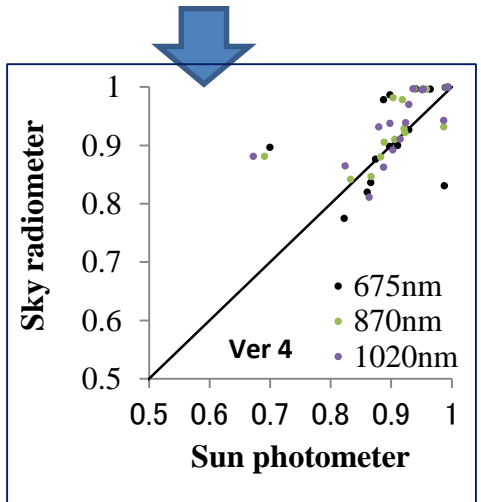
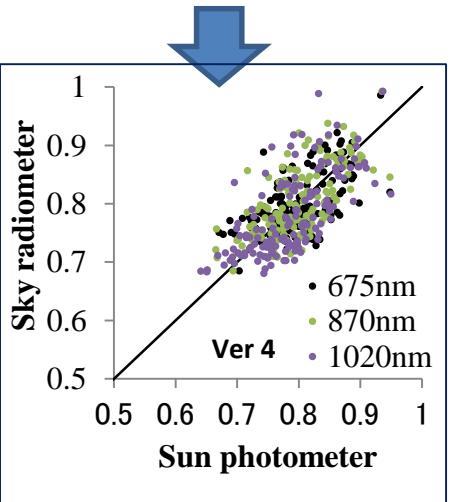
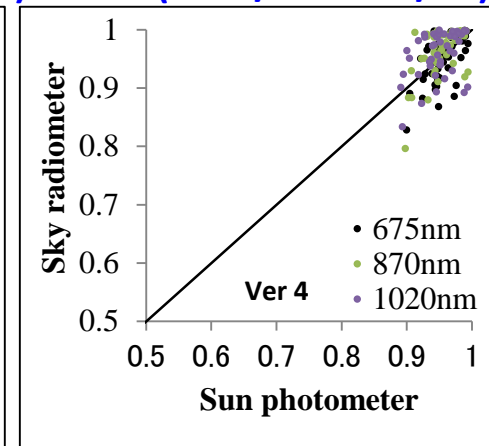
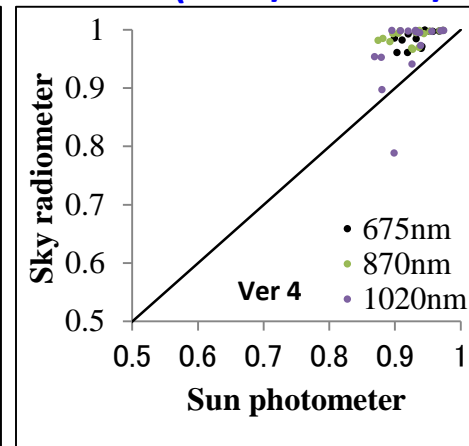
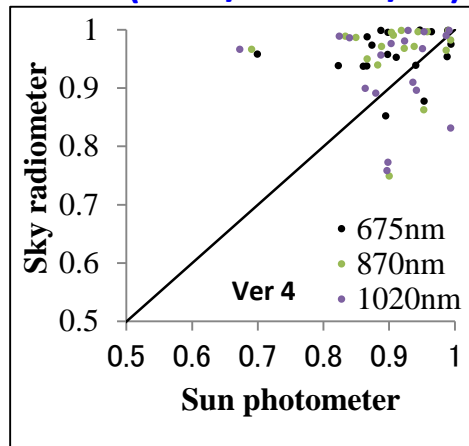
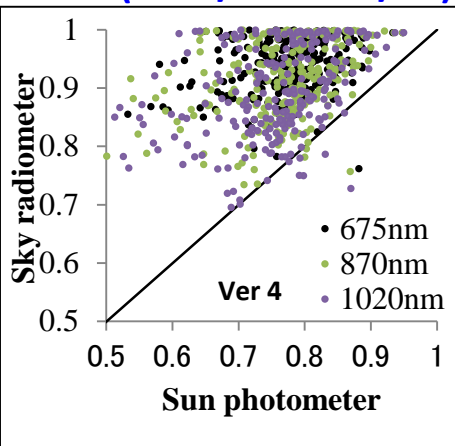
SVA (angle not significant)

Pune (2004/10-2005/12)

Chiba(2011/12-2012/10)

Valencia (2008/04-2009/08)

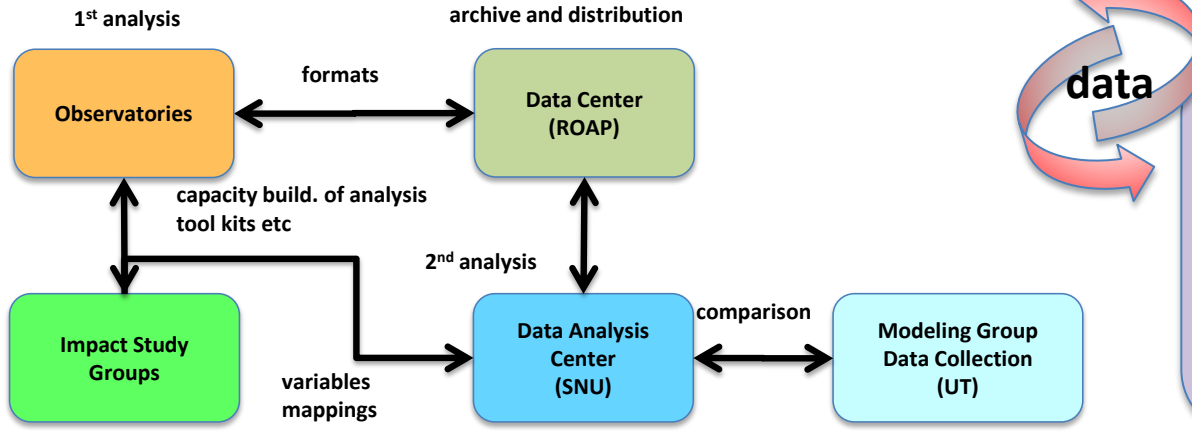
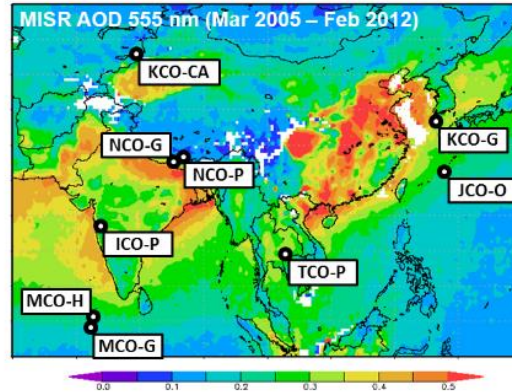
Seoul(2012/03-2012/05)



# UNEP/ABC- (Asia) Climate Observatories

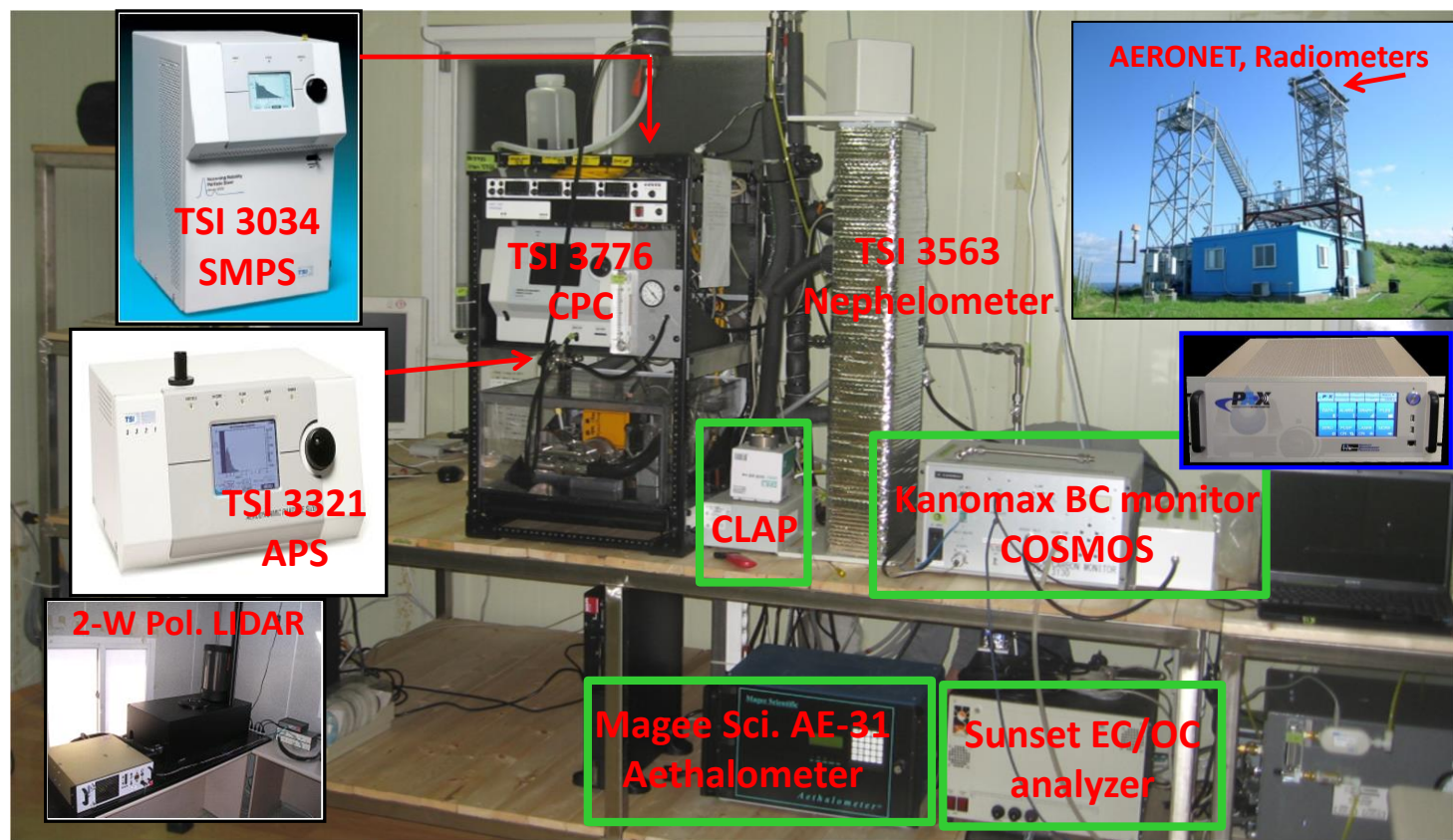


- Intensive Analysis Period (2011-)
- Data archives @ SNU (2011-)



- data
- ACCMIP/AC&C/IGAC-SPARC
  - AEROCOM
  - EANET
  - AERONET&SKYNET
  - MPL, AD-ONET
  - Various national projects

# Korea Climate Observatory at Gosan (KCO-G)

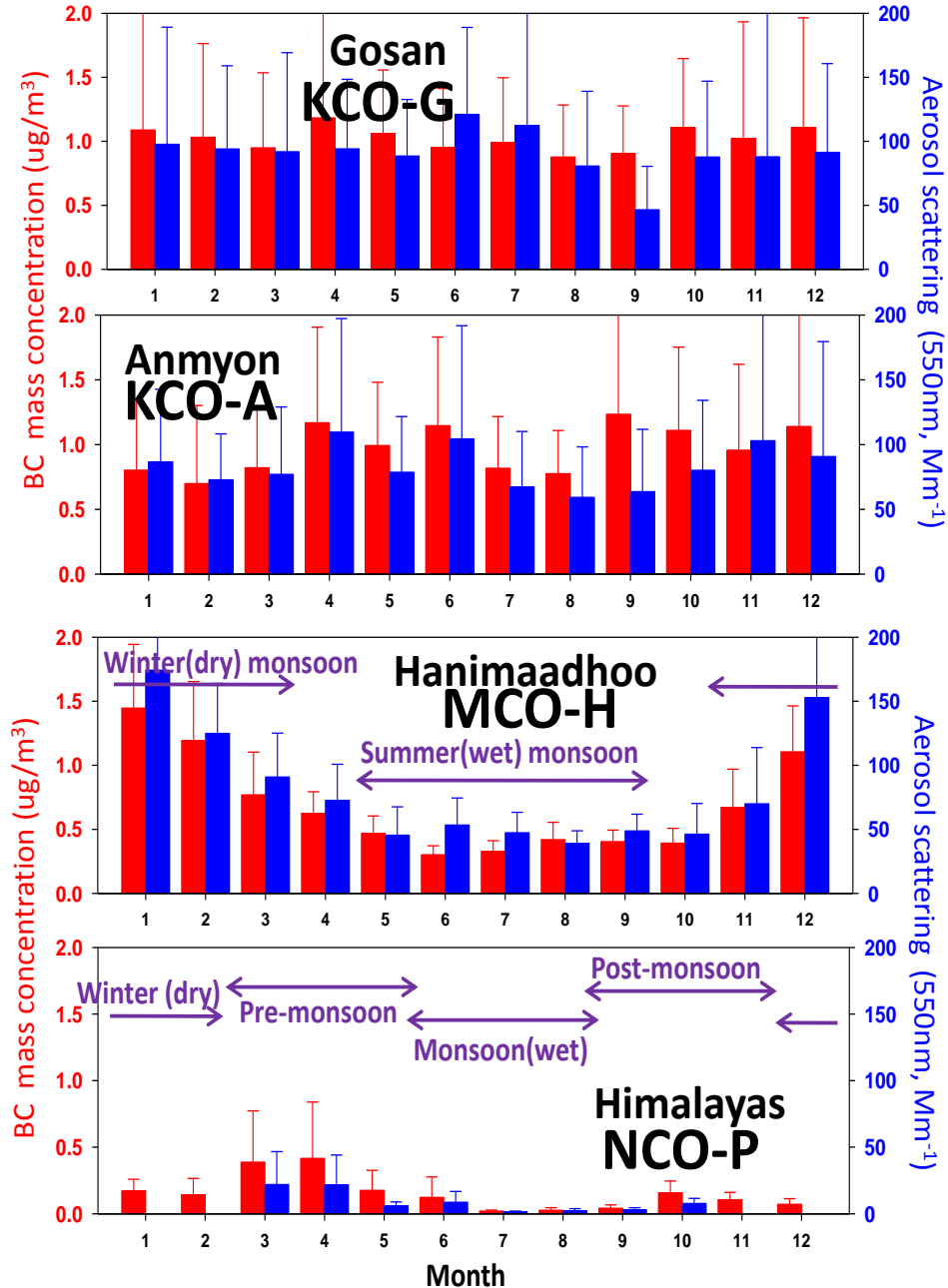
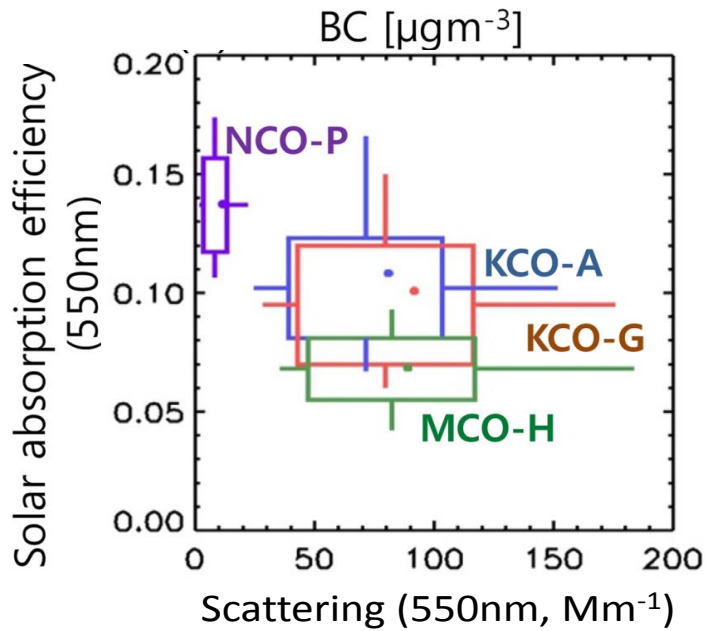
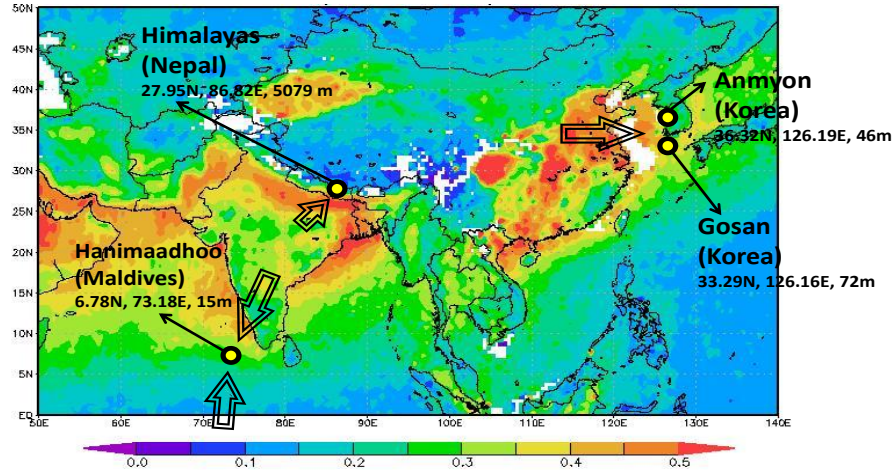


# Maldives Climate Observatory at Hanimaadhoo (MCO-H)



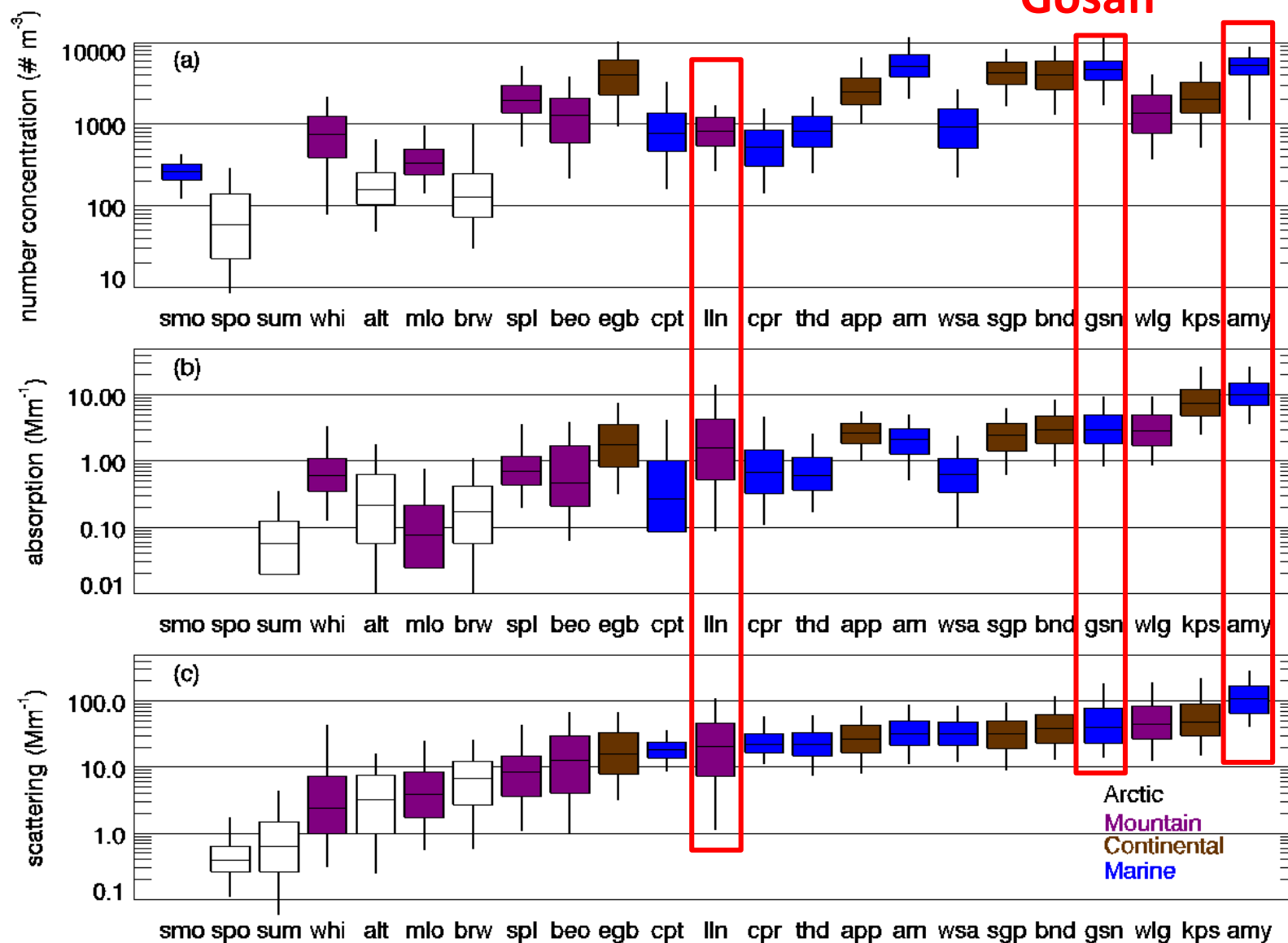
# BC Mass and Aerosol Scattering Coefficient

MISR-Derived Aerosol Optical Depth at 555nm (2008-2010)

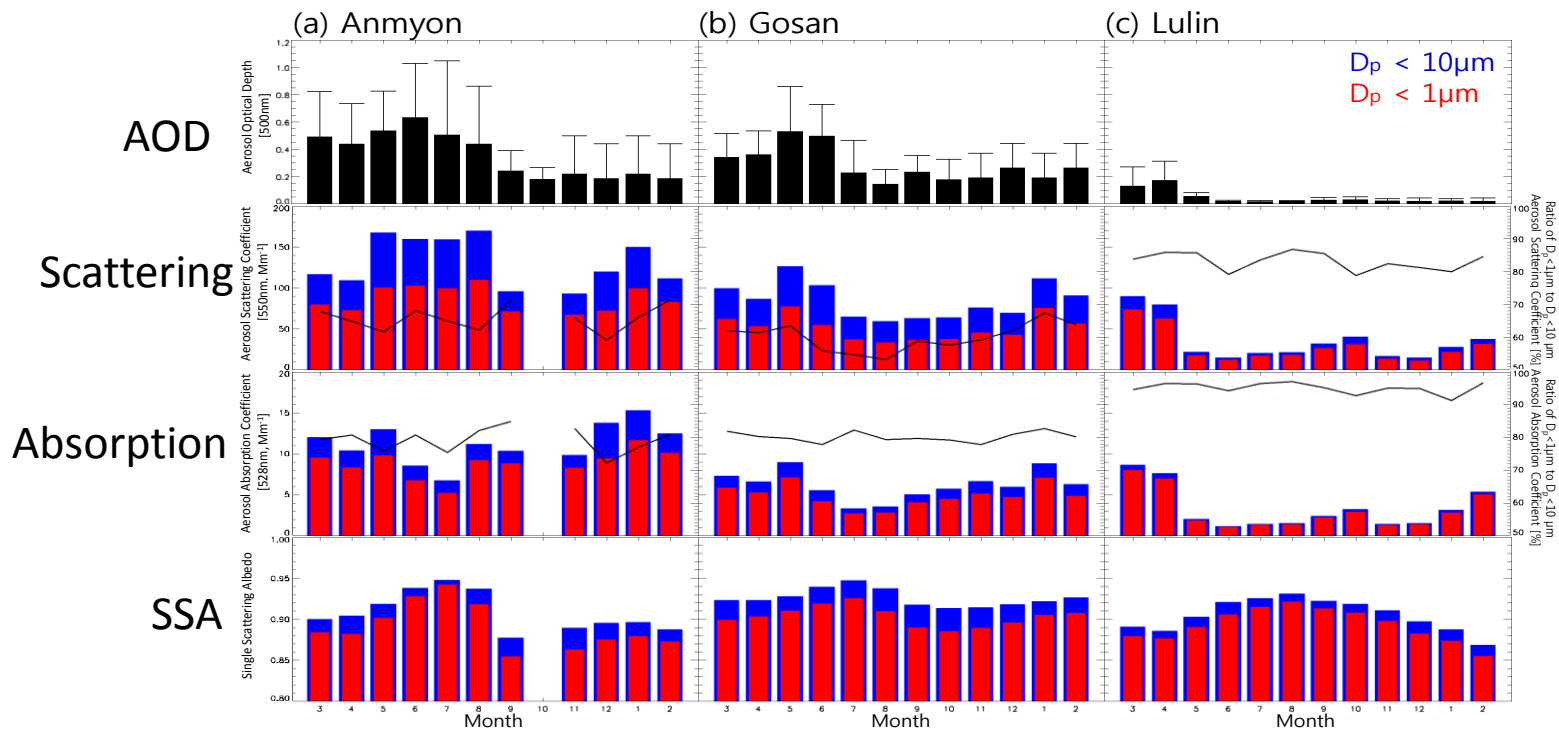
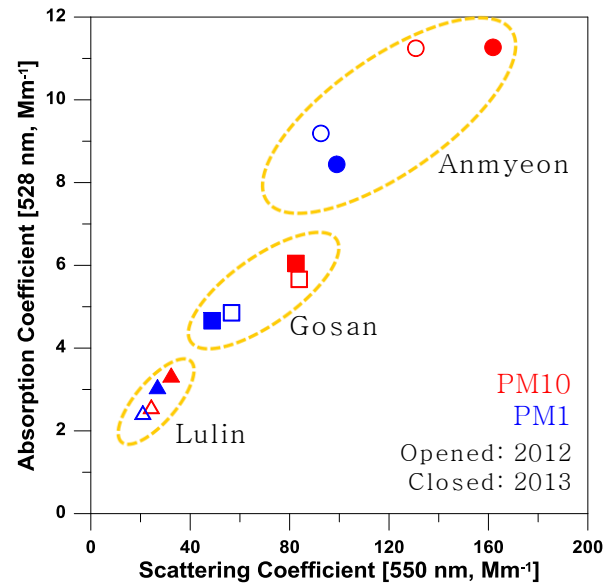
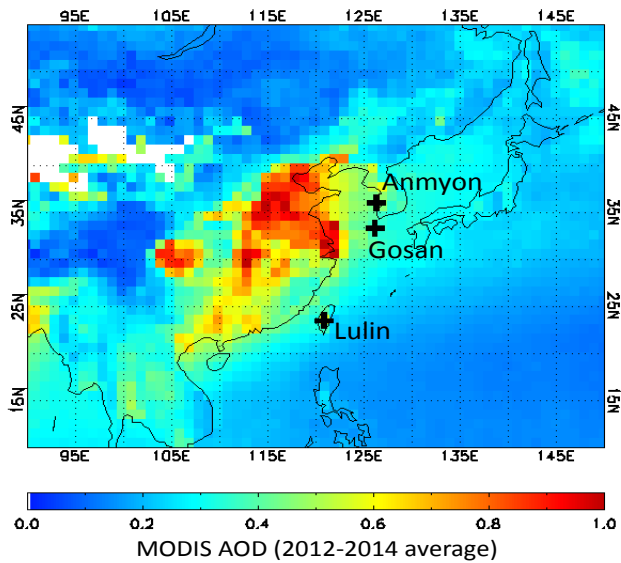


# NOAA/ESRL Federal Aerosol Network

Gosan



# NOAA/ESRL Federal Aerosol Network



- **Vertical: MPLNET + AD-NET**
- **Column: AERONET + SKYNET + CASNET ?**
- **Ground: WMO/GAW + ABC-Asia + NOAA/ESRL**

**Thank you for your attention!**



Gosan Climate Observatory