A new JMA program of operational aircraft observation for atmospheric CO_2, CH_4, CO and N_2O in the mid-troposphere

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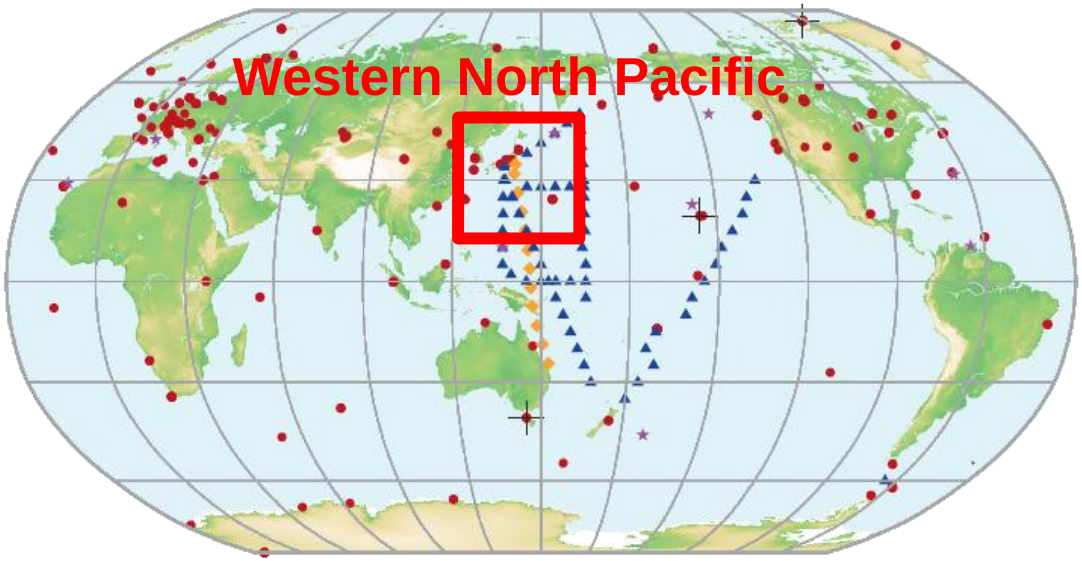
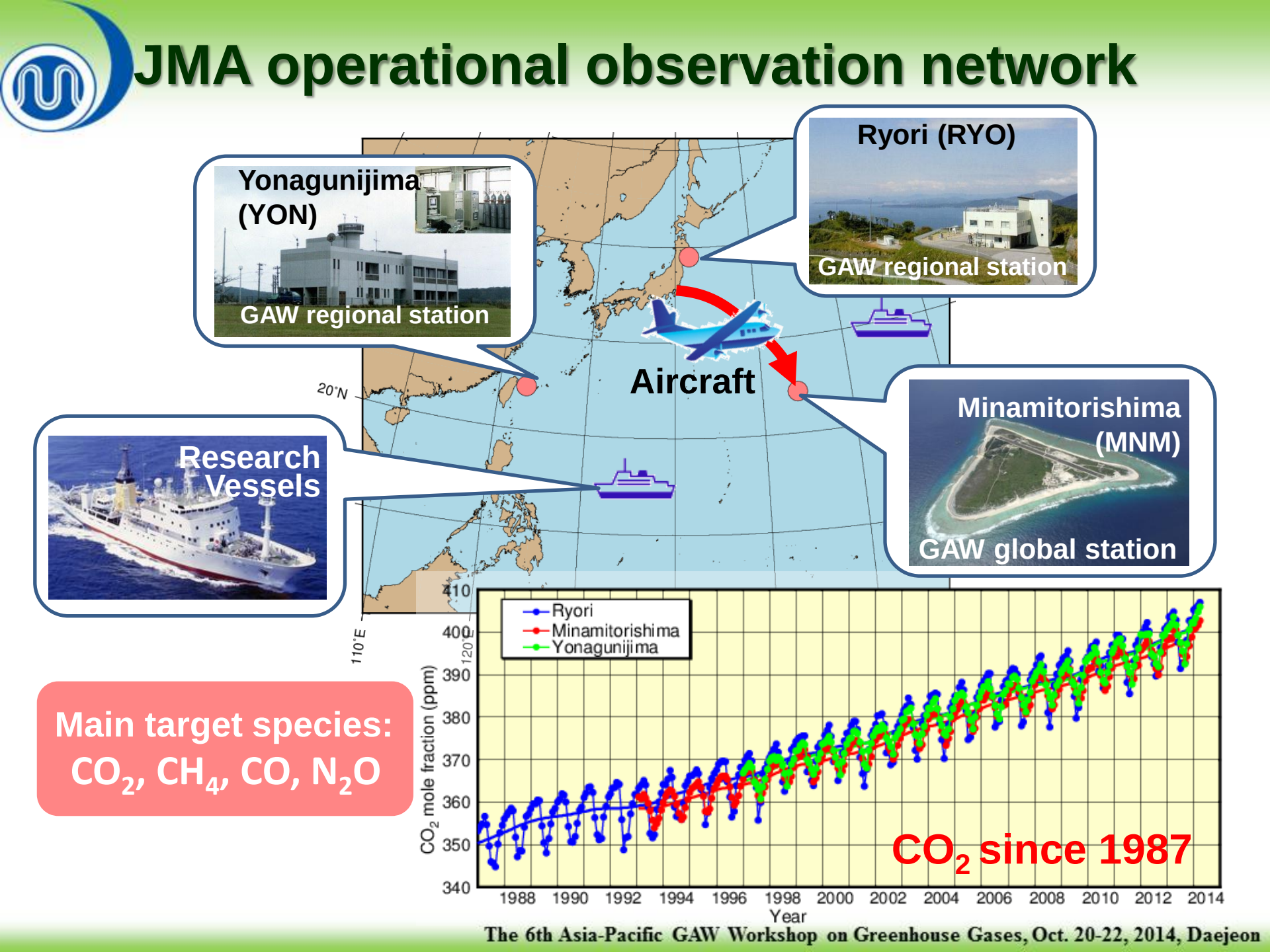
WMO GAW programme for global GHGs observation network



(Released in September, 2014 by WMO)

WMO
World Data Centre for Greenhouse Gases
(WDCGG)
Operated by JMA Headquarters

JMA operational observation network



Main target species:
CO_2, CH_4, CO, N_2O

Advantage of JMA's aircraft Observation

JMA's aircraft observation has following advantages in comparison with observations operated by commercial airlines such as CONTRAIL[*1] and IAGOS[*2].

- **Observe mid-troposphere in the western North Pacific**
  - **"Unique flight" that is regularly operated around 500hPa**
  - **Affected by meteorological tropospheric phenomena (e.g. Convection)**
- **Observe vertical profile over the GAW global station**
  - **Minamitorishima (MNM) is one of the GAW global stations**

**1 CONTRAIL - http://www.cger.nies.go.jp/contrail/index.html*
**2 IAGOS - http://www.iagos.org/*

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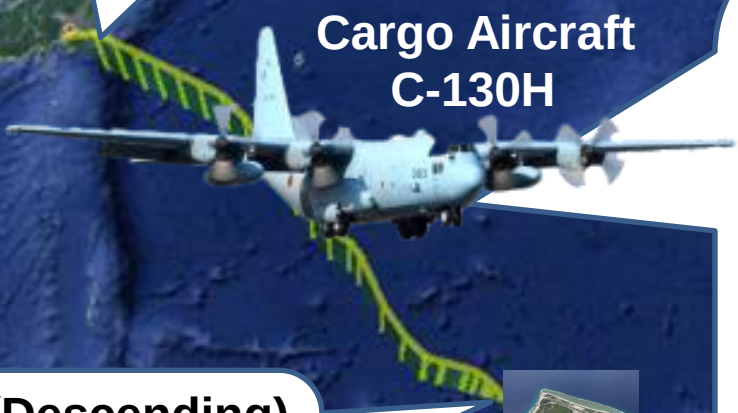
JMA aircraft observation

Horizontal (Cruising)
Altitude: - 6km (Mid-Troposphere)
Samples: - 18 flasks
Intervals: - 100km

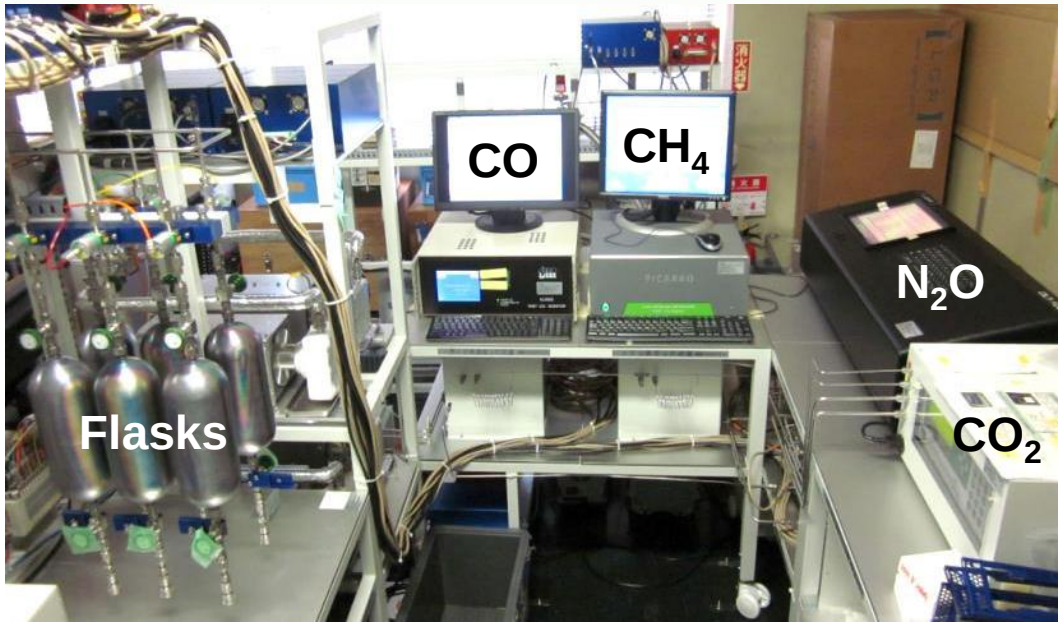


Inside of Aircraft (Cargo room)

Vertical (Descending)
Altitude: 6km to surf.
Samples: - 6 flasks
Intervals: - 1km

Minamitorishima (GAW global station, MNM)

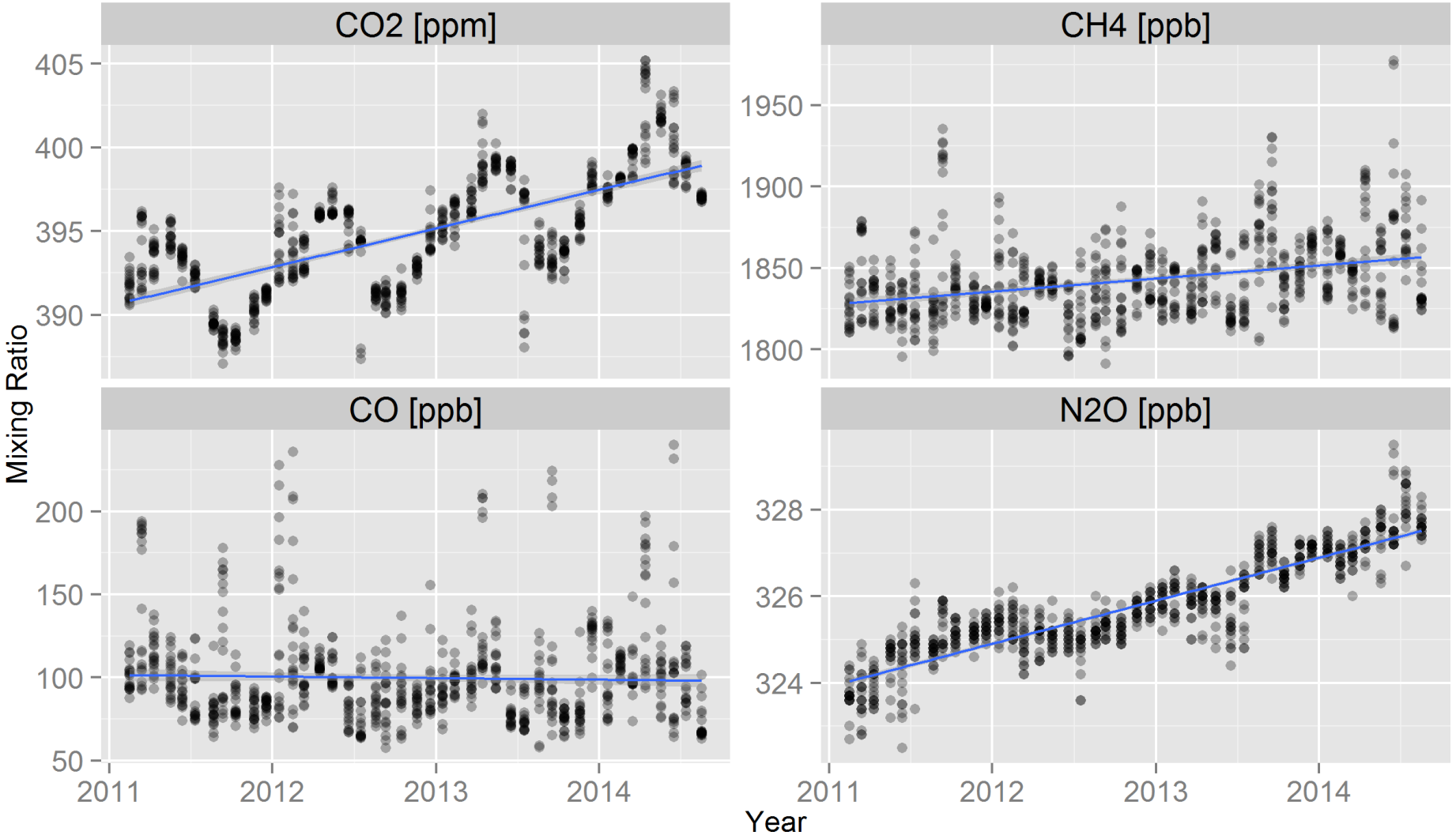
High precision measurement system



Species	Analyzer (Method)	Precision	Standard Gas Scale (WMO scale)
CO_2	LI-COR LI-7000 (NDIR)	0.014 ppm	WMO X2007
CH_4	Picarro G2301 (CRDS)	0.26 ppb	NOAA 04
CO	Aero-Laser AL5002 (VURF)	0.28 ppb	WMO CO X2004
N_2O	Los Gatos Research DLT100 (ICOS)	0.07 ppb	NOAA 2006A

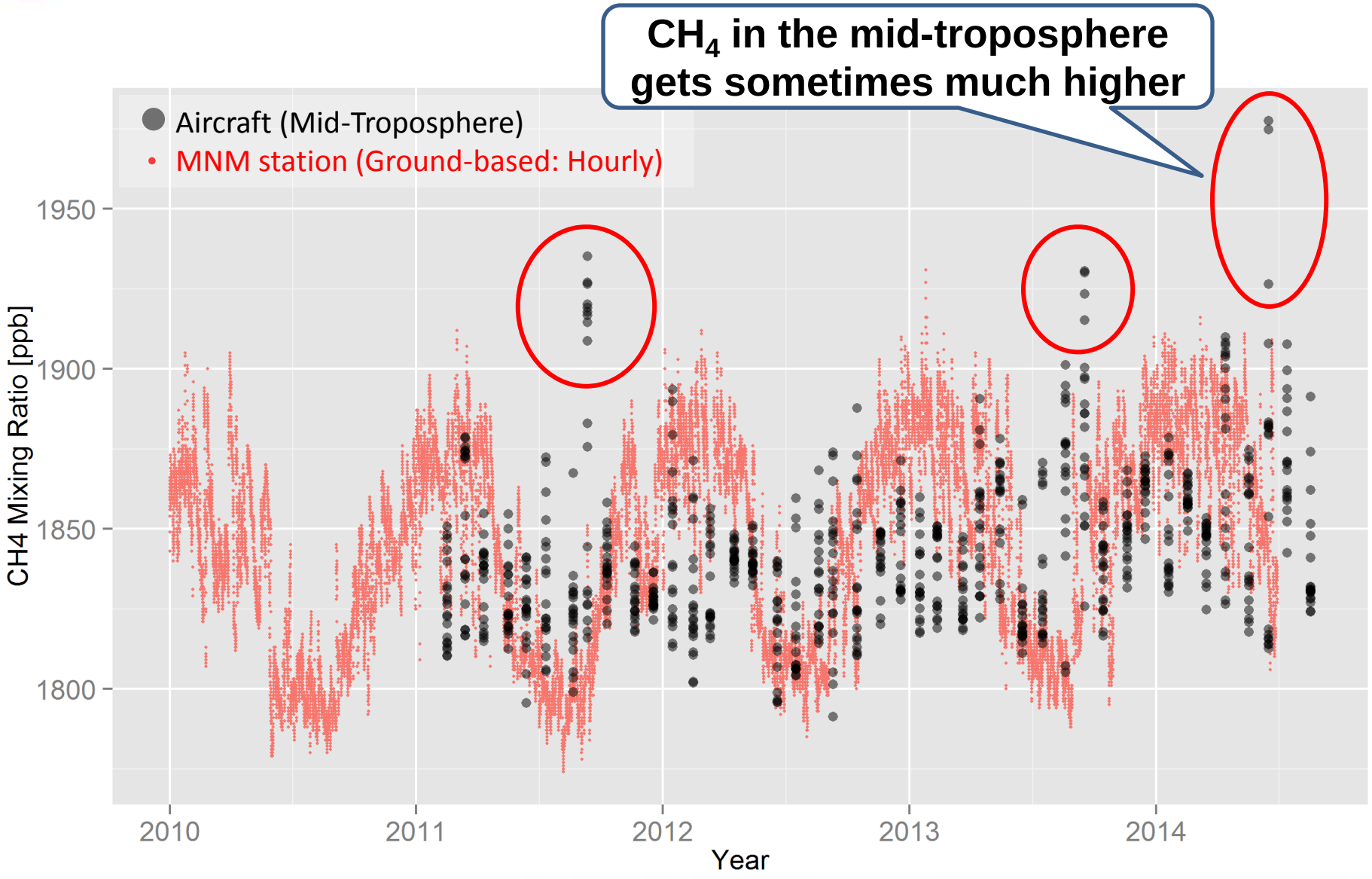
(Tsuboi et al., 2013 AMT)

Time Series of CO_2, CH_4, CO & N_2O at 6km

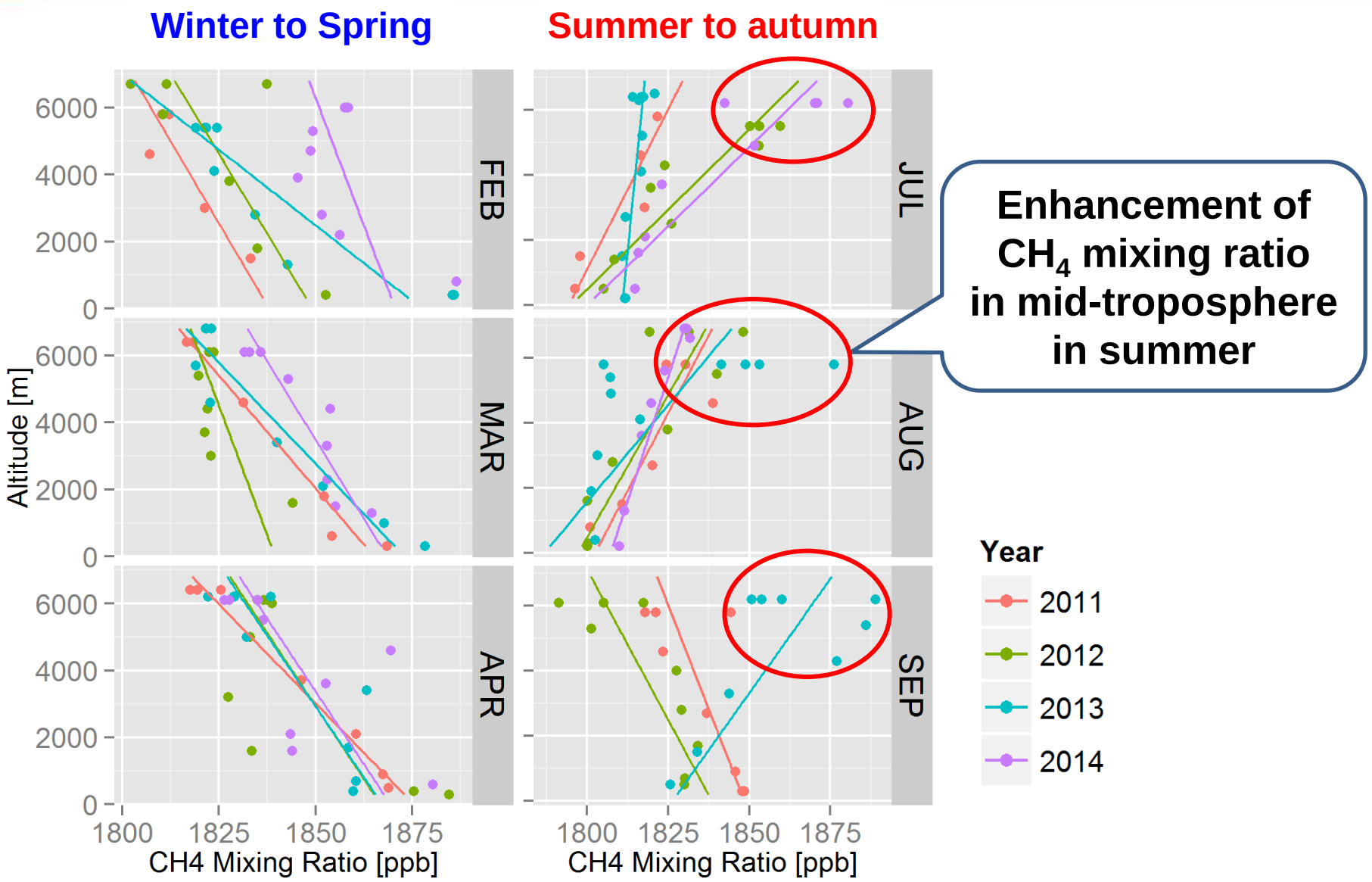


(Niwa et al., 2014 JMSJ)

Comparison of CH_4 between 6km and surface

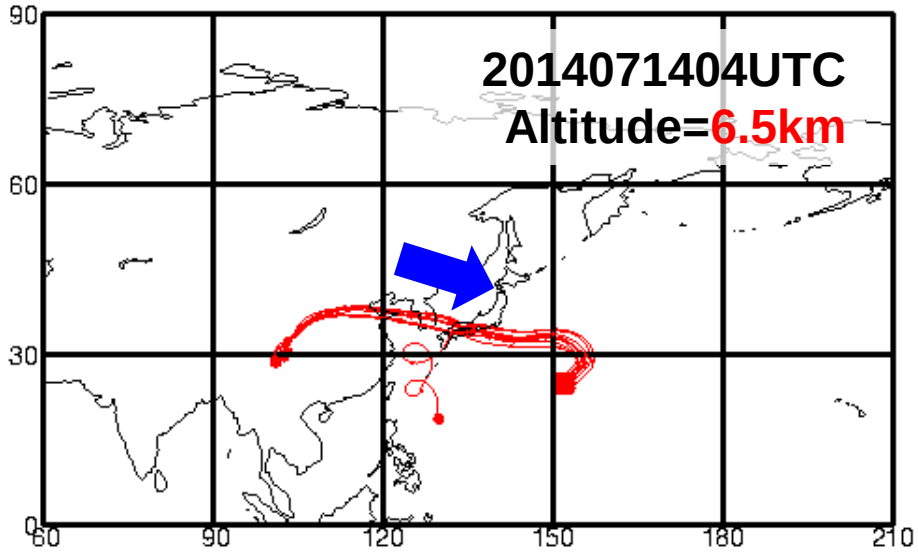


Vertical profiles of CH_4 over Minamitorishima station

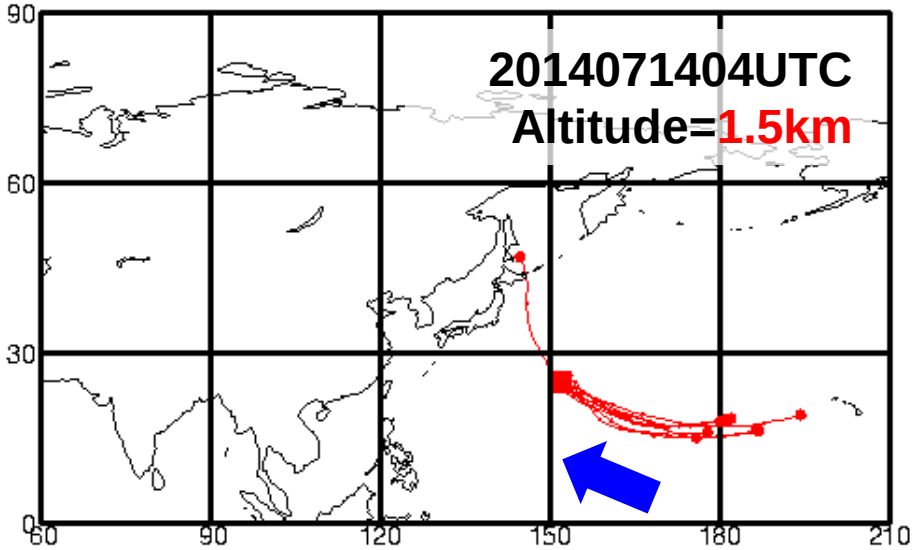


Trajectories from the Asian continent in summer

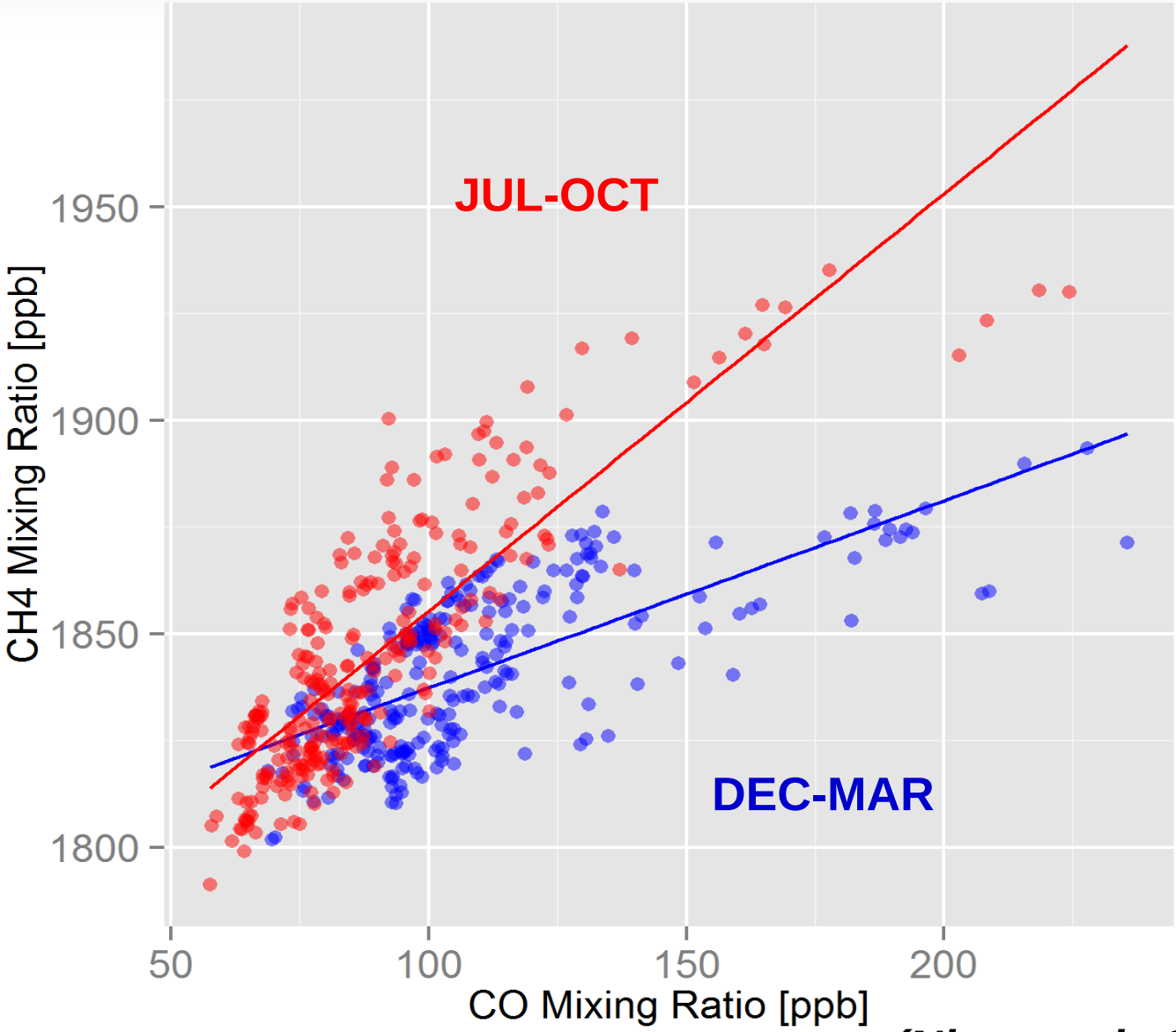
Mid-troposphere:
Continental air mass



Lower troposphere:
Background
(Oceanic) air mass



Strong biogenic CH_4 signal in summer



(Niwa et al., 2014 JMSJ)

Summary

- In order to better understand the spatial and temporal variations of GHGs fluxes in Asia and their contributions to the global carbon cycle, JMA has carried out an operational aircraft observation since 2011.
- Over Minamitorishima, CH_4 vertical profile varied seasonally. Especially, the profile during summer-autumn suggests that the air masses of the Asian continental outflows over the western North Pacific were influenced by increased biogenic sources.
- JMA's aircraft observation data are available from WDCGG website. Please access WDCGG website and use our data for your study!

http://ds.data.jma.go.jp/gmd/wdcgg/