



Northwestern Pacific observation network data show atmospheric CO₂ concentration exceeding 400 ppm

The Japan Meteorological Agency (JMA) operates a three-dimensional greenhouse gas observation network covering the Japanese archipelago and other parts of the northwestern Pacific (Fig 1). Precise measurement data obtained from the network show levels of carbon dioxide (CO₂) concentration in the region exceeding the significant level of 400 parts per million (ppm, by volume).

Ground stations

Monthly averages of in situ CO₂ concentration for April 2014 and annual averages for 2013 at three ground stations operated by JMA all showed record highs as listed in Table 1 (see also Figs. 2.1, 2.2 and 2.3). These stations are located at Ogasawara Village on Tokyo's Minamitorishima (Marcus Island), Ryori in Iwate Prefecture and Yonagunijima in Okinawa Prefecture. The Minamitorishima facility is registered as one of 29 Global Stations of the World Meteorological Organization (WMO) Global Atmosphere Watch (GAW) Programme, and the others are GAW Regional Stations.

Table 1

Station		Ryori	Minamitorishima (Marcus Island)	Yonagunijima
CO ₂ concentration (ppm)	Annual, 2013	399.6	397.5	399.5
	Monthly, Apr. 2014	407.0	402.7	405.9

Marine air and surface sea water

In winter 2014, CO₂ concentration in the marine surface atmosphere to the south of Japan reached 400.6 ppm, thereby exceeding 400 ppm for the first time since monitoring began in 1984 (Fig. 3). Data showing CO₂ concentration in ocean surface water, which is measured concurrently, indicate lower levels but a rate of increase similar to that for surface air over the long term, indicating that the ocean absorbs CO₂ from the atmosphere along this trackline. JMA implements biannual monitoring using two research vessels (the Ryofu-maru and the Keifu-maru) along a track at 137°E from 7°N to 33°N.

Aerial monitoring results

Another record-high CO₂ concentration of 402.7 ppm was detected in operational aircraft observation during April 2014 over southeastern mainland Japan. Aircraft-based CO₂ sampling has been performed once a month since February 2011, and this was the first time a value exceeding 400 ppm had been recorded. Figure 4 shows data from a cruising altitude of about 6 km averaged along the flight route. The Japan Ministry of Defense supports this observation work with its C-130H cargo aircraft.

Related information

- ✧ Atmospheric greenhouse gas monitoring information and technical details
http://ds.data.jma.go.jp/ghg/info_ghg_e.html
http://www.data.kishou.go.jp/obs-env/cdrom/report/html_e/technical_info.html
- ✧ Annual changes in oceanic and atmospheric carbon dioxide (CO₂) concentrations in the western North Pacific
http://www.data.jma.go.jp/gmd/kaiyou/english/co2_trend/co2_trend_en.html
- ✧ World Data Centre for Greenhouse Gases (WDCGG)
<http://ds.data.jma.go.jp/gmd/wdcgg/>
- ✧ WMO Global Atmosphere Watch (GAW) Programme
<http://www.wmo.int/pages/prog/arep/gaw/measurements.html>

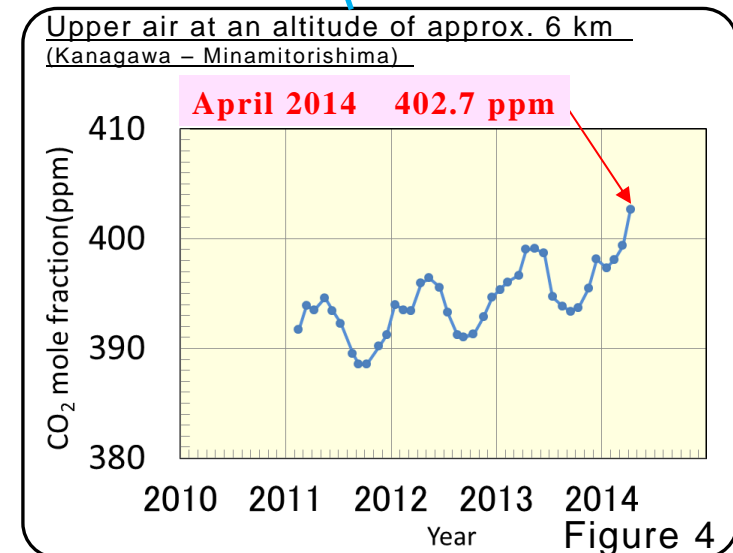
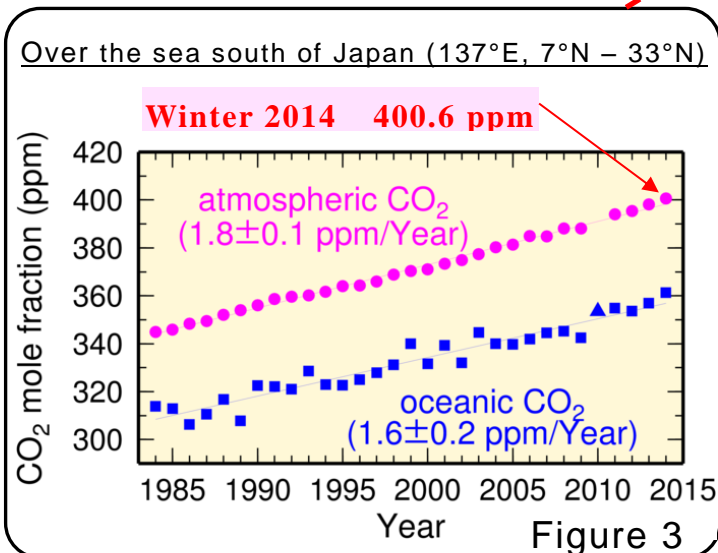
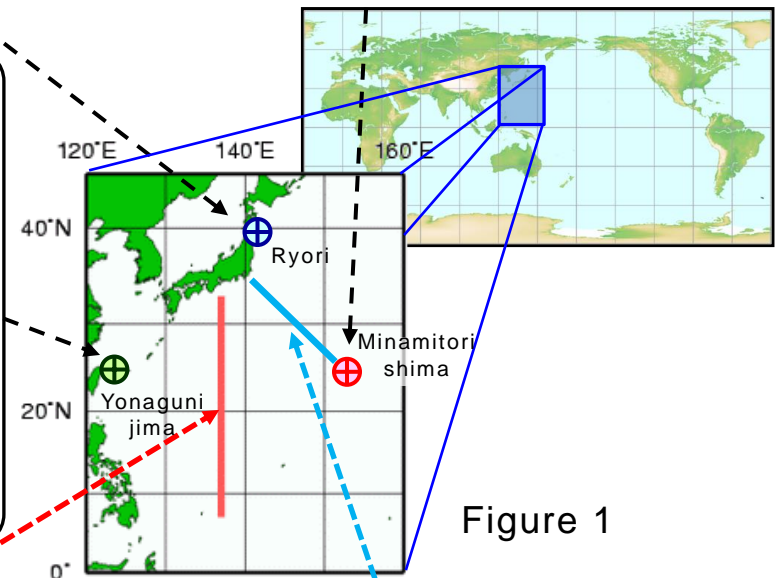
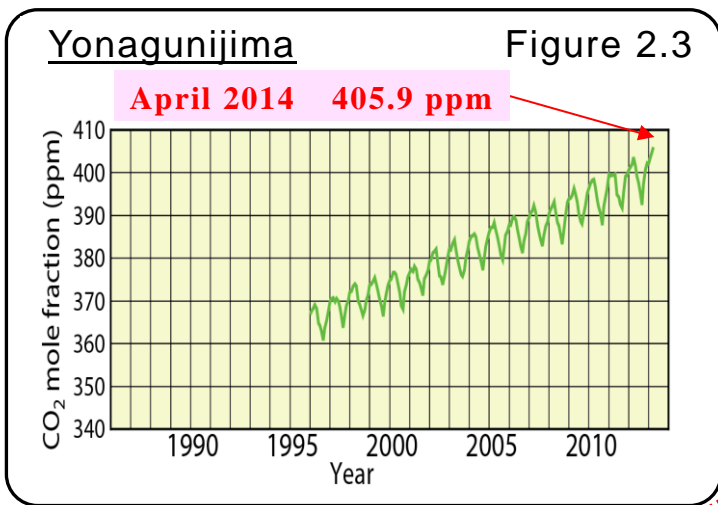
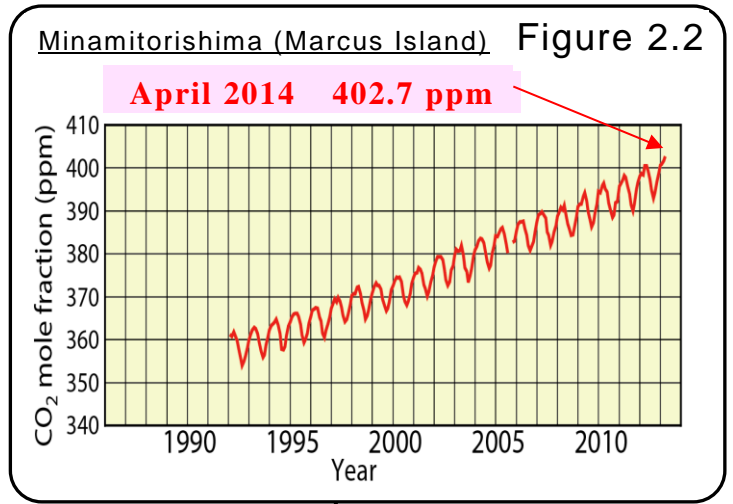
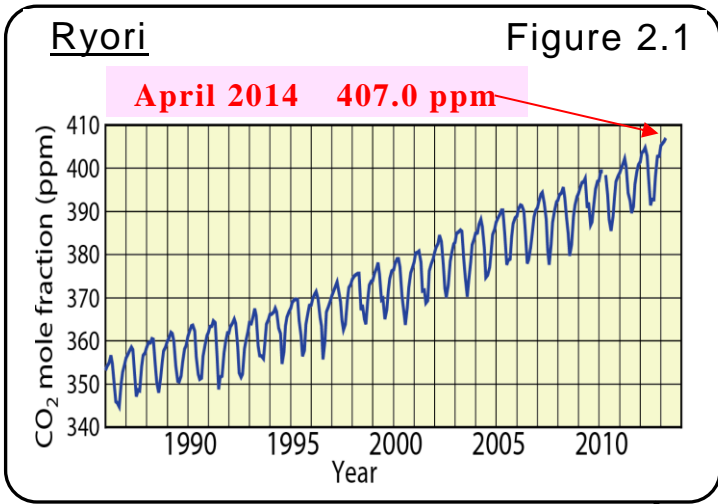


Fig.1 JMA's operational CO₂ monitoring network; stations are marked with ⊕, and solid lines indicate mobile observation tracks.

Fig.2.1-3 Time-series representations of monthly mean atmospheric CO₂ concentrations for Ryori, Minamitorishima (Marcus Island) and Yonagunijima, respectively

Fig.3 Annual changes in oceanic (blue squares) and atmospheric (red circles) CO₂ concentrations averaged along 137°E between 7°N and 33°N for winter (January - February) from 1984 to 2013

Fig.4 Time-series representation of upper-air CO₂ concentration averaged along the flight route at an altitude of approx. 6 km between Minamitorishima and Ayase City in Kanagawa Prefecture