

Session 7: National and regional reports on ozone research and monitoring

Region 2: Asia

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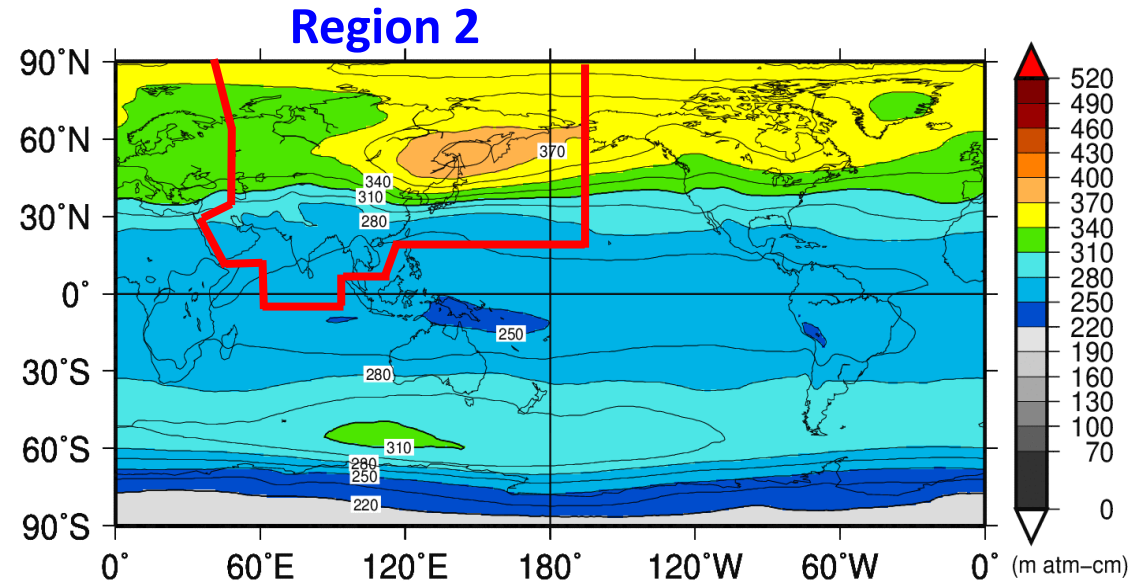
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Background

Region 2: Asia



Annual mean total ozone amount (2022)

The **highest concentration of ozone** is found in the Region

N-S **gradient is very sharp** (i.e. isolines are very dens around 30 deg N)

-> Systematic in-situ ozone observations at **a certain number of stations are necessary** to check and calibrate absolute values for horizontal distribution derived by satellite and numerical simulation

1. Observational Activities

- Roughly 25% of the WMO Members submitted the national report for the 12th ORM.

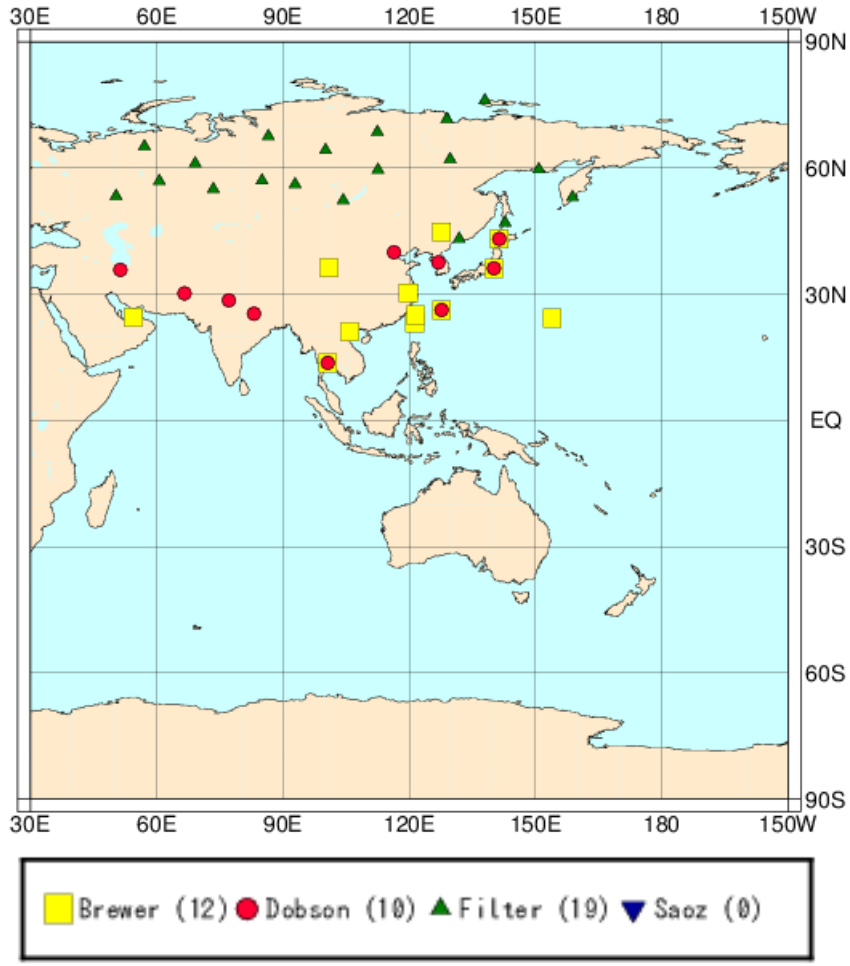
- Ozone
- UV
- Substances
- Calibration

Members that have submitted national reports

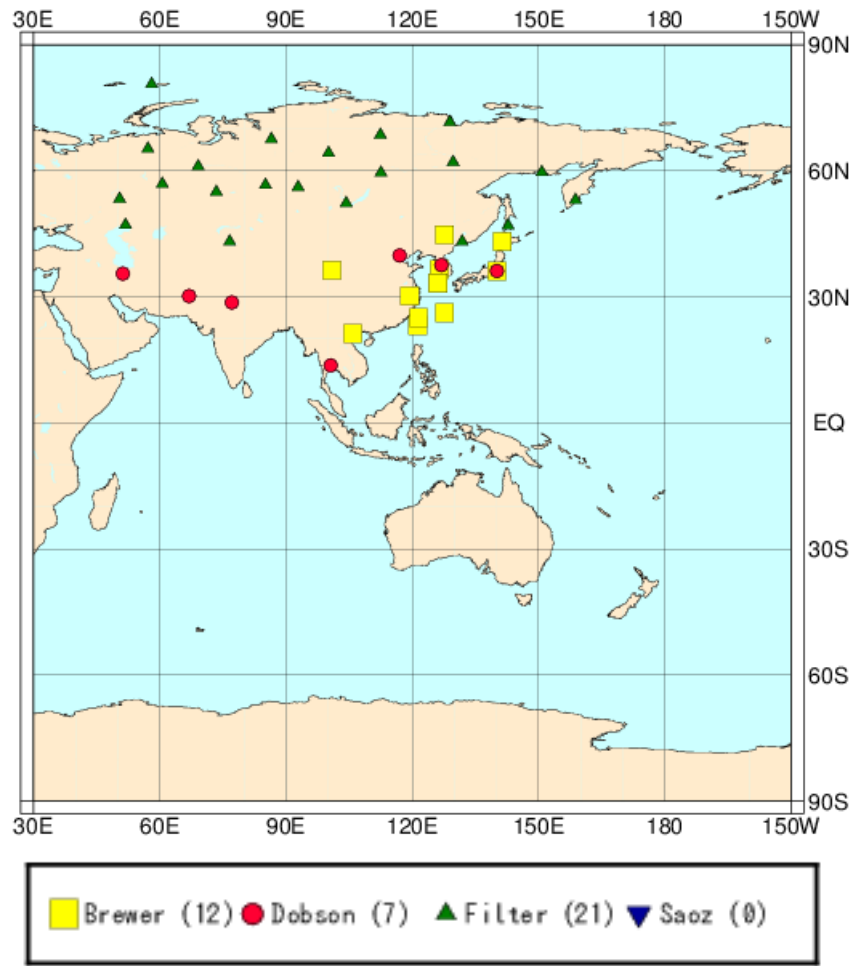
Bangladesh
China
India
Iraq
Japan
Nepal
Russian Federation
Sri Lanka

Status of total ozone data archived in WOUDC

2017-2019



2020-2022



Data from about 40 stations are available in Region 2 (Asia) on WOUDC.

Ozone observations

	Active Observational Stations/Instruments
Bangladesh	1 Pandora
China	6 Brewer, 2 Satellites GF5-02, FY-3F
India	1 Dobson (Total 6 instr.; work 3 (incl. 1 need cal.), not work 3) 0 Brewer (Total 5 instr.; work 4 (incl. 2 need cal.), not work 1) 2 ozonesonde
Iraq	x surface ozone
Japan	OP: 1 Brewer , 1 ozonesonde, x surface ozone RD: 7 Pandora , 1 LIDAR, 2 mm-wave radiometry, 1 R/V
Nepal	x surface ozone
Russian Federation	28 filter ozonometers M-124, 6 Mini-SAOZ, 1 Dobson (Total 3 instr.; in use 1, not used 2 need cal.), 3 Brewer (Total 4 instr.; in use 3 need cal. , not used 1), 17 surface ozone, x MW Radio., x LIDAR (for research?)
Sri Lanka	National Ozone Unit (NOU) of Sri Lanka is expected to establish ozone and UV radiation monitoring stations

Observation over Antarctica is not included in this table

There are some Members with no routine observational work.
A number of instruments are needed calibration and maintenance.

UV observations

Active Observational Stations

Bangladesh	-
China	3 Brewer , 1 Kipp & Zonen
India	45 (UV-A, UV-B)
Iraq	-
Japan	OP: 1 Brewer RD: 1 broadband radiometer
Nepal	-
Russian Federation	12 M-124 , 10 global UV radiation, 3 Brewer (Total 4 instr.; in use 3 need cal., not used 1)
Sri Lanka	National Ozone Unit (NOU) of Sri Lanka is expected to establish ozone and UV radiation monitoring stations

Observation over Arctic and Antarctica is not included in this table

(Same as previous slide)

There are some Members with no operational observational work. A number of instruments are needed calibration and maintenance.

Measurement of substances

Active Observational Stations

Bangladesh	1 ODS and HFCs (flask sampling; supported by UNEP)
China	3 CFCs/HCFs/HFCs/Halons/Solvents, 7 canister sampling
India	-
Iraq	-
Japan	OP: (JMA) 1 CFCs/HFCs/x, 2 CFCs by R/V, (MOE) 3 CFCs/HCFs/x RD: (NIES) 2 CFCs/HFCs/x
Nepal	-
Russian Federation	1 CFC-11/CFC-12/HCFc-22 (Fourier Spectrometer of IR)
Sri Lanka	-

Measurement of **ODS and related substances** controlled by MP **are limited**.

Calibration activities

Intercomparison / Traceability

Bangladesh	-
China	ODS/HFCs: AGAGE or NIM
India	Dobson #112: Irene, South Africa in 2019 Dobson #036: MOHp, Germany in 2020 Brewer #089/#094: IOS Canada in 2022
Iraq	-
Japan	Dobson #116 (Reg. Std.): Melbourne, Australia in 2022 -> Reg. Intercomp. Dobson for Asia will be held in Sep. 2025 Brewer #253 (Natl Std.): ECCC, Canada in 2023
Nepal	-
Russian Federation	Dobson #108: Hohenpeissenberg, Germany in 2019 (MOHp2019) Brewer #044: Aros Climate Obs., Switzerland in 2018 Ozonometer F-105: calibrated in 2022 * There are some instruments which require calibration
Sri Lanka	-

2. Results from observations and analysis

China:

Estimation of CHCl_3 , SO_2F_2 , CH_3CCl_3 , HCFCs emissions

Iraq:

Progresses of regulations on ODS

India:

Positive trend on TCO was seen by in situ (Dobson) observation
Positive trend was also estimated by MERRA-2 data

Japan:

No marked TCO trend could be seen after 2005.
Downward **UV** radiation shows **a significant increase**.
-> Air quality improvement? / Change of local climate?

Russian Federation:

The range of TCO (250 - 450 DU) is generally kept
The level of surface **UV irradiation remained moderate**

3. Theory, Modelling, and Other Ozone Related Research

- Monitoring: ODS, surface ozone, and related compositions
- Satellite: INSAT-3DR (India), ex SMILES (Japan)
- China: **National Key Research and Development Project**
“High Sensitivity Continuous Analyze for Ozone Depleting Substances”

- Modeling

China	FLEXPART (to be conducted; ODS & HFCs)
India	Air Quality Early Warning System (AQ-EWS), IITM-ESMv2
Japan	CCSRNIES-MIROC5, MRI-CCM2, MRI-ESM2.0, CHASER
Russian Federation	Chemico-climatic model of the ozonosphere SOCOL

4. Dissemination of Results

Data Reporting

India	WOUDC
Japan	WOUDC, CREX, NDACC
Russian Federation	WOUDC, NDACC

Information to the public

UV irradiance forecast: China, Japan, Russian Federation

UV irradiance Observation: India (Air Quality Early Warning System), Japan

Relevant Scientific Reports

So many lists are shown in national reports.

5. Project, Collaboration, Twinning and Capacity Building

Bangladesh:

Flask sampling experiment with UK supported by UNEP
Joining Pandora project

China:

National key R&D project, national capacity buildings

India:

National training on Dobson, Ozone sonde, GAWTEC, AEMET

Nepal:

National Ozone Unit is supported by Multilateral Fund

Sri Lanka:

Realtime Monitoring on Air Quality at 20 stations in collaboration between NBRO and Meteor. Dep.

6. Implementation of the recommendations of the 11th ORM

China:

- * MST founded programs for promoting ODS/HFCs monitoring
- * Build stations to monitor ODS/HFCs
- * Enhancing supervision of ODS and HFCs enterprises

India:

- * Brewers #089/#094 were calibrated in 2022 with WMO supports
- * NIST Standard Reference Photometer #43 is playing a role as a primary standard for Ozone monitoring network

Japan:

- * Continuing contribution to WOUDC activity
- * Continuing to develop and upgrade CCMs

Nepal:

- * Still needs the capacity on research relevant to ozone layer

7. Future plans

Bangladesh:

- * Hoping a **tower renovation**, new observatory and ODS laboratory

China:

- * **ODS/HFCs** additional primary gases will be studied and developed
- * Comparison with **international standards is planned**
- * Progressing estimation of **ODS/HFCs** utilizing with transport model

India:

- * Dobson/Brewer instruments **should be refurbished or calibrated**

Iraq:

- * Ministry of Environment are going to facilitate continuous data collection **by providing high-end land stations and monitoring equipment**

Japan:

- * JMA offers to **host the Regional Intercomparison of Dobson Spectrophotometers for Asia in September 2025**. Certain amounts of financial support are needed to support developing countries to be participated in

Nepal:

- * Necessary to plan for establishing the observational activities for **UV measurement**

Russian Federation:

- * Continuing and enhancing observations utilizing Lidars/satellites and so on

Sri Lanka:

- * NOU will **promote observation of ozone and UV radiation**

8. Needs and Recommendations

- **Systematic observations** to evaluate the changing state of the ozone layer, targeting not only ozone itself but also UV, ODS and other ozone related matters, **should be continued in cooperation with international monitoring networks**, such as WMO/GAW and NDACC
- Many members in Region 2 **need financial/technical support** to increase capabilities on research/monitoring ozone, UV, and so on
- Especially, **supports for Article 5 countries' strong motivation on the calibration/refurbishment of existing instruments are urgent needs** in Region 2