

## CHINA

### OBSERVATIONAL ACTIVITIES

In 1938 and in 1958, two Dobson Spectrophotometers have been setup in Kunming, Yunnan province and in Xianghe, Beijing, by the Institute of Atmospheric Physics (IAP), the Chinese Academy of Sciences (CAS). Four MK II Brewer Spectrophotometers have been set up by Chinese Meteorological Administration (CMA) in Waliguan, Lin'an, Longfengshan WMO GAW station, and Chinese Zhongshan South Pole station in 1990s. In Taiwan and in Hongkong, they each have one Brewer to observe ozone and UVB. They are the current total ozone and UVB observation net in China. Their data are reported to WOUDC routinely.

Another Brewer Spectrophotometer has been set up in Lhasa, Tibet in 2008. Total ozone observation from space will be implemented when satellite Fengyun III is launched in May 2008.

### Column measurements of ozone and other gases/variables relevant to ozone loss

Station	Institution	Instruments	Location	Start of observations
Xianghe	Institute of Atmospheric Physics, Chinese Academy of Science	Dobson	116°E, 39°N	1979
Kunming	Institute of Atmospheric Physics, Chinese Academy of Science	Dobson	102°E, 25°N	1979
MT. Waliguan	China Meteorological Administration	Brewer#54 MKII	100°E, 36°N	1991
Longfengshan	China Meteorological Administration	Brewer#76 MKII	127°E, 44°N	1993
Lin'an	China Meteorological Administration	Brewer#77 MKII	119°E, 30°N	1993
Zhongshan	China Meteorological Administration	Brewer#74 MKIV	South Pole	1993
Hongkong		Brewer	114°E, 22°N	
Taiwan		Brewer	121°E, 24°N	
Lhasa	China Meteorological Administration	Brewer	91°E, 23°N	1998; 2008

### Profile measurements of ozone and other gases/variables relevant to ozone loss

There are two stations for ozone profile observation which are in constructing by CMA. One is in Lhasa, another is in Beijing. Ozone sondes have been routinely released in Shanghai by Shanghai Meteorological Bureau since 2007.

### UV measurements

Station	Institution	Instruments	Location	Start of observations
MT. Waliguan	China Meteorological Administration	UVB-1 Yankee	100°E, 36°N	1991
Longfengshan	China Meteorological Administration		127°E, 44°N	1993
Lin'an	China Meteorological Administration		119°E, 30°N	1993
Zhongshan	China Meteorological Administration	UVB-1 Yankee	South Pole	1993
Hongkong			114°E, 22°N	
Taiwan			121°E, 24°N	
Lhasa	China Meteorological Administration		91°E, 23°N	1998; 2008
Shangdianzi	Institute of Urban Meteorology, CMA, Beijing	KIPP&ZONEN	117°E, 40°N	

### Calibration activities

The Brewers are calibrated by WMO/GAW Brewer Spectrophotometer Ozone Calibration Centre about every two year. A calibration lab in CMA will be setup in 2008.

## RESULTS FROM OBSERVATIONS AND ANALYSIS

The published and unpublished results all shows the total ozone concentration was slightly decreasing during last 20 years.

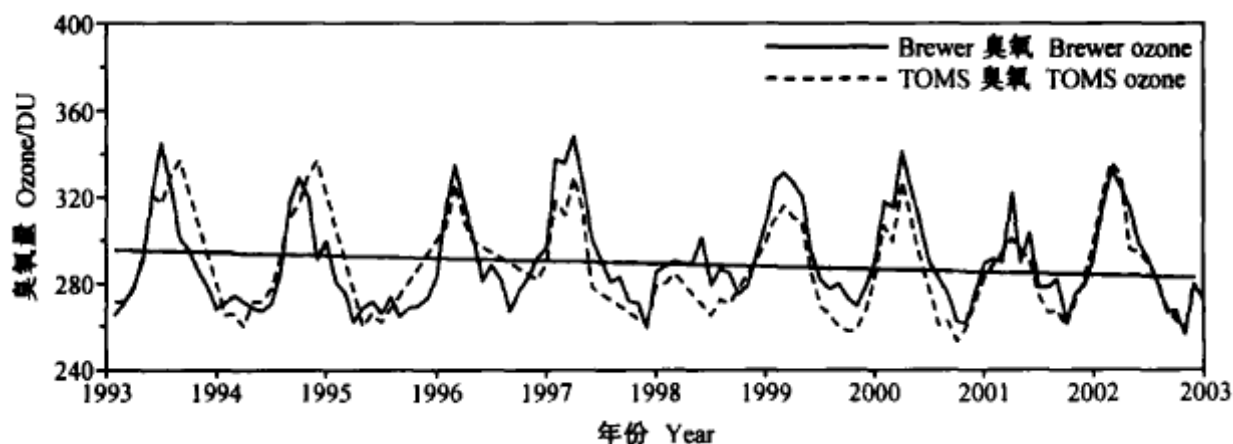


Figure 1: The monthly mean variation of the total ozone in Mountain Waliguan (Linear fitting trend:  $y = -0.106X + 295.51$ )<sup>1</sup>.

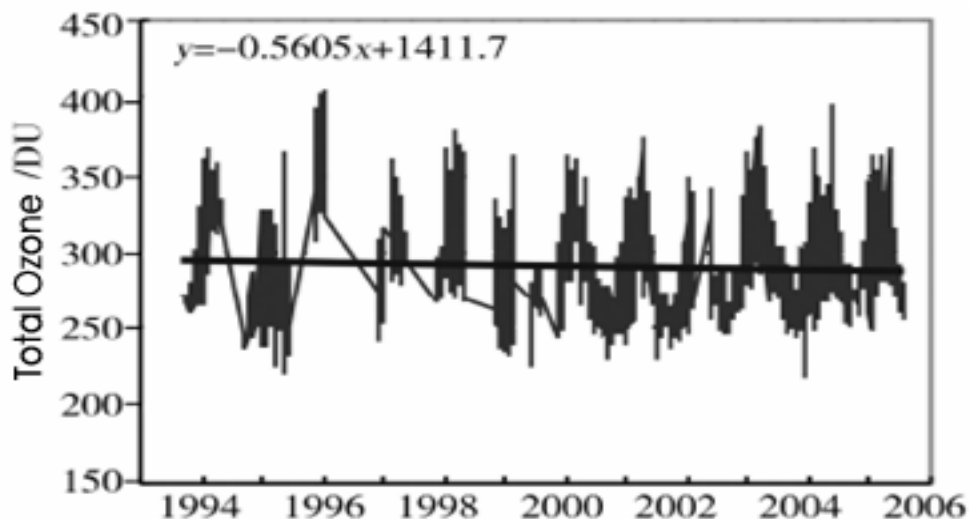


Figure 2: The daily average variation of total O<sub>3</sub> over Mt1 Waliguan in 1993—2005<sup>2</sup>.

## THEORY, MODELLING, AND OTHER RESEARCH

School of Earth and Space Science, University of Science and Technology of China and other research organizations, have done some research on the vertical distributions and variation characters of ozone over the Iranian Plateau and Tibetan Plateau by using the TOMS, HALOE and SAGE II data<sup>3</sup>.

<sup>1</sup> ZHANG Zhongbo, BIAN Jianchun, et al. Analyze and Verify Variation Features of Total Atmospheric Ozone in Mountain Waliguan Based on Comparison between Brewer and TOMS Data. *Climatic and Environmental Research*, 11(4): 451-456, 2006.

<sup>2</sup> Deliger, ZHAO Yucheng. The Variation Characteristics of Atmospheric Background Chemical Component in Recent 10 Years over Mt. Waliguan of Qinghai Province. *Environmental Chemistry*, 26(2): 241-244, 2007.

<sup>3</sup> ZHOU Renjun, CHEN Yuejuan. Ozone Variations over the Tibetan and Iranian Plateaus and Their Relationship with the South Asia High. *Journal of University of Science and Technology of China*, 35(6): 899-908, 2005.

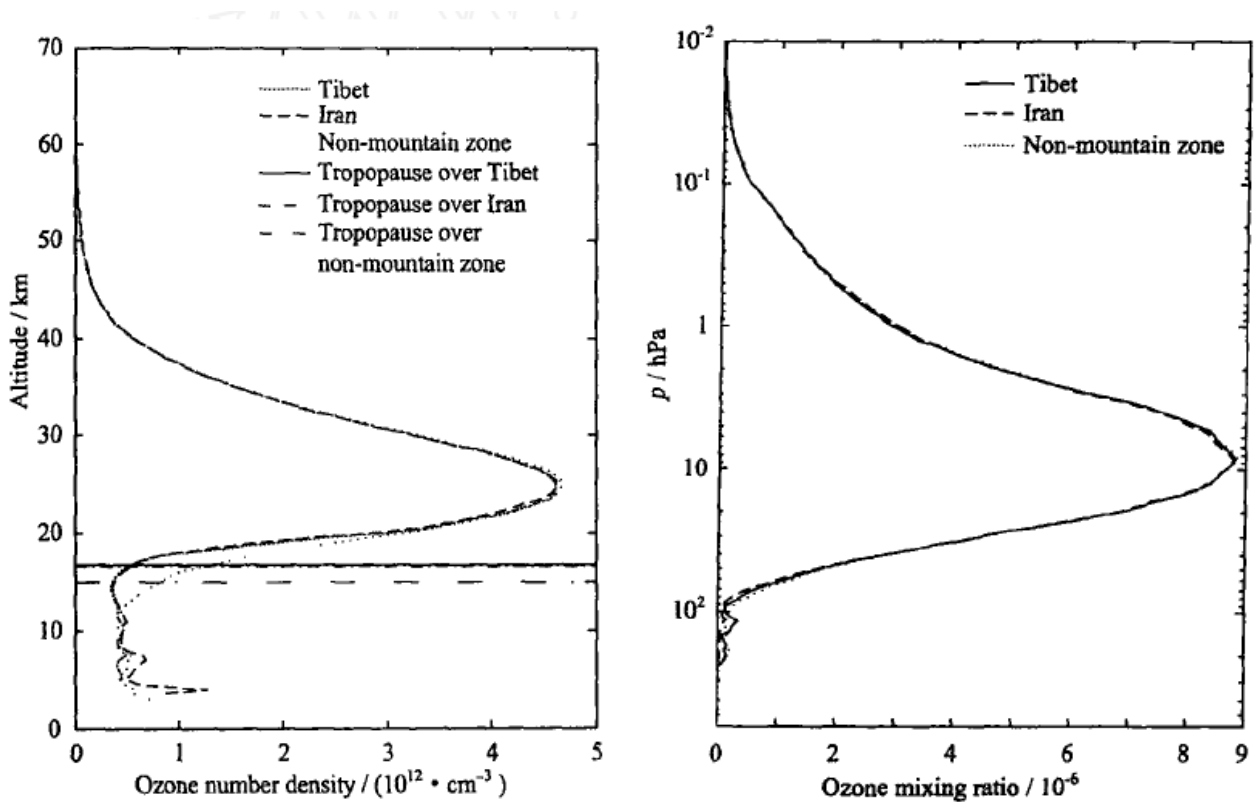


Figure 3: Profile of ozone number density from SAGE $\alpha$  data and ozone mixing ratio from HALOE data (in summer)<sup>4</sup>.

Based on the observation data of CERN (Chinese Ecosystem Research Network) from 29 ecological stations of CAS in 2002, including UV radiation, global solar radiation, sunshine duration, relative humidity, temperature, etc., then on the basis of the 1km $\times$ 1km grid Atlas of the Chinese Meteorological Factors, ZHU Qinglin use ArcGIS to accomplish the spatialization of monthly UV radiation in China.<sup>5</sup>

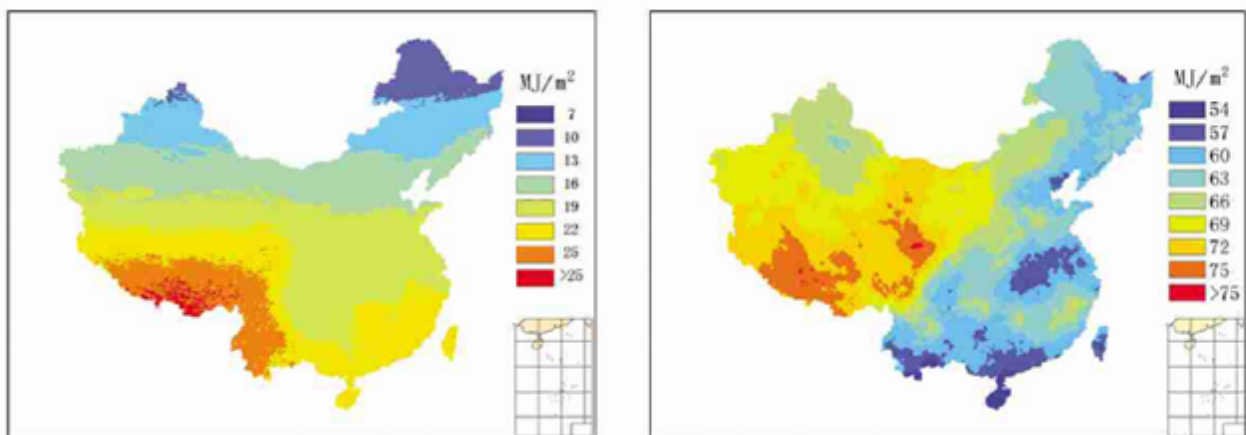


Figure 4: Spatial distribution of UV in January (left) and July (right)<sup>6</sup>.

<sup>4</sup>ZHOU Renjun, CHEN Yuejuan. Ozone Variations over the Tibetan and Iranian Plateaus and Their Relationship with the South Asia High. *Journal of University of Science and Technology of China*, 35(6): 899-908, 2005.

<sup>5</sup> ZHU Qinglin, YU Guirui, et al. Spatialization Research on Ultraviolet Radiation in China. *Resources Science*, 27(1): 108-113, 2005.

<sup>6</sup>ZHU Qinglin, YU Guirui, et al. Spatialization Research on Ultraviolet Radiation in China. *Resources Science*, 27(1): 108-113, 2005.

## DISSEMINATION OF RESULTS

### Data reporting

The data from the current ozone and UVB observation net in China are reported to WOUDC routinely.

### Information to the public

- The National Meteorological Service has included UV-Index in the public weather forecasts and reports.
- Relevant information can be seen on the China Meteorological Data Sharing Service System, <http://cdc.cma.gov.cn/>.

### Relevant scientific papers

*Deliger, ZHAO Yucheng. The Variation Characteristics of Atmospheric Background Chemical Component in Recent 10 Years over Mt. Waliguan of Qinghai Province. Environmental Chemistry, 26(2): 241-244, 2007.*

*ZHANG Zhongbo, BIAN Jianchun, et al. Analyze and Verify Variation Features of Total Atmospheric Ozone in Mountain Wal iguan Based on Comparison between Brewer and TOMS Data. Climatic and Environmental Research, 11(4): 451-456, 2006.*

*ZHOU Renjun, CHEN Yuejuan. Ozone Variations over the Tibetan and Iranian Plateaus and Their Relationship with the South Asia High. Journal of University of Science and Technology of China, 35(6): 899-908, 2005.*

*ZHU Qinglin, YU Guirui, et al. Spatialization Research on Ultraviolet Radiation in China. Resources Science, 27(1): 108-113, 2005.*

## PROJECTS AND COLLABORATION

**Table 1: List of recent projects supported by the National Science Foundation of China (NSFC).**

No.	Project	Institution	Period of the project
49645006/D0507	Vertical structure of ozone over large scale topography	Institute of Atmospheric Physics, CAS	1996.1 – 1996.12
49675254/D0503	Research on Multi-Wavelength Laser Detection of ozone and aerosol	Institute of Atmospheric Physics, CAS	1997.1 – 2000.12
49765012/D0507	Analyses on the Meteorological Fields of ozone anomaly over Tibetan Plateau	Xizang Meteorological Bureau	1998.1 - 2001.12
49775275/D0510	Observation of ozone and aerosol over Tibetan Plateau	Institute of Atmospheric Physics, CAS	1998.1 – 2000.12
49775258/D0503	Research on troposphere ozone based on laser radar measurement	Anhui Institute of Optics and Fine Mechanics, CAS	1998.1 – 2000.12
49775276/D0512	Research on secular variation of ozone over large scale topography	Institute of Atmospheric Physics, CAS	1998.1 – 2000.12
49865001/D0501	Research on climatologic and environmental effect of stratospheric ozone in Yunnan, China	Yunnan University	1999.1 – 2001.12
49975026/D0510	Research on characteristics of ozone concentrations vertical distributions over several sites in China	Peking University	2000.1 – 2002.12
40265001/D0501	Variation of ozone and UV-B Radiation and effect on the ecological environment over the low latitude plateau area	Yunnan University	2003.1 – 2005.12
40375005/D0503	Total ozone amount and aerosol optical properties based on the Brewer spectrometer	Chinese Academy of Meteorological Sciences	2004.1 – 2006.12
40475014/D0503	Research on the characteristics and variation of ozone vertical distribution in the atmosphere over Beijing	Institute of Atmospheric Physics, CAS	2005.1 – 2007.12
40775024/D0503	Quantitative Evaluation on accuracy of retrieval method for ozone vertical profiles based on the satellite measurement	National Satellite Meteorological Center	2008.1 – 2010.12

## **FUTURE PLANS**

The current monitoring networks are to be maintained in operation. However, there is no special plan or project for building new capacities to conduct ozone or UV radiation, some projects, such as projects focusing on climate change, may include instruments installation and research related to ozone and UV.

## **NEEDS AND RECOMMENDATIONS**

Much work needs to be carried out to understand many aspects of the ozone evolution and change, including impact of HCFCs, ozone-climate relationships, UV relationships, etc. The international cooperation and assists for improvement the research level and quality are appreciated.

\*\*\*\*