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# Progress report on Mt. Fuji Weather Station and future research proposals

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**Yukiko Dokiya,**

**NPO”Valid Utilization of Mt. Fuji  
Weather Station”**

**<http://npo.fuji3776.net>**

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# A Progress Report

What's going on at Mt. Fuji  
weather station?



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<http://npo.fuji3776.net>

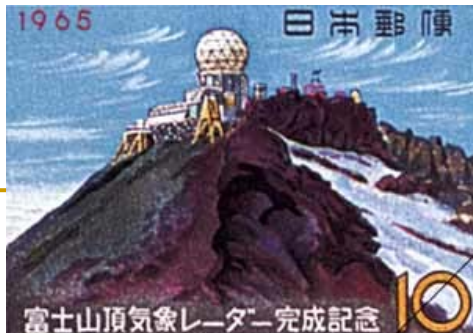
# Pre History of Mt. Fuji Weather Station (more than 100 years ago)

- 1817? Measurement of Altitude (Tadataka Ino)
- 1827 Measurement of Altitude (Keisaku Ninomiya, F. F. von Siebold)
- 1880 Pressure measurement (T.C. Mendenhall)
- 1889 Meteorological Observation ( Kiyoo Nakamura)
- 1895 October to December observation (Mr. & Mrs. Itaru Nonaka)
- ~1910 Observation in summer



# Mt. Fuji Weather Station

- 1927** A private observation laboratory was built by Jun-ichi Sato by the fund of Mitsui
- 1932** Second IGY, International observation. One year weather station at Higashi Yasunogawara
- 1936** Mt. Fuji weather station at Kengamine
- 1950** Mt. Fuji weather station of JMA
- 1964** 800km Mt. Fuji RADAR
- 1999** End of the RADAR operation
- 2001** RADAR dome removed
- 2004** End of attended operation



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# Short history of the Society

**Autumn, 2003** “Save Mt. Fuji Air  
Observation” appeal

**Winter** Appeal to scientific  
societies

**Feb.5, 2004** **Speech at IGOS meeting**

**Got a recommendation**

Mt. Fuji High Altitude Research Society

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# IGOS-P

## Atmospheric Chemistry Theme:

### Discussion and Summary **Recommendations**

IGOS International Workshop, February 4-6, 2004, Tokyo, Japan

#### **Need for:**

**Coordinated network of long-term and systematic satellite/balloon/aircraft/ground-based measurements, especially focusing on realizing the followings:**

1. Coordination among in-situ observations of several agencies  
(i.e., JMA/GAW, NIES rural stations, NIES/NDSC, etc... )
2. Satellite monitoring system for air quality in Asia, including precursor gases of GHG for GHG inventory/climate change
- 3. Maintaining the mountain-top station at Mt. Fuji**
4. Additional ground-based column measurements  
( i.e., CO & CO<sub>2</sub> with FTIR; NO<sub>2</sub> & SO<sub>2</sub> with DOAZ)
5. Campaign type measurements (in addition to long-term comprehensive measurements) for validating satellite data and model results

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# Short history of the Society (continued)

**Got a recommendation but.....**

## **Nothing happed**

Spring, 2004 Appeal to Shizuoka and Yamanashi Local Governments

summer An investigative tour to weather station

## **Establishment of the society**

autumn Publication of a book.  
Applied to research funds

winter Meetings



# Mt. Fuji High Altitude Research Society

includes the researchers of atmospheric chemistry, high altitude physiology and medicine, astronomy, ecology, etc. (50 members on Sept. 1, 2005)

## **Atmospheric Chemistry**

Tasuku AKAGI, Hiroshi BANDOW, Yukiko DOKIYA, Shinnichi FUJITA, Shiro HATAKEYAMA, Hiroshi HAYAMI, Tomoyoshi IDETA, Yasuhito IGARASHI, Yasunobu IWASAKA, Yoshizumi KAJII, Naoki KANEYASU, Yasuko KASAI, Yoko KATAYAMA, Shungo KATO, Mizuka KIDO, Hiroshi KOBAYASHI, Kazuhisa KOMURA, Jun MATSUMOTO, Yukiya MINAMI, Kazuhiko MIURA, Hitoshi MUKAI, Ippei NAGAO, Osamu Nagafuchi, Tomoaki OKUDA, Hiroshi OKOCHI, Kazuo OSADA, Yasumune SADANAGA, Yoshihiro SHINODA, Akira TAKAHASHI, Hiroshi TAKAHASHI, Norimichi TAKENAKA, Hiroshi TSUNO, Takatsugu UEHIRO, Koichi WATANABE, Katsuhiko YOSHIOKA

## **High Altitude Medicine**

Katsumi ASANO, Masako HORII, Rika IDE, Shigeru MASUYAMA, Kou MIZUNO, Shigeyoshi NAGASAKI, Eisuke TAKAZAKURA, Masayoshi YAMAMOTO

## **Astronomy**

Satoshi YAMAMOTO,

## **Ecology**

Takehiro MASUZAWA, Emiko MARUTA

## **Glaciology**

Keisuke SUZUKI

## **Organization**

Yoshiyuki SAKURAI, Toyohiro WATANABE

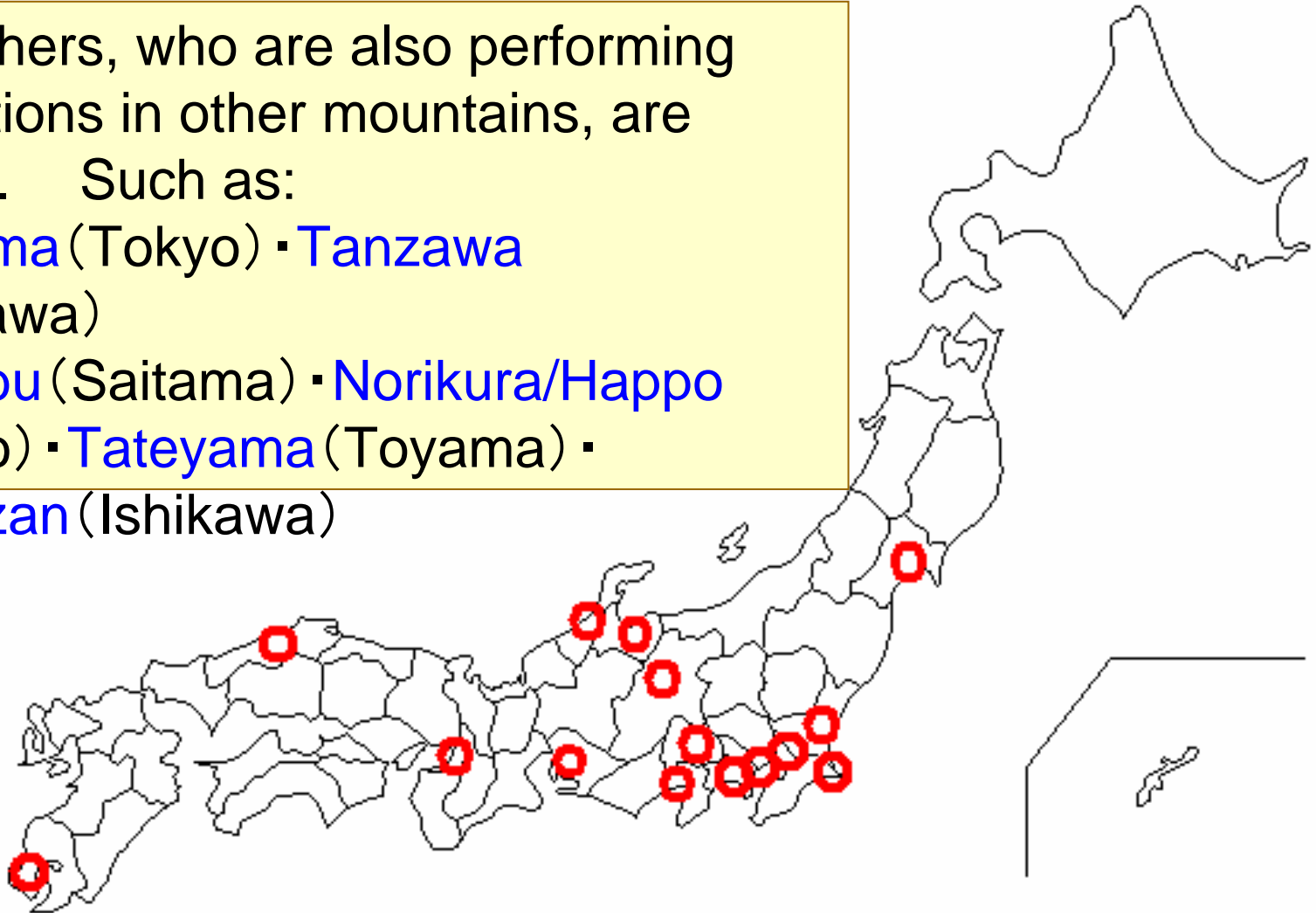


# Mt. Fuji High Altitude Research Society

The aim of the society is the scientific utilization of the facilities of the Mt. Fuji weather station.

Researchers, who are also performing observations in other mountains, are included. Such as:

[Okutama](#) (Tokyo) ▪ [Tanzawa](#) (Kanagawa)  
[Chichibu](#) (Saitama) ▪ [Norikura/Happo](#) (Nagano) ▪ [Tateyama](#) (Toyama) ▪  
[Hotatsuzan](#) (Ishikawa)



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# Research activities other than meteorology at Mt. Fuji

- 1980~** Plant ecology, observation on snow and ice
  - 1980–81** CO<sub>2</sub> observation (Tohoku University)
  - 1986–91** Experiment of high altitude medicine studies on mountain sickness
  - 1990–92** Precipitation chemistry  
Feasibility study on the establishment of the sub-mm wave telescope
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# Research activities other than meteorology at Mt. Fuji (continued)

1992–2004 Continuous measurement of surface ozone

1993,4 Precipitation and aerosol chemistry observation  
(summer)

1994 The summit of Mt. Fuji was proved to be an ideal spot for sub-mm wave telescope

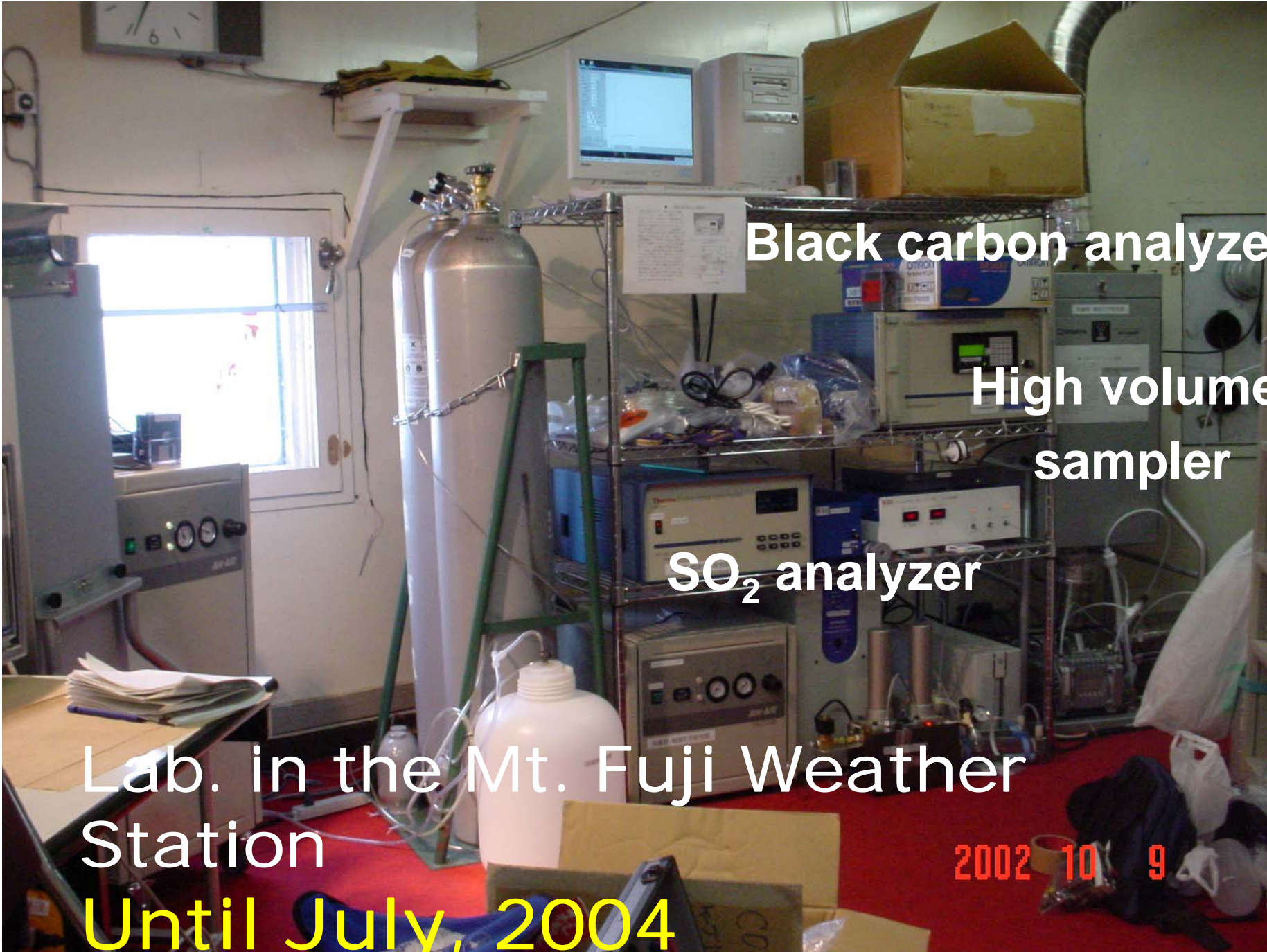
1998 Establishment of the first sub-mm wave telescope at Nishi Yasunokawara (winter)

1997–2001 Intense observation study on plant ecology and snow and ice

1997–2001 Summer campaigns on atmospheric chemistry

2002–2004 Summer/autumn campaigns and

~~continuous measurement on atmospheric chemistry~~



Black carbon analyzer

High volume sampler

SO<sub>2</sub> analyzer

Lab. in the Mt. Fuji Weather Station

Until July, 2004

2002 10 9

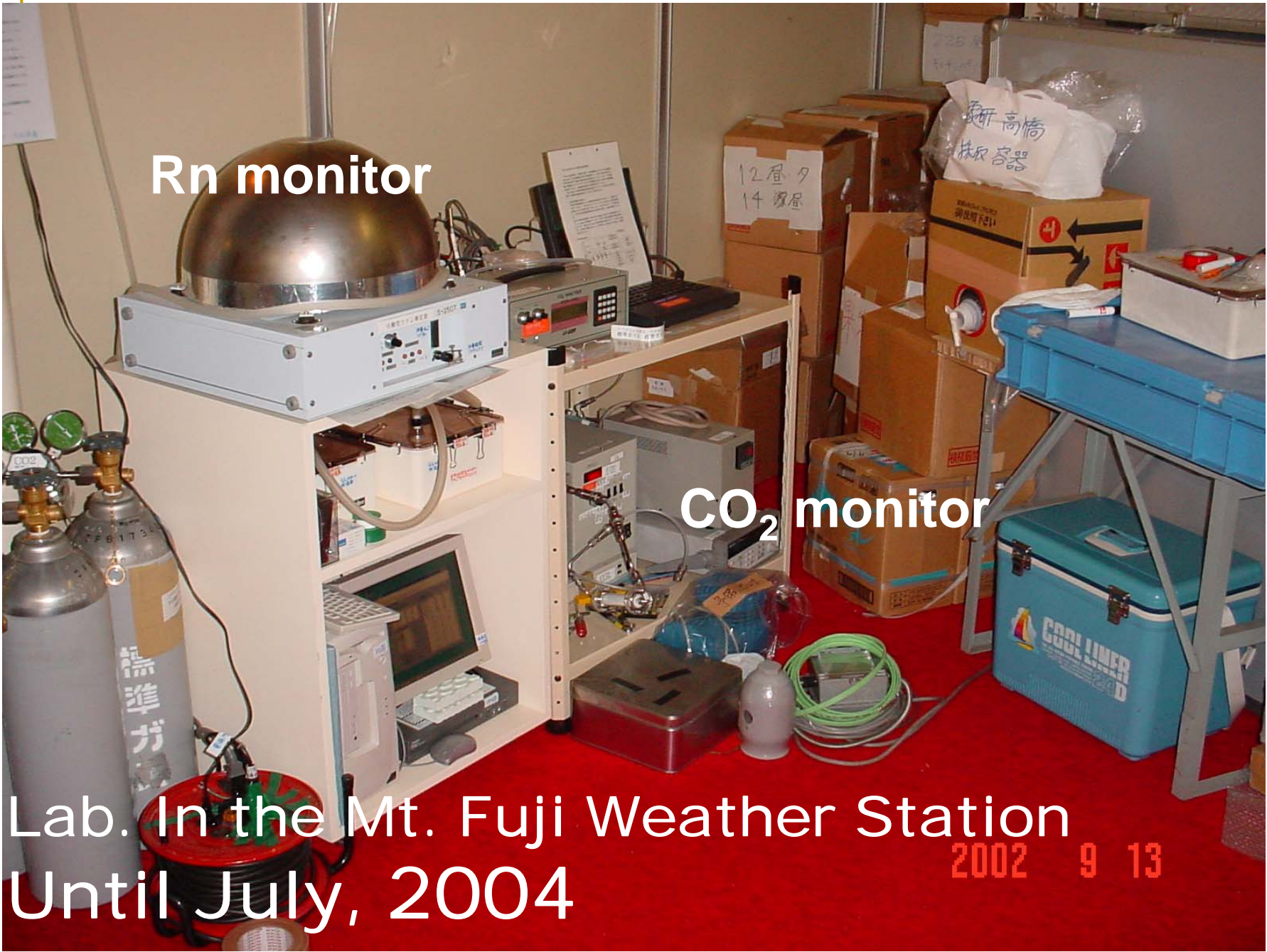


Rn monitor

CO<sub>2</sub> monitor

Lab. In the Mt. Fuji Weather Station  
Until July, 2004

2002 9 13



Now it looks.  
August 23, 2005



Photo by Dr. H. Kobayashi

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# High Mountain Observation sites in the World

Mauna Loa (USA)

(CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, CO, CFCs, Aerosols, etc.)

Jung Frau Joch (Switzerland)

(CH<sub>4</sub>, N<sub>2</sub>O, CO, NO<sub>x</sub>, SO<sub>2</sub>, VOC, CFCs, etc.)

Waligan(China)

(CH<sub>4</sub>, CO<sub>2</sub>, CO, H<sub>2</sub>, SO<sub>2</sub>, etc.)

Zugspitze (Germany)

(CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, CO, VOC, CFCs, Rn, Kr)

Mt. Fuji (Japan)

(No continuous observation)

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**Japan is far behind in this field.**



# In the world, researches using mountains are getting popular



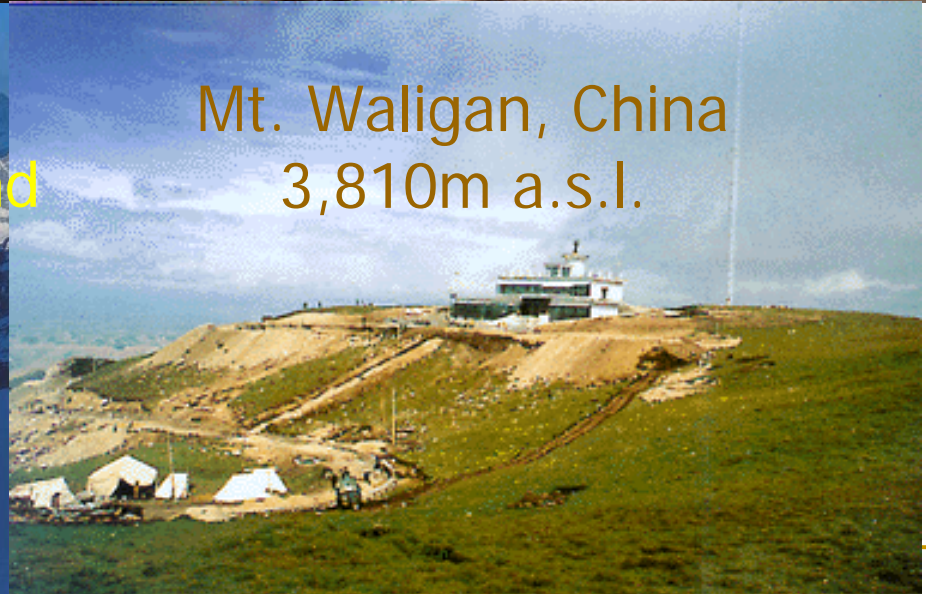
Zugspitze, Germany  
2,962m a.s.l.



Mauna Loa, USA  
3,397m a.s.l.

## Jungfrauoch-Top of Europe

Jung Frau Joch, Switzerland  
3,550m a.s.l.



Mt. Waligan, China  
3,810m a.s.l.

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# Short history of the Society (continued 2)

Spring, 2005 A symposium on the activities of the society,

Publication of the research proposal

May 17 A “Revival of Mt. Fuji weather station” event  
was held in Shizuoka

June 26 ... at Odaiba, Tokyo

Approached to JMA and other governmental  
organization and found:

**JMA is reluctant in promoting any new valid  
utilization way of the weather station.**

**EA and MEXT are willing to utilize and also to support, however,  
have no intention to take the leadership.**

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# And hot and long summer of 2005 . . .

*Visiting members of Diet, asking for help, visiting to JMA, ME, MEXT and MLIT, with plenty of data , brochures and name cards, sometimes in vain. . . . .*

**We did whatever we could!**

**Our conclusion is:**

- Establishment of NPO is the only solution
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# Research Proposals

## Utilizing Mt. Fuji Weather Station

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**NPO Valid Utilization of Mt. Fuji  
Weather Station**

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# Contents

28 proposals are collected up to present  
(Feb., 2006) including 5 research fields  
from 42 researchers.

Atmospheric chemistry 19 titles (27  
researchers)

High altitude medicine 6 (10)

Astronomy 1(1)

Ecology 1(3)

Glaciology 1 (1)

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# Atmospheric Chemistry

- Continuous observations of trace gases and aerosols in the free troposphere
- Base line observation over Japanese Islands
- Long range transport of chemicals

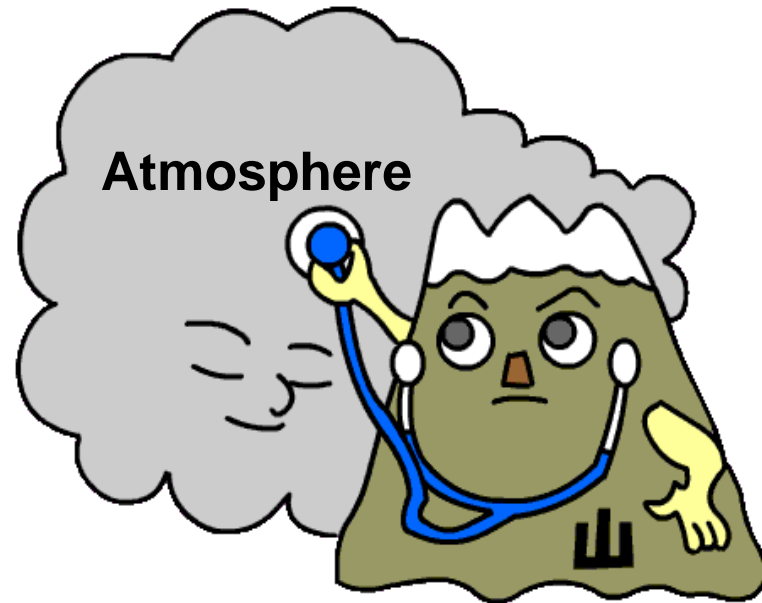


イラスト: つみた ゆういちろう

The summit is covered with fog very often, which means the cloud can be collected on site. Wet and dry processes of air chemistry can be clarified

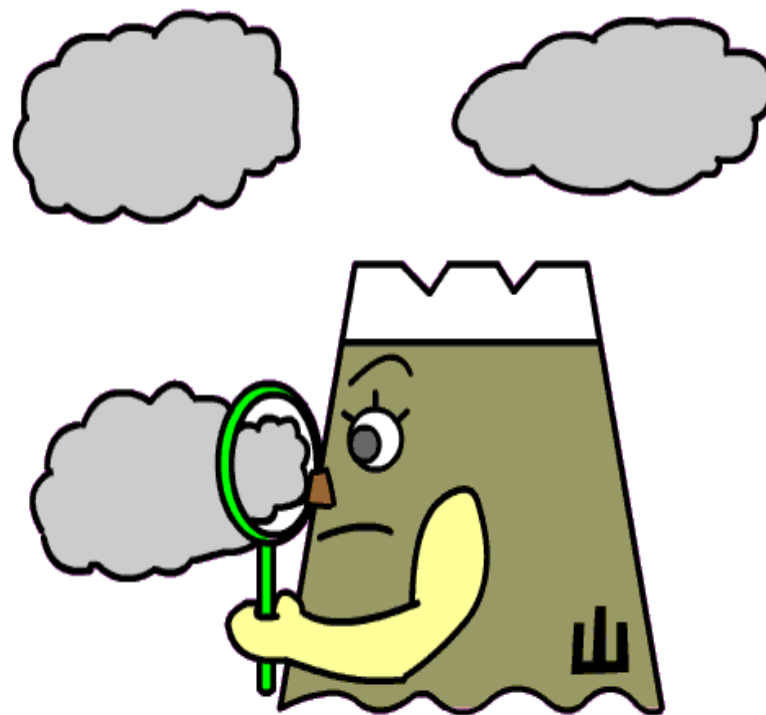
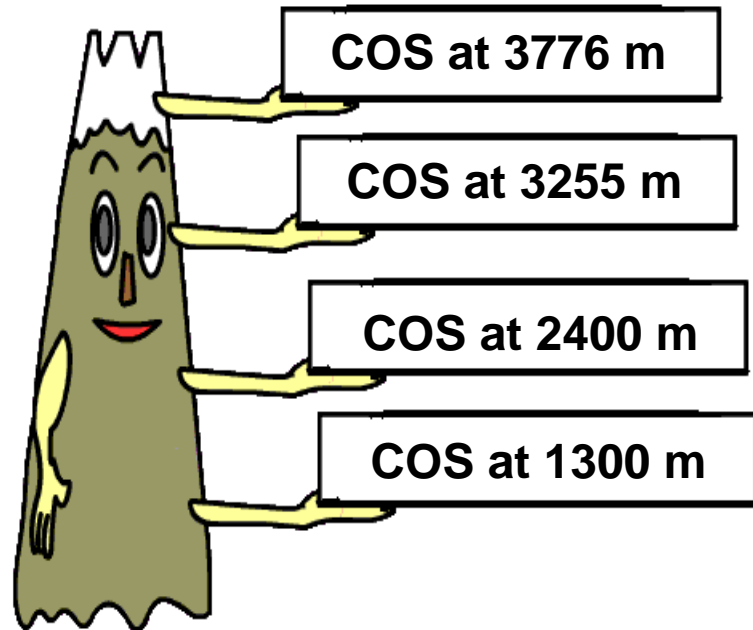


イラスト: つみた ゆういちろう



The mountain can serve as an observation tower of 4000m. Vertical information on the concentrations of trace gases and aerosols will be obtained

**Mt. Fuji is an observation tower of 4000 m**



# High Altitude Medical Studies

At the summit of Mt. Fuji

air pressure : about 60 % of the surface,  
respiratory oxygen:

12 %

acute mountain  
sickness.

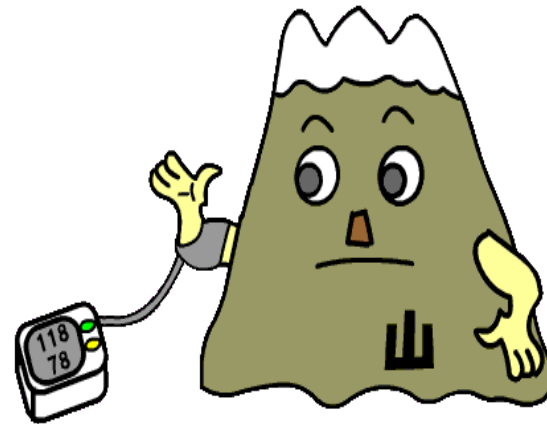


イラスト: つみた ゆういちろう

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The mechanism of the disease will be studied from the view point of blood circulation, otorhinolaryngology, pulmonary circulation and preventive medicine

High altitude training is a promising training method in many fields of sport, the mechanism of which will be very efficiently investigated utilizing the facilities

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# Astronomy

The summit of Mt. Fuji is one of the best sites in the world for astronomical Observations.

In winter,  
Low  
temperature  
and humidity



イラスト: つみた ゆういちろう

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- A telescope of sub-mm wavelength has been set at the Nishinogawara, the summit of Mt. Fuji in 1998.
  - Successful operation (1998-2005) showed:  
Sub-mm line of the atomic carbon toward a number of nearby molecular clouds and explored formation of molecular clouds:  
birthplace of new stars.



- Circulation of interstellar matter in galaxy
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# Ecology

- Permafrost was found at the summit of Mt. Fuji in 1970s. The moss and lichens growing near the summit of Mt. Fuji utilize the melt of the permafrost for their life. Recently, the distribution of these organisms are found to be changing because of the decrease of permafrost.
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# Actual Measure of Global Warming

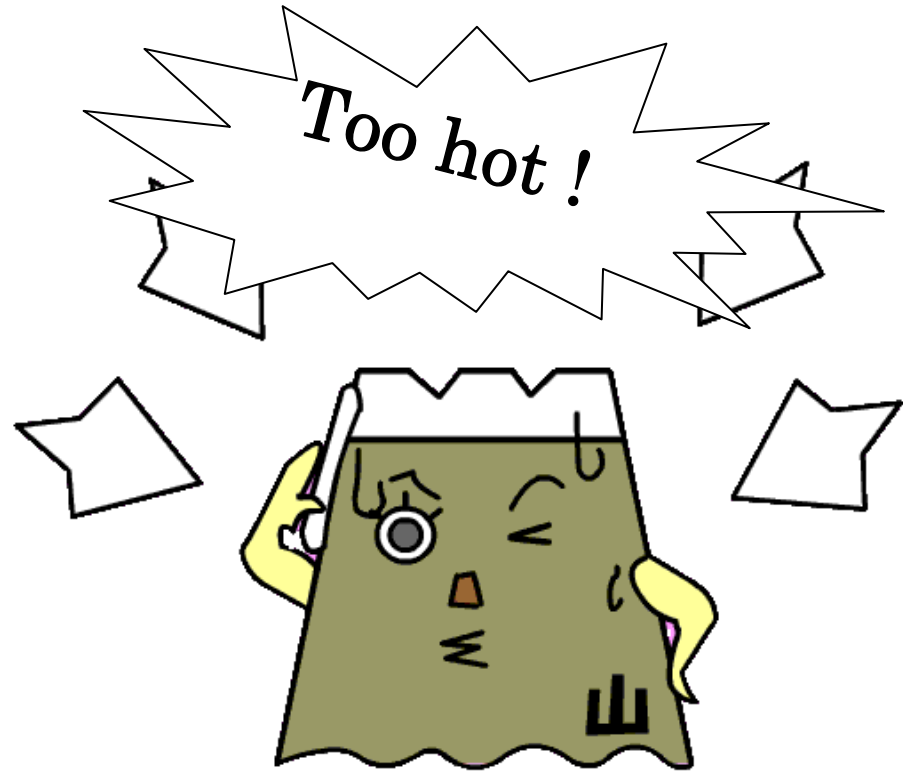


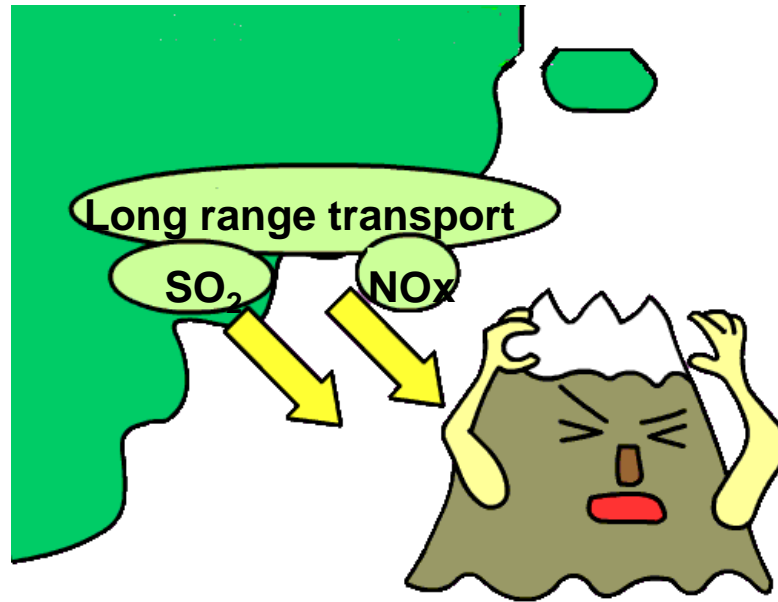
イラスト: つみた ゆういちろう



# Glaciology

Mountain snow of high altitude conserves the history of air pollution as the concentration of chemical species.

Collaboration  
with  
Precipitation,  
fog and rime  
chemistry



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**Details of the proposals will follow.**

**Thank you**

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