Mt. Fuji: A Proposal for a Permanent Ground Base Platform of Free Troposphere

Yukiko Dokiya[1], Yasuhito Igarashi[2], Yousuke Sawa[2], Hiroshi Takahashi[2], Naoki Kaneyasu[3], Katsuhiro Yoshioka[4], Yoko Katayama[5] and Tasuku Akagi[5]

1:Edogawa U., 2:MRI, 3:AIST, 4:Shimane Pref., 5: Tokyo U. Agr. Tech.

Why Mt. Fuji？
Free Troposphere
Weather Station since 1932

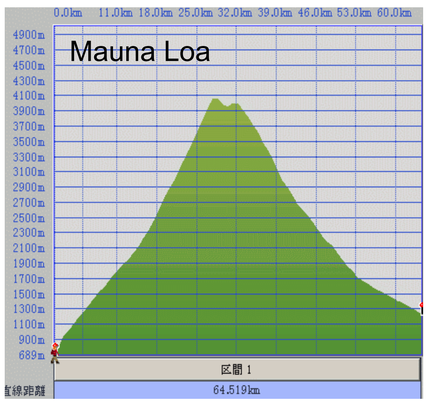
Free Troposphere

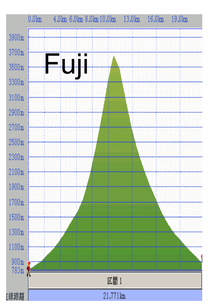
How it is shown:
Diurnal change in O_3: ***very little***
Concentrations of chemical species in aerosol:
comparable to the reported values of those in free troposphere→background level
High wind speed ***→long range transport***

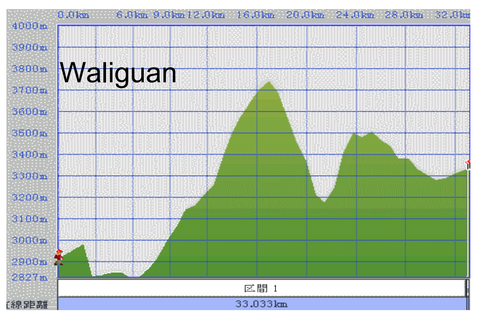
Reasons why it is so
The shape of the mountain (heat capacity)

Sole peak
Height

E-W Cross Section of Mountains







The summit is above boundary layer!
Levels of contamination from local area are very low!

Weather Station since 1932 *Short History*

19th century: an important meteorological observation point.
pioneers : **Itaru & Chiyoko Nonaka**
(Oct.-Dec., 1895)
: **Junichi Satoh**
(Jan.-Feb., 1926),
Since 1932 operated manually by Japan Meteorological Agency (JMA)

1964 RADAR Dome set up
Typhoon forecast
1999 RADAR observation ceased
staff members: 5 →4
2001 RADAR Dome removed

Air Chemistry:
What we have done since 1990

1990-1992: occasional precipitation sampling
(E. Maruta and Meteorol. Coll.)
1992～ : surface ozone started
(continuous) *(Y. Tsutsumi)*
aerosol by LV（*Meteorol. Coll.)*
1993 : aerosol by LV, Andersen LV,
HCl, SO_2, NH_3 (a week in summer)
1994 : aerosol by LV& HV(7Be), Andersen LV,
HCl, SO_2, NH_3 (five days in summer)
1997: Summer Campaign (*Meteorol. Res. Inst. & Meteorol. Coll.)*
1998-2001: (*Meteorol. Res. Inst., Meteorol. Coll. & Tokyo U. Agr.&Tech.)*
2002-2004:（ *MRI, Meteorol. Coll. , TUAT、Edogawa U., NIES, AIST, Shimane Pref. Inst. Publ. Health & Environ Sci.,Toyama Pref. U.)*

Major findings during 1997-2001

Aerosol chemical species Dokiya et al., (2001) Anal. Sci.
CO and O_3 Tsutsumi and Matsueda (2000), Atmos. Environ.
O_3 and Be-7 Tsutsumi, Igarsashi, et al.(1998) J. Geophys. Res.
H_2O_2 and MHP Yonekura et al. in contribution

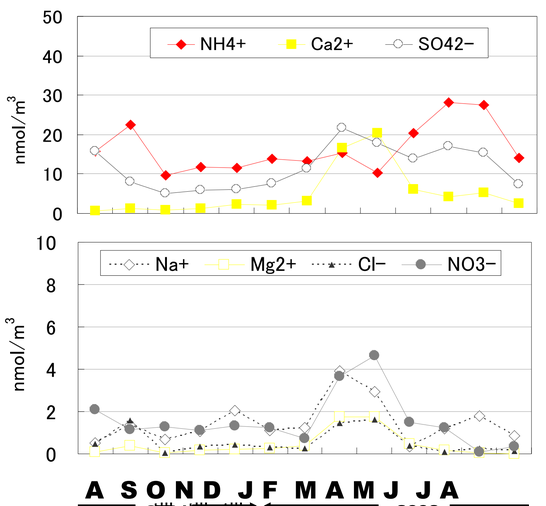
Mt. Fuji Weather Station *at Present*

4 staff members conduct surface meteorological observation on site, rotating every 3 weeks

Atmospheric radionuclides and trace species measured （until July,2004)

Species	measurement method	Instrument	DL	Precision
^{7}Be	HV-sampler → g spectrometry	Sibata HVC1000F Ortec or Eurysis	～0.1 mBq/m3	～20% RSD
^{222}Rn	Electrostatic collection → a spectrometry	Semi-home made Ohyoh-Koken Co.	0.3 Bq/m3	～20% RSD at 1 Bq/m3
Species compared				
O_3	Ultraviolet absorption	Dylec 1007-AHJ Dylec 1150		2 ppbv
CO	Gas filter correlation	Thermo Electron 48C		15 ppbv
SO_2	Ultraviolet fluorescence	Thermo Electron 43C-TL	0.1 ppbv	0.1 ppbv
Other species measured				
CO_2	Infrared absorption	Licor 6252		0.1 ppmv
Black carbon	Aethalometer	Andersen Instruments		
Aerosol sulfate and ionic species	HV sampler → ion chromatograph	Sibata HVC1000F HP-Yokogawa or Dionex		
Particle number	Laser particle counter	Kanomax		

Soluble Chemical Species in Aerosol



High in Spring

Ca^{2+}, Na^{+}, Mg^{2+}, Cl^{-}, NO_3^{-}

High from Spring to Summer

SO_4^{2-}

High in Summer

NH_4^{+}

Recent issues found at the summit of Mt. Fuji

(1) Determination of the effects of a Siberian forest fire, as found **in black carbon concentration**
(2) Continuous SO_2 observation prevails sporadic transport of polluted air masses from the continent controlled by synoptic scale meteorology
(3) Nitrate transportation with Kosa particles

Mt. Fuji has potential importance as ***a platform for chemical observation of free troposphere.***
* Mt. Fuji can offer ***continuous observation*** data, which cannot be obtained by airplane observations.
****More fruitful outcomes can be expected from observation in the future, if continued***

Mt.Fuji Weather station is now closing!!

An Atmospheric Science Institute must be established
at the summit of Mt. Fuji
which is ***open for all researchers***
which is ***open internationally***

We ask for Support ***Domestic*** and also ***International***

Particle counter compared with Aethalometer

(*H. Takahashi and N.Kaneyasu)*

Smoke from Siberian forest fire

Aethalometer showed peaks (BC)
Particle counter showed peaks in small particles
CO showed good correlation with BC
O_3 showed no correlation with BC
Model study