Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

MIS029-01 Room:203 Time:May 23 16:30-16:45

Distributions of low molecular weight dicarboxylic acids in Mt. Fuji aerosols and their stable carbon isotopic ratios

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Aerosols, suspended particles in the atmosphere, are thought to affect climate and weather condition via scattering solar radiation and acting as a cloud condensation nuclei (CCN), which can be a nuclei to form clouds. Among them, water-soluble organic aerosols, including low molecular weight dicarboxylic acids, are thought to have a large effect on a climate. Water-soluble organic aerosols are composed of not only primary emitted materials to the air, but also chemical degradation products of organic precursor compounds. Our laboratory has done many campaigns to reveal chemical compositions and distributions of organic aerosols at many locations.

This study aim to reveal molecular distributions, origins and transport pathway of organic aerosols over East-Asia and North-East Pacific region by collecting filter samples at the summit of Mt. Fuji. Here we will present the results of the 2009 and 2010 campaigns for the study of water-soluble organic aerosols including dicarboxylic acids. We will also show the analytical results of stable carbon isotopic composition of individual diacids.

Keywords: aerosols, dicarboxylic acids, stable carbon isotopic composition, Mt. Fuji

Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

MIS029-02 Room:203 Time:May 23 16:45-17:00

High levels of gaseous elemental mercury and particulate mercury observed at the summit of Mt. Fuji during summer observ

Osamu Nagafuchi[1*], Kuriko YOKOTA[2], Mayumi JIGE[3], Tomonori KAWAKAMI[4], Shigehiro KAGAYA[5], Yasuhito IGARASHI[5], Shinichi FUJITA[7]

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The chemical cycling and spatiotemporal distribution of mercury in the troposphere is poorly understood. We measured gaseous elemental mercury (GEM) and particulate mercury(p-Hg) along with SO2, ozone, aerosols and meteorological variables at the summit of Mt. Fuji (3776m a.s.l.) from 23 August to 30 August. The mean mercury concentrations were 23ng/m3 (GEM) and 4.7ng/m3 (p-Hg). We observed this event of strongly enhanced atmospheric GEM levels with maximum concentration up to 25 ng/m3. High GEM and p-Hg levels were related to pollution events, particularly SO2 transported from Asian Continent. As result of back trajectory analysis will show this phenomena

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MIS029-03 Room:203 Time:May 23 17:00-17:15

Data analysis of meteorology and sulfur oxides observed at Mt. Fuji during summer seasons

Yasuhito Igarashi[1*], Genki Katata[2], Mizuo Kajino[1], Hiroshi Takahashi[1], Osamu Nagafuchi[3], Kuriko Yokota[4], Naoki Kaneyasu[5], Shinichi Fujita[6]

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We have concerned sulfuric acid and the sulfate in the atmosphere, which are products of sulfur dioxide (SO_2) oxidations, among pollutants from the continental sources, and have carried out the observational research by using Mt. Fuji (Igarashi et al . 2004; 2006; Igarashi et al., JAAST2008). The sulfate aerosol is mostly a minute liquid droplet scattering the solar radiation and working as cloud condensation nuclei, so it is deeply involved in the climate change. Also, sulfate has impacts on the ecosystem as acidic matter. Therefore, SO_2 is very important pre-cursor gas to be monitored, but many of the observations are done within the atmospheric boundary layer = surface of the earth. In order to obtain the vertical distribution information, aircraft or mountain observations have been carried out. However, the continuous observation of the SO_2 in the atmosphere over East Asia is still scarce. The long-term monitoring data at high mountains are valuable for the clarification of various processes in the atmosphere as well as for the model verification.

It was revealed by previous work (Igarashi et al., 2004; 2006) that the SO_2 concentration at the summit of Mt. Fuji didn't show a diurnal variability, being characterized by the long-range transport of pollution that arises from the change of the weather pattern of the cyclonic scale. Such transport events were found a lot in winter but not in summer. However, concerning the observed interesting phenomena in summer remains unclear; full analysis has not been given yet (Igarashi et al., JAAST2008). In order to achieve a further analysis of the temporal-spatial variation of the mountain air quality during summer, simulation of the atmospheric chemical fields along with meteorology in the Mt. Fuji surrounding area is given in the present study (association with a poster in the same session; Igarashi, Katata, and Kajino). Targets are diurnal variation of SO_2 at Nana-gou Hachi-shaku (7.8-gou; about 3,200masl) during early August 2007 and trans-boundary pollution events in late August 2007. A chemical transport model, WRF-Chem, which is able to express precise geographical features of/around Mt. Fuji was used to simulate the regional as well as local meteorological and chemical fields. Detailed analysis with the comparison between simulation and observation will be given in the present work.

Keywords: Mountain meteorology, Mt. Fuji, Meteorological observation, Sulfur oxides, Summer season, WRF-chem

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MIS029-04 Room:203 Time:May 23 17:15-17:30

Observation of aerosol particles at the summit and a base of Mt. Fuji

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Sulfur and organic species originated from ocean make new particles to increase the number of cloud condensation nuclei and change properties of cloud (Charlson et al., 1987). However, in the planetary boundary layer, there are many sea-salt particles that provide surfaces for heterogeneous chemical reactions with sulfur or organic gases. There are a few papers of new particle formation observed in the boundary layer under a high-pressure system (ex. Covert et al., 1996). It suggests that particles are produced in the free atmosphere. As the summit of Mt. Fuji, Japan is usually positioned in the free troposphere, we can measure the variation of aerosol in the free troposphere. Our purpose is studying the new particle formation and particle growing process.

Size distributions from 4.4 nm to 5000 nm in diameter were measured with a scanning mobility particle sizer (SMPS, TSI 3936N25 or 3936L22) and an optical particle counter (OPC, RION KR12 or KC01C), at the summit (3776m, 35.36N, 138.73E) and the base Tarobo (1300 m) in July and August 2006 to 2010. Sample air was dried to lower than 20% with a diffusion dryer.

One topic of the results is a peak measured with SMPS at the summit. This peak of 10 nm appeared at about 11 o'clock on 9th and 10th August 2006 and increased their size during daytime. Volume distributions kept almost constant value during increasing their size. This suggests that this size increasing was due to coagulation and these phenomena happened in the wide area. Moreover, these events did not synchronized at Tarobo. This suggests that these peaks may be the new particle formation by gas to particle conversion in the free troposphere around the summit. The event on 9th was occurred after a passing of a typhoon. It is expected that sulphur and organic species winded up by the typhoon produce new particles in the free troposphere.

The burst of the particles smaller than 20nm in diameter continuing longer than 3 hrs was observed 81 times during four summer seasons (134 days). These events were more observed in the daytime (25) than at night (56). Most of these events did not synchronize at Tarobo.

Origins of air mass of 13 times events in 2010 was estimated with a weather map, a prediction of chemical weather map by CFORS, surface weather elements, and surface gas concentrations. The results showed that the continental and maritime origin were estimated 2 and 5 times, respectively. It is found that the concentration just before the maritime event showed lower than those just before the other events.

Acknowledgments
This study was partly supported by the Grants-in-Aid for Scientific Research, Category A (Grant No. 17201007), and Category C (Grant No. 22510019), from Japan Society for the Promotion of Science and the Sumitomo Foundation. This work was performed during the period in which the NPO "Valid Utili-zation of Mt. Fuji Weather Station" maintained the facilities.

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Charlson et al., Nature 326, 655, 1987.
Covert et al., J. Geophys. Res., 101, 6919, 1996.

Keywords: background aerosol, new particle formation, size distribution, radon, ion, cloud condensation nuclei

Japan Geoscience Union Meeting 2011
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MIS029-05 Room:203 Time:May 23 17:30-17:45

Size distribution measurement of air ions at the summit of Mt. Fuji

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Atmospheric aerosols regulate the climate either by interfering with solar and terrestrial radiation, or indirectly by acting as cloud condensation nuclei upon which water vapor condense onto. The term new particle formation literally refers to an event by which new particles are formed in the atmosphere through condensation of precursor gases. Such gases are often adsorbed on preexisting particles (e.g. in polluted environments) and there will be no net change in the number of particles. On the other hand, explosive blooms of tiny particles have been observed in rather clean environments. The condition or mechanism that triggers the new particle formation is still not very well constrained, but attracted much attention as an important pathway for increasing the number of cloud condensation nuclei.

Elevated concentrations of ultrafine particles have been observed during ground-based measurements in the Asian high mountain ranges (Nishita et al., 2008; Venzac et al., 2008). These events were commonly associated with characteristic daytime upslope valley winds, consistent with reports from other parts of the world. If any, new particle formation in Mt.Fuji may be unique in its way since the mountain consists of a steep single peak. Our focus is to monitor the variation of air ion clusters and intermediate ions at the summit of Mt. Fuji, in order to conduct an in-depth identification of the types of nucleation events taking place over the unique topography.

We have measured the size distribution of ion clusters (0.4nm?2nm) and charged nanoparticles or intermediate air ions (2nm-10nm) for the first time at the summit of Mt. Fuji (3776m, 35.36N, 138.73E) using Air Ion Spectrometer (AIS, Airel Ltd.). AIS was installed in a corner of former building of Mt. Fuji weather station of JMA (Japan Meteorological Agency) during the 2009 summer measurement campaign (14 Jul-23 Aug). In 2010 (18 Jul-24 Aug), AIS was replaced by NAIS (Neutral cluster & Air Ion Spectrometer) which is capable of measuring uncharged clusters in addition to naturally charged air ions.

Unlike in Himalayas (Venzac et al., 2008), only one daytime event was observed (5 Aug 2010) through the 10 weeks worth of measurement, that accompanied typical banana-shaped continuous growth pattern with high concentration of intermediate ions covering the entire measuring range of AIS. This example strongly suggests that the new particle formation indeed took place at the site.

To our surprise, the elevated concentrations of ultrafine particles (D>10nm) were regularly found instead during the night hours (21:00-04:00LST). The positively charged particles were more pronounced during these events. Since there was no intermediate ion growth connecting ion clusters and the ultrafine particles, this gap suggests that the particles possibly nucleated at some distance from the measurement site (e.g. in the free troposphere), or via mechanisms other than ion-induced nucleation. We plan to compare these findings with the meteorological parameters, trace gases and aerosol concentrations to analyze the condition of such events in more detail.

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Acknowledgement:
This work was performed during the period in which the NPO ”Valid Utilization of Mt. Fuji Weather Station” maintained the facilities. We would like to ac-knowledge the summit crew and NPO personnel for organizing and safely maintaining the measurements. The authors thank H. Okochi, H. Kobayashi, N. Kaneyasu, F. Taketani, H. Takahashi, Y. Minami, Y. Igarashi, H. Yasuda O. Nagafuchi, S. Kato and other research team members for their very warm support.

Keywords: atmospheric aerosols, new particle formation

Japan Geoscience Union Meeting 2011
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MIS029-06 Room:203 Time:May 23 17:45-18:00

Energetic radiation associated with thunderstorm activity on Mt. Fuji.

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Gradual energetic radiations probably caused by a summer thunderstorm have been observed at the top of Mt. Fuji, Japan. The largest of such variation was gradual and lasted for about 20 minutes, and was found to be high-energy gamma rays having a continuous energy spectrum up to 10 MeV or more. As for the feature of these variations, such variation might be caused by the bremsstrahlung photons generated by the energetic electrons produced continuously with an intense electric field in the thundercloud rather than originated in the process of lightning discharge.

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MIS029-07 Room:203 Time:May 23 18:00-18:15

Radiation Measurements at the Summit of Mount Fuji to Improve the Reliability of Cosmic Radiation Exposure Management

Hiroshi Yasuda[1*], Kazuaki Yajima[1], Takao Matsuzawa[1], Masashi Kamogawa[2]

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The intensity of cosmic radiation in the atmosphere increases with altitude; the dose level at the cruising altitude of a civilian aircraft are nearly 100 times higher than that on ground. Accordingly, the exposure accompanying to the operation of jet aircraft is considered to be occupational exposure and, in some countries such as European countries and Japan , the management of cosmic radiation exposure for aircraft crew is performed. Its main task is the evaluation of crew doses by calculation. To obtain reliable estimations, it is desirable to monitor actually the cosmic radiation exposure at high altitude in addition to improvement of calculation models. For this purpose, we have started to utilize the former Mount Fuji Weather Station located at the summit of Mount Fuji, the highest place in Japan (3,776m asl) and measured cosmic radiation using several radiation instruments in the facility during the summer of 2008, 2009 and 2010. From September 2010, unattended continuous measurement was carried out using an energy-extended neutron monitor coupled with rechargeable batteries and a wireless LAN system. It was observed that the measured radiation dose levels were stable during those periods, as expected from the quiet condition of solar activity. Some variation which did not agree to both atmospheric pressure and the pattern of solar activity was observed, which suggests the uncertain effects of atmospheric condition. Spatial variation of shielding condition in the facility was also confirmed by neutron measurements. The unattended measurement operation continued for 4 months up to early January 2011. We like to establish a whole-year measurement in near future by solving the problems such as the fast falling of battery voltage.

Keywords: cosmic, radiation, Fuji, neutron, exposure, aircraft

Japan Geoscience Union Meeting 2011
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MIS029-P01 Room:Convention Hall Time:May 23 14:00-16:30

Black particles falled in Kanagawa Prefecture on December 15, 2010

Tomohiro Kasama[1*], Hiroyuki Yamashita[1], Kazutaka Mannen[2]

[1]Knagawa prefectural museum, [2]Kanagawa prefectural hot spring research

Black particles falled in Kanagawa Prefecture on December 15, 2010.People thought that it may be the artificial material and worried about the hazardous property. Black particles are brought in to the Kanagawa environmental research center and analyzed.But neither the poisonous substance nor the radioactivity were contained in black particles. On the other hand, the blowing dust was observed on the southeast flank of Mt. Fuji and strong westerly of 40m/s was measured above Kawaguchiko-machi, 3000m in height, on December 15. These particles were thought to be the natural product, brought in to the Kanagawa prefectural museum and Kanagawa prefectural hot spring research, and analyzed. Black particles were dispersed east of Mt. Fuji. Dispersed area was sector which top was Mt. Fuji and its center was toward east. The Most distant dispersal point was Ichihara, Chiba prefecture, about 132km from summit of Mt. Fuji. Almost of particles were brown to black glass shards which were not weathered. Its size were about 0.1 to 0.01mm and became smaller toward east. The result of the chemical analysis using EPMA showed similarity to Fuji-Hoei tephra erupted 1707, especially high content of TiO2 and K2O. Black particles were thought to be reworked Fuji-Hoei tephra brought by strong westerly.

Keywords: Fuji-Hoei tephra, Black particles, reworked tephra, glass shard

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MIS029-P02 Room:Convention Hall Time:May 23 14:00-16:30

Measurement of Cloud Condensation Nuclei at the Summit of Mt. Fuji

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[1]Tokyo University of Science

1. Introduction

Aerosols serve as Cloud Condensation Nuclei (CCN) when cloud is formed and control the effect of cooling earth by cloud. Aerosol particles in the atmosphere have the various critical supersaturation by its solubility and size on dry condition. Generally, the higher supersaturation is, the more particles that can serve as CCN are because the smaller size that particles begin to grow as cloud droplets is. The relationship between CCN concentration and supersaturation is called supersaturation spectrum and this is used by some researchers when they take observations of CCN. The example of fixed point observations of CCN in Japan is a few. It is particularly a few in the mountain atmosphere, so we observed CCN at the summit of Mt. Fuji in summer.

2. Methods

This observation is done at the Mt. Fuji Weather Station from 17 July 2010 to 25 Aug. 2010. We used CCNC (Cloud Condensation Nuclei Counter ; DMT Inc.) as measuring instrument. This CCNC makes supersaturation inside, so we can experimentally make clouds. CCNC can count the number of CCNs grown according to the condition if CCN is contained in sample air. In this time, we set 6 stages of supersaturation between 0.1% and 0.44%.

In analysis, we used the backward trajectory (NOAA HYSPLIT) and drew supersaturation spectra by its origin.

3. Results and Discussion

There was a difference in the shape of supersaturation spectra between continental air and maritime air, and CCN concentration of continental air was higher than maritime air. When air had come from the sea and the land of Japan, supersaturation spectra lay between continental air and maritime air. This is suggested that the CCN concentration depends on how long the air has been on the land. Concerning its shape, this result correspond to the results that Uchida (1971) observed CCN at the Youth House and Tarobo at the bases of Mt. Fuji (650m and 1,300m levels) in spring. The years and seasons that Uchida observed there are different from this observation, so it is necessary to observe at the summit of Mt. Fuji and Tarobo at one time.

Also, the power of supersaturation spectra of the summit of Mt. Fuji was higher than other area's observations (Seinfeld and Pandis, 2006). The power depends on the size distribution and the chemical compound of particles then. We set the narrow range of supersaturation against other area's observations in terms of the size distribution, which some researchers set supersaturation between about 0.1% and 1%. So, we concerned that the size particles begin to grow as cloud droplets is large and the range of supersaturation made the difference of the power wide in comparison. Therefore it is necessary to be compared in the same range of supersaturation from now on. Then, we must consider whether the power is still high, and which of the effects is larger, by the size distribution or the chemical composition of particles.

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Acknowledgements

This study was done in the term when nonprofit organization 'Valid Utilization of Mt. Fuji Weather Station' had received a part of the Mt. Fuji Weather Station from the Japan Meteorological Agency and managed.

Keywords: Cloud Condensation Nuclei, CCN, Mt. Fuji, supersaturation spectrum

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MIS029-P03 Room:Convention Hall Time:May 23 14:00-16:30

Measurement of variation of total mass, composition, and optical property for aerosol particles at summit of Mt. Fuji

Fumikazu Taketani[1*], Yugo Kanaya[1], Naoki Kaneyasu[2], Shinataro Fujiwara[3], Kimitaka Kawamura[3]

[1]JAMSTEC, [2]AIST, [3]Hokkaido Univ.

It is well known that a particle in which diameter is less than 2.5 ?m(PM2.5) influence health issue by air pollution and climate change by scatting and absorbing sun light. It is important to observe the chemical composition, optical property and mass concentration of PM2.5 to clear source, transportation of PM2.5. To investigate behavior of PM2.5 at the summit of Mt. Fuji, we measured total mass concentration and optical property of PM2.5 using SHARP monitor and nephelometer, respectively, and collected PM2.5 using high-volume air sampler in this study.

Mass concentrations of PM2.5 in the daytime were higher than that in the night time. It is suggested that top of Mt. Fuji is strongly influenced by valley breeze. Using two high-volume air samplers we collected PM2.5 on the quartz filter which was exchanged every week or 3 days. We controlled sampling time for high-volume air sampler to classify daytime (10:00-19:00) and nighttime (0:00-5:00) PM2.5. We analyzed the chemical composition such as water soluble compounds (sulfate, nitrate, and ammonium etc.), metals and organic and elemental carbon of PM2.5 on the filter we collected. From the observed results and metrological data we investigated the cause of variety of aerosol concentration and mass closure.

Keywords: Mt. Fuji, optical property, chemical composition, mass closure

Japan Geoscience Union Meeting 2011
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MIS029-P04 Room:Convention Hall Time:May 23 14:00-16:30

Temporal and spatial trends of acidic substances in the ambient air at the top and foot of Mt. Fuji (1)

Shohei Maruyama[1], Hiroshi Okochi[1*], Hiroshi Kobayashi[2], Yukiya Minami[3]

[1]Waseda University, [2]University of Yamanashi, [3]Ishikawa Prefectural University

It was clarified that long-range transport of acidic substances and the subsequent deposition caused forest decline in Europe and North America in the 1960s. Various air pollutants, emitted in East Asia by recent economic and industrial development, are inevitably transported to Japan by the westerlies because Japan is located at the east end of Asian continent. Chemical transport model like CMAQ revealed that the long-range transport of ozone and the precursors from China causes the increase of advisory for photochemical smog in widespread area from the northern part of Kyusyu to Kanto region in Japan.

Mt. Fuji, which is the highest mountain in Japan (3776 m a.s.l.), is an isolated peak and therefore could be regarded as the tower to observe the long-range transportation from East Asia such as China and Korea to Japan, the mixing processes from the boundary layer to the free troposphere, and the nucleation/precipitation scavenging processes of various atmospheric pollutants.

Simultaneous sampling of acidic gases (SO2, HNO2, HNO3, HCl) and aerosols were performed with a four-stage filter pack sampler at daytime (6:00 ? 18:00) and at nighttime (18:00 ? 6:00) at the top and foot of Mt. Fuji during summer observational campaign. After sampling, chemical analysis was performed by commonly used method after extraction with ultra pure water or hydrogen peroxide solution (0.05 %) and filtration samples through 0.45 um. Cloud water was also collected by a passive sampler (Usui Kogyo, FWP-500).

We here report the spatial and temporal trends of acidic substances in the ambient air and discuss the influence of long-range transportation on the background concentration of acidic substances in the ambient air at the top of Mt. Fuji during the summer observational campaign in 2009 and 2010.

Keywords: background concentration, free troposphere, Long-range Transportation, East Asia, backtrajectory analysis

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MIS029-P05 Room:Convention Hall Time:May 23 14:00-16:30

Study on cloud water chemistry and its controlling factors using Mt. Fuji as an observational tower (2)

Daisuke Tahara[1*], Hiroshi Okochi[1], Syohei Maruyama[1], Yukiya Minami[2]

[1]Waseda Univ., [2]Ishikawa Pref. Univ.

It was clarified that long-range transport of acidic substances and the subsequent deposition caused forest decline in Europe and North America in the 1960s. Various air pollutants, emitted in East Asia by recent economic and industrial development, are inevitably transported to Japan by the westerlies because Japan is located at the east end of Chinese continent. Chemical transport model like CMAQ revealed that the long-range transport of ozone and the precursors from China causes the increase of advisory for photochemical smog in widespread area from the northern part of Kyusyu to Kanto region in Japan.

Mt. Fuji, which is the highest mountain in Japan (3776 m a.s.l.), is an isolated peak and therefore could be regarded as the tower to observe the long-range transportation from East Asia such as China and Korea to Japan, the mixing processes from the boundary layer to the free troposphere, and the nucleation/precipitation scavenging processes of various atmospheric pollutants. Simultaneous sampling of cloud water has been performed at the summit and in the foot (1300 m a.s.l.) of Mt. Fuji during the summer from 2006. We here mainly report the summer observational campaign in 2010.

Keywords: Free Troposphere, Background Concentration, Long-range Transportation, Aerosol-Gas-Cloud Interaction

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MIS029-P06 Room:Convention Hall Time:May 23 14:00-16:30

Numerical simulation of mountain air quality around Mt. Fuji during summer season

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Introduction

The atmospheric model research relating to the chemical observation at mountains in Japan is a few (e.g. Inomata et al., 2010; Osada et al., 2009). We have concerned atmospheric sulfate, which is a product of sulfur dioxide (SO_2) oxidations, among pollutants from the Asian continent, and have carried out the observational research by using Mt. Fuji (Igarashi et al . 2004; 2006; Igarashi et al., JAAST2008). It was confirmed, by the data analysis with a synoptic-scale transport model, that 1) the gaseous species observation at the summit of Mt. Fuji captures the free tropospheric nature through a year, 2) the summit is the best point to detect the Asian outflow of the pollution, and 3) the reproduction by the chemical transport model is effective and beneficial (Inomata et al., 2010). However, the conclusion obtained by simple meteorological analyses exhibited limitation for the observation results in Mt. Fuji during summer. The non-hydrostatic chemical transport model (WRF-chem) was applied to deepen the understanding of the interesting SO_2 variations observed at Mt. Fuji during summer (association with an oral presentation in the same session; Igarashi et al.), and the reproduction of the event was carried out in the present study.

Target events

There were two interesting phenomena in the summer of 2007. The first one is a diurnal variability of SO_2 in 7.8-gou (about 3200m asl). After August 5, 2007, the highest SO_2 concentration reached 1 ppbv for the period until the tenth August, and a remarkable diurnal variability was observed. The second one is SO_2 observation data at the summit of Mt. Fuji. The maximum concentration reached 5 ppbv during the end of August, 2007, and the recorded concentration level was comparable with those in winter that was brought by trans-boundary pollution event. It was found that the air parcel which reached the vicinity of the summit originated from the Asian continent by the backward trajectory analysis. There were other evidences that the air parcel responsible for the event was from the Asian continent. The high aerosols number concentration (Kobayashi et al., 2010) and high radon concentrations (Nagano, Kojima, KEK Proc. 2009-8) were observed at the same time, synchronizing with an early southward shift of the autumnal rain (Shurin) front in summer.

Reproduction and analysis by WRF-Chem model

In order to explain transportation and the variation of SO_x concentration level around Mt. Fuji during summer, which are influenced by mountain and valley winds that were not clarified by simple data analysis so far, the reproduction of the above-mentioned phenomenon was performed by using chemical transport model coupled online with the non-hydrostatic meteorological model (WRF-Chem). Taking the transport event from the Asian continent into considerations, the most outside domain was set to cover the East Asian area, and the inner area with Mt. Fuji as the central point was set by nesting procedure in the calculation. JCAP II emission inventory (Chatani et al., 2011) were used for a detailed domestic inventory. The REAS inventory data (Ohara et al., 2007; Kurokawa et al., 2009) were used for the Asian inventory. The model performance for the mountain air quality was examined by comparing the numerical results with the SO_2 concentration, etc. observed during the summer of 2007.

Keywords: Mountain air qual, Non-hydrostatic model, WRF-chem, Mt. Fuji

Japan Geoscience Union Meeting 2011
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MIS029-P07 Room:Convention Hall Time:May 23 14:00-16:30

Long-range transport of mercury in Mt. Fuji during summer observation campaign, 2008

Kuriko Yokota[1*], Osamu NAGAFUCHI[2], Naoki HASHIMOTO[3], Hazumu KINOSHITA[3], Tomonori KAWAKAMI[4]

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An intensive field campaign for the measurement of elemental gaseous mercury (Hg(0)) and Particulate mercury Hg(p) concentrations in ambient air was conducted in summit of Mt. Fuji from 11 August to 17 August in 2008 using an developed measurement technology, which was the first time Hg(0) and Hg(p) were monitored at a remote area in Mt. Fuji. The overall average Hg(0) covering the sampling periods was 2.61 1.24ng/m3, which is only a little elevated comparing to global background of approximately 1.5-2.0ng/m3.

Elemental gaseous mercury concentrations range from 1.45ng/m3 to 5.42ng/m3 in ambient air. Although there is not significant difference in concentration between daytime and night time, distinct daily variability of Hg(0) observed during survey periods. The phenomenon is caused by the direction of airmass. The back trajectory analysis were shown in Fig. 2. From this result, when airmass come from East Asian continent, elemental gaseous mercury concentrations were larger when that come from the Pacific Ocean.

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Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

MIS029-P08 Room:Convention Hall Time:May 23 14:00-16:30

Dynamic analysis of particulate matter at Mt. Fuji during summer seasons using inorganic constituents

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Unlike other pollutants, airborne particulate matter (PM) is a complex mixture of particles that are very different in size, chemical composition, physical state and morphology. Moreover, PM has a variety of emission sources, which range from natural to anthropogenic and stationary to mobile. It also has a variety of physical and chemical properties. Therefore, not only the size distribution of particles but also information related to their chemical composition will play an important role in solution of the behavior and major emission source of PM and their effect on human health and the ecosystem. Test analysis samples of size-resolved PM were collected using a 3-stage NLAS impactor (Tokyo Dylec Co., Ltd., particle cut-size of stage is 10 micron, 2.5 micron and

1.0 micron for a flow rate of 3 L/min) with a one-day sampling interval on the a polycarbonate filter and back-up filter. Sampling of the PM was conducted at the summit of Mt. Fuji, from 11 to 18 August, 2008 using by the developed active sampler system which can operate anywhere with dry batteries and/or car batteries. . Elemental compositions of sample were determined by ICP-MS, and ionic species were analyzed by IC. For ICP-MS analysis, a part of filter and half of a back-up filter were directly treated with 10mL of nitric acid for 10 min using an ultrasonic apparatus, and 100uL of 1% Triton solution was added. For IC analysis, treatment was conducted with 8 mL of ultra pure water for 10 min of ultrasonication. A blank filter and a blank back-up filter were analyzed with all the procedures. The determination limits and concentration range of ICP-MS and IC were investigated from the reproducibility of calibration standard solutions and linearity of calibration curves.

Almost complete detachment of the collected samples from the polycarbonate filter and back-up filter sample was achieved by 1% nitric acid and/or ultra pure water with 10 min of ultrasonication. Characteristic inorganic composition data were obtained for each PM size, and it is believed to be possible to elucidate the behavior and major emission sources of PM by analyzing these data. Therefore, obtaining highly accurate analysis data in a short time by combining collection of PM using the polycarbonate filter with the simple method and the developed active sampler system will lead new development in PM research.

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Development of a passive sampler for gaseous mercury in the atmosphere- Application to different altitudes of Mt. Fuji

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UNEP initiated Global Mercury Partnership to protect human health and global environment from the release of mercury and long-range transport issue, especially from anthropogenic mercury such as coal combustion.

To elucidate the vertical distribution of mercury concentration the different altitudes of Mt. Fuji, we have developed a passive sampler to measure the gaseous mercury concentration in the atmosphere.

A passive sampler does not require electric power supply and is suitable for multi points sampling. The body was made of fluorocarbon to prevent mercury from deposition on it. As an adsorbent of mercury in the sampler, a quarts fiber filter coated with gold was prepared in order to make it possible to measure the mercury by the heating atomic absorption spectrophotometry method.

The developed passive sampler was applied to measure the vertical distribution of gaseous mercury concentration in the atmosphere of Mt. Fuji. The sampling was carried out on July and August, 2010.

The passive sampler for the atmospheric mercury was successfully developed to measure the vertical distribution of mercury concentration each altitude of Mt. Fuji.

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Observation of VOCs in the ambient air and in cloud water at the top and foot of Mt. Fuji during the summer

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Hydrophobic organic compounds such as PAHs, PCBs, and VOCs are harmful to humans and have adverse affects on ecosystem, so it is important to elucidate the fate of HOCs. In recent years the presence of HOCs, which is considerably larger than expected from the surrounding gas-phase concentration and Henry's law constants, has been reported in fog water and rainwater. There are several hypotheses to explain the discrepancy between the observed and the estimated concentration, for example the effect of dissolved and colloidal organic materials in atmospheric droplets and the effect of the large specific air-water interfacial area available for adsorption of hydrophobic organics. However, the wet scavenging mechanism of those toxic organic compounds as well as the dry deposition mechanism has been poorly understood.

Simultaneous sampling of cloud water along with atmospheric VOCs was performed at the top and foot of Mt. Fuji during summer observational campaign. We here report the concentration of VOCs in cloud water as well as that in the ambient air. Chlorinated hydrocarbons (CHs) and monocyclic aromatic hydrocarbons (MAHs) in cloud were determined by Head Space-Solid Phase Micro Extraction (HSSPME) / GCMS. The concentration of MAHs was higher than that of CHs both in cloud water and in the ambient air and toluene was the most abundant among VOCs. Cloud water contained higher amounts of VOCs than would have been expected from the gas-phase concentrations and Henry's law constants. We will also discuss the enhanced dissolution of atmospheric VOCs into atmospheric droplets.

Keywords: Free Troposphere, Background Concentration, Henry's law

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Atmospheric electric field measurement on Mt. Fuji

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In the view of global electrical circuit, variations of fair-weather atmospheric electric field simultaneously show similar signatures all over world. Meanwhile, the mountain-top observation of atmospheric observation field shows local-time dependent variation. Our concurrent observation of atmospheric electric field and photo camera shows that this variation is caused by cloud-sea electrical charges.