Volcanic eruption clouds in southwest Japan observed from the ground and satellites

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Monitoring & archiving volcanic clouds
Kagoshima Univ./Kumamoto Univ. Group

in collaboration with PHIVOLCS

Mayon volcano 2003–
Bulusan volcano 2011–

Mayon 2009
Automatic recordings with fixed time intervals
The combination of filters to obtain NIR records by using a CCD video camera in night-shot mode to allow the NIR light, and an IR filter to shield the light below 840nm. Here the primitive sensitivity of a CCD to NIR light up to about 1.1 μm is utilized, with the sacrifice of the color balance.

(For the camera with the iris maximally open in night-shot mode, an appropriate ND filter is necessary to reduce overall light in the daytime.)
Remote volcanic islands to S of Kagoshima

← Suwanosejima
Suwanosejima volcano

Natural color       NIR                         NIR-3D from S

ASTER 2006.1.28
Network Camera  2008.8-

after 2002-2007 from Nakanoshima 25 km NE

Visible and NIR camera at 2F gallery of the building
2008.10.8_18:00

JMA from Nakanoshima

Vis. & NIR from the building
Multi-point obs. of Sakurajima volcano

Telescopic Obs. of Kirishima Volcano from B

A: Kagoshima Univ., 11km W from the crater
B: Point near Kamoiike port, 10km WSW
K: Kinkodai, 17km SW
T: Tarumizu city office, 10km SSE

Manual multi-directional obs. at B
Sakurajima “Showa” new crater
Eruptive since June 2006,
in addition to Minami-dake crater since 1556

From N

SiPSE 3D
Eruption clouds of Sakurajima

From T, 10km SSE
Eruption clouds in Near-Infrared view

From B, 10km WSW

2009.3.1.

a: At 15:08, 4min. after expl.

b: At 15:13
30 sec. sequence of an eruption on 2009.4.9_15:34 JST

Sakurajima 2009.4.9 (1) Eruption and Rise
Suffering ash-fall

2009.4.9 Movie

On the web
Panoramic views of extended ash clouds

Visible panoramic view

2009.3.02_7:09
2009.9.19_5:53
Eruption at Showa crater 2012.3.12

Eruption at 15:07

Photographs at
15:09, 15:11,
15:25
2012.3.12_14:30-16:20  Web camera NIR

10 min. interval from 10 sec. interval data (1511-19 hidden)
9 hr. with 10 min. interval (4+1 eruptions or more)
Kirishima-Shinmoedake 2011 eruption

3 stages
[1] White plume
[2] Continuous ash plume
[3] Sub-plinian ash cloud
Observation sites

(Distance from ▲)

Ag: Asagiri (N 38 km)
Tg: Taguchi (SSW 9 km)
Ks: ERI provisional obs. At KBO (SSW 11 km)

B: (SW 50 km)
K: (SW 58 km)

Red: NIR camera

Satellite images

NOAA/APT: Kumamoto Univ.,
MODIS/Aerosol Vapor Index: Tokyo Univ. Info. Sci,
MTSAT/AVI: ERI/IIS, Tokyo Univ.
Satellite images

NOAA-APT (TIR) : Kumamoto Univ.


MTSAT-2 ERI/IIS, Tokyo Univ. ⇒ AVI
  Forward trajectories : NOAA HYSPLIT Model, every 6 hour

Ground observation

Visible & NIR automatic interval recordings at B and other sites, supplemented with manual zooming and photo-shootings
[1] Fume or white plume (-2011.1.17)

NIR photography from B 50km away

JMA 2008:
8.22 small ash eruption.
White plume - 400m, 9.4 max. 1,300m.
(Level 2, near crater)
10-12 Fume (Level 1)
Kirishima-Shinmoedake 2011

Kirishima–Shinmoedake plume

2011.1.2_10:34

50 km from B
2011.1. 2-17 : White plume
Continuous ash plume 1.22, 25

1.19_01:27 JST small but phreat-magmatic erup.  (ERI-AIST)

22 (i) 1055n .  (ii) 1332n

25日 1614n
[3] Sub-plinian eruption. 1. 26_15:30-

Gigantic ash clouds seen also from K and Ag sites.
Continuous ash plume MODIS & Photo 1.22&25
[3] Sub-plinian erup. 1.26_15:30-

See details on the web
1.27: Magmatic eruption continues
Forward trajectories for 3 eruptions:
NOAA HYSPLIT Model, every 6 hour

① 1.26_1449 Magmatic eruption 26_15～+24h 4500 m±500m
② 27_0220 Erup.→Fan type 27_03～+39h H= 4800 m
③ 27_1541 Erup. 27_16～+36h H= 3800 m best result
③ 27_1541 Explosion

1.27_16JST〜+36hr.

H=3800 m best

1.27_1832 JST +3h
1.27: Sub-Plinian eruption continues

8:45
Kirishma volcanoes from the air

2011.3.8_11:12  Vis & NIR
Close-up 3.8_11:14
Interval recordings of volcanic clouds are very effective to obtain automatic long-time records at various situations. Interval less than 10 min. is recommended so as to avoid missing eruptions.

Manual photo-shootings are suited to get wide angle views of cloud dispersion, supplementing fixed angle view of automatic systems.

Satellite imagery provides wide range flow of eruption clouds, while the ground observation gives their height information near the sources.

NIR camera is very effective to observe volcanic clouds at a long distance such as 50 km in the case of Kirishima-Shinmoedake eruption in 2011.
Please visit
Volc - Photo and video images of volcanic clouds and related phenomena - http://wwwkav.ddo.jp/volc/index-e.html

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