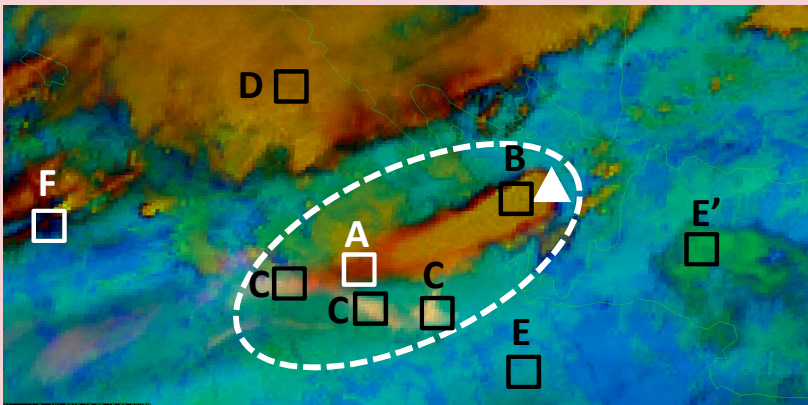
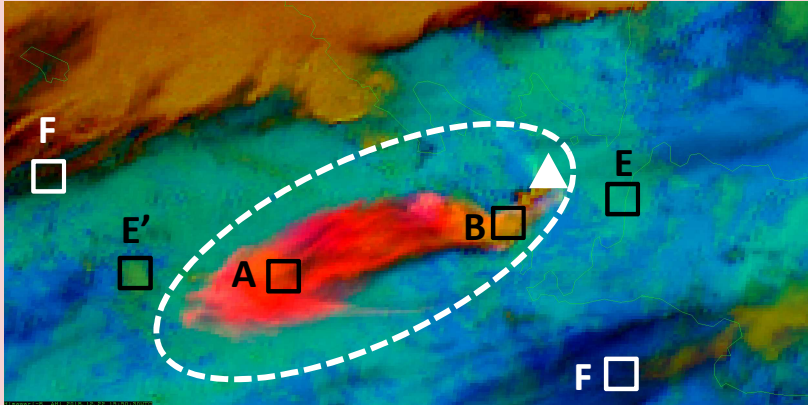


Himawari SO2 RGB Quick Guide



Eruption of Mt. Krakatoa (Krakatau) in Indonesia, 22 December 2018 (top: 15:50 UTC; bottom: 18:20 UTC). Outlined reddish and light-brownish areas indicate volcanic plume areas, and white triangles show the volcano.

- A ■ : upper-level water vapor, ice and SO₂
- B ■ : water vapor and ice
- C ■ ■ : SO₂
- D ■ : thick clouds
- E/E' ■ : low-/mid-level clouds
- F ■ : thin high-level clouds

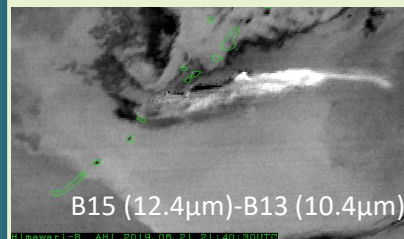
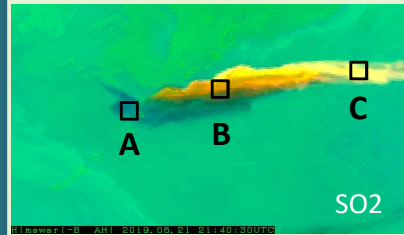
Main applications: Daytime/nighttime detection of volcanic SO₂

Benefits:

- Daytime/nighttime applicability thanks to infrared image composition
- Provision of information on volcanic SO₂ from Bands 10 and 11 due absorbency observational properties
- Support for all-day monitoring of volcanic SO₂ with high temporal resolution

Limitations:

- Inability to estimate volcanic plume height and concentration from SO₂ RGB data alone
- Difficulty of distinguishing SO₂ from other volcanic plume components (e.g., water vapor and ice crystals)
- Difficulty of identifying very thin or lower-level volcanic plumes
- Disturbance from high-level clouds over volcanic plumes
- Lack of clarity for low-level clouds



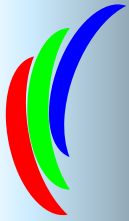
Volcanic plumes containing ash appear brighter in difference imagery (bottom). In SO₂ RGB (top), volcanic ash in the plume is difficult to distinguish, but can be seen along with ice crystals (probably originating from water vapor in the plume).

- A ■ : volcanic plume with ice crystals;
- B ■ ■ : volcanic plume with SO₂
- C ■ : volcanic plume (thick) with SO₂

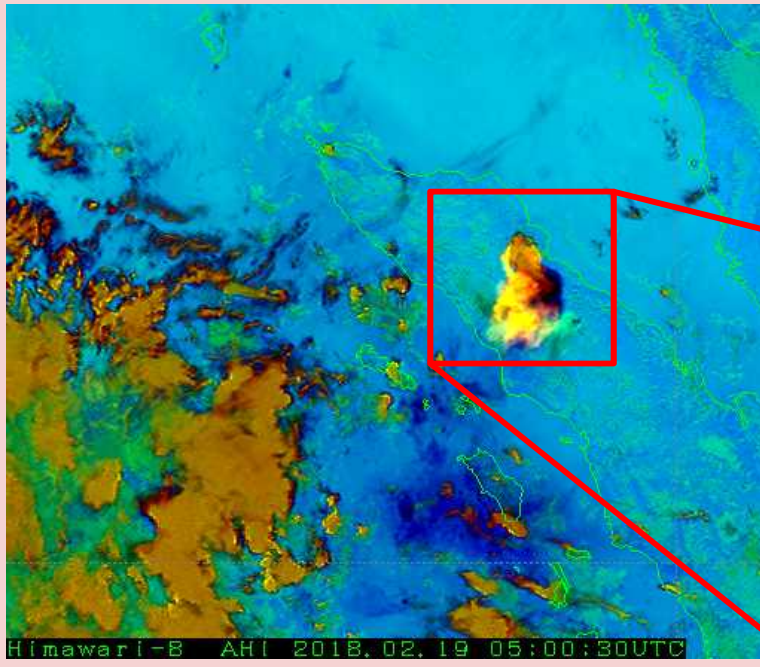
Eruption of Mt. Raikoke in the Kuril Islands (21:40 UTC, 21 June 2019)

RGB composition with recommended thresholds and related specifications for SO₂ RGB

Color	AHI bands	Central wave length [μm]	Min [K]	Max [K]	Gamma	Physical relation to	Smaller contribution to signal of	Larger contribution to signal of
Red	B10-B09	7.3-6.9	-6.0K	5.0K	1.0	SO ₂ Thick clouds Vertical water vapor distribution	Thin ice clouds Dry mid-upper levels	Mid-/high-level SO ₂ Thick high level clouds
Green	B11-B13 /B11-B14	8.6-10.4 /8.6-11.2	-1.6K -5.9K	4.9K 5.1K	1.2 0.85	SO ₂ Cloud phase	Thin ice clouds	SO ₂ Water clouds
Blue	B13 (inverse)	10.4	243.6K	303.2K	1.0	Cloud top temperature Surface temperature	Cold clouds Cold surface	Warm clouds Warm surface

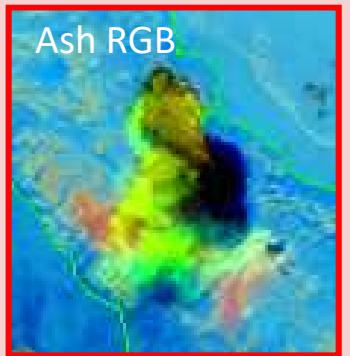
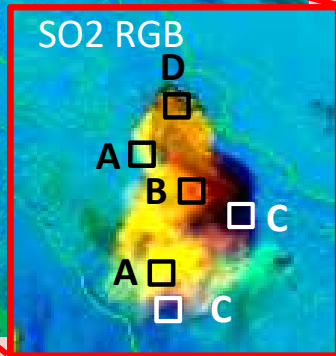


Himawari SO2 RGB Quick Guide



Eruption of Mt. Sinabung, Indonesia (05:00 UTC, 19 February 2018)

- A ■ : SO₂
- B ■ : upper level SO₂ and water vapor
- C ■ : ice particles
- D ■ ■ : ice and SO₂

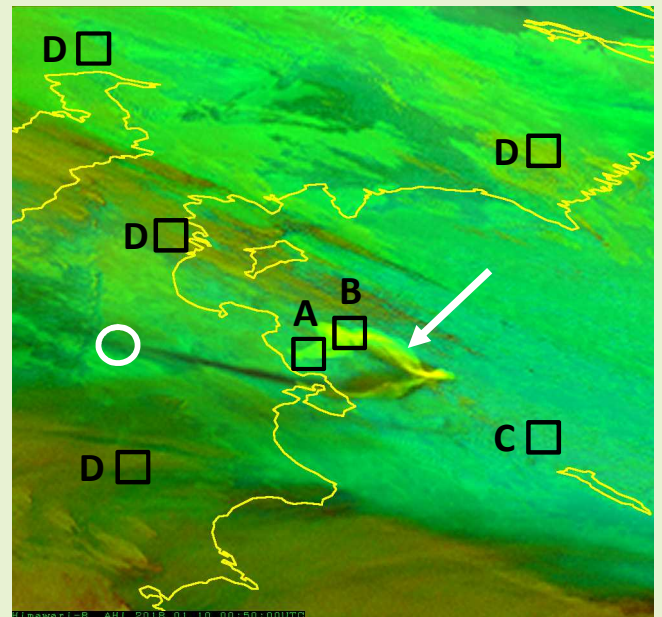


Himawari-8 AHI 2018.02.19 05:00:30UTC

Eruption of Mt. Shiveluch, Russia (00:50 UTC, 10 January 2018)

The white circle indicates Mt. Shiveluch. The green shading represents thermal conditions (i.e., latitude and diurnal/seasonal variations).

- A ■ : volcanic plume with SO₂
- B ■ : volcanic plume with relatively thick SO₂
- C ■ : mid-/low-level cloud
- D ■ ■ : thick mid-/high-level clouds



Himawari-8 AHI 2018.01.10 00:50:00UTC

Color interpretation for SO2 RGB

Color	Interpretation
■	Upper-level SO ₂
■	Lower-level SO ₂
■	Lower-/upper-level SO ₂
■	Thick clouds
■	Thin high-level clouds
■	Low-level clouds

Color interpretation may be developed in future work to enhance distinguishability.