Eruption of the Hunga Tonga-Hunga volcano (Tonga), 15 January 2022

The volcanic ash and the tsunami accompanying the eruption of the submarine volcano, Hunga Tonga-Hunga Ha‘apai, located north of the main island of Tonga (GLIDE No. VO-2022-000005-TON) caused great damages to houses and serious shortage of drinking water in Tonga. Tsunami

Plume Altitude

According to the Ozone Mapping Program (OMPS) aboard NOAA's Suomi NPP satellite, the maximum altitude of the plume is estimated to be 30 km, indicating that it has reached the stratosphere.

Figure 2: Altitude of the plume (Source: Volcano Discovery)

https://www.volcanodiscovery.com/hunga-tonga-hunga-haapai/news/170639/Hunga-Tonga-Hunga-Ha-apai-volcano-Tonga-activity-update-latest-measurements-confirmed-30-km-column-h.html

Tsunami, atmospheric vibration generation and tidal level fluctuations

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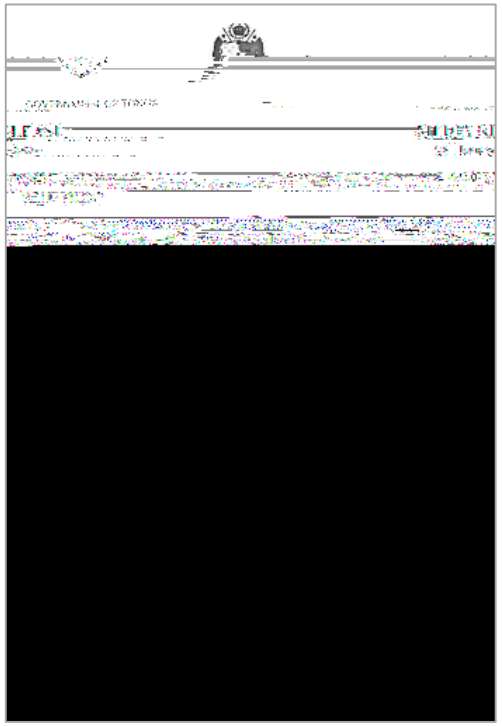
Effects of the Volcanic Activity



- According to an official announcement by the Government of Tonga (@ConsulateKoT, Twitter, 18 January), communications (including calls and internet) were disabled until 17 January due to damage to the submarine cable. Communication via satellite phone and wireless communication was partially restored on 18 January. Domestic communication was possible only in Tongatapu and Eua.
- Search and rescue operations in the affected areas (Atata Island and Ahau Village) began on the 16 January.
- Evacuation from Atata Island to Tongatapu Island and from Mango Island and Fonoifua Island to Nokuma Island began.
- In the western part of Tongatapu Island, 21 houses were completely destroyed, 35 houses were badly damaged, and other damages occurred in many places.
- The supply of drinking water has been severely affected by volcanic ash.
- On 19 January, the Prime Minister officially declared a state of emergency.

Emergency Observation by Space Satellites

- In response to the news of the eruption and tsunami, ADRC, who serves as the Sentinel Asia Secretariat, approached SPC, the organization in charge of the South Pacific region, to inquire about the possibility of activating Sentinel Asia. SPC was unable to confirm due to the local communication situation, so ADRC acted as the requestor and activated Sentinel Asia on 16 January.
- The international disaster charter covering the entire world was also activated on the 16th.

Images of Hunga Tonga-Hunga Ha’pai Island After the Eruption by ALOS2 Satellite

Analysis of data taken by JAXA's ALOS2 earth observation satellite confirmed that the Hunga Tonga-Hunga Ha’pai island disappeared after the eruption, leaving only part of the island.

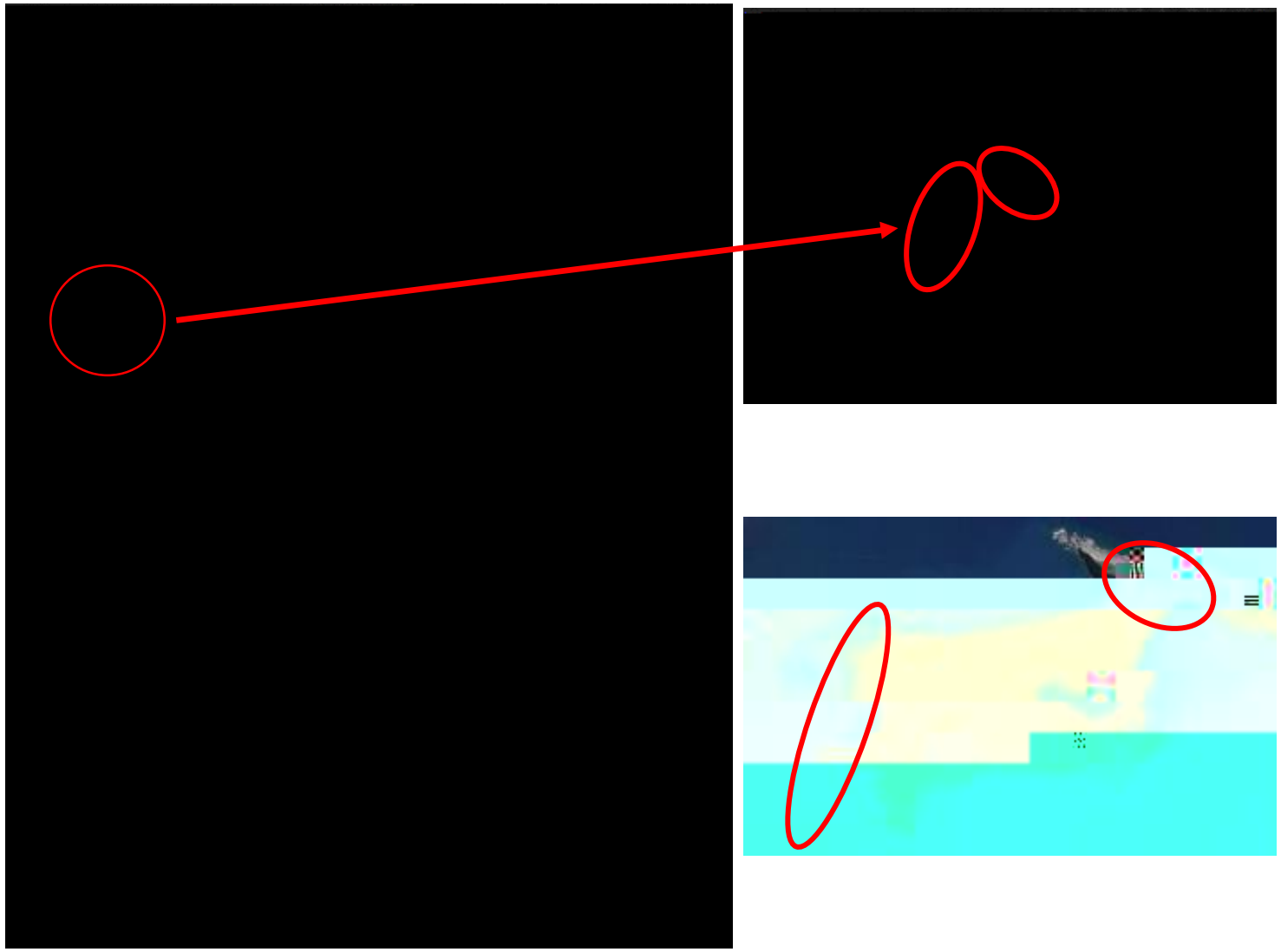
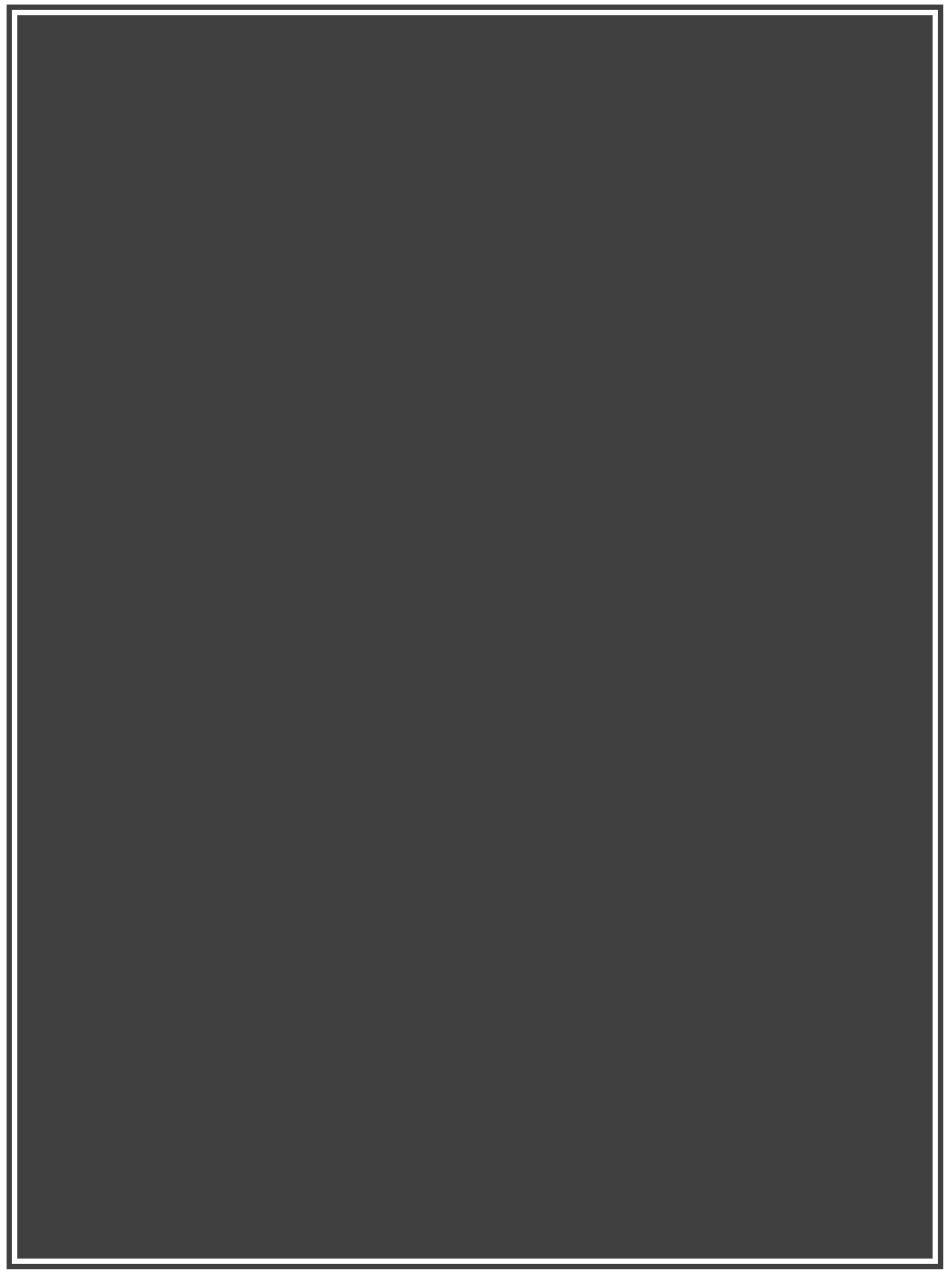


Photo 3: Hunga Tonga

Various data provided by the participating organizations of Sentinel Asia

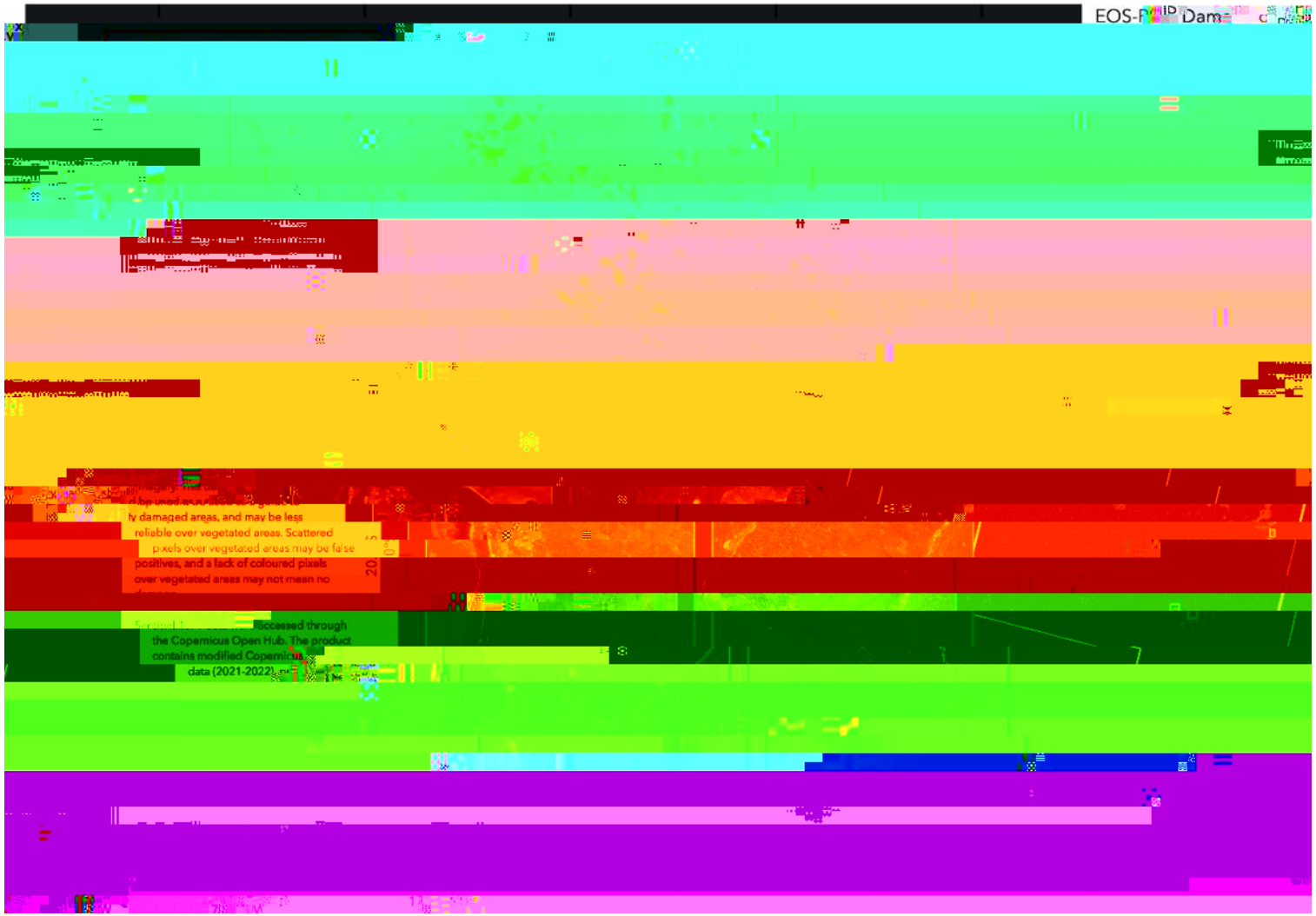
Figure 2: Data provided by Sentinel Asia.
https://sentinel-asia.org/EO/2022/article20220115TO.html

Taiwan's space agency, NARL and Thailand's space agency, GISTDA, also provided a series of post-disaster images to the Sentinel Asia website.



Analysis by Earth Observatory of Singapore-Remote Sensing Lab (18 January)

- By analyzing data from the Sentinel-1 satellite, buildings that showed great change before and after the disaster were colored from yellow to red.
- Colors in residential areas are considered to be damaged buildings, while colors in agricultural areas may not represent damage.



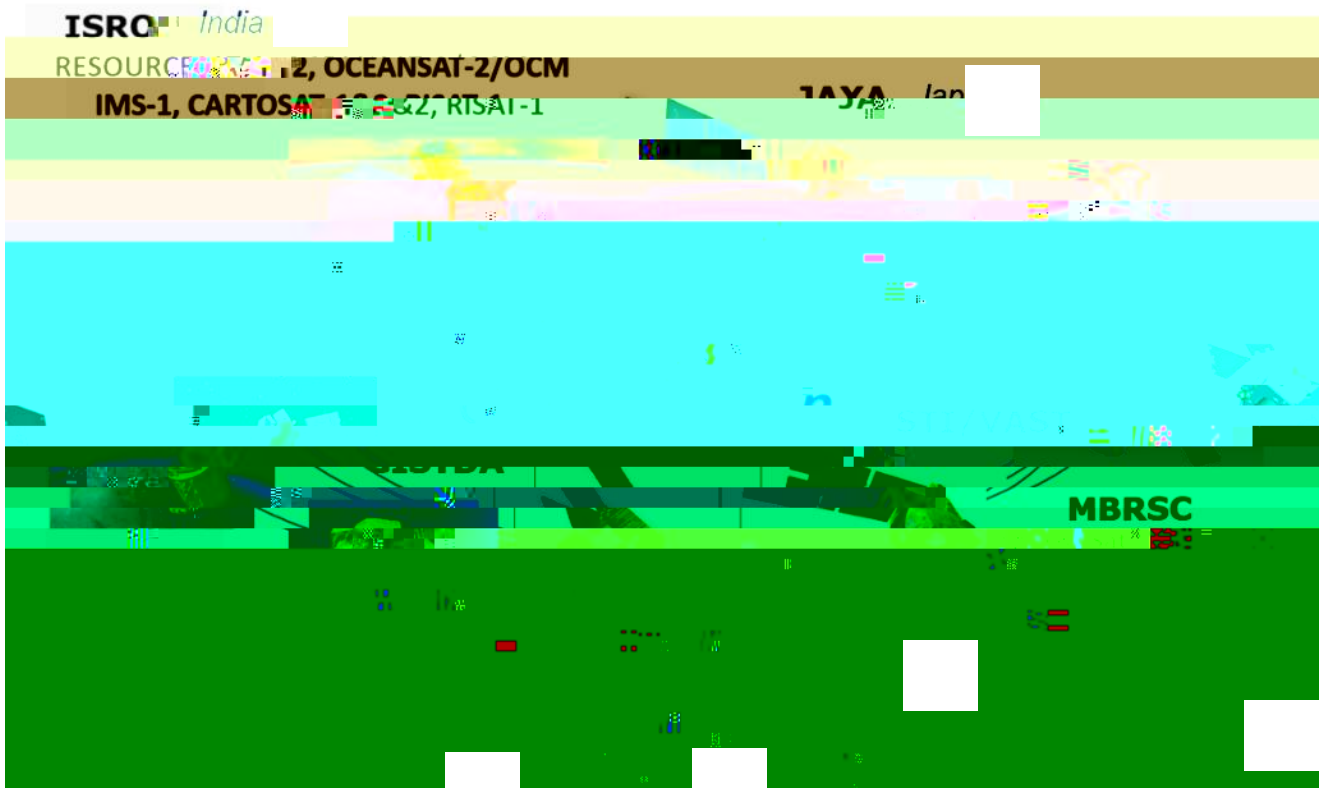
https://sentinel-asia.org/EO/2022/article20220115TO/EOS-RS_20220115_DPM/EOS-RS_20220115_DPM_S1_Tonga_HungaTonga_Volcano_v0.9_MAIN.png

Analysis by MBRSC, UAE Dubai Government Space Agency (21 January) (cont.)

- By analyzing data from Sentinel-2 satellite, pre- and post-disaster damage maps of western Tongatapu island were created.
- It can be estimated from the maps that vegetation has been lost and buildings have been washed away.

https://sentinel-asia.org/EO/2022/article20220115TO/MBRSC/Tsunami-Impact-Map-2.jpg

[Ref.] Sentinel Asia project



- In the event of a disaster, it is important to be able to quickly assess the disaster area for emergency response. Earth observation satellites effectively serve this purpose by analysing the disaster area and providing those data to the local community.
- ADRC continues to participate in the Sentinel Asia project, which was launched in 2006 with an objective of establishing a disaster risk management system in Asia utilizing the satellite images. ADRC functions as the focal point to receive emergency observation request in the framework of the Sentinel Asia.
- Upon receiving a request, ADRC decides whether the request is appropriate and whether the emergency observation should be implemented mainly by assessing the damages and casualties.
- Based on its own judgement, ADRC will forward the request to space agencies that participate in the Sentinel Asia Project, namely: ISRO (India), JAXA (Japan), GISTDA (Thailand), NARL (Taiwan), CRISP (Singapore), and MBRSC (United Arab Emirates).