

Stratospheric Circulation Changes Associated with the Hunga Tonga-Hunga Ha'apai Eruption



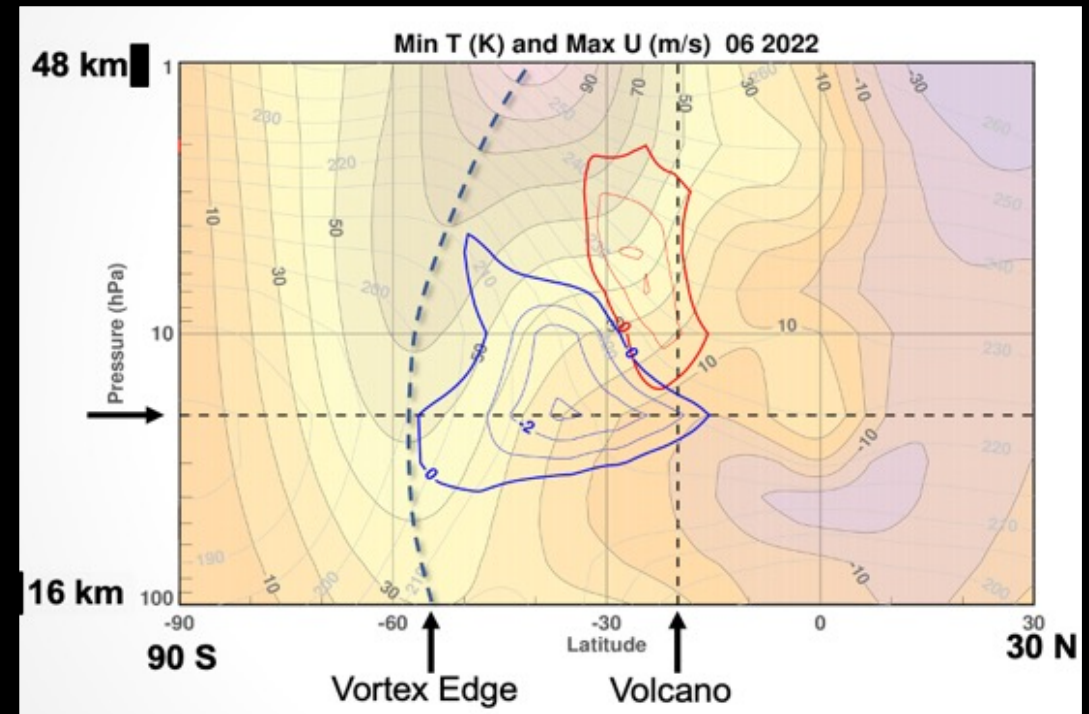
When the Hunga Tonga-Hunga Ha'apai underwater volcano erupted on January 15, 2022, it injected a record amount of water into the stratosphere. This anomalous water vapor is expected to stay in the stratosphere for several years.

The extreme nature of the stratospheric temperature, wind, and circulation changes created by the water vapor anomaly were tracked by comparing the first six months of 2022 with the past 42 years. The MERRA-2 model, which inputs data from multiple sources, including both aircraft and space-based observations, was used for this comparison.

In June 2022, anomalously low temperatures were found in the stratosphere near 25 km altitude above the location of the eruption. In response to this cooling, the atmosphere adjusted by creating strong westerly winds above the temperature anomaly, which resulted in large changes to the usual circulation patterns.

This event gives scientists a chance to improve our models of how the atmosphere responds to dramatic events like a volcanic explosion.

Coy, L., P. A. Newman, K. Wargan, G. Partyka, S. Strahan, and S. Pawson, 2022. Stratospheric Circulation Changes Associated with the Hunga Tonga-Hunga Ha'apai Eruption. Geophysical Research Letters. <https://doi.org/10.1029/2022GL100982>



This diagram shows a cross section of the atmosphere between 16-48 km above the eruption for June 2022. Mean wind speeds in units of 10 m/s are shown by the color-filled contours. The blue contour shows record cold temperatures, and the red contour shows record strong winds for that area of the atmosphere.