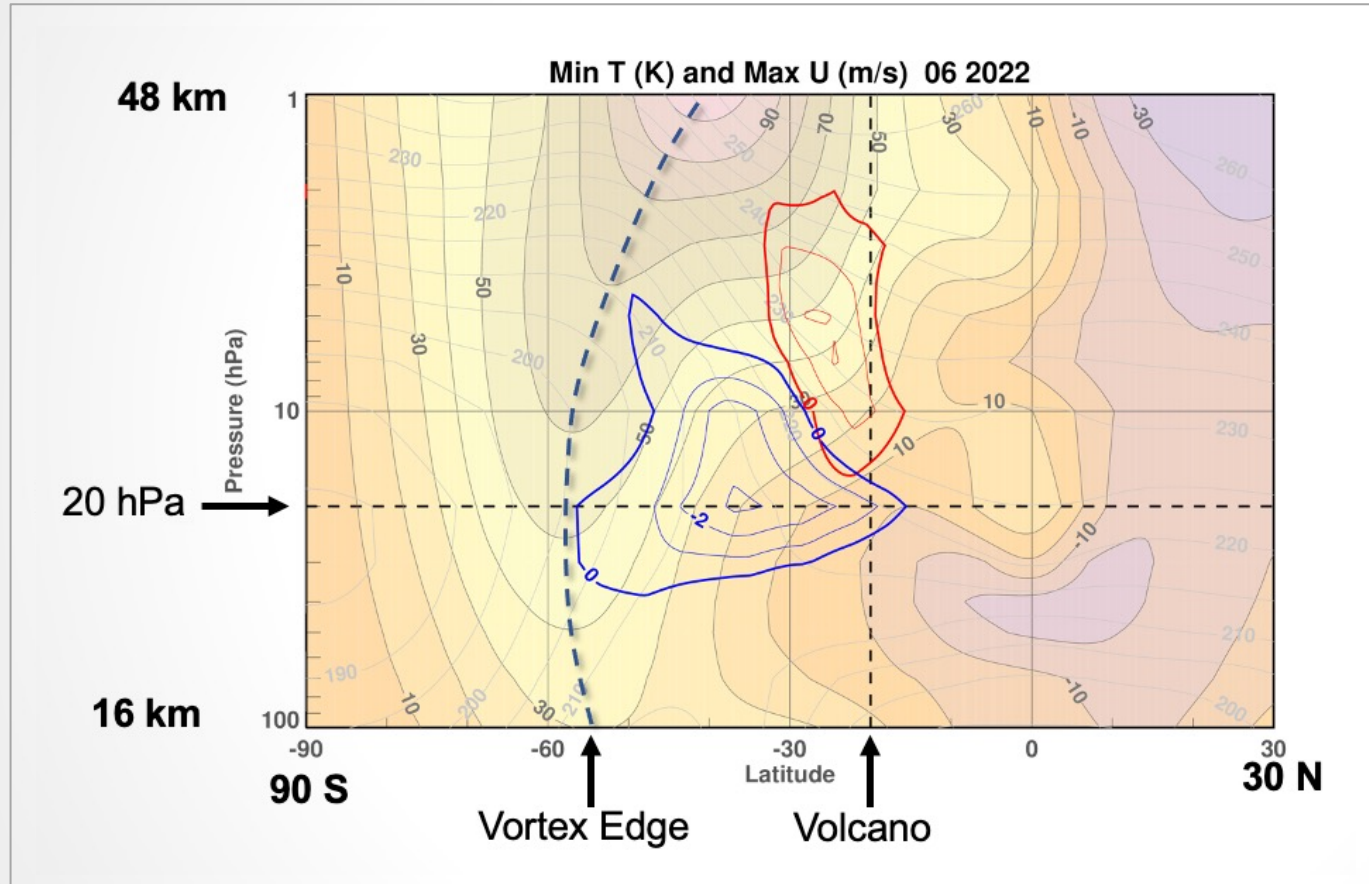


Stratospheric Circulation Changes Associated with the Hunga Tonga Hunga Ha'apai Eruption



Cross section for June 2022 showing zonal mean zonal winds (10 m/s, filled contours), temperatures (5K, gray contours), record cold temperatures (1 K, blue contours), and record strong zonal mean winds (5 m/s, red contours).

The 15 January 2022 eruption of the Hunga Tonga-Hunga Ha'apai underwater volcano injected a record amount of water directly into the stratosphere. The extreme nature of the stratospheric temperature, wind, and circulation changes created by the water vapor anomaly were tracked through comparisons of the first six months of 2022 with the past 42 years. The anomalous water vapor is expected to stay in the stratosphere for several years.

In June 2022, stratospheric anomalously low temperatures were found near 20 hPa (25 km) altitude from 55°S to 15°S. In response to this cooling, the atmosphere adjusts by creating strong westerly winds above the temperature anomaly and large changes to the downward and poleward mean meridional circulation.