Ishizaki H., T. Sakazaki and K. Ishioka, 2023: Estimationof the equivalent depth of the Pekeris mode using reanalysis data. *J. Meteor. Soc. Japan,* **101,** https://doi.org/10.2151/jmsj.2023-027.

Plain Language Summary: Theoretical equivalent depths of free oscillation modes under the realistic vertical temperature profile of the atmosphere are calculated motivated by the recent detection of the Pekeris mode after the Hunga Tonga-Hunga Ha'apai (HTHH) volcano in January 2022. The obtained equivalent depths depend to some extent on the horizontal and temporal averaging used to determine the vertical temperature profile, but in the tropical region, the equivalent depth of the Lamb mode is about 10.1 km, which is consistent with the estimate in the recent observational study, and that of the Pekeris mode is about 6.5 km, which is larger than the estimate in the recent observational study, but it is consistent with a spectral analysis of 57 years of reanalysis data.

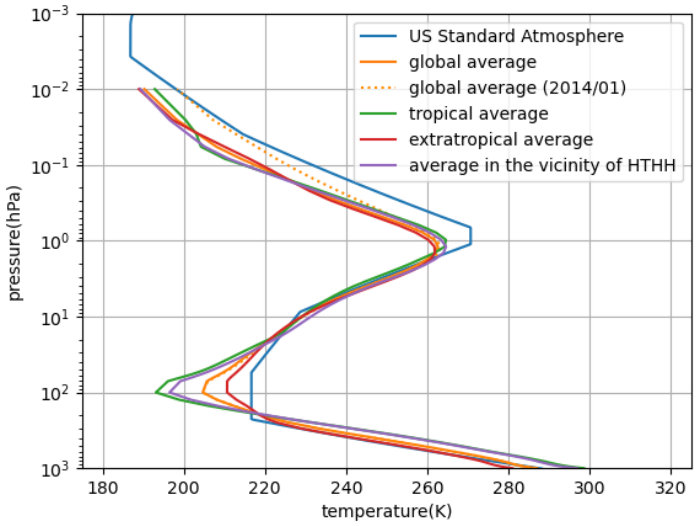

Figure 1. Vertical temperature profiles obtained by taking various horizontal averages of the January 2022 monthly average of ERA5 data. Explanations on the correspondence between the color of the curves and the type of average are written in the figure. HTHH stands for Hunga Tonga-Hunga Ha'apai volcano. Note that the orange dotted curve shows the January 2014 monthly average. The vertical temperature profile of the US Standard Atmosphere, 1976 is also shown for reference.

- Six different horizontal averages, namely, the global average, the tropical/extratropical average, and the average taken in the vicinity/north/south of HTHH, are used to create the vertical temperature profile.
- The equivalent depths of the Lamb mode and Pekeris mode are estimated to be 9.8-10.1 km and 6.4-6.8 km, respectively, depending on the vertical temperature profile used for the calculation.
- The vertical structures of the p-velocity corresponding to the Lamb and Pekeris modes are also calculated. The p-velocity profile of the Pekeris mode has a node around 270 hPa, which is a significantly lower altitude than the numerical simulation in the recent study.