Ishioka, K., 2023: What is the equivalent depth of the Pekeris mode? *J. Meteor. Soc. Japan*, **101**,139-148. https://doi.org/10.2151/jmsj.2023-008.

Plain Language Summary: Inspired by the detection of the Pekeris mode of atmospheric free oscillations by a recent study, high-accuracy numerical calculations of the problem of determining the equivalent depth of atmospheric free oscillations are performed. Here, the computational method is largely based on a previous study, but with modifications to improve the accuracy of the calculation. Two equivalent depths are found, with values of 9.9 km and 6.6 km. The former corresponds to the Lamb mode and the latter corresponds to the Pekeris mode. These values deviate from those obtained in the previous study, especially for the Pekeris mode.



Figure 1. Dependence of the error (ϵ) of the lower boundary condition on the parameter $\alpha = H/h$. Here, H is the prescribed scale height ($H \approx 7.32$ km) and h is the equivalent depth. The computation is done for the vertical structure equation with taking the dependence of the gravity acceleration and the mean molecular weight on the altitude into account. There are two distinct dips at $\alpha = 0.739$ and $\alpha = 1.114$. The corresponding equivalent depths are h = 9.90 km and h = 6.57 km, respectively.

- A problem with the calculation method for determining the equivalent depths of free oscillations proposed by a previous study is pointed out and a solution to it is described.
- The dependence of the gravity acceleration and the mean molecular weight on the altitude are taken into account.
- Vertical structures of the free oscillation modes are also shown.