It is important to study the tidal variability in the troposphere and stratosphere, since it has a great impact on the mesosphere and lower thermosphere (MLT region). However, there has not been a comprehensive study of tides in this altitude region. Here, we reveal the global structure and seasonal variation of diurnal migrating tides in the troposphere to lower-mesosphere, using TIMED/SABER satellite data and six reanalysis data sets (NCEP/CFSR, NASA/MERRA, ERA-Interim, JRA-25, NCEP1, NCEP2), as well as output data from Global Scale Wave Model (GSWM09).

It is shown that CFSR, MERRA and ERA-Interim perform best in reproducing the observed features in SABER as follows. The amplitude is basically the largest in the tropics for this altitude region, except for the maximum in midlatitudes in the upper stratosphere. The amplitude maximizes in winter over the tropics, while it maximizes at solstice in midlatitudes.

Using the classical Hough mode decomposition, it is confirmed that the propagating modes are mainly excited by the tropospheric heating, while the trapped modes are excited by the heating in the troposphere and upper stratosphere. Also, it is inferred that the seasonal variation of background winds/temperatures (non-classical terms) shows a non-negligible contribution to that of tidal signatures.