

Seasonal and interannual variability of the diurnal tides observed by SABER

Rolando R. Garcia

National Center for Atmospheric Research, Boulder, CO, USA

The SABER instrument onboard NASA's TIMED satellite has been making observations of temperature since January 2002. TIMED orbits the Earth ~15 times per day on a high-inclination polar orbit, and SABER makes regular observations on both ascending and descending nodes. Because of viewing geometry constraints, latitude coverage alternates between 54°S and 83°N and 54°N and 83°S every ~61 days. However, latitudes in the range 54°S-54°N are observed continuously, which provides a record of atmospheric variability spanning more than 14 years. We process these data using Salby's (1982) Fast-Fourier Sampling Mapping technique to obtain spectra within the Nyquist limits of the observations: approximately ± 1 cpd and zonal wavenumbers $m = 0 - 6$. In particular, the migrating diurnal tide and all non-migrating diurnal tides with $m < 6$ are resolved by SABER. In addition, the spectra of the time series has extremely fine bandwidth, ~ 0.0004 cpd, which makes it possible to resolve annual, semi-annual and quasi-biennial variability. In this study, we use SABER data from January 2002 through February 2016 to investigate the seasonal and inter-annual variability of the diurnal tides and its relationship to the annual and semi-annual cycles, as well as the quasi-biennial oscillation.

Key words: thermal tides, tidal variability, SAO, QBO

Reference

Salby, M. L., 1982: Sampling theory for asynoptic satellite observations. Part II: Fast Fourier synoptic mapping. *J. Atmos. Sci.*, **39**, 2601–2614.