Propagation of the S2 Tide Throughout the Whole Atmosphere: The Remarkable Information in a Simple Barometric Record

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The solar semidiurnal (S2) tidal oscillation is excited primarily by a combination of atmospheric heating sources, the most important of which is the daily variation in the amount of solar radiation directly absorbed in the atmosphere (particularly by ozone in the stratosphere). The barometric S2 tide measured at ground level will be affected by variations in solar output, stratospheric composition and the mean winds and temperatures over a deep layer of the atmosphere. The dynamics of the linear S2 response at low latitudes ensures that the barometric observations even at a single location represent a diagnostic of these influences integrated over much of the globe. The idea of using the time dependence of S2 barometric observations as a diagnostic of variations in the solar-terrestrial system was introduced over 3 decades ago and has been investigated occasionally since then. Here we will review earlier work and report on some of our own recent calculations. Issues to be discussed include indirect observations of the rotation of the sun and of the low frequency variations of upper atmospheric flow, and calculations that place bounds on the magnitude of other phenomena including solar cycle variations in the sun's output, long-term ozone variability, and the effects of the famous 1908 Tunguska explosion on the chemistry of the atmosphere.

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