

Ozone and temperature Quasi-Biennial Oscillation signatures observed by lidar at Mauna Loa, Hawaii (19.5°N, 155.6°W).

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Abstract

Using more than six years of nighttime lidar measurements obtained by the Jet Propulsion Laboratory at Mauna Loa Observatory, Hawaii, the stratospheric Quasi-Biennial Oscillation (QBO) signatures (15-55 km) are revealed in the ozone and temperature profiles[†]. Several clear QBO signatures have been observed in both temperature and ozone. The clearest QBO signature in stratospheric ozone maximizes near 31 km and is seasonally synchronized in late winter-early spring and out-of-phase with the expected equatorial ozone QBO anomaly. Other ozone signatures are observed in winter-spring near 47 km, in summer near 26 km, and in winter-spring near 22 km, respectively in-phase, in-phase, and out-of-phase with the expected equatorial ozone QBO. The QBO signature in temperature maximizes at 35 km (5 K amplitude) and is also seasonally synchronized (winter) and out-of-phase with the expected signature at the equator. Above 45 km, and near 24 km, a temperature QBO is also observable with opposite phase to that observed at 35 km. The identified anomalies in ozone and temperature are highly consistent with the previously observed and modeled QBO anomalies assuming that Hawaii is located in the subtropical branch of the asymmetrical QBO-induced meridional circulation. The observed temperature and ozone QBO were both strongly disturbed by the El Niño-Southern Oscillation (ENSO) below 25-27 km in 1997-1998.

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