Geophysical Research Abstracts
Vol. 12, EGU2010-5599, 2010
EGU General Assembly 2010

What can we learn about Brewer-Dobson circulation changes from temperature data, 1979-2005?

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Monthly trends of brightness temperature data from the lower stratospheric channel of the Microwave Sounding Unit (MSU T4/TLS) and channels 25, 26 and 27 of the Stratospheric Sounding Unit (SSU) were examined for patterns in latitude, season and height. Results are shown to suggest changes in the stratospheric Brewer-Dobson (BD) circulation over 1979-2005. In particular, less cooling at high latitudes and more cooling in the Tropics (compared to the global mean trend) were evident for all channels for August and December, consistent with a wintertime increase in the strength of the southern hemisphere (SH) and northern hemisphere (NH) circulation cells respectively. Based on Monte Carlo analysis, the observed vertical and latitudinal trend pattern would have a very small (< 5%) likelihood of occurring through natural variability/chance alone. A reverse pattern (relative cooling of the extratropics and warming of the Tropics) was evident in NH spring for the MSU T4 and SSU 25 channels, from the mid-1980s to mid-1990s. This is consistent with an effective weakening of the NH branch of the circulation during spring. Radiosonde data at 30 hPa and weighted as per MSU T4 display consistent trend patterns, supporting the conclusions for the lower stratosphere based on independent observations. However, while the temperature trends reveal changes in the BD circulation since 1979 on decadal time scales, longer records would be needed to establish a clear secular trend.