

Do global circulation patterns change?

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Climate is changing. As one of the consequences it is expected that intensity and/or track of stronger cyclones will change. This is because climate change is likely modifying the global circulation pattern which – in turn – significantly drives the cyclones. Consequently, possible variations in the Brewer-Dobson circulation are currently discussed in the scientific community. Even an effect on the circulation in the mesosphere is expected due to changed filter characteristics for the propagation of gravity waves.

The global circulation in middle latitudes is mainly characterised by the activity of planetary (Rossby-) waves. In order to investigate possible longer term changes in the planetary wave activity we used total column ozone data since they can be used as a conservative tracer for atmospheric dynamics.

We analysed the 25 year TOMS total column ozone data record (1978 – 2005) in the Northern Hemisphere. Longitudinal and latitudinal dependant ozone trends are revealed. Sinusoidal structures in the longitudinal trend behaviour are interpreted in terms of planetary wave activity. This is tentatively interpreted as a trend predominantly in the planetary waves with zonal wave numbers one and two, respectively. It is shown that the meridional structure of the trend is similar to a Hough-function. Consequences for the occurrence of so-called “streamer events”, which show up more frequently over Europe, are presented; the impact on regional atmospheric heating/cooling is discussed.