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The extratropical QBO effects in total ozone: dependence on solar cycle and season.

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Using total ozone data obtained at 10 European stations in the period 1957-2005 an analysis of the QBO effects, manifesting in different seasons and in the periods of solar maximum and solar minimum was carried out. The QBO effects, characteristic for different solar activity conditions substantially differ. On average over the region in the maximum (minimum) the positive (negative) total ozone anomalies dominate, respectively. During the winter and spring seasons the QBO related anomalies in the maximum lag behind those in the minimum by 4-6 months. In solar maximum conditions positive total ozone anomaly starts to develop in the autumn and spring, while the onset of negative one falls on the spring and summer. As a rule, the largest positive anomalies are manifested in the spring in solar maximum conditions, while the largest negative ones are revealed in the winter in solar minimum conditions. Thus, it seems that the magnitudes and even the signs of QBO related anomalies in total ozone over Europe will differ, depending on the relationships between the QBO phase, the phase of the 11-years solar cycle and a season.