



The QBO effects in solar maximum and in solar minimum conditions over Europe

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A comparative analysis of the responses on the equatorial quasi-biennial oscillation (QBO), manifesting in total ozone (TO) as well as in ozone and temperature profiles during solar maximum and solar minimum conditions over Europe was carried out. The mean values and phases of the TO QBO effects reveal substantial differences in solar maximum and minimum. TO anomalies in the maximum averaged on the QBO cycle exceed those in the minimum by about of 5 D.U. Also the TO QBO effect in the minimum lag behind that in the maximum by approximately 6 months. Distinctions of the QBO effects, manifesting in ozone and temperature profiles consist in different vertical phase dynamics of the QBO signals in the lower stratosphere and troposphere. Below 20 km (above 25 km) in solar maximum conditions the QBO effects in ozone and temperature, being in phase, reveal upward (downward) phase dynamics, respectively. In solar minimum conditions the downward phase dynamics of the QBO effects in ozone and temperature with a rate of the phase descend of about 1.2 km/month can be easily traced from the height of 25 km down to a surface. This feature can be considered as the fact of stratosphere-troposphere exchange of ozone and also can serve as a proof of stratospheric influence on tropospheric processes and climate. The amplitude of the QBO effect in ozone amounts to 6 (9) nbar in the maximum (minimum), respectively, while the amplitude of the effects in temperature is approximately twice larger in the maximum than in the minimum.