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Temporal characteristics of cloud tops during storm evolution

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Water vapor plays a very important role in radiative and thermodynamic processes in the atmosphere, and therefore a good knowledge of its distribution is crucial. In this study is described a method used for a detection of lower stratospheric water vapor above cloud tops, so called brightness temperature difference (BTD) technique. This technique is based on brightness temperature difference between water vapor absorption and infrared window bands, assuming a thermal inversion above cloud top level. BTD techniques were investigated in many previous studies and the most frequently offered explanation of positive BTD values above convective storms is a presence of warmer water vapor in the lower stratosphere. We used BTD technique to propose an algorithm for the objective detection of anomalies in BTD field. These regions of higher BTD values not corresponding to lower brightness temperatures in windows band could be manifestation of locally increased amount of moisture. Such locally increased stratospheric water vapor have probably an origin in the troposphere and is a manifestation of the stratospheric-tropospheric exchange of water vapor.

Other part of this study is focused on the application of the BTD technique and the proposed BTD anomaly detection algorithm. Temporal characteristics of parameters describing BTD (brightness temperature difference), BTD anomaly and infrared window brightness temperature were investigated during storms evolution on the dataset of over 300 storms from the area of Europe and north Africa. This dataset was used for studying above mentioned parameters for different groups of storms during their evolution.