Title: Cloud-top morphology of convective storms as observed by meteorological satellites

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Abstract: This work focuses on study of features occurring at tops of convective storms, namely embedded warm areas, cold rings, cold-U/Vs and overshooting tops (OTs), mainly from the perspective of satellite observations.

We have assembled a database of 104 subjectively detected cold rings and cold-U/Vs from the area of Europe. We discuss relationship between satellite-observed brightness temperature and cloud top height determined from radar measurements for storms with distinct cold-rings. Our results support the hypothesis that the warm area is a consequence of presence of central elevated dome reaching warmer lower stratosphere. Moreover, a storm with transformation of cold ring into cold-U is studied and an elevated plume above storm anvil in the warmer lower stratosphere is found to be a likely explanation of the warm area inside the cold-U. Both analyses confirm that thermal inversion above the tropopause is a necessary prerequisite for occurrence of cold rings and cold-U/Vs. We also propose a method for automated objective determination of spatial characteristics of these features.

In the second part, characteristics of OTs are investigated on experimental 2.5-minute rapid scan satellite data using database of 1811 subjectively detected OTs. On the basis of this database, previously published OT detection algorithms are verified and a new, more successful algorithm based on machine learning method AdaBoost is proposed.

Keywords: convective storm, cold ring, cold-U/V, overshooting top, parallax