

Investigating thunderstorm activity in Moscow region via the method of muonography

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Thunderstorms, being one of the dangerous atmospheric phenomena, are studied by means of various methods. Measurements of the muon flux variations using muon hodoscopes offer a tool for detection, study and possible prediction of the thunderstorm activity.

The URAGAN muon hodoscope (MH), located in Moscow, Russia, allows simultaneous detection of muons from all directions of the upper hemisphere. Using its data, muon imaging (muonography) method can be applied to visualize disturbed areas of the atmosphere, and the muon counting rate and muon flux anisotropy can be acquired. Using these characteristics, 235 thunderstorm event candidates were identified during the spring and summer periods of 2014 – 2020. 211 (90 %) of the event candidates were accompanied by a thunderstorm cell detection via an independent method within a ± 6 -hour interval.

By comparing muon snapshots (muonographs) and meteorological maps obtained by the Doppler weather radar DMRL-C it was shown that disturbed areas with decreased muon counting rate correspond to the regions of thunderstorm activity. It was established that the thunderstorm events detected using muon hodoscope URAGAN data are mainly associated with thunderstorm cells that occurred in the time interval of ± 2.5 hours from the event.

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