# Severe Weather Episodes over Romania: A Study Based on Cloudnet Observations and Synoptic Analysis

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## Abstract

Understanding severe convective weather is essential for both operational forecasting and climate risk assessment, particularly in the context of climate change. This study analyzes several meteorological episodes recorded in Romania during 2021, using remote sensing data from the Cloudnet station in Bucharest-Magurele. Events such as thunderstorms, hailstorms, mixed precipitation and prolonged rainfall are investigated. The approach integrates observations from cloud profiling Radar, LIDAR and microwave radiometer to evaluate cloud structure and dynamics. Parameters such as Doppler velocity, Radar reflectivity factor, liquid water content and attenuated backscatter coefficient were correlated with synoptic-scale indicators including CAPE, Lifted Index (LI), precipitation distribution and relative vorticity. The results revealed the presence of deep convective columns reaching altitudes up to 12 km, Doppler velocities of ±4 m/s and significant accumulations of water and ice in clouds. High CAPE values and large precipitation amounts confirm the severity of these episodes. The correlation of Cloudnet data with synoptic maps proved effective in validating storm intensity and analyzing microphysical processes. All these findings will contribute to the scientific understanding of convective processes, supporting the improvement of weather forecasting, the validation of numerical models, and the development of effective strategies for managing climate-related risks associated with severe weather events.

## Keywords

Cloudnet, synoptic analysis, clouds, CAPE, Lifted Index (LI).