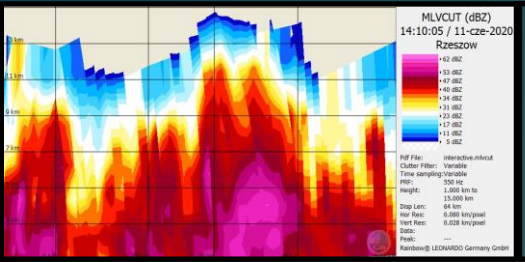
Use of Dual-Polarization Wave Meteorological Radar Data to Determine Precipitation Intensity



The research was aimed to:

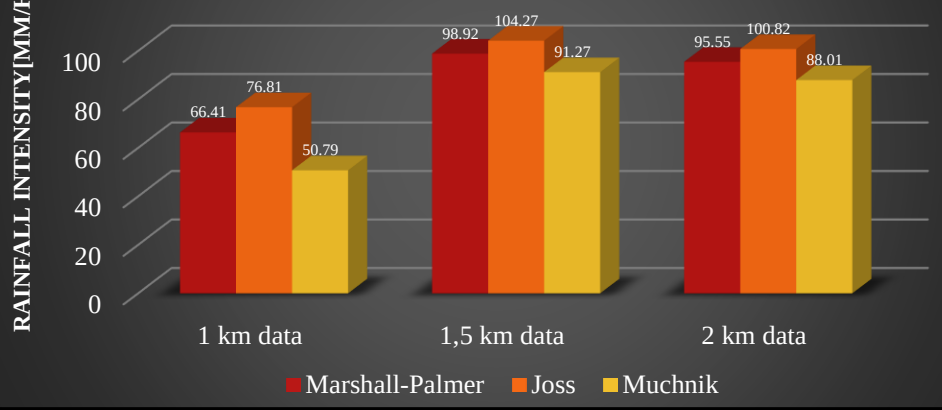
- develop a methodology for processing radar data that would enable detailed analysis of cloud systems producing hail;
- apply and verify selected empirical relationships between radar reflectivity and rainfall intensity;
- analyze of the results of precipitation intensity determination based on radar reflectivity data at various heights above ground level (1 km, 1.5 km and 2 km).

Relationship between radar reflectivity and precipitation intensity

$$Z = A\,R^{b}$$

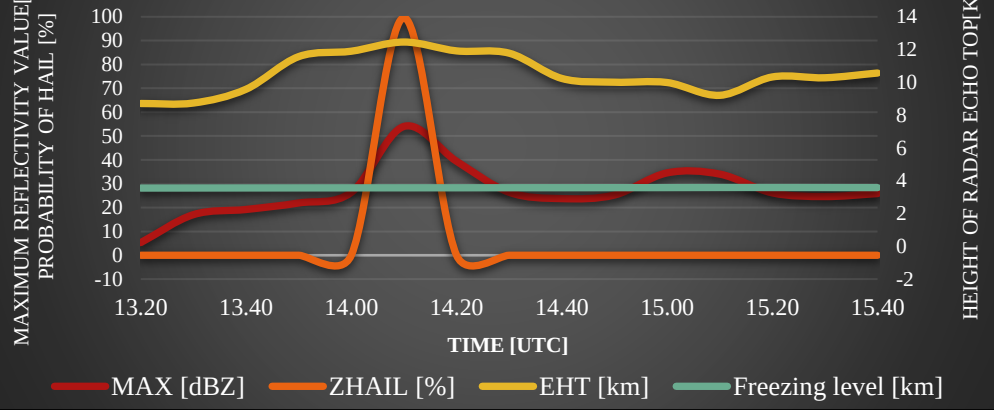
Z – value of radar reflectivity [$mm^6 \cdot m^{-3}$];
R – precipitation intensity value [$mm \cdot h^{-1}$];
A, b – numerical parameter

Summary of DPSRI rainfall intensity values determined using the Marshall-Palmer, Joss and Muchnik relationships for data from 1 km, 1.5 km and 2 km above ground level



Numerical parameter		Name of relationship	Main application
A	b		
500	1,5	Joss	Precipitation occurring in the storm zone
250	1,5		Rainfall
140	1,5		Drizzle
204	1,7	Muchnik	Shower rain and constant rain
200	1,6	Marshall-Palmer	Constant rain

Relations between maximum reflectivity (MAX), hail probability (ZHAIL) and radar echo top height (EHT) with the freezing level



CONCLUSIONS

1. The results of the analysis showed that the differences between the smallest and largest rainfall intensity values determined using data in the cloud layers at 1.5 km and 2 km levels are twice as big as for the data at the 1 km level for all tested empirical relationships;
2. The highest precipitation intensity values were determined for the 1.5 km level which justifies data acqusition from this level for operational purposes and indicates the highest activity in this cloud layer;
3. The Joss relation yields the smallest differences between the precipitation intensity values at the three cloud levels. Therefore, it would be recommended to use this relationship to determine the rainfall intensity in showers;
4. A series of analyses in order to establish a relationship between rainfall intensity (DPSRI) and hail probability (ZHAIL) seems to be justified for further studies.