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## Hydrometeor classification based on cloud radar Doppler spectrum peaks using the PEAKO-peakTree toolkit

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Microphysical processes in clouds like ice formation, riming, and ice multiplication can be investigated through cloud radar Doppler spectra: When hydrometeor types within a cloud radar observation volume have sufficiently different terminal fall velocities, they generate individual Doppler spectrum peaks. By separating these peaks, valuable information on the fall velocity, size, number, and potentially the shape of hydrometeors can be extracted. This separation depends both on radar settings and atmospheric dynamics (Vogl and Radenz et al., 2024).

Here, we are using two algorithms, PEAKO and peakTree, for analyzing Doppler spectrum peaks. PEAKO is a supervised machine learning tool, trained to optimize peak detection for specific radar settings, while peakTree organizes and interprets these peaks using parameters learned from PEAKO.

Based on the moments of each extracted sub-peak, hydrometeor types can be assigned to peaks that have properties typical of liquid cloud droplets, columnar ice and rimed ice. This novel cloud radar Doppler spectrum peak-based hydrometeor classification mask can be used for detailed case studies, e.g. for tracking hydrometeor populations through the cloud along Doppler spectrum peak-based fall-streaks. Furthermore, statistics on the occurrence of different hydrometeor types at different sites and temperature ranges can be derived.

VAT

### Session

From Classical to Integrated Remote Sensing: New observation strategies for clouds and precipitation (multi-frequency, spectral polarimetry, multi-sensor)

### Preferred Contribution Type

Oral Presentation

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