During recent years a number of micro rain radars (MRR) are performing continuous high resolution measurements at coastal sites of the Baltic Sea as well as at several inland sites. Here the intensity profiles of precipitation events measured over a period of 4 years are analysed with respect to rapid changes in raindrop size distributions. Different modes of spectral formation mechanisms for raindrops. The melting layer suggests a change in the melting layer was detected, its position is marked by a bold dot. The distinctive decreases to 700 m till the end of the time event the height of the melting layer height of about 1000 to 1200 m. During the a weakly distinctive melting layer with a diameter is not strongly coupled to the intensity.

FIG 1: Time series of integral rain intensities R given in mm h\(^{-1}\) based on the drop size spectra measured by a MRR during stratiform rain event on 1st November 2002 at Zingst. The intensities vary up to several hours. The corresponding relations, after sequential intensity filtering technique (SIFT) of Lee and Zawadzki (2005) is applied according to the different periods (right panel). The dashed lines give climatically Z-R relations.

FIG 2: Time series of vertical reflectivity profiles Z given in dBZ, measured by the MRR. The reflectivity profiles give accordant low values of reflectivity Z during the first three hours combined with a weakly distinctive melting layer with a height of about 1000 to 1200 m. During the event the height of the melting layer decreases to 700 m till the end of the time series while its strength increases. If a melting layer was detected, its position is marked by a bold dot. The distinctive melting layer suggests a change in the formation mechanisms for raindrops.

FIG 3: Time series of the spectral rain intensities in terms of the slope of derived mass spectra S_\text{MS}:

\[ S_{\text{MS}} = \frac{\delta r(D)}{\delta D} \]

in units mm h\(^{-1}\). Two spectral modes can be clearly distinguished. The first mode is characterised by a maximum in the mass spectra at 0.9 mm, while the second one appears at 2 mm. Note that the occurrence of the mode around 2 mm diameter is not strongly coupled to intensity.

The classification of rain events into single subdivided periods in terms of spectral modes lead to Z-R relationships with significantly reduced scatter. These periods may last from minutes up to several hours. The classifications arise from sudden changes in the characteristics of the drop size distribution. If it would be possible to identify these persisting modes with spatial structures in the measuring volume of weather radars, it would possible lead to improved estimation of rainfall from radar measurements. Continuative work will be done during the AQUARADAR project.

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