Quantitative Precipitation Estimates Measured by C- and X-Band Radars

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Introduction

Facilities for urban drainage are important as the similarities, because it is within the differences that the radar measurements.

The purpose of this study was to gain more knowledge about the potential for integration of the two radar systems. As an example of this, a stratiform and a convective precipitation event are displayed in figure 4. The area for comparison is the full range of the LAWR (see figure 4) and the data shown is the full spatial resolution of both systems.

Visually, the images show both similarities and dissimilarities, see figure 3. One explanation for the differences is that the C-band radar detects a much wider spatial extent of the stratiform precipitation than the LAWR. Due to the large convection opening angle and the low-laying precipitation, important as the similarities, because it is within the differences that the radar measurements.

Acknowledgment

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Discussion and Conclusion

The two radars are working with different temporal and spatial resolution, see table 1 and 2. To be able to quantify the correlation between the two systems, the LAWR data has been averaged in space to fit the 2 x 2 km resolution of the C-band radar. The spatial correlation between the two radar measurements is illustrated in figure 3 for the 6th of July 2009 in the time interval 18:00 to 20:10. The area for comparison is a square with the LAWR located in the center as illustrated in figure 2. Visually, the images show both similarities and dissimilarities, see figure 3. One explanation for the differences could be the different scanning strategies employed by the two different types of radars. The LAWR is conducting the measurement by a time average with a wide vertical antenna opening angle. The C-band radar is creating a 'snap shot' conducted from several scans in different elevations every 10 minutes. Despite the differences of the radar systems, the spatial detection of the precipitation by the two systems is relatively similar through the period. At the same time, it is obvious that the images are not identical which is shown by the low correlation coefficients. The similarities of precipitation intensities are somewhat more variable for some images the highest precipitation intensities and areas remain in the same locations, while for others it differs.

Strength and Weaknesses

Different meteorological conditions are bound to yield different results for the two radar systems. As an example of this, a stratiform and a convective precipitation event are displayed in figure 4. The area for comparison is the full range of the LAWR (see figure 4) and the data shown is the full spatial resolution of both systems.

It is evident that the C-band radar detects a much wider spatial extent of the stratiform precipitation than the LAWR. Due to the large convection opening angle and the low-laying precipitation, the upper part of the LAWR beam will break out of the precipitation quite close to the radar. This results in only partly filled sampling volumes and thereby poor observations at longer distances.

In the case of convective precipitation, the vertical extent of the precipitation is much higher and partly filled sampling volumes are not an issue for the LAWR radar. In this case, the disadvantage of low spatial resolution for the C-band radar becomes clearer. Even though there is a good visual agreement between the radar images, the result also shows that LAWR detects the spatial variations within the convective precipitation in more details.

Spatial Correlation

The two radars are working with different temporal and spatial resolution, see table 1 and 2. To be able to quantify the correlation between the two systems, the LAWR data has been averaged in space to fit the 2 x 2 km resolution of the C-band radar. The spatial correlation between the two radar measurements is illustrated in figure 3 for the 6th of July 2009 in the time interval 18:00 to 20:10. The area for comparison is a square with the LAWR located in the center as illustrated in figure 2. Visually, the images show both similarities and dissimilarities, see figure 3. One explanation for the differences could be the different scanning strategies employed by the two different types of radars. The LAWR is conducting the measurement by a time average with a wide vertical antenna opening angle. The C-band radar is creating a 'snap shot' conducted from several scans in different elevations every 10 minutes. Despite the differences of the radar systems, the spatial detection of the precipitation by the two systems is relatively similar through the period. At the same time, it is obvious that the images are not identical which is shown by the low correlation coefficients. The similarities of precipitation intensities are somewhat more variable for some images the highest precipitation intensities and areas remain in the same locations, while for others it differs.

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