



Measurements of precipitation size distribution in selected rain events of Warsaw with shadowgraph imaging technique

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The present study investigates capability of the “Oxford Lasers VisiSize D30” instrument, which works based on the shadowgraph imaging technique, in measuring precipitation size distributions. To this aim, series of measurements have been performed during rain events at spring and summer 2018 in Warsaw, Poland.

Size distribution of rain droplets and precipitation particles have been measured using a technique which is called “Particle/Droplet Image Analysis” (PDIA). Aforementioned method involves illuminating the region of interest from behind by using incoherent, expanded and collimated laser light beam and collecting shadow images of droplets as well as particles at up to 30 frames or pairs of frames per second with a high resolution digital camera. The laser and camera are triggered so that a single laser pulse freezes the motion of particles/droplets present within the measurement volume during each frame capture. Particles/droplets detected inside the depth of field are then measured based on their shadow images. Lastly, size distribution is built by analyzing a series of images. Following this, final results have been compared to the statistical data captured by an “OTT Parsivel²” laser disdrometer which was mounted at the measurement site in order to demonstrate the performance of PDIA imaging technique. In addition, the instrument also has capability of capturing and analyzing non-spherical particles/droplets, and then storing series of their shadow images on the memory as well. The tests described here demonstrate the technique and establish the potential for further more quantitative studies of size distribution of rain droplets as well as other precipitation particles.