Performance evaluation of low-cost poor-visibility meter for hyper-densely observation of blowing snow

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In our previous study, we developed a low-cost poor-visibility meter (~\500,00) for hyper-densely observation of blowing snow. Our developed instrument works as a reduced intensity of light when snow particles block off. We used semiconducting laser for the light source (~\500). The laser beam is reflected three times by using mirrors and it enables us to make compact instrument with enough length of light path. Our developed system has a capability of extending a hyper-densely observation in real-time using wireless network. Our study aims performance evaluation of the low-cost poor-visibility meter for hyper-densely observation of blowing snow in the condition of artificial and natural one. We have checked the correlation between the reduced laser intensity taken by our system and the visibility recorded by conventional video camera simultaneously; the visibility corresponds to the pixel intensity obtained from the movie (1frame 1/30sec, 8-bit). Natural (Artificial) blowing snow was measured in Sapporo City (Cryospheric Environment Simulator of the Shinjo Branch, Snow and Ice Research Center, National Research Institute for Earth Science and Disaster Prevention in Shinjo city). The wind velocity was 10-15m/s and temperature was from -4℃ to -15℃. We have performed theoretical analysis for the relation between the laser intensity and the poor visibility based on our original formulation. The resultant value for the correlation coefficient in artificial blowing snow was 0.95. In conclusion, we have conducted the performance evaluation of the low-cost poor-visibility meter for hyper-densely observation of blowing snow, having a potential of hyper-densely monitoring on wireless network, and have made sure the practicability.

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