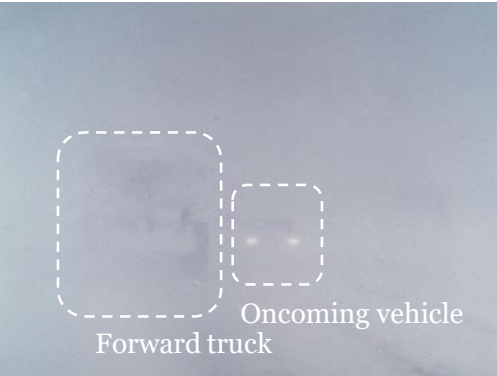


# The visual distance of industrial cameras varies with exposure time during blowing snow

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Poor visibility during blowing snow can cause a chain-reaction and sometimes result in traffic fatalities. Therefore, an accurate understanding of visibility during blowing snow is important to provide drivers with safe traffic and road administrators with accurate road traffic information. We examine the visual distance of industrial cameras varying with exposure time during blowing snow in Hokkaido, Japan. Two industrial cameras which we used were set on the windshield of the weather observation vehicle. The two cameras are for comparison of the difference in how a visual distance changes and how we see suspended blowing snow particles when we use different exposure times with each camera. The exposure time is related to the visual distance because the suspended snow particles' afterimages are identified and perceived as lines or tails. In general, the exposure time of the video camera cannot be set manually, while the industrial camera (WAT-2400S, WATEC Co. Ltd.) which we used can set the exposure time arbitrarily. The results show that the shorter the exposure time of the industrial camera, the longer the visual distance. The images were taken by the industrial cameras while driving the vehicle during blowing snow. The result suggests that monitoring blowing snow by using cameras with properly adjusted exposure times will provide accurate visibility information to road administrators and provide more clear sight with shorter exposure time on vehicle cameras to motorists.



Hard to see forward during blowing snow



industrial cameras lined up on the windshields (upper images)  
Weather observation vehicles (lower images)



Industrial camera used in this study  
(WAT-2400S, WATEC Co. Ltd.)  
2 cameras for 1 observation  
Frame rate: 30 fps (fixed)  
Exposure time:  $0.04 \sim 4.0 \times 10^{-5}$  second



Captured images are taken by the industrial camera during the observation. The exposure time is a) auto, b) 40ms

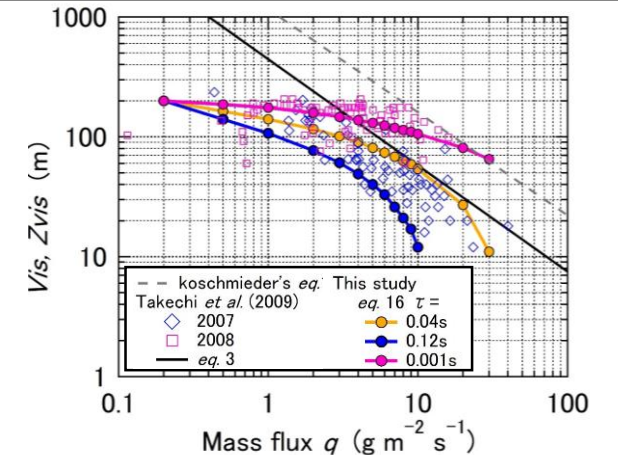
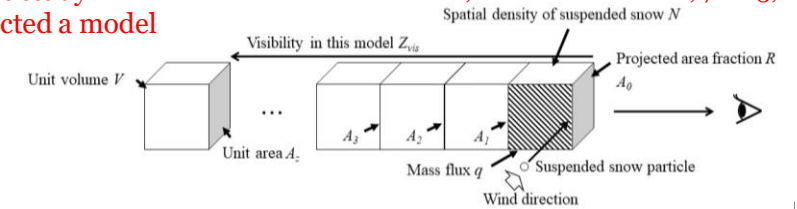


Captured images are taken by the industrial camera. The exposure time is a) 0.16ms, b) 40ms

## A visibility model of the human eye during blowing snow

Previous study constructed a model

Sakurai *et al.*, *Int. J. ITS Res.* **21**, 76-85, 2022



### Conclusion

We observed visual distance during blowing snow using industrial camera varying with exposure time.  
✓ short exposure time may see further when the exposure time is shorter.