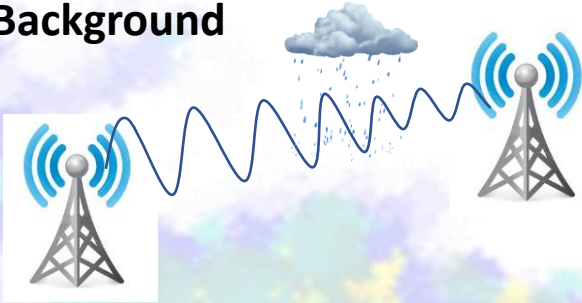


A win-win situation for telecom operators and hydrologists: A proof of concept of providing probabilistic attenuation nowcasting for the telecommunication networks

1. Background



Rainfall measurement using signal attenuation data from mobile operators

Challenges with data sharing

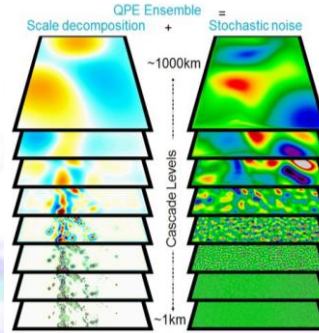


Reliable
communication
services



2. Proposal

Ensembles of rainfall nowcast from enhanced radar QPE

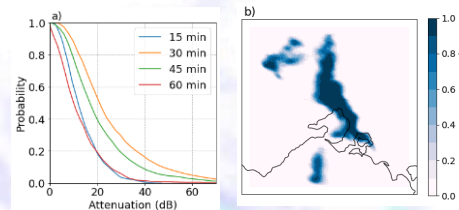


Short Term Ensemble Prediction System
(STEPS)

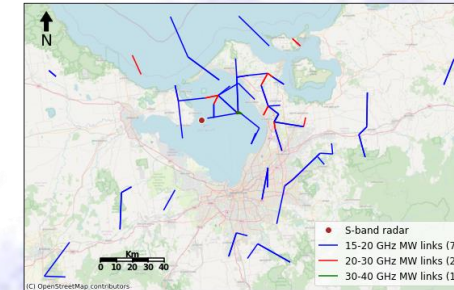
Estimating attenuation

$$k = aR^b$$

Probabilistic attenuation nowcasts



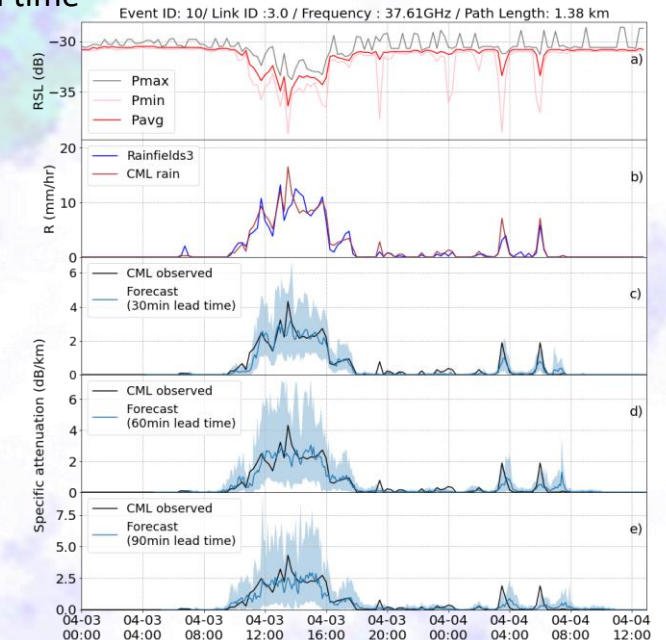
3. Study area and data



- Greater Melbourne Area, Australia.
- 109 microwave links ranging from 15 -38 GHz
- 10 rainfall events used for the verification of attenuation nowcast.

4. Results

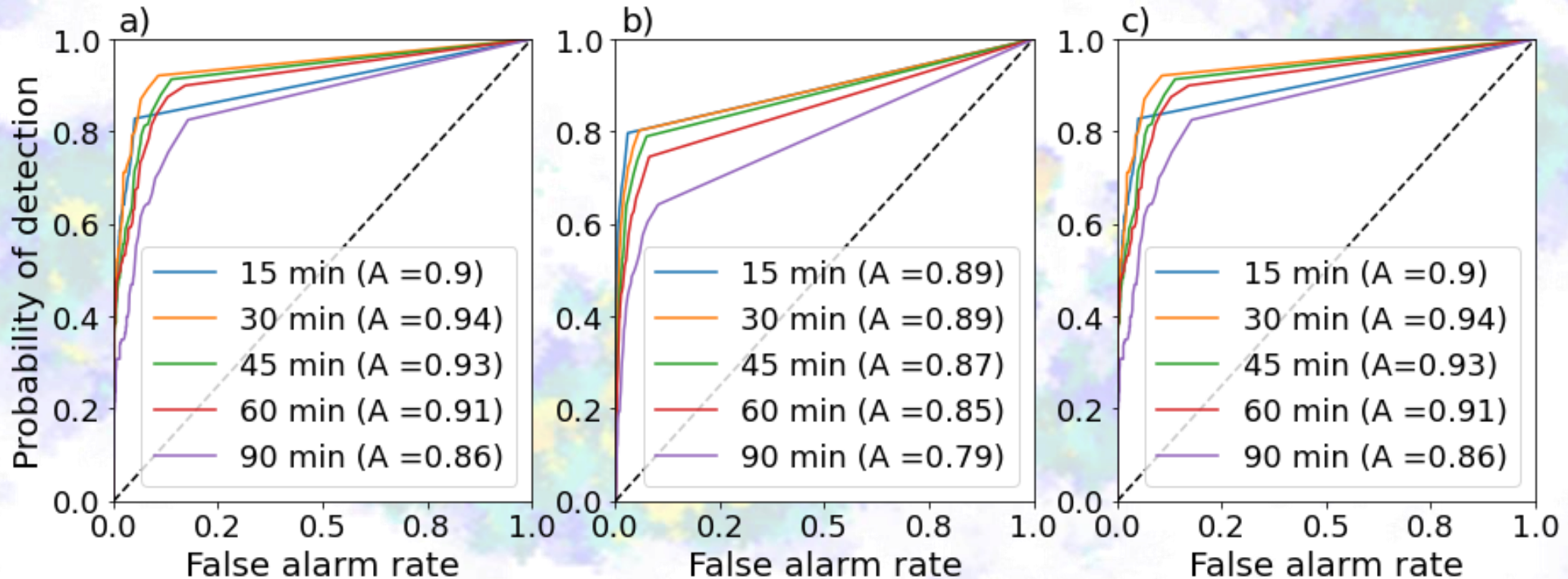
Attenuation nowcast was able to predict observed attenuation within the narrow 90 percent confidence interval for all links up to 30-min lead time



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Pudashine et.al, 2021. Probabilistic attenuation nowcasting for the 5G telecommunication networks, *IEEE Antenna and Wireless Propagation Letters*. DOI: [10.1109/LAWP.2021.3068393](https://doi.org/10.1109/LAWP.2021.3068393)

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ROC curves for different lead times with a threshold of 1 dB km^{-1} for (a) links between 15 to 20 GHz (b) links between 20 to 30 GHz and (c) above 30 GHz

A win-win situation for telecom operators and hydrologists: A proof of concept of providing probabilistic attenuation nowcasting for the telecommunication networks

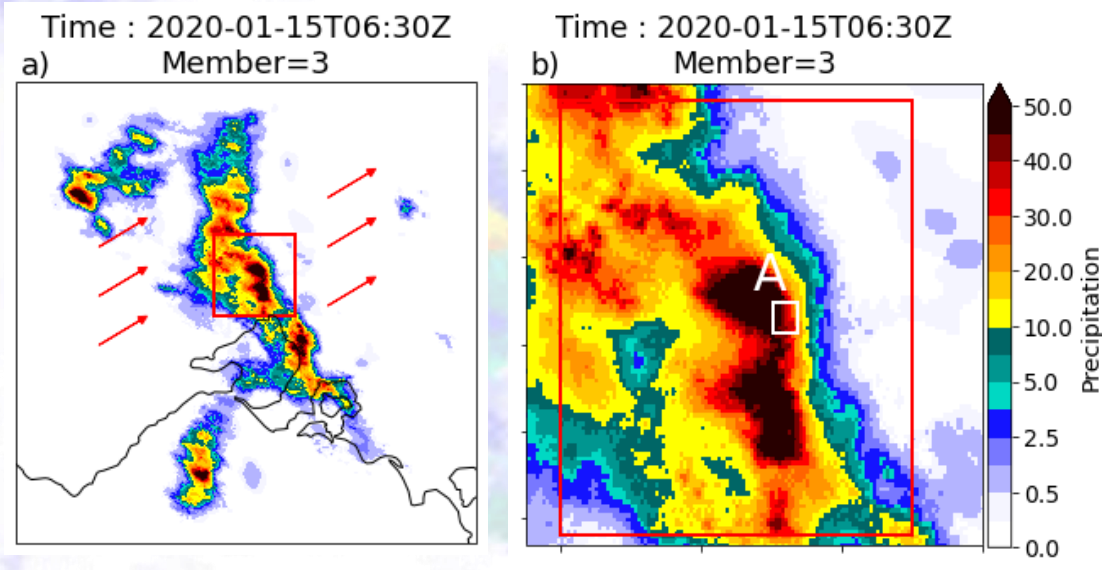


Figure : Rainfall field obtained from one of the ensemble members at 2020-01-15 06:30 UTC (15-min lead time forecast from 2020-01-15 06:15). Red arrow indicates the direction of rainfall field (b) Zoomed section showing the variability of the rainfall field.

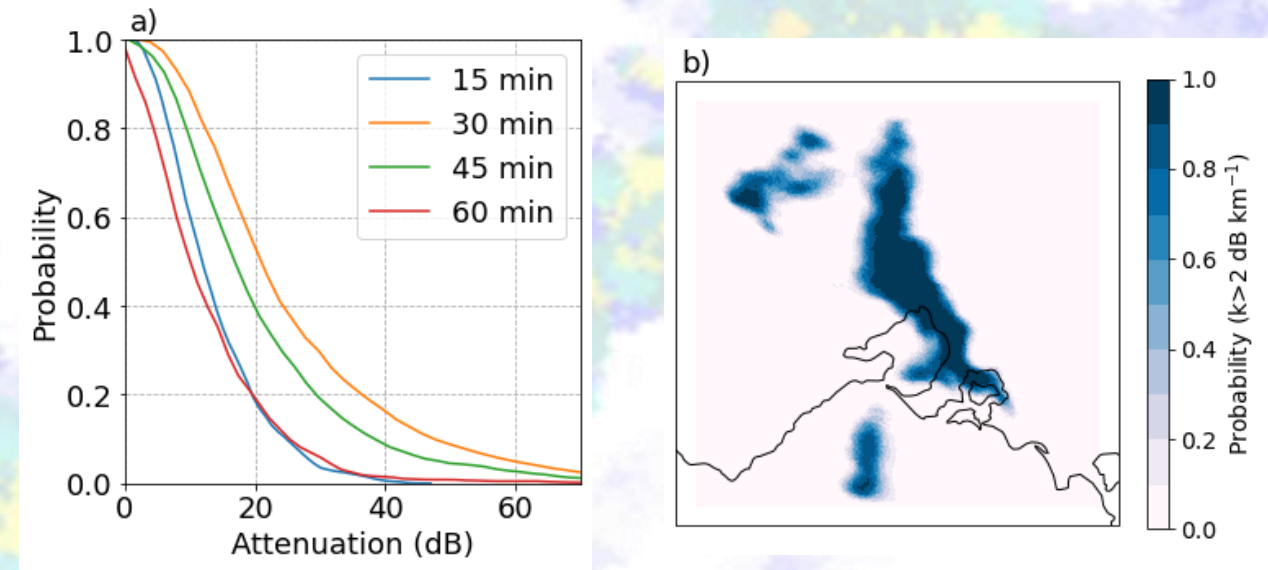


Figure: Cumulative distribution function of attenuation for different lead times for 65 GHz within a radius of 2km from the center of a cell. (b) Probability of attenuation between points 500 m apart for a threshold of 2 dB km^{-1} and lead times of 30 minutes for 65 GHz