# Preliminary Analysis of Radiowave Propagation Data Using a Gigabit Radio Link Operating at 83.5 GHz Close to Oslo in Norway

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## Outline

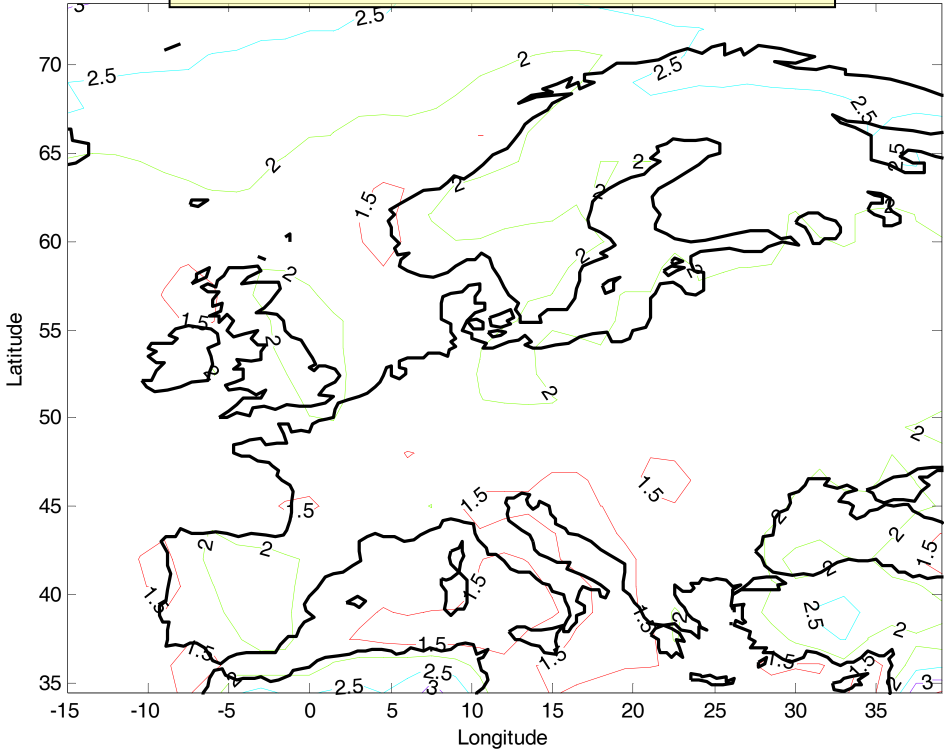
- Applications for gigabit links
- Description of the test link
- Propagation effects
- Results, 9 months measurements

# Applications for gigabit radio links

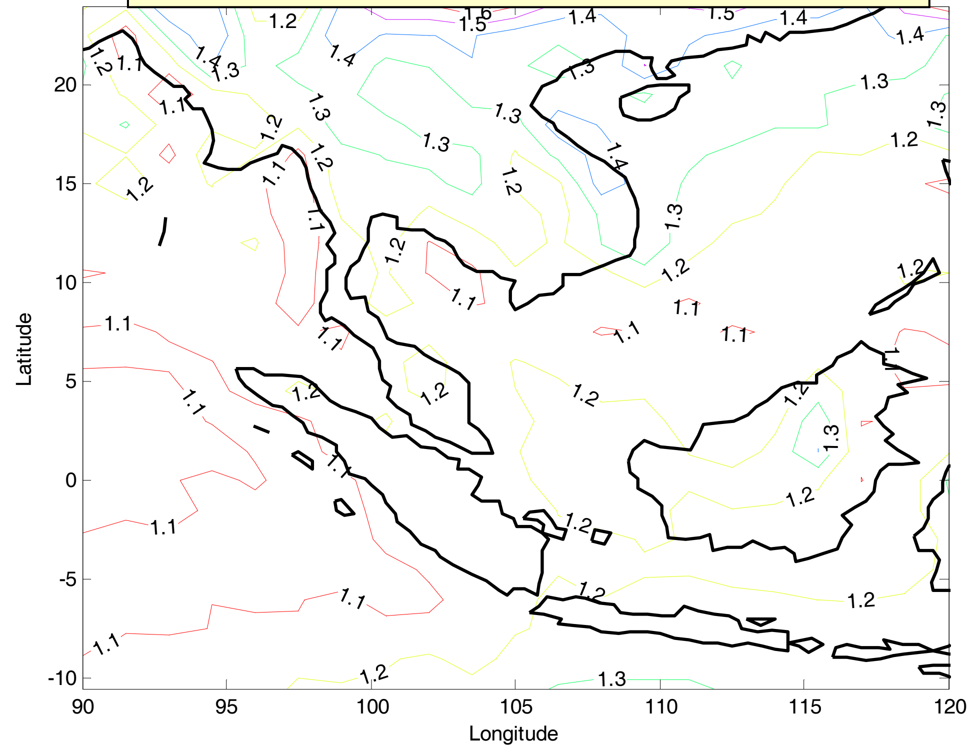
- Traffic grows in all parts for the network
  - Fixed access capacity doubles every 1.9 years
  - Mobile access peak capacity increases even faster
- Much higher capacity backhaul is needed for fixed and mobile base sites, noting that area coverage generates squared transport network demand
- Some may want to own and control their proper gigabit infrastructure
- Fibre connections are close by, but often not at the exact building where the gigabit network is needed

# Range of 1 Gbit/s links at 83.5 GHz, 99.999 % availability using ITU-R recommendations

Europe range: 1.5 – 2.5 km

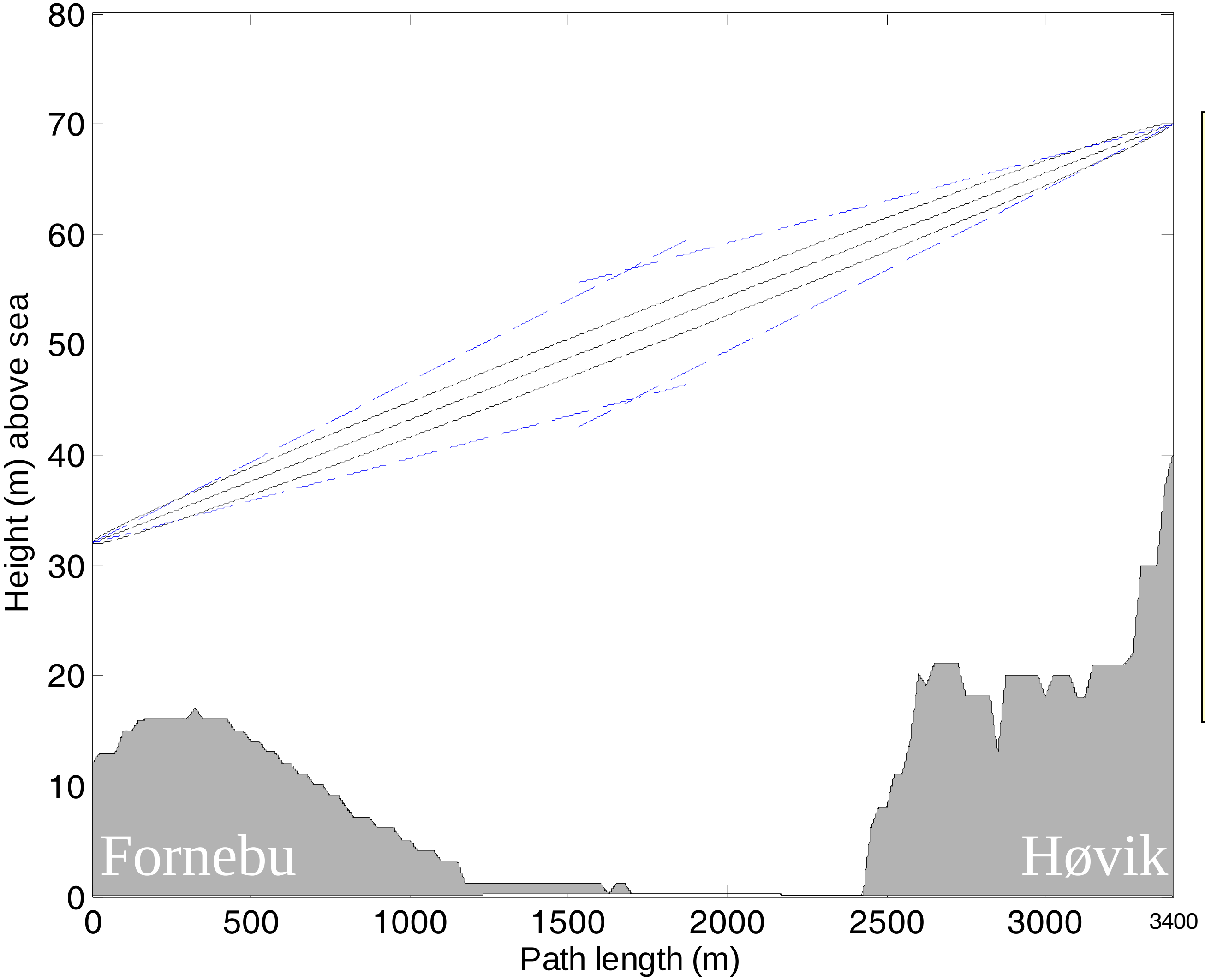



South East Asia range: 1.1 – 1.6 km




Additional link data:
vertical polarisation, 80 dB system gain, antenna each 50 dB gain, no branch loss

# Terrain and path profile Fornebu - Høvik




The path at 83.5 GHz is shown with first Fresnel zone and 3 dB antenna beam indicated.

Note the small Fresnel ellipsoid and the small common volume.

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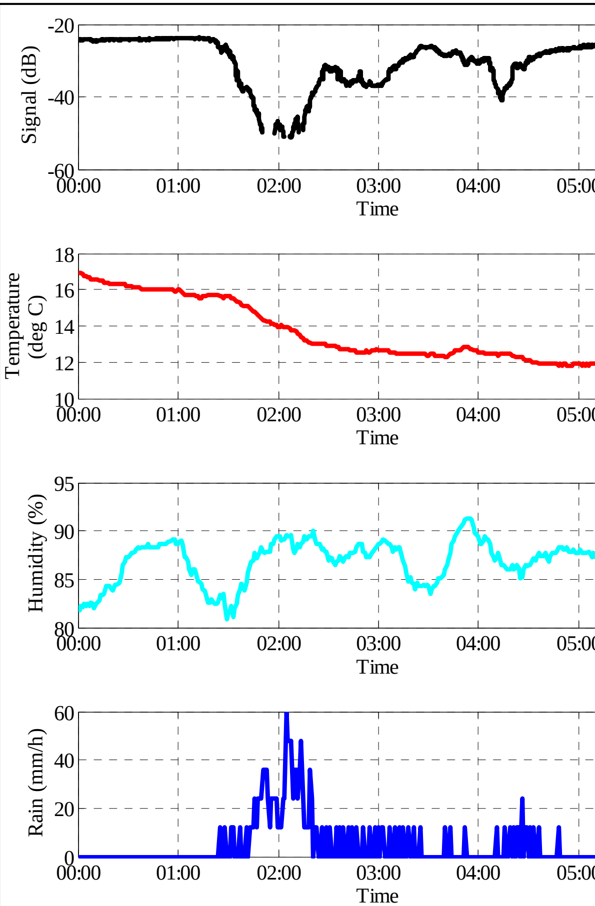
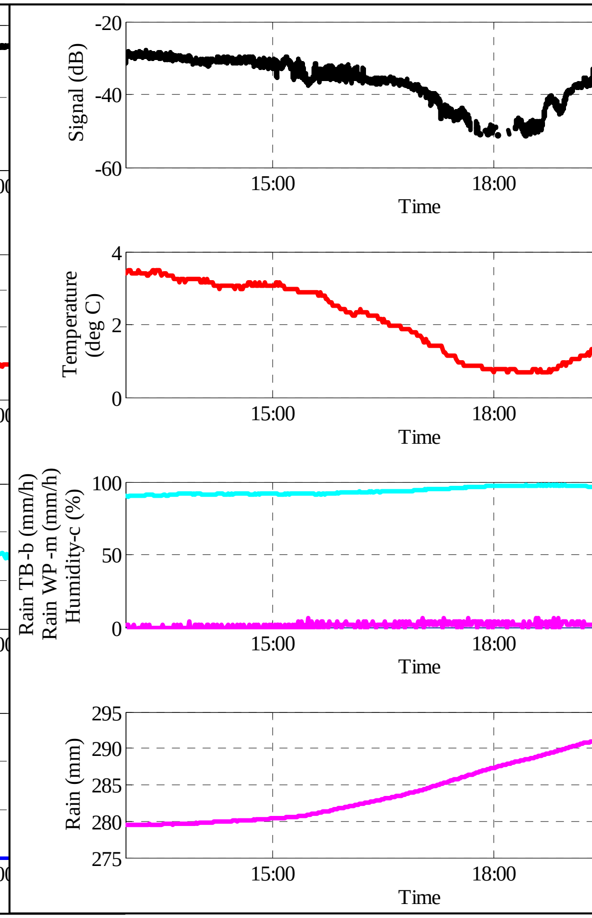
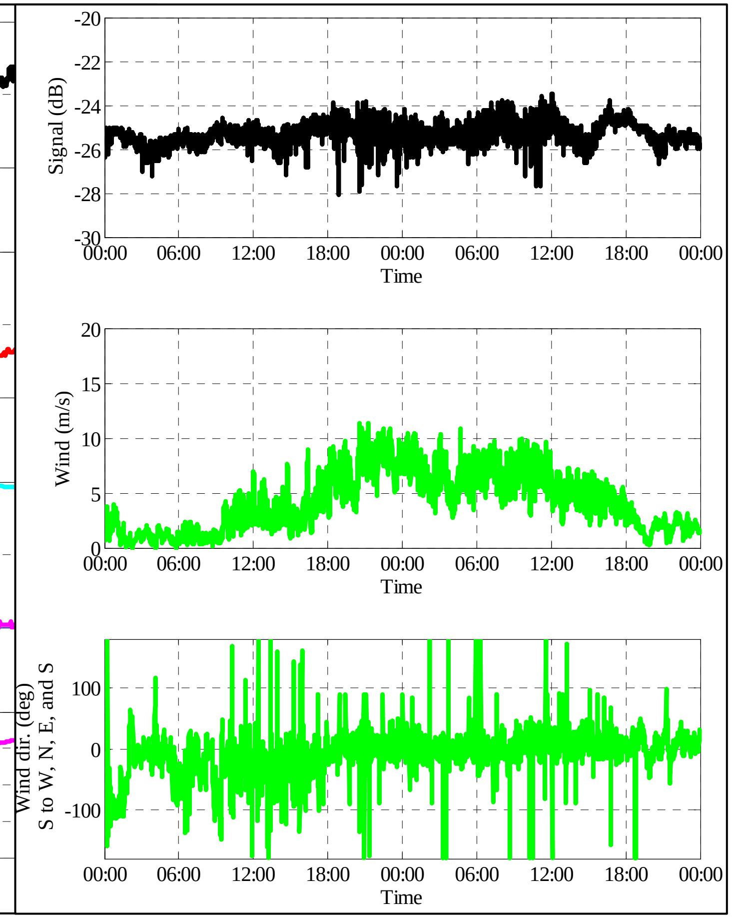
# Some events




Rain




Wet snow




Scintillation

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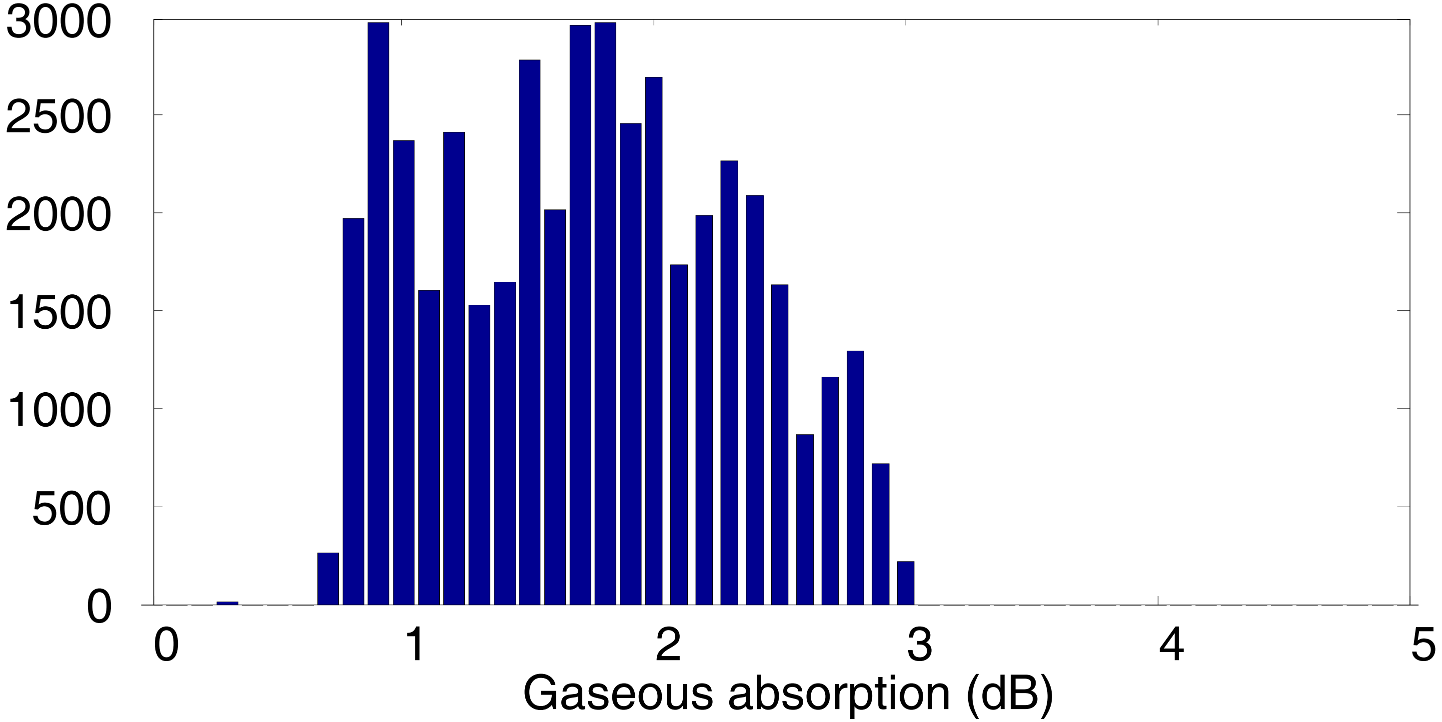
# Gaseous absorption, August 2007

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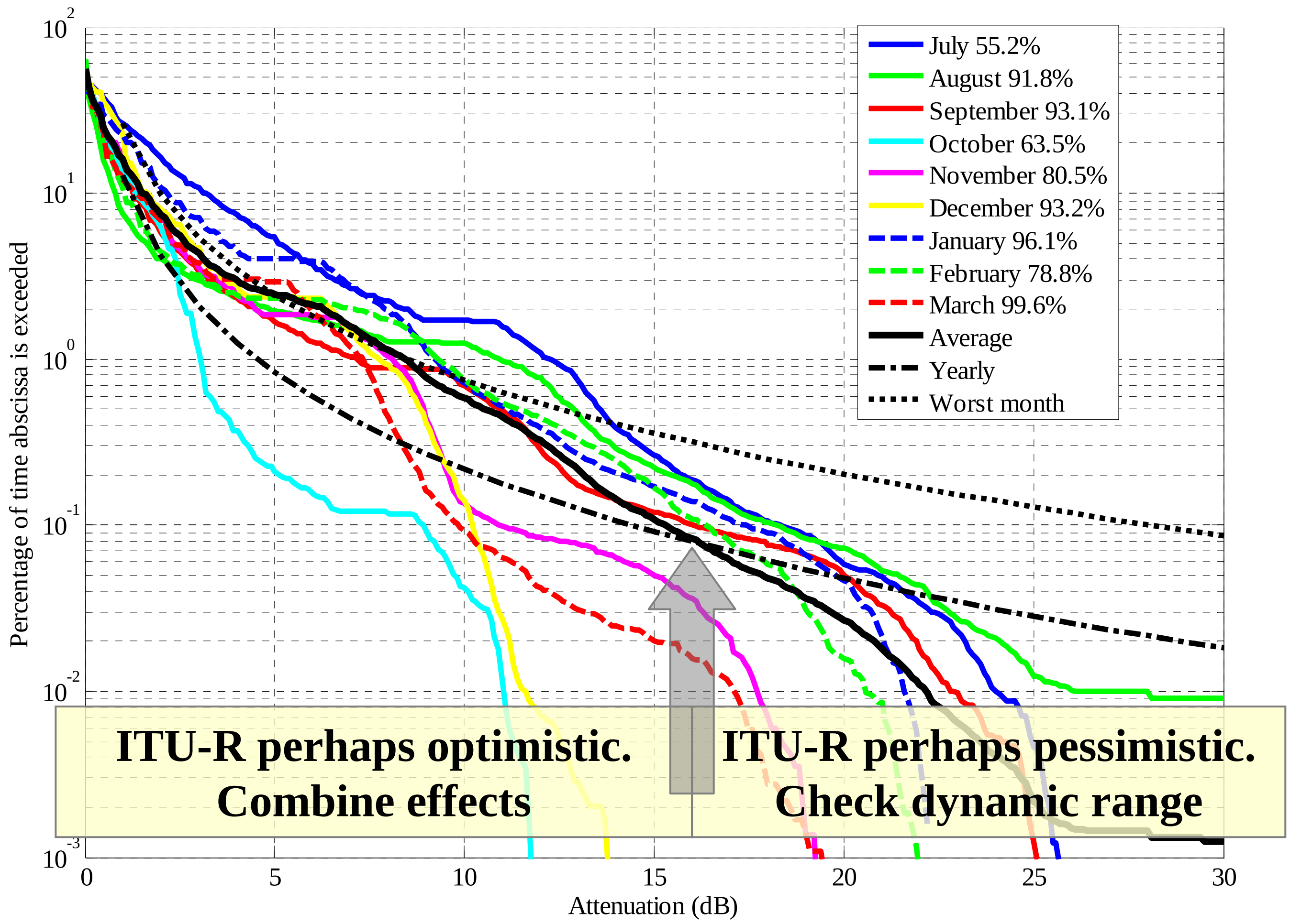
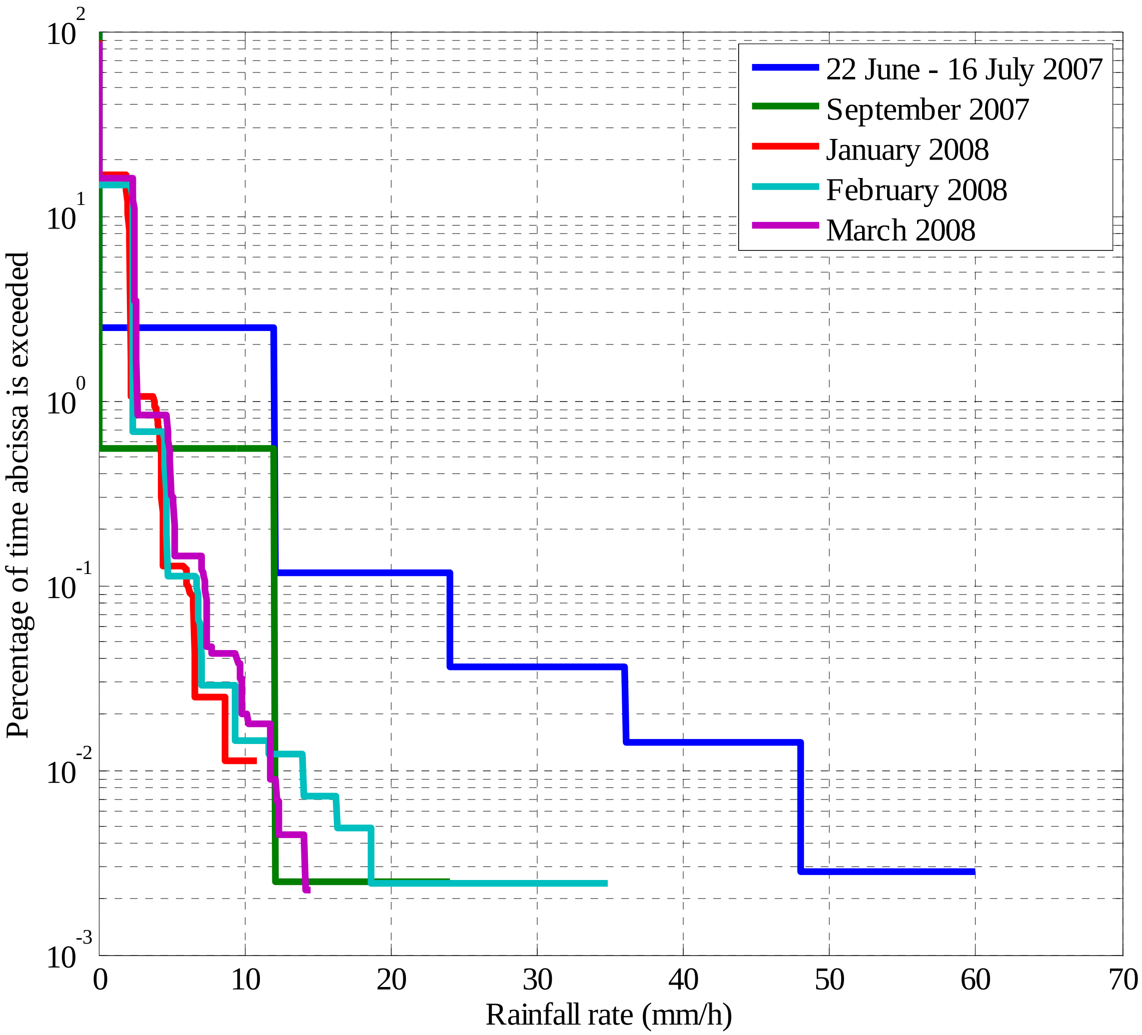
# Calendar month and average distributions




Referenced to monthly medians of the available data.

Data loss due to recording errors, and no link failures.

# Rainfall rate

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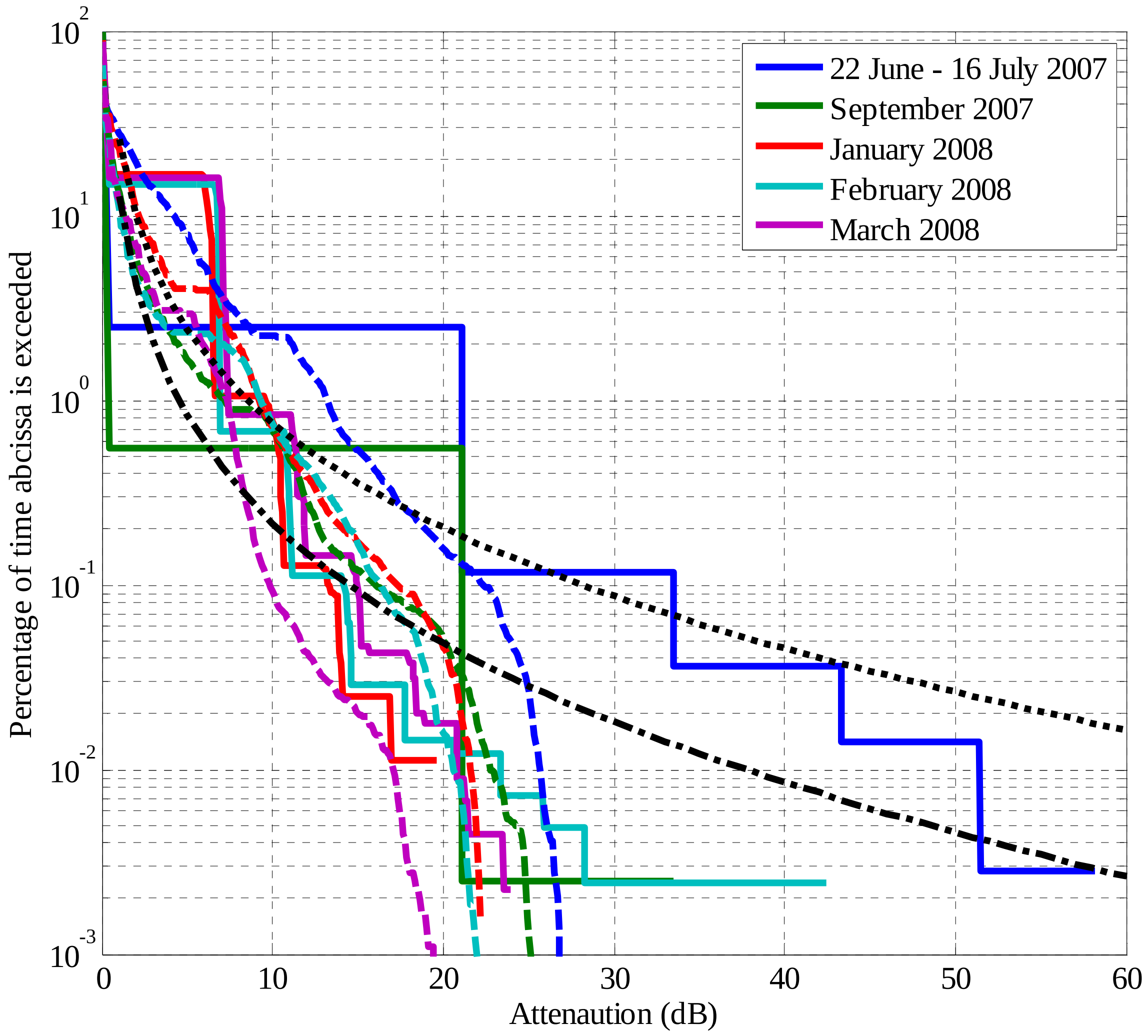
# Attenuation derived from rainfall distributions compared to measured ones




Concurrent data except 5-6 days in February and a very short period in January radio data missing.

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# Conclusions

- Gigabit links are interesting as backhaul for both fixed and mobile broadband networks or own high capacity networks
- Initial results suggest that ITU-R rain attenuation recommendation is somewhat conservative for high availability or attenuation beyond 16 dB
- At low availability combination of effects needs to be considered, e.g., rain and fog, and perhaps gases
- Scintillation seems not to be severe, probably due to very small common volume, could be antenna movement
- Improved rain attenuation can be achieved using the full rain rate distribution