

The NERIS near-range atmospheric dispersion modelling experiment

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Goal and lay-out of experiment

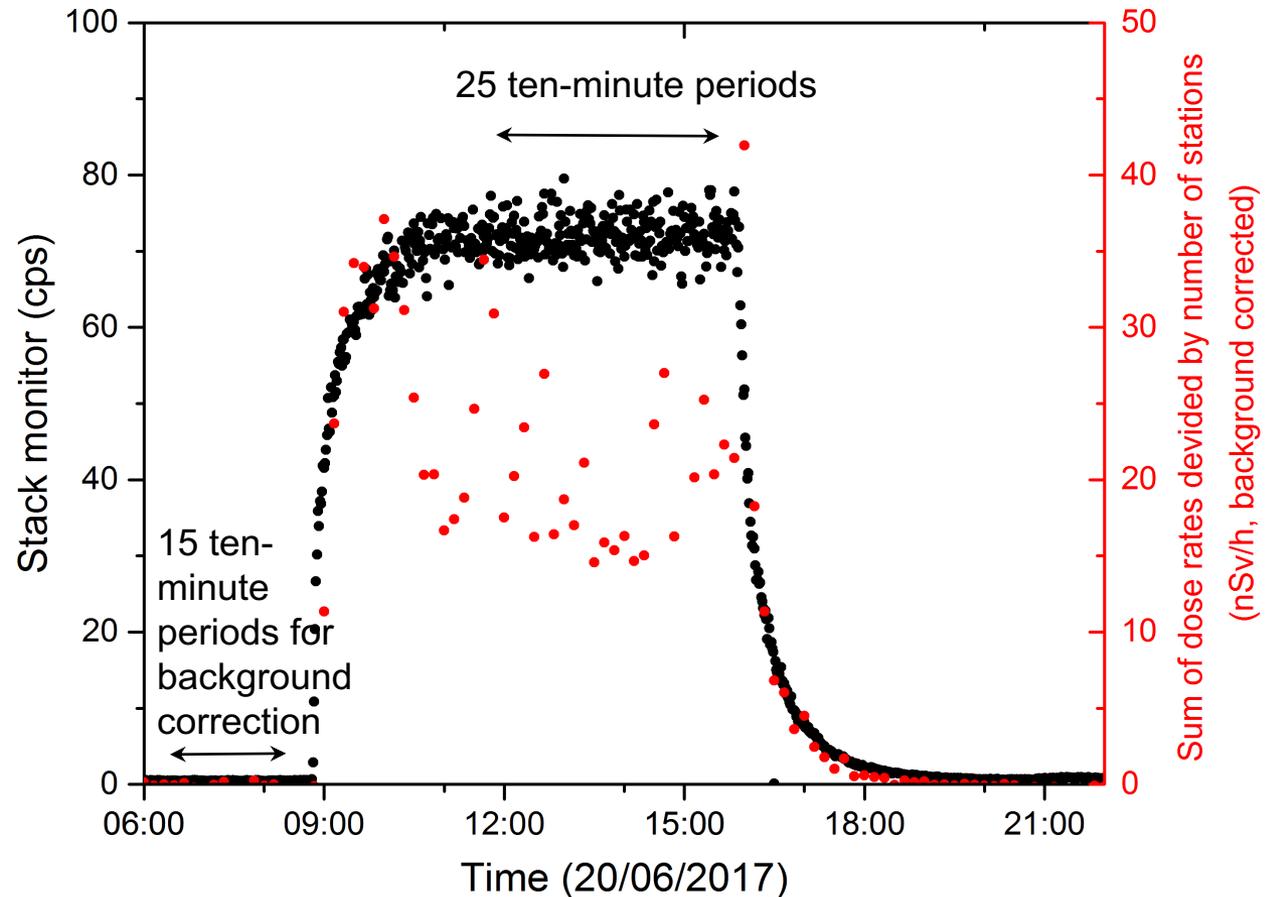
- ✓ Comparison of atmospheric dispersion models for near-range in a very well-defined release scenario (routine Ar-41 stack releases of BR1 at SCK•CEN)
 - ✓ Comparison of results with real gamma dose rate data obtained by 7 ring stations of TELERAD early warning network (operated by FANC-AFCN)
 - ✓ Participation of both model developers as well as operational users of ADM within NERIS community (6 institutes, 8 participants, 12 different model runs)
 - ✓ Statistical relevant sample size (not just case study), with on-site met-data
- Get insight in overall performance at near-range (@ around 200 m)



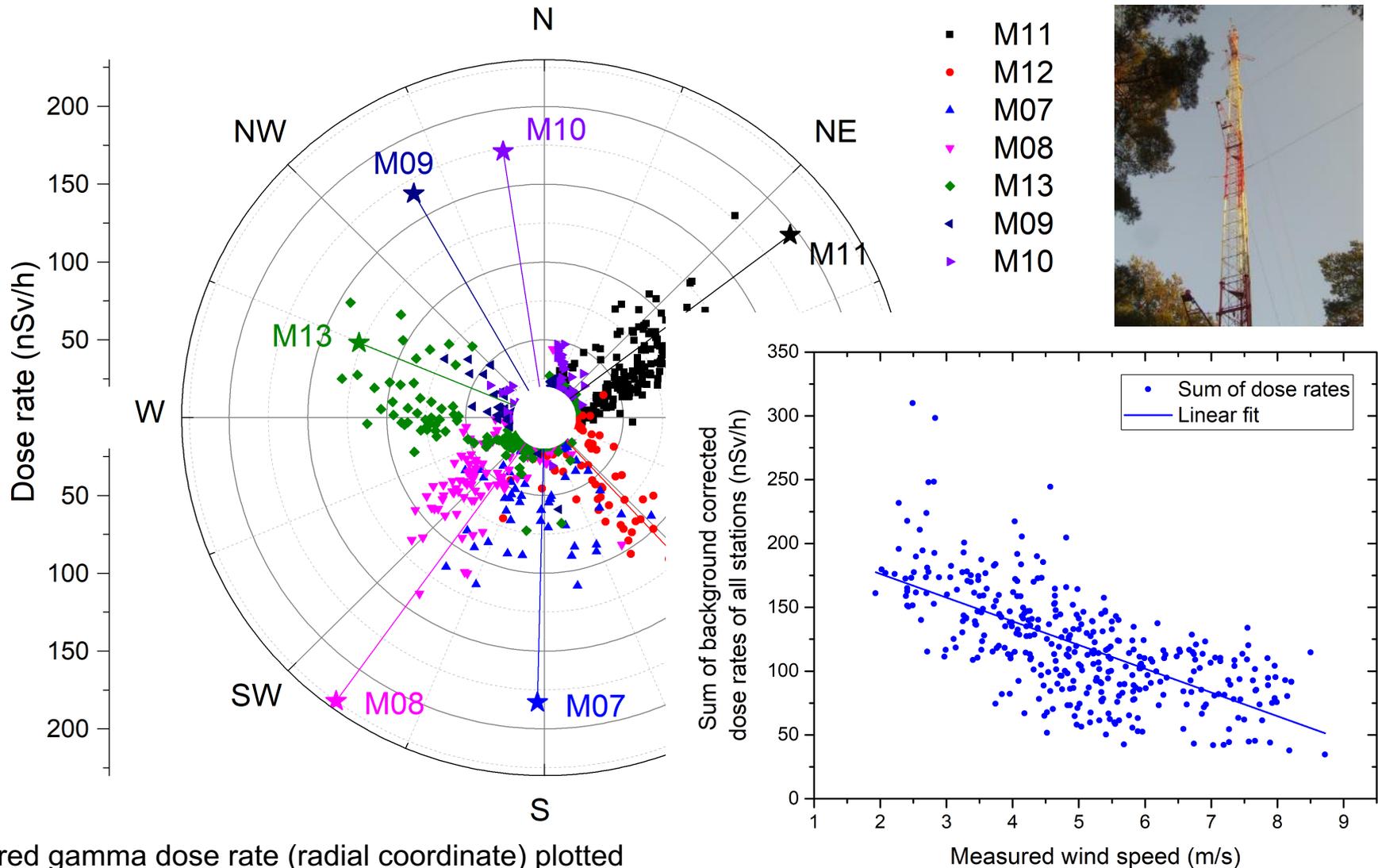
Release data and gamma dose rate data

- ✓ Stack monitor only used to define periods of constant release
- ✓ Release rate determined based on reactor power
- ✓ Participants got hypothetical source term, results corrected in analyses
- ✓ Background corrected ambient gamma dose rate data (NaI detectors, spectroscopic information not used)

Example of one of the 16 selected days:



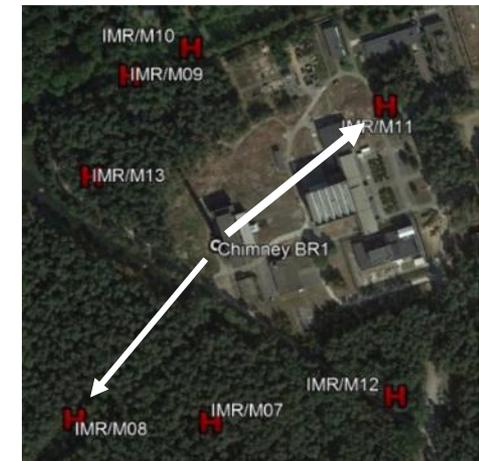
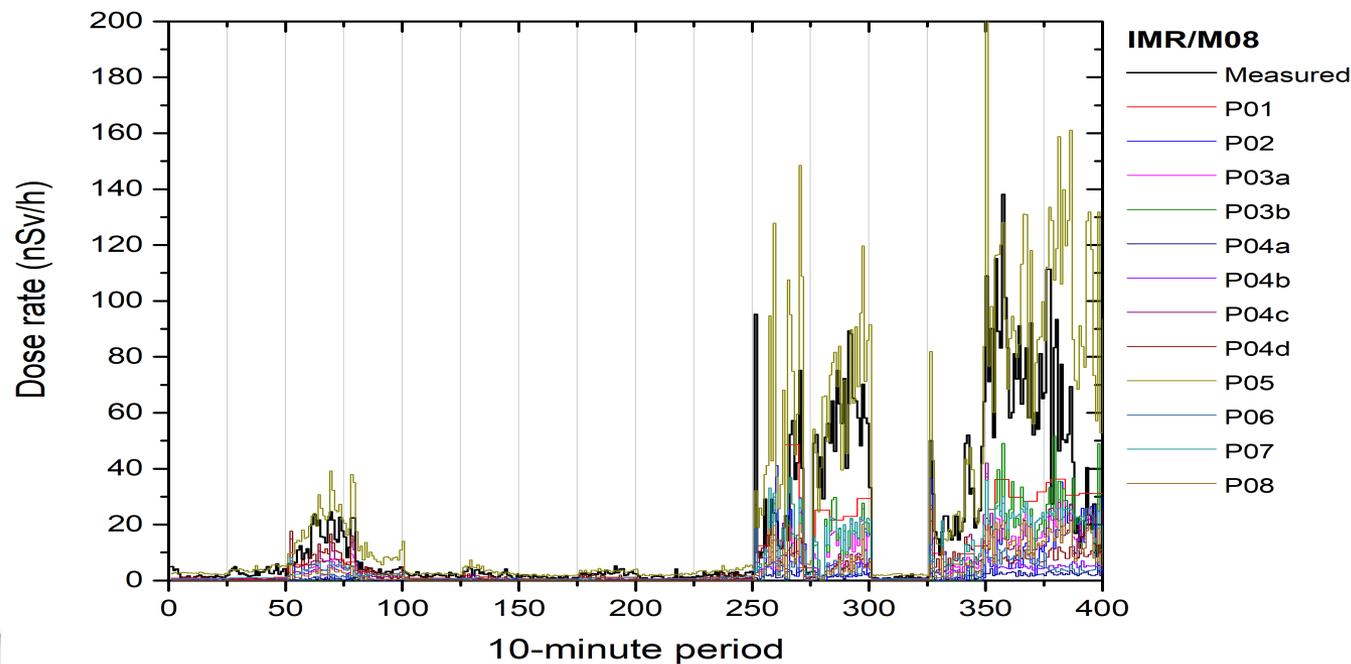
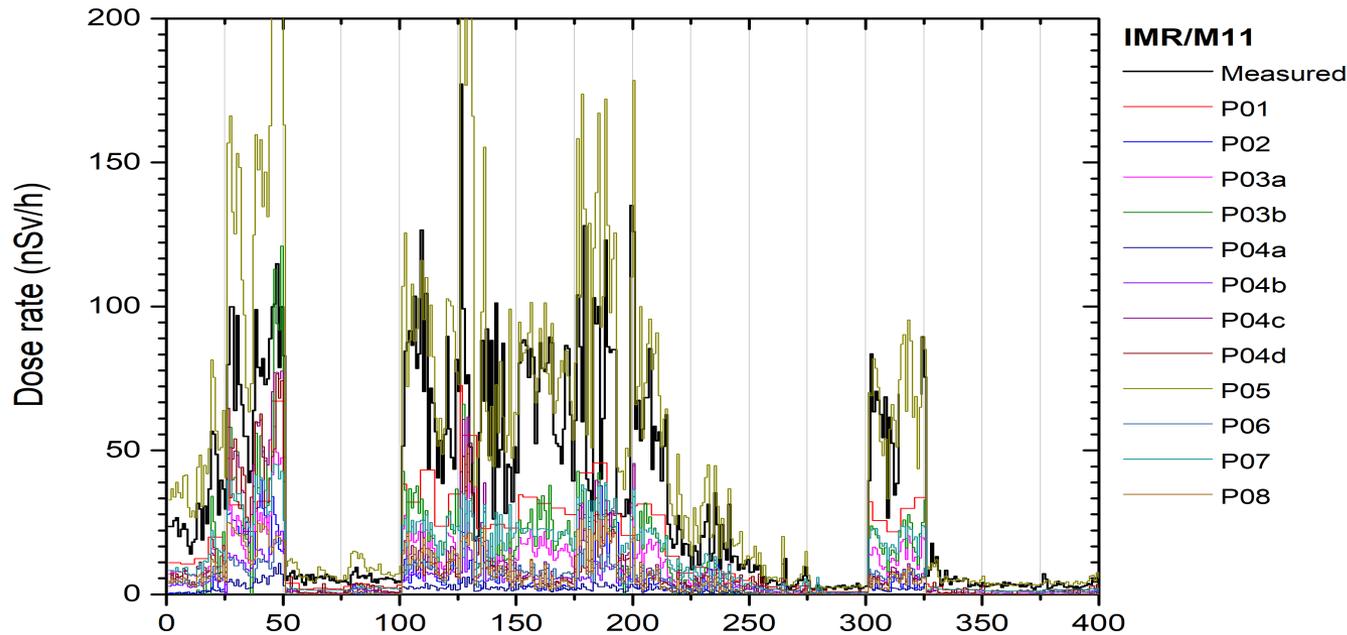
Meteo-data Correlation wind direction (@69 m) – measurements



Measured gamma dose rate (radial coordinate) plotted against 180° reflected measured wind direction (angular coordinate)

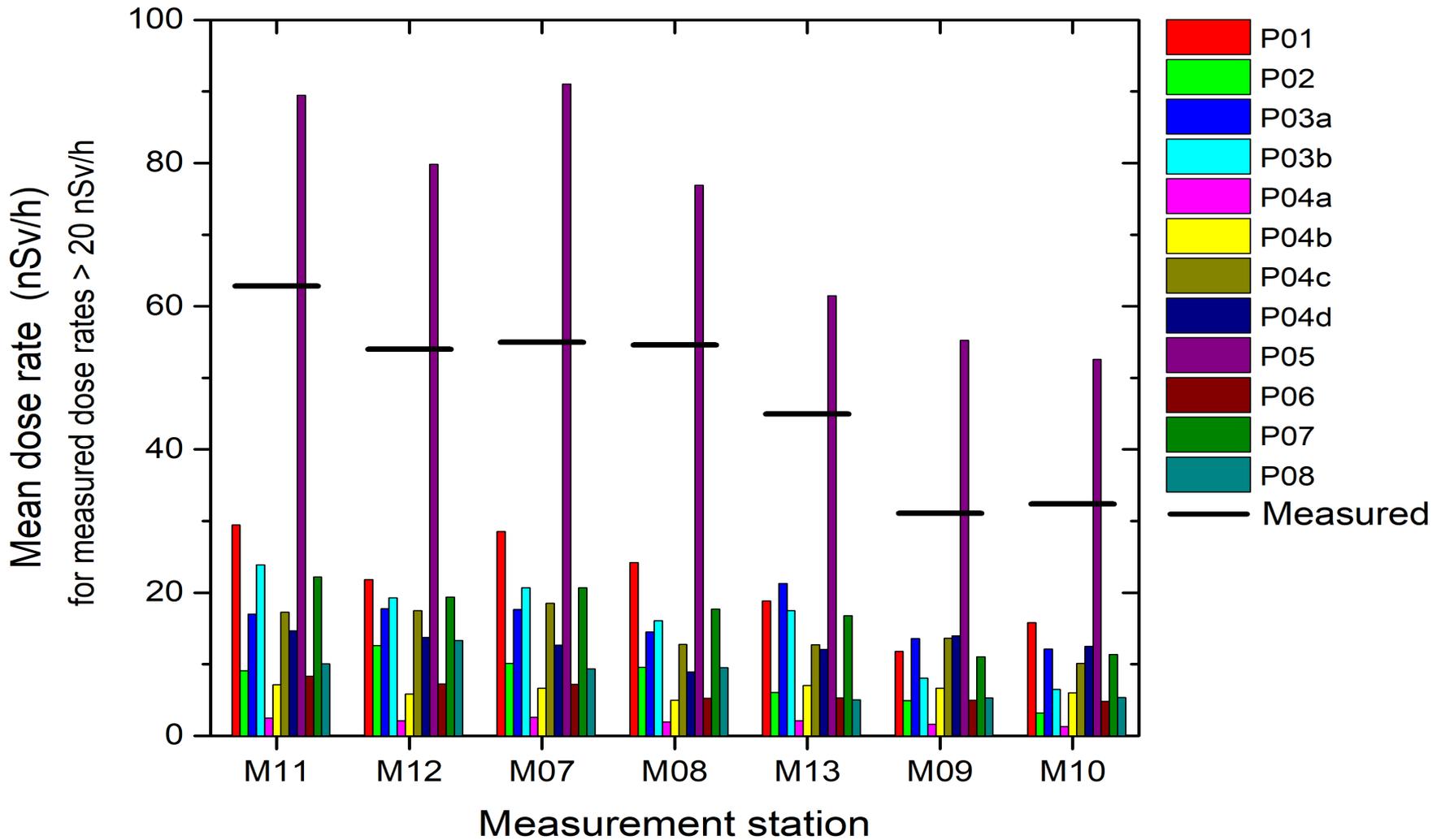
Results

Example of 2 nearly opposite stations (measured and calculated by participants)

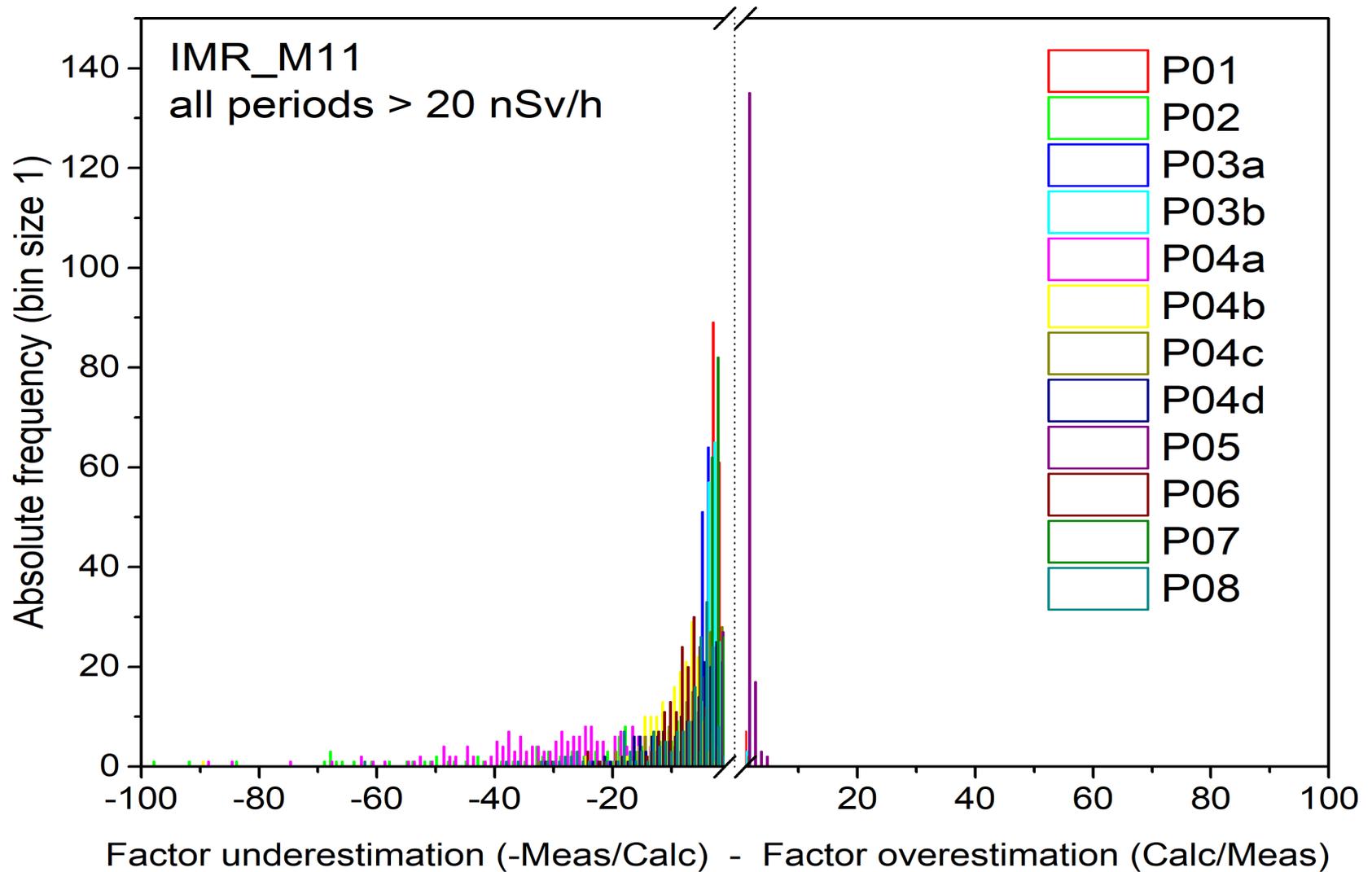


High correlation between measured and calculated results

Comparison of mean results for every station



Distribution of individual results of different participants (example of one station)



Discussion of results – future plans

- ✓ Atmos. Disp. Model types: simple Gaussian, puff, particle & CFD
- ✓ Gamma dose rate models range from semi-infinite plume approximations towards 3D finite plume models
- ✓ Differences between different models (measured >20 nSv/h)
 - ✓ Mean results: up to factor 30 (at least some models would not produce right order of magnitude)
 - ✓ Individual results: up to a factor > 100
 - ✓ Number of similar results: dose rate robust observable for source term estimation?
- ✓ Most models (except one) underestimate systematically the measured dose rates, “bias” by most models currently not understood:
 - ✓ Atmospheric dispersion modelling
 - ✓ Dose model
 - ✓ Source term
 - ✓ (combination of effects)
- ✓ Paper/report in preparation → data available for other interested modellers
- ✓ Interest in continuation:
 - ✓ Specific campaign around BR1 at larger distances (500 m)
 - ✓ Other sites with routine emissions