Long term seismic noise in Matra

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Content

1. Long term seismic characterisation of Matra
2. What is characterised by rms_{2Hz} ?

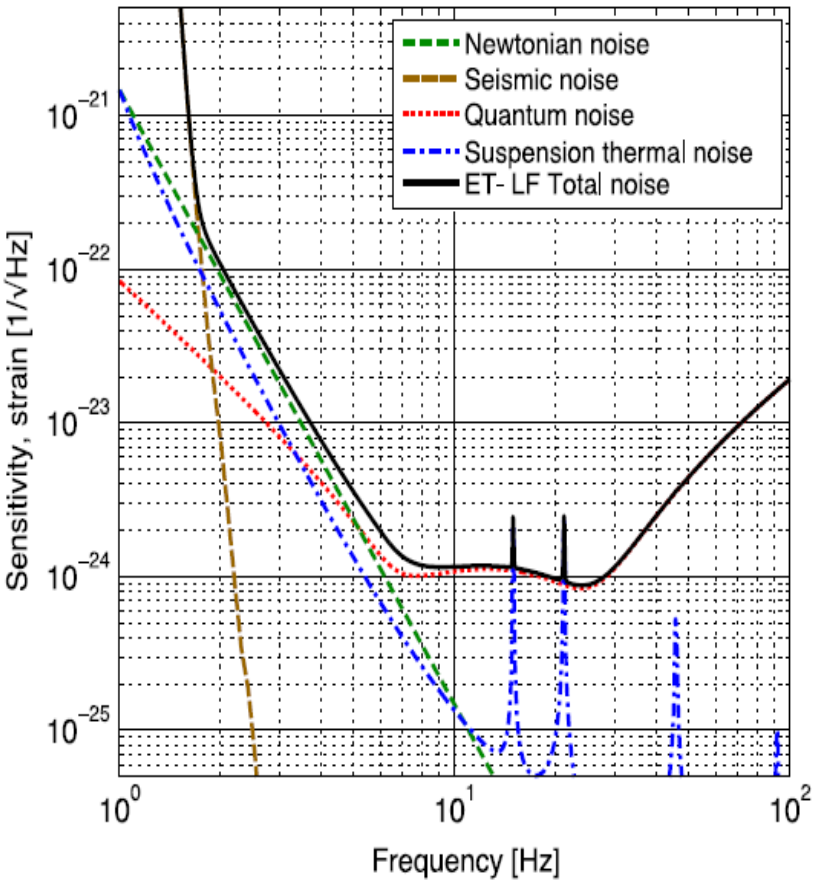
Site selection characteristics

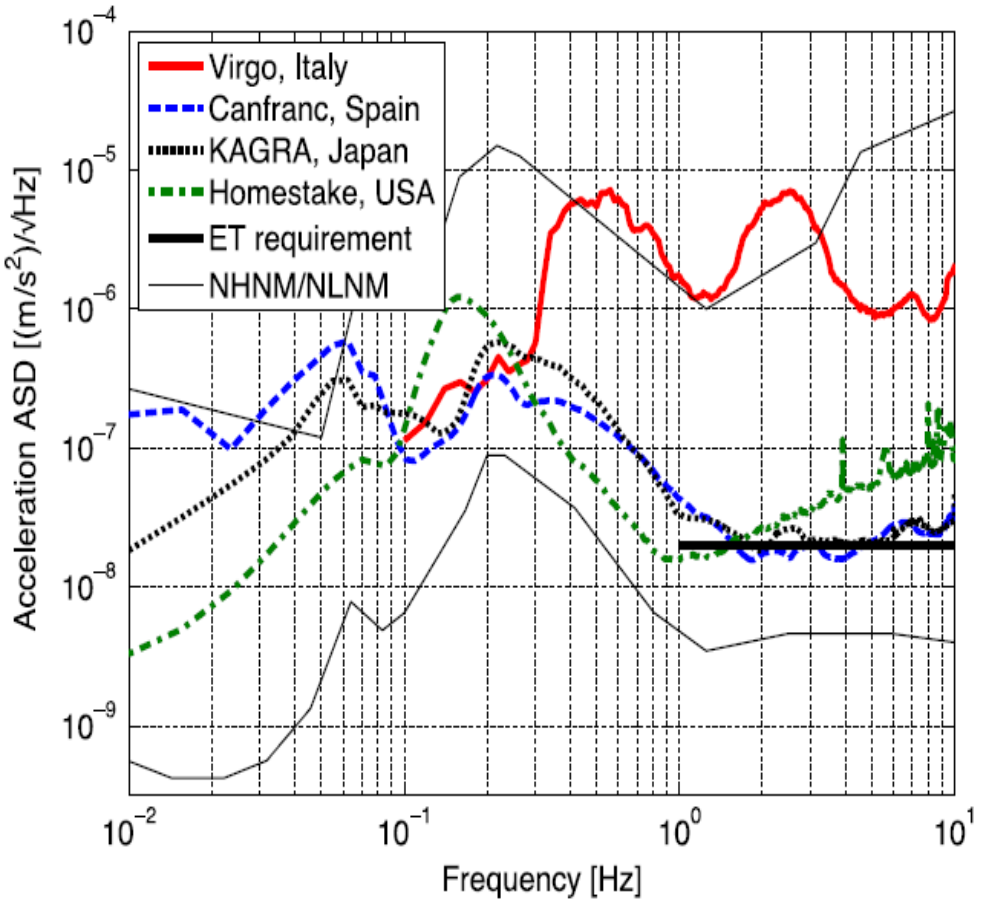
Beker 2013 PhD thesis, Beker et al. 2015.

Spectral: Black Forest line, AASD $2 \times 10^{-8} \frac{ms^{-2}}{\sqrt{Hz}}$

Cumulative: 2Hz-f_N displacement rms < 0.1 nm.

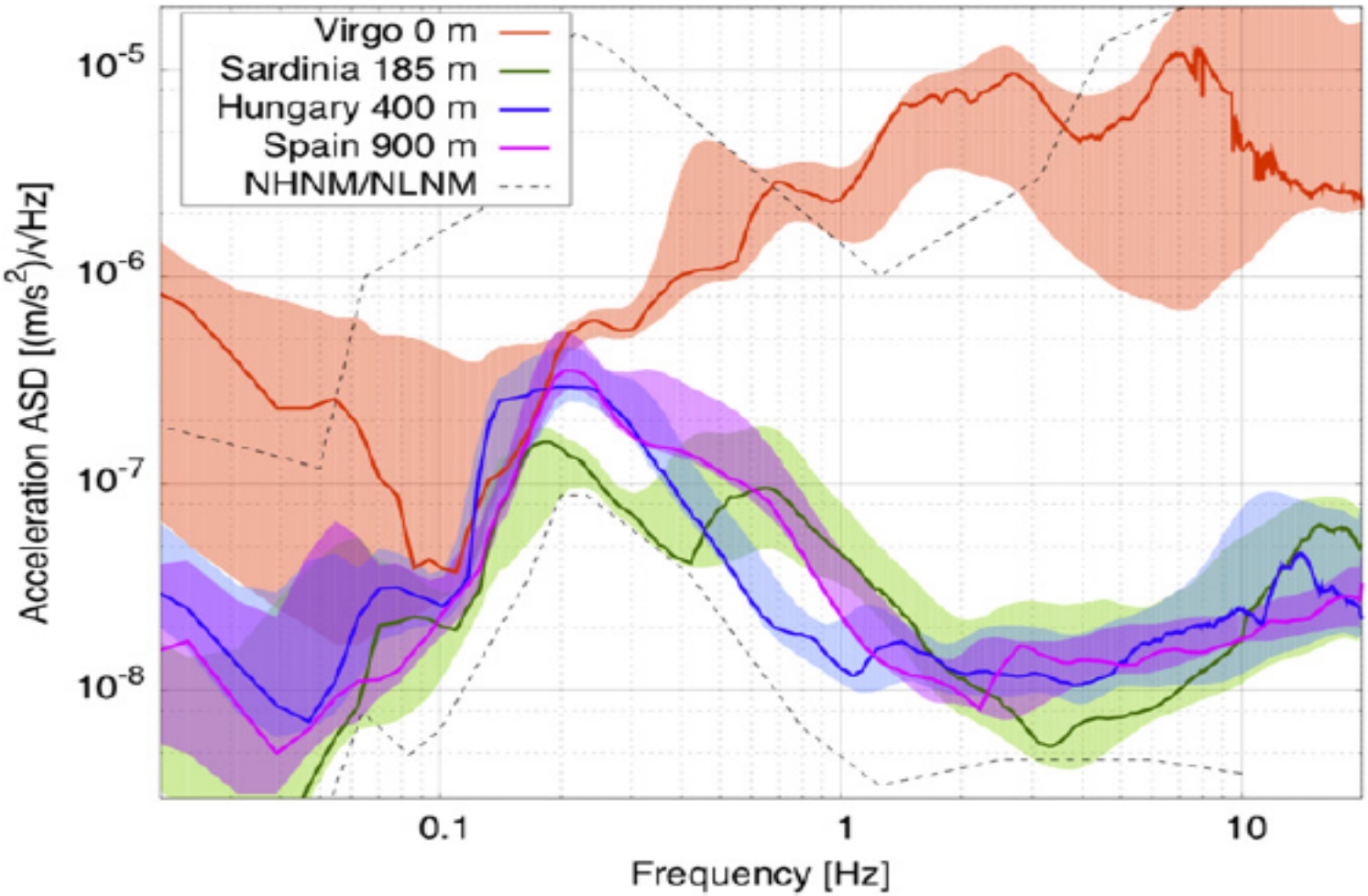
Variation: average between 2-3Hz of the acceleration ASD.





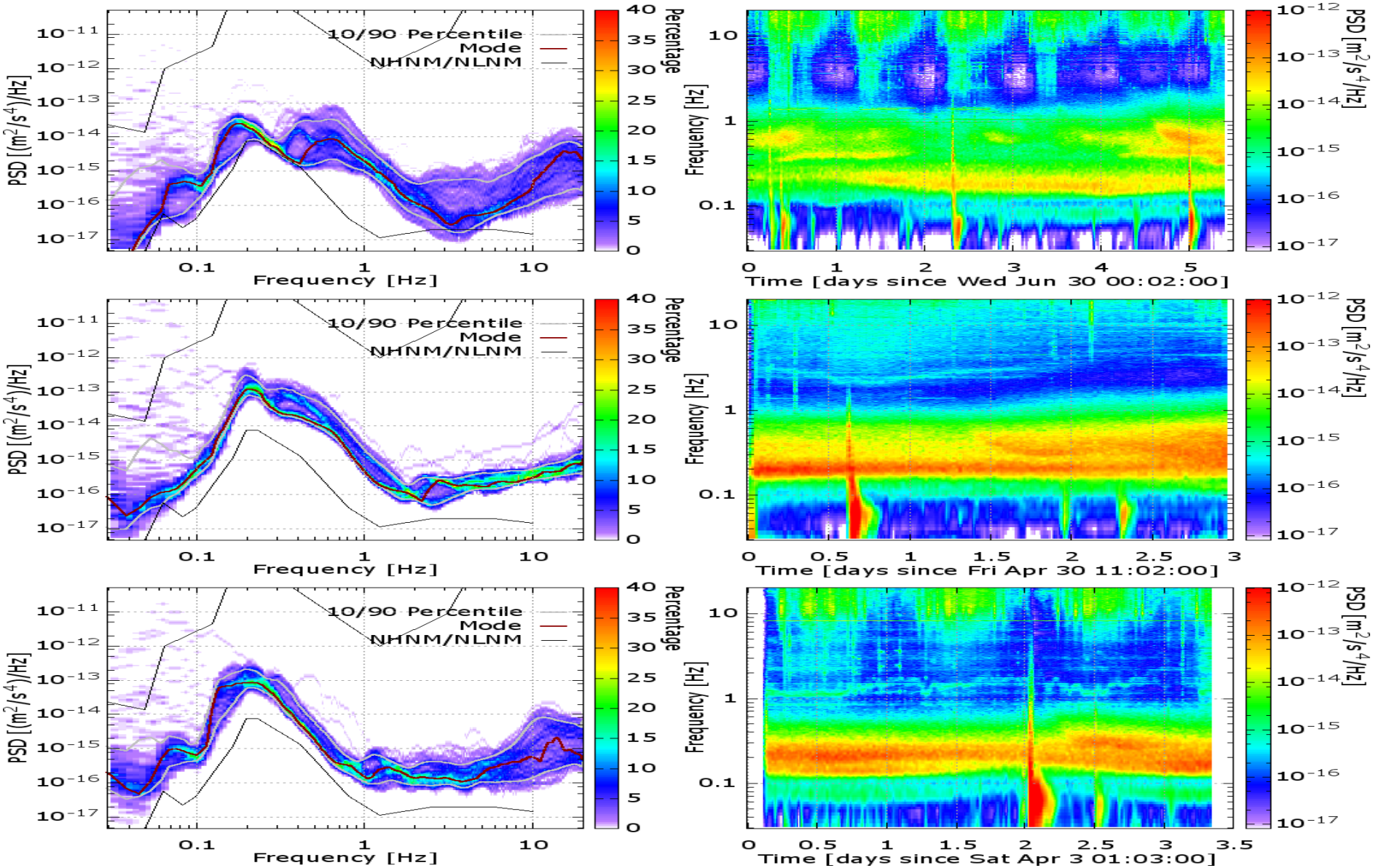
Best sites

Beker 2013 PhD thesis.



rms_{2Hz} [nm]	Spain	Italy	Hungary
	0.070	0.077	0.082/0.12

Sardinia (-189m) - Spain (-900m) - Hungary (-400m)



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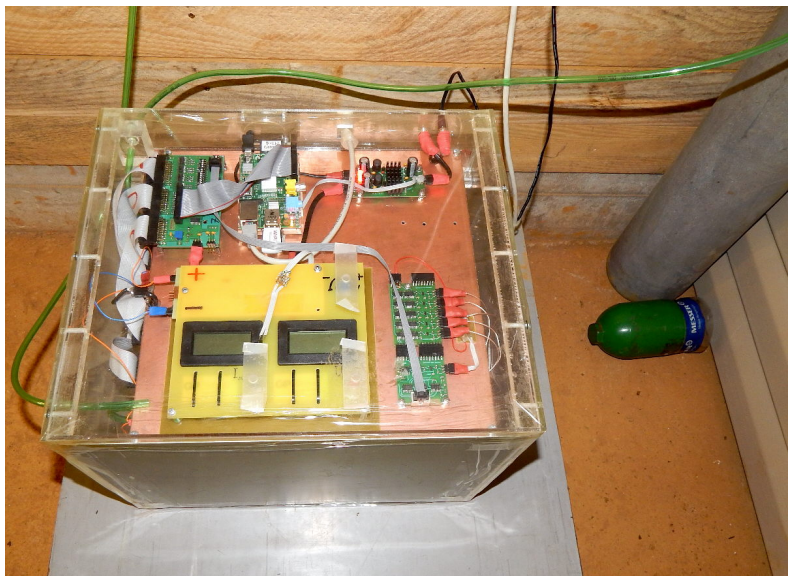
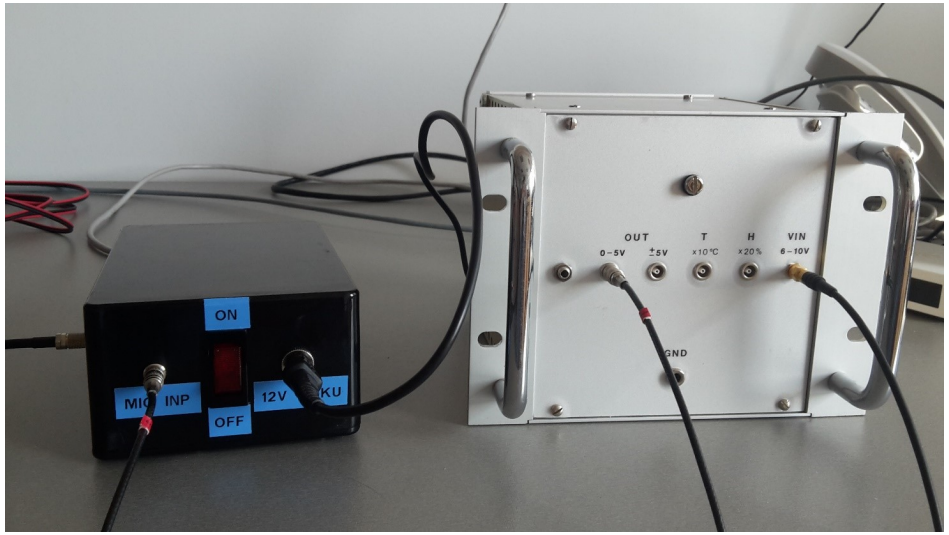
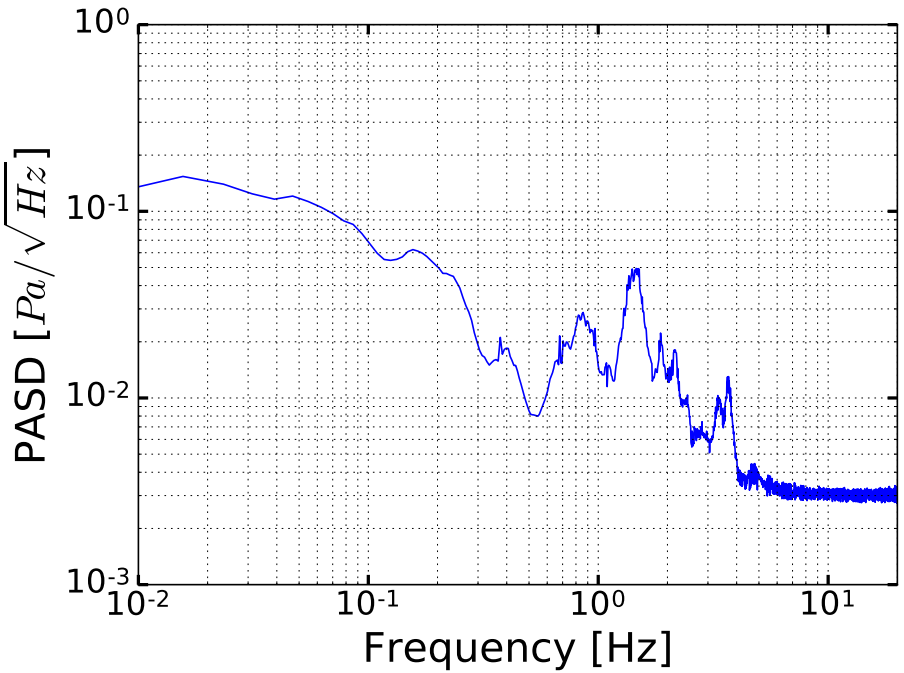
Depth	88m	404m
Distance	1285m	3764m
Data acquisition	02/2016-12/2017	01-14/06/2017

MGGL : seismometers (WU, Güralp), EM, muon detector

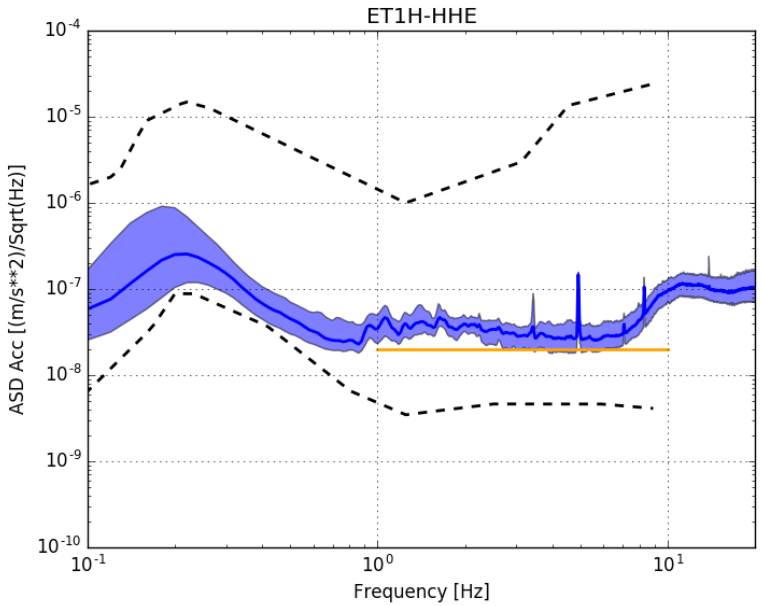


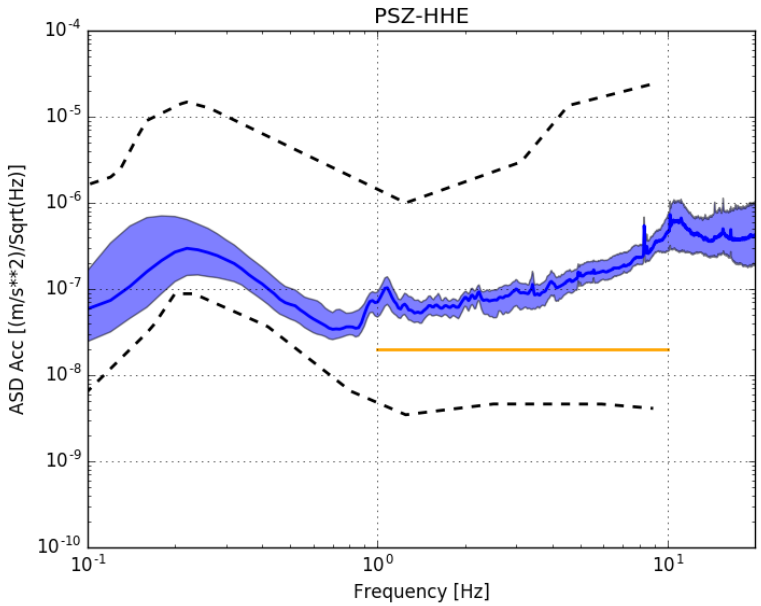
Infrasound measurements

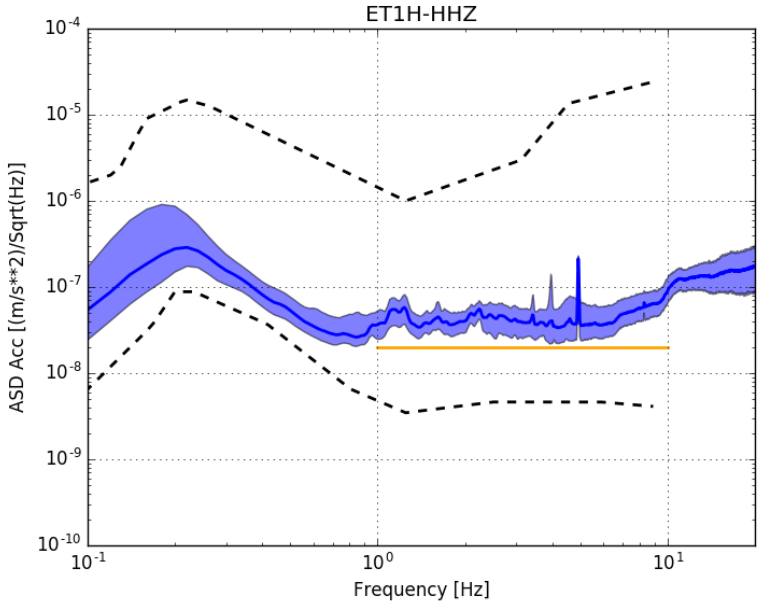


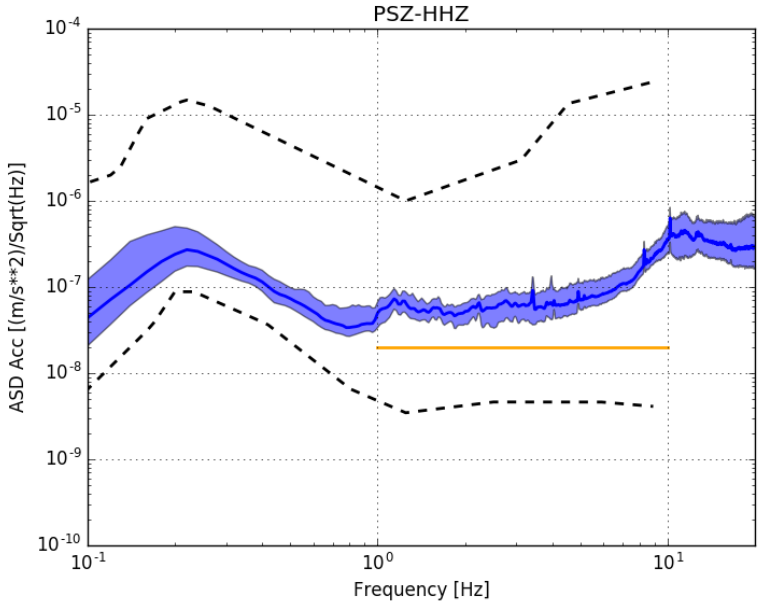


ET1H 88m, 604 days vs. PSZ 0m(944m), 332 days

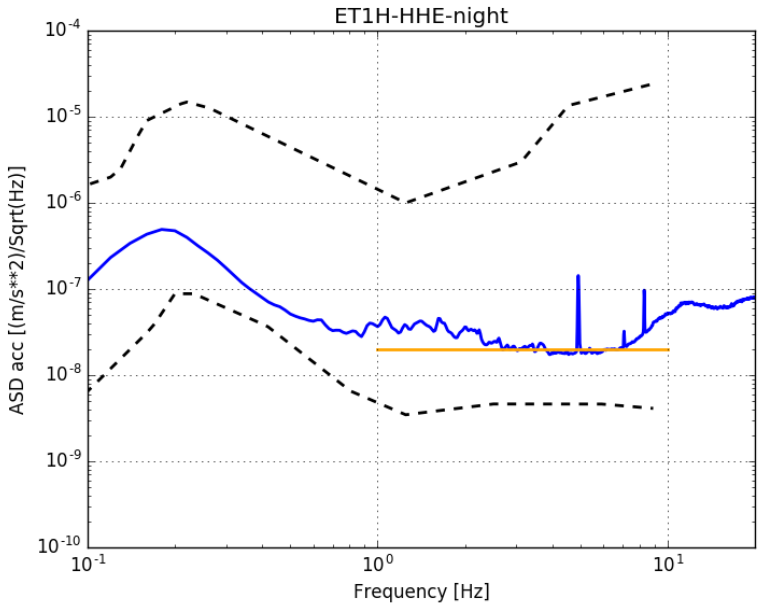


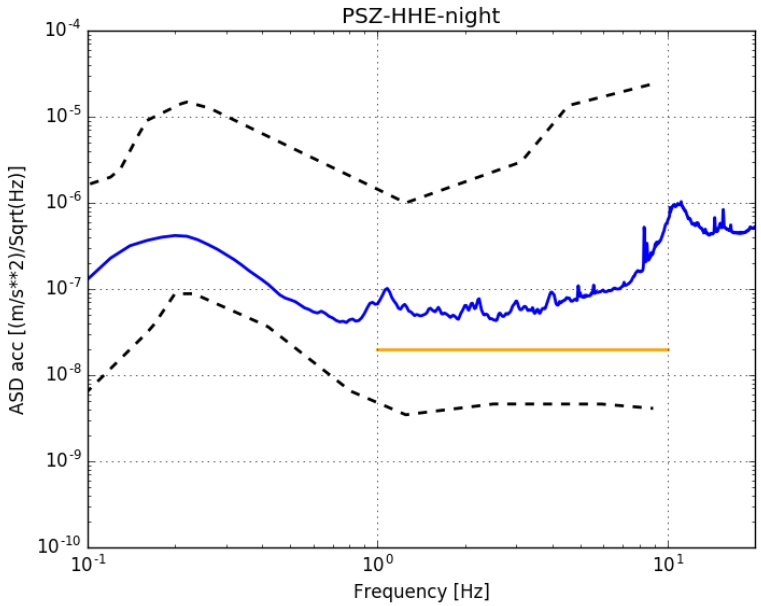


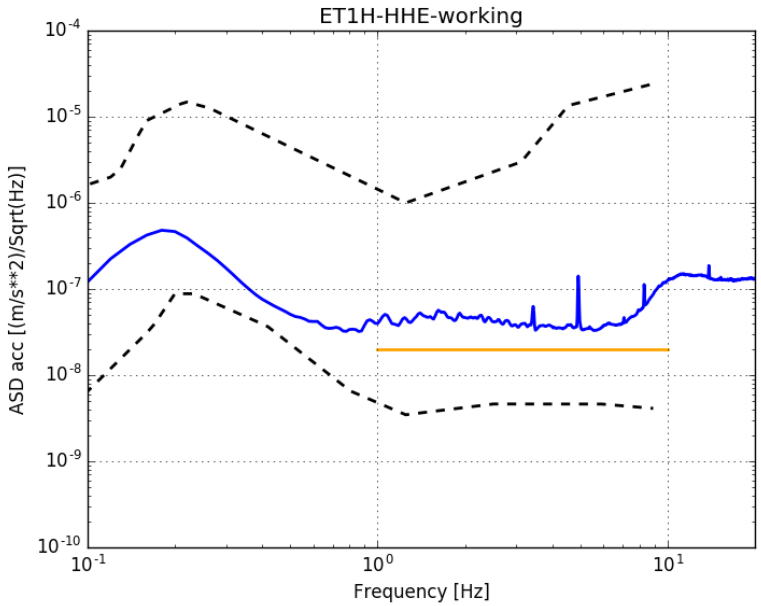


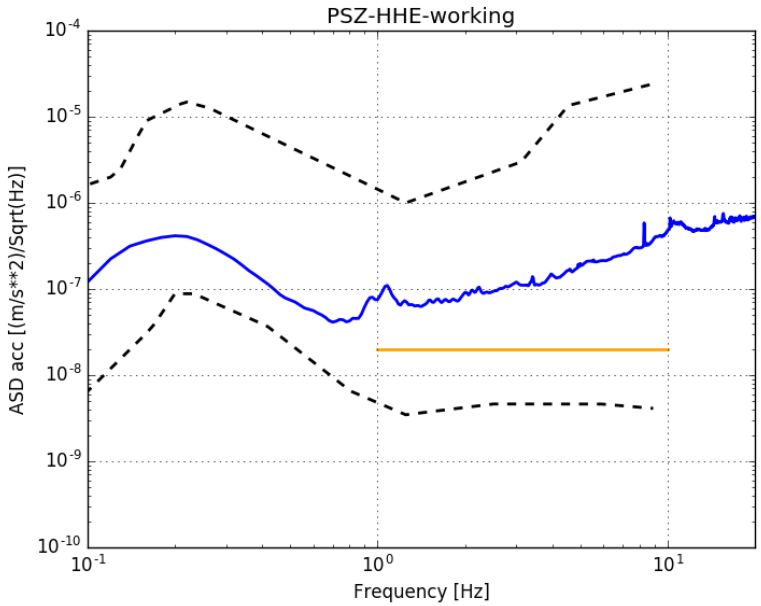


ET1H 88m, 604 days: night (21pm-3am) vs. work (10am-16pm)

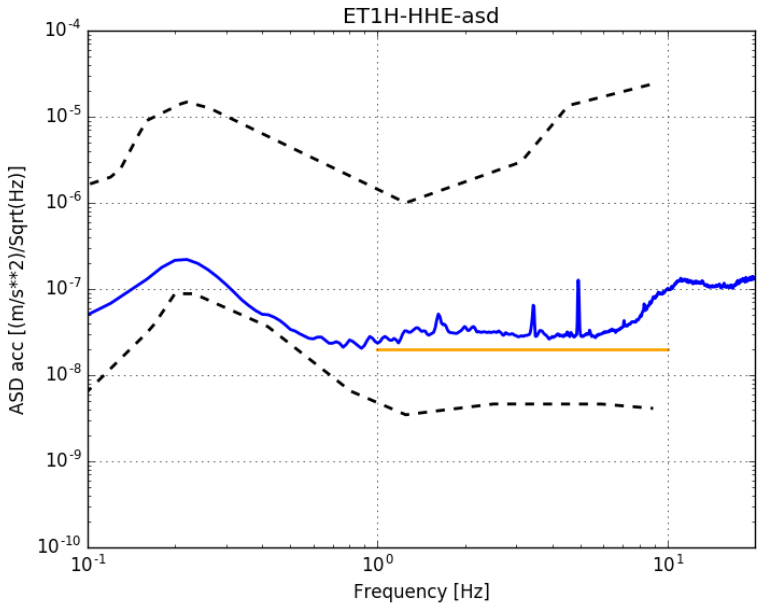


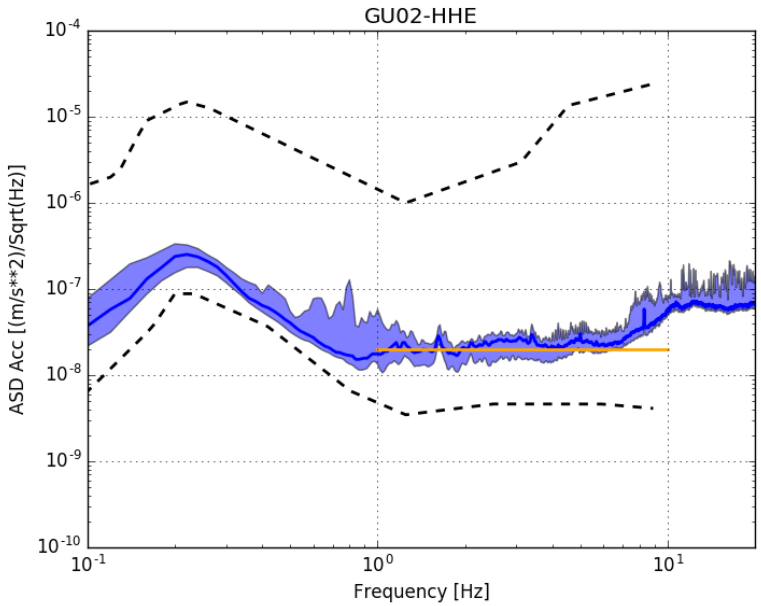


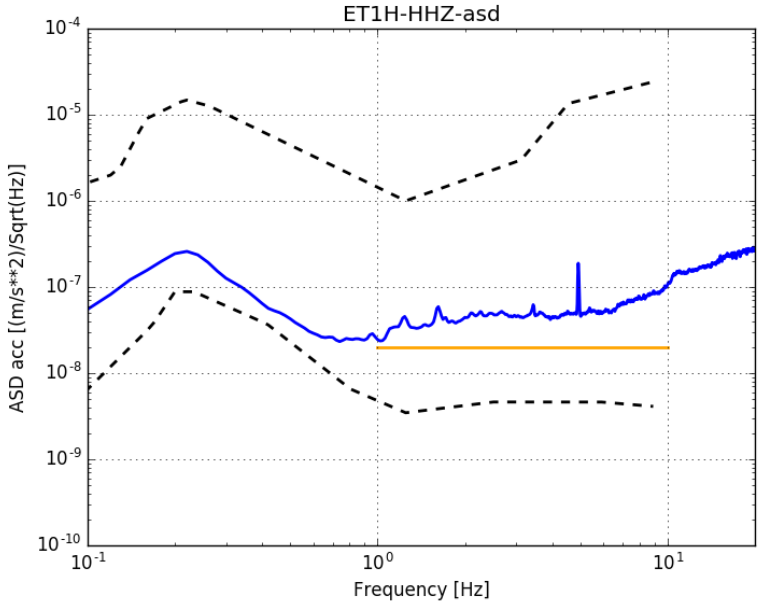


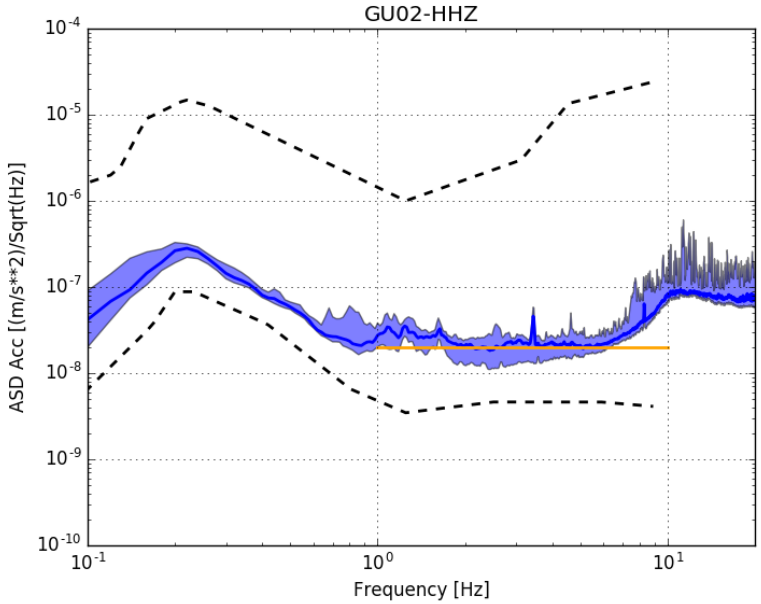


01-14/06/2017: ET1H 88m vs. GU02 404m

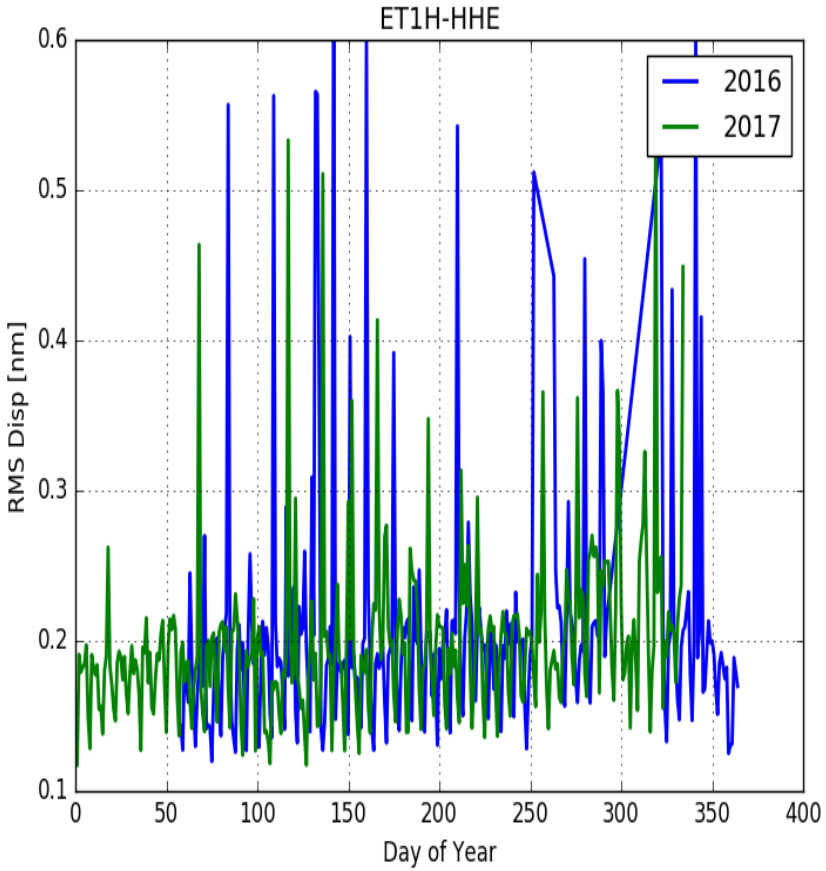


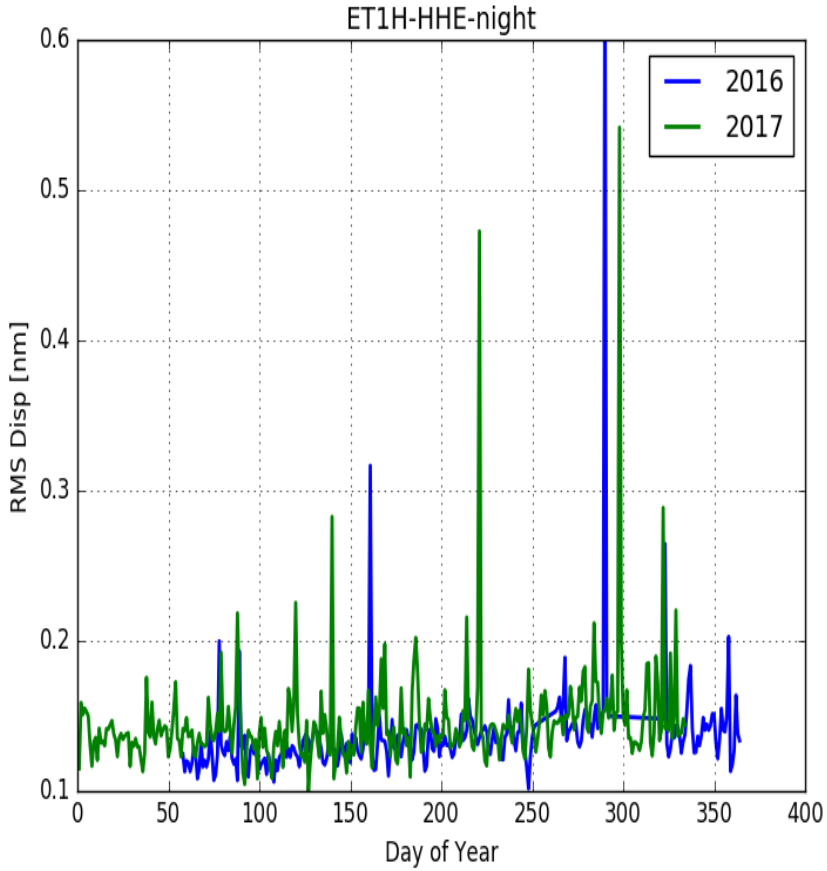






ET1H 88m, 604 days, rms_{2Hz} : average vs. night

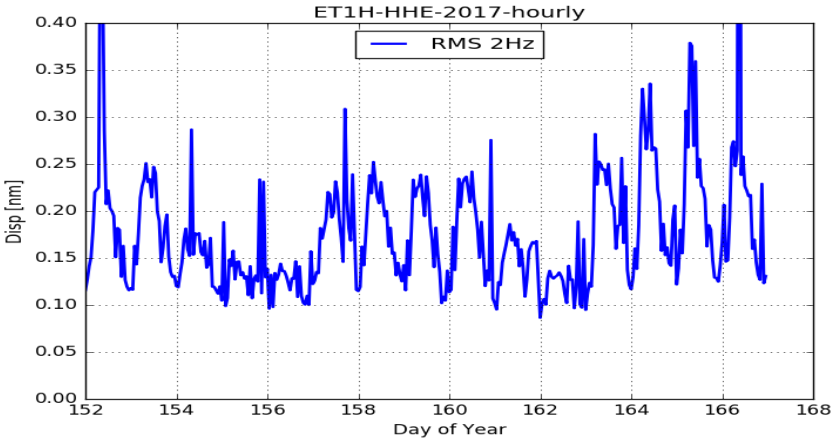


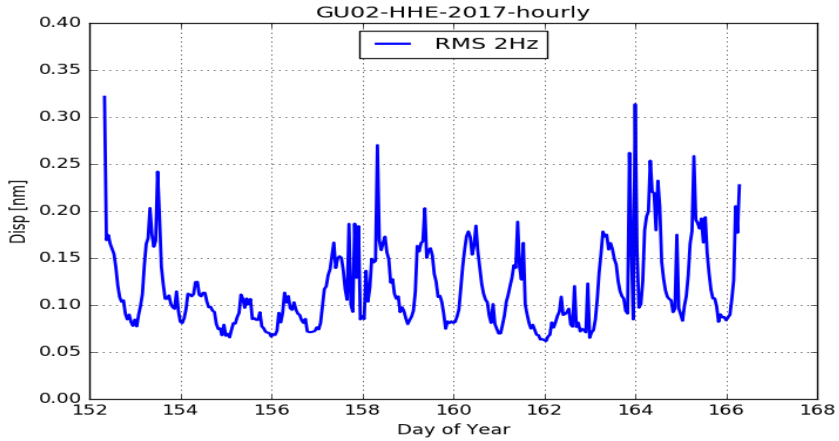


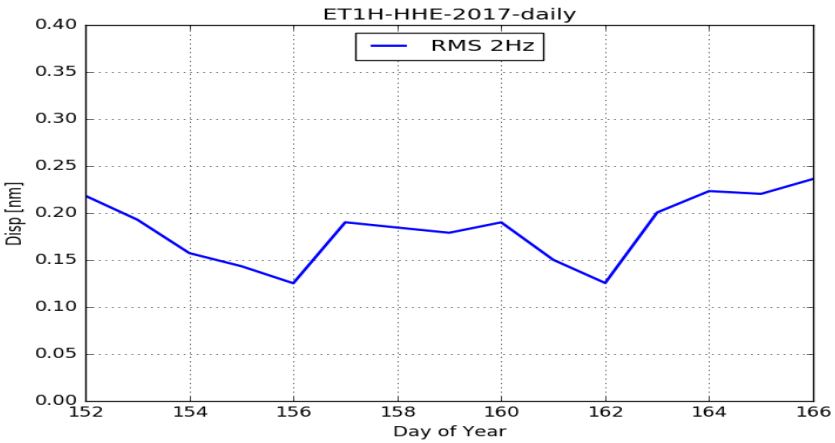
HHE rms_{2Hz} [nm]	Total	Night	Work
ET1H	0.214	0.146	0.239
PSZ	0.590	0.480	0.673

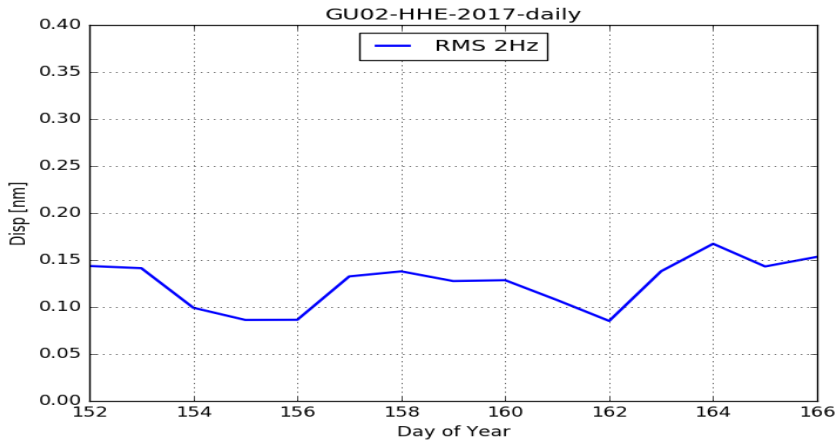
External noises are not filtered. Continous activity inside the mine. Daily train.

01-14/06/2017 rms_{2Hz}: ET1H 88m vs. GU02 404m







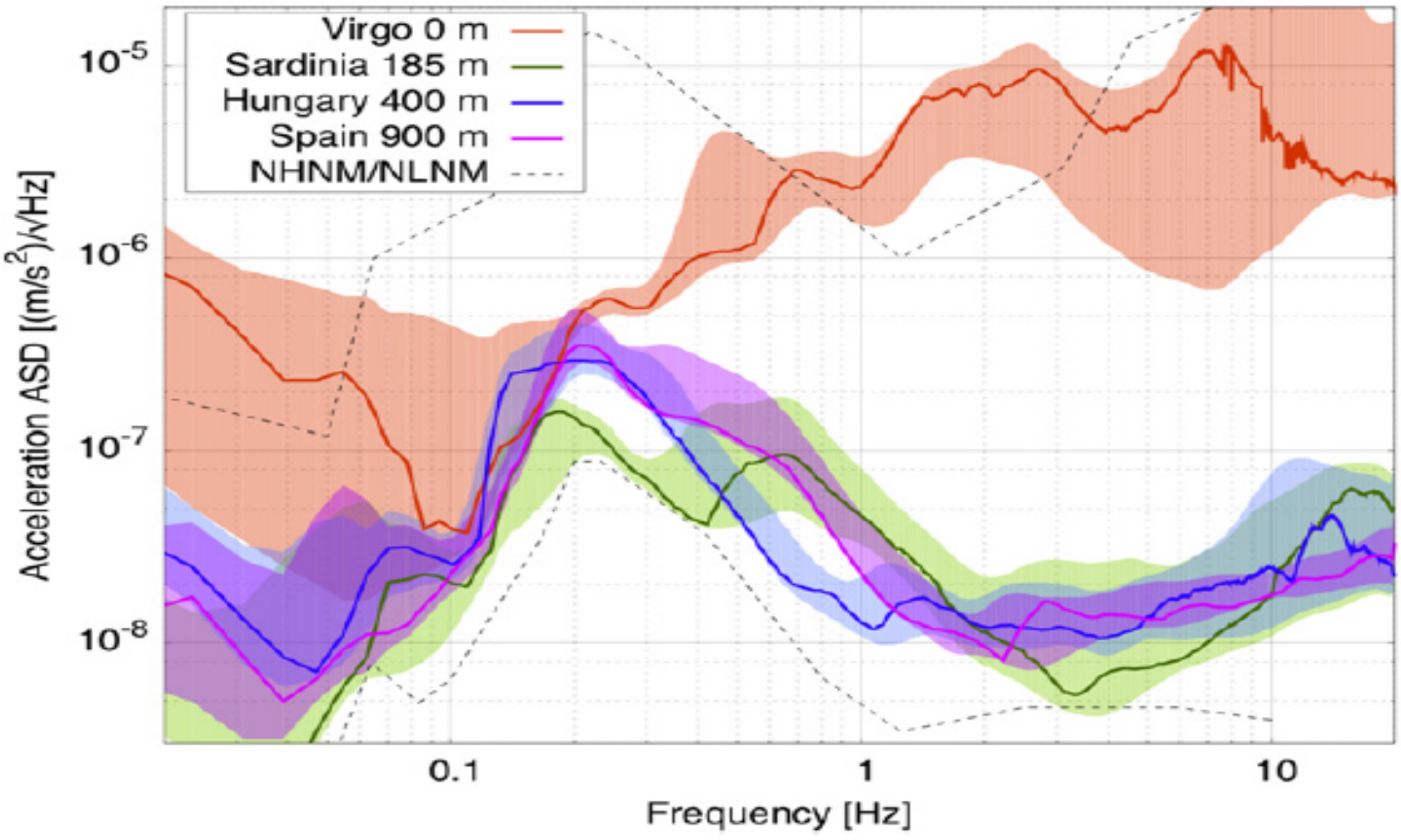


HHE rms_{2Hz} [nm]	Total	Night	Work
ET1H	0.185	0.141	0.200
GU02	0.126	0.093	0.140

External noises are not filtered. Work in 3 shifts near to MGGL. 3 trains/day.

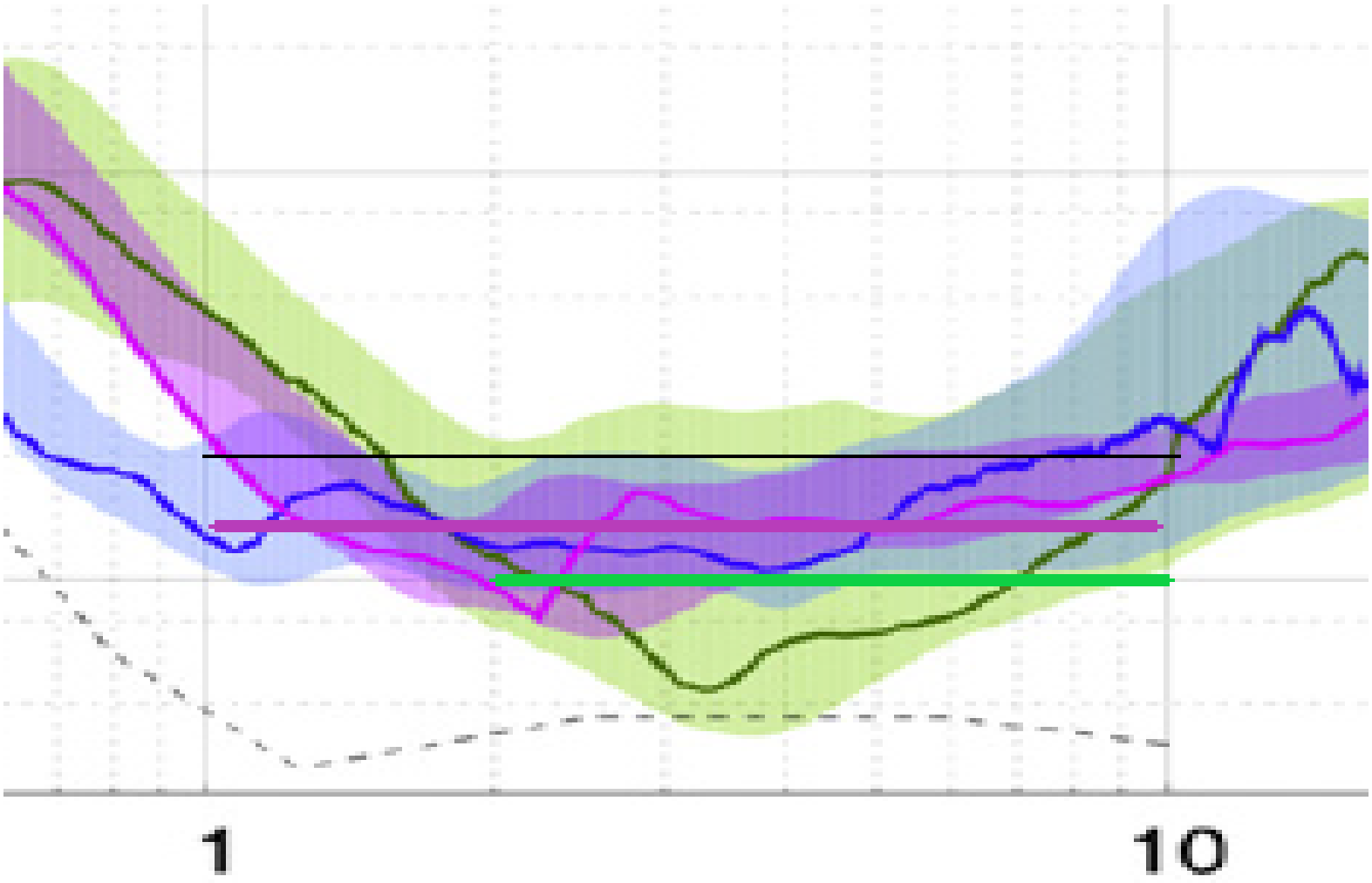
What is characterised by $\boldsymbol{rms}_{2\,Hz}$?

Consistent spectral and cumulative information



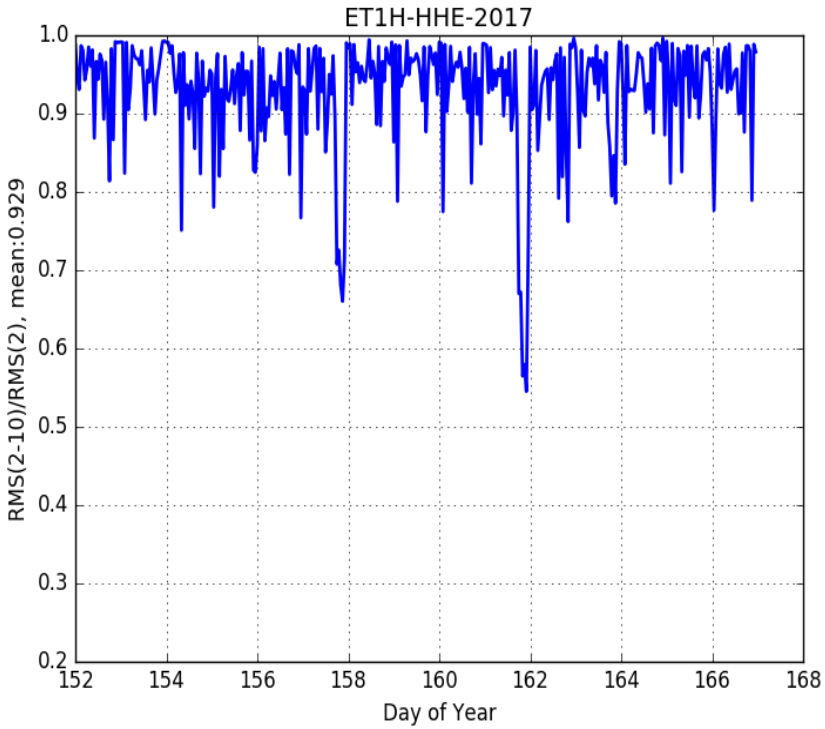
rms_{2Hz} [nm]	Spain	Italy	Hungary	Virgo	Black Forest
	0.070	0.077	0.082/0.12	26.4	0.2

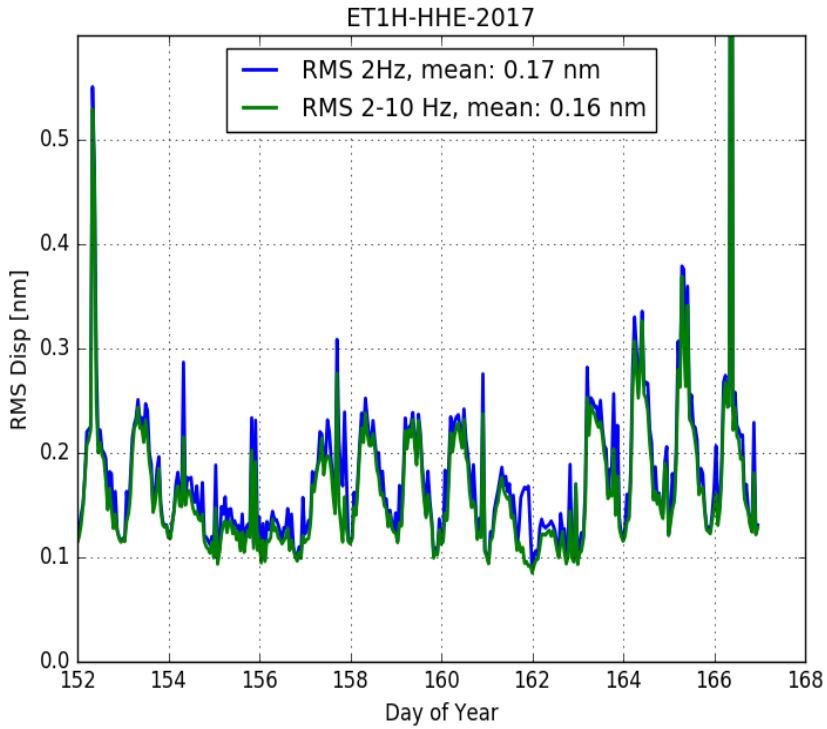
rms_{2Hz} : contributions below 2Hz?



	black	Spain	Italy
$Crms_{2Hz}$ [nm]	0.1	0.073	0.05
rms_{2Hz} [nm]	-	0.070	0.077

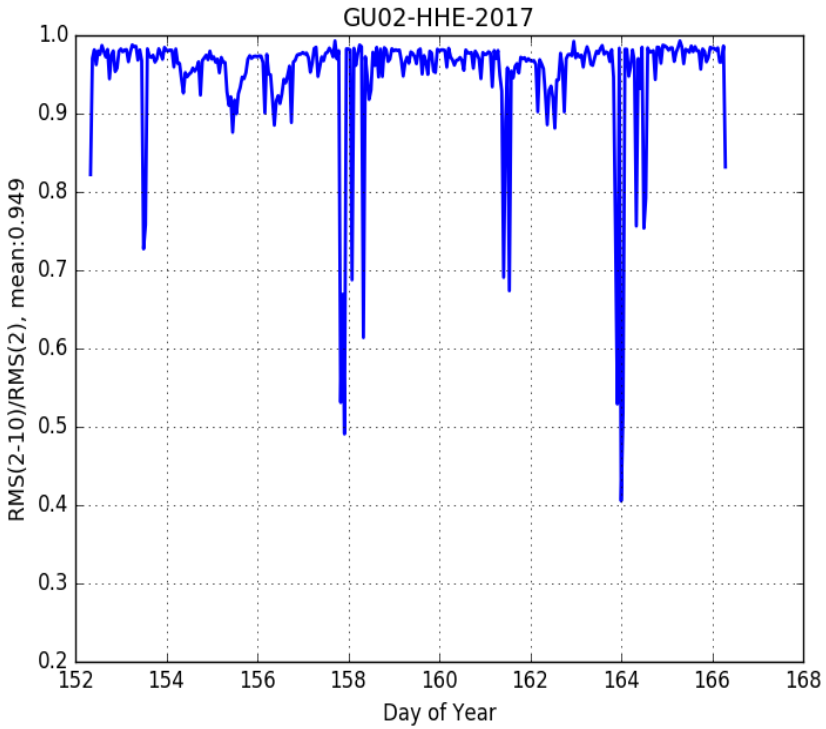
rms_{2Hz}: information above 10Hz?

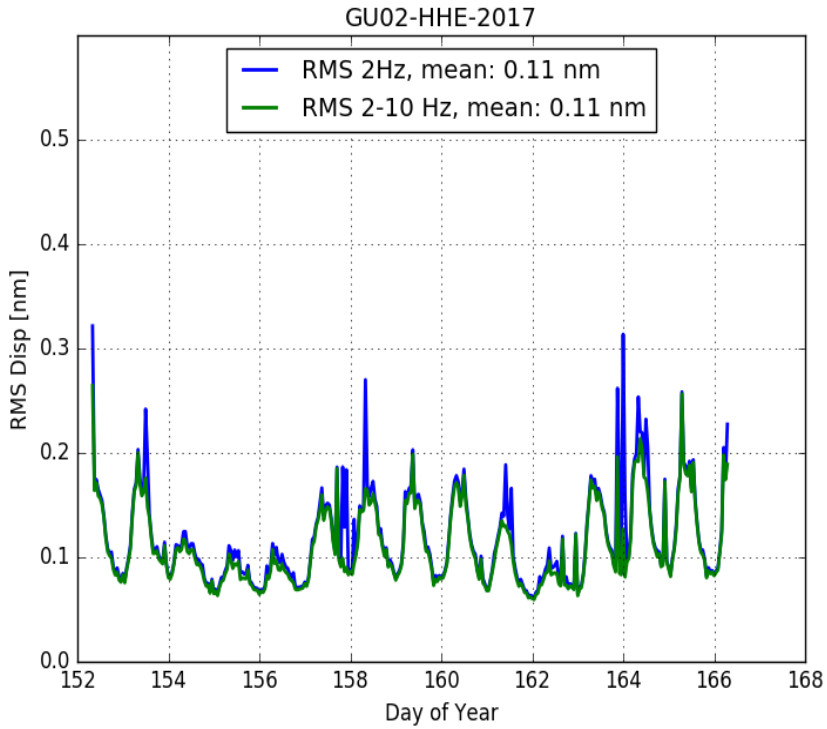




rms_{2Hz} and rms_{2-10Hz} can be significantly different.
Max ET1H 88m: 40%. The mean is 93% in two weeks.

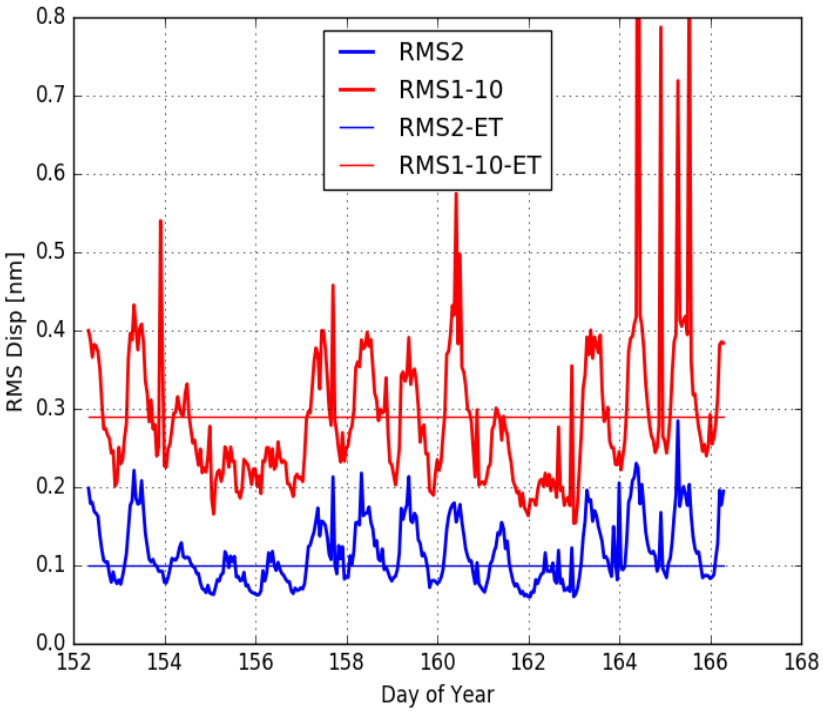
rms_{2Hz}: information above 10Hz?

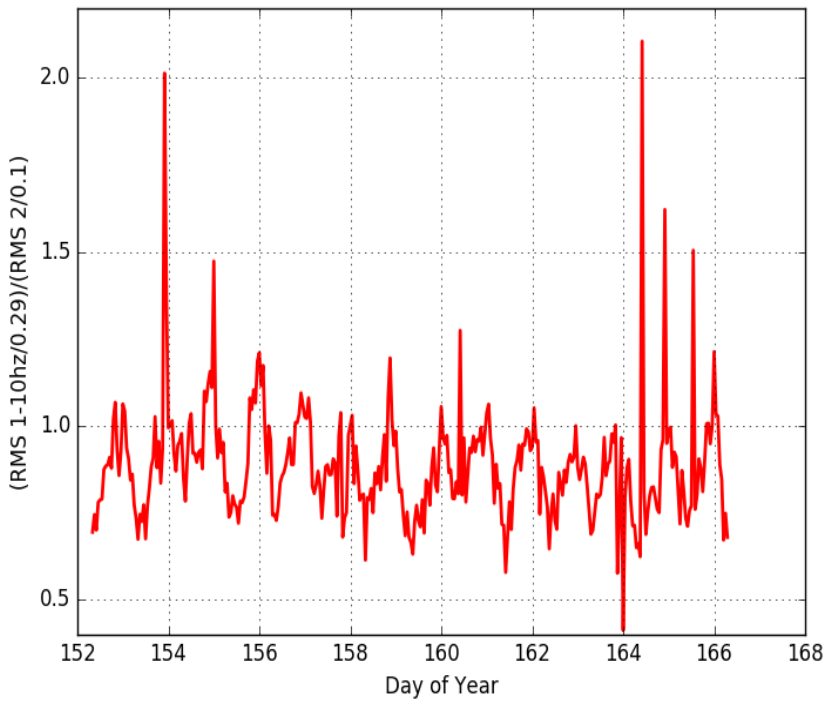




rms_{2Hz} and rms_{2-10Hz} can be significantly different.
Max GU02 404m: 50%. The mean is 95% in two weeks.

rms_{1-10Hz}?





From ET requirement $rms_{2Hz} = 0.1nm$ and $rms_{1-10Hz} = 0.29nm$.
Low frequency criteria ratio: $Lfcr = \frac{0.1}{0.29}\frac{rms_{1-10Hz}}{rms_{2Hz}}$,
$LFcr = 1$ if they are the same.

Plans

1. Separation of internal and external noises,
2. Correlation of infra and seismic information,
3. Characterisation of noise damping by rock masses.

Cross validation of the special seismometer of the Warsaw University. Some problems.
Our spectral data and many plots (spectrums and rms) is open here:

https://mydrive.kfki.hu/d/b630234440/

We are interested in processing the data of any other sites. Validation.

Thank you for the attention !

The MGGL group

- Wigner Research Centre for Physics:
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  DAQ laboratory: E. Dávid;
- Research Centre for Astronomy and Earth Sciences:
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- Technical University of Warsaw: T. Bulik, D. Gondek-Rosinska, M. Suchenek;
- Eszterházy Károly University: T. Novák, Zs. Bernáth*, A. Molnár*;
- Furthermore: B. Vásárhelyi (BME), J. Molnár (Atomki), G. Surányi (ELTE);

Industrial collaborations: Nitrokémia Zrt., Kőmérő Kft., Geo-Faber Zrt.

*PhD, MSc or BSC student