PEM meeting

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  - ③ Differential Motion Reduction Effect

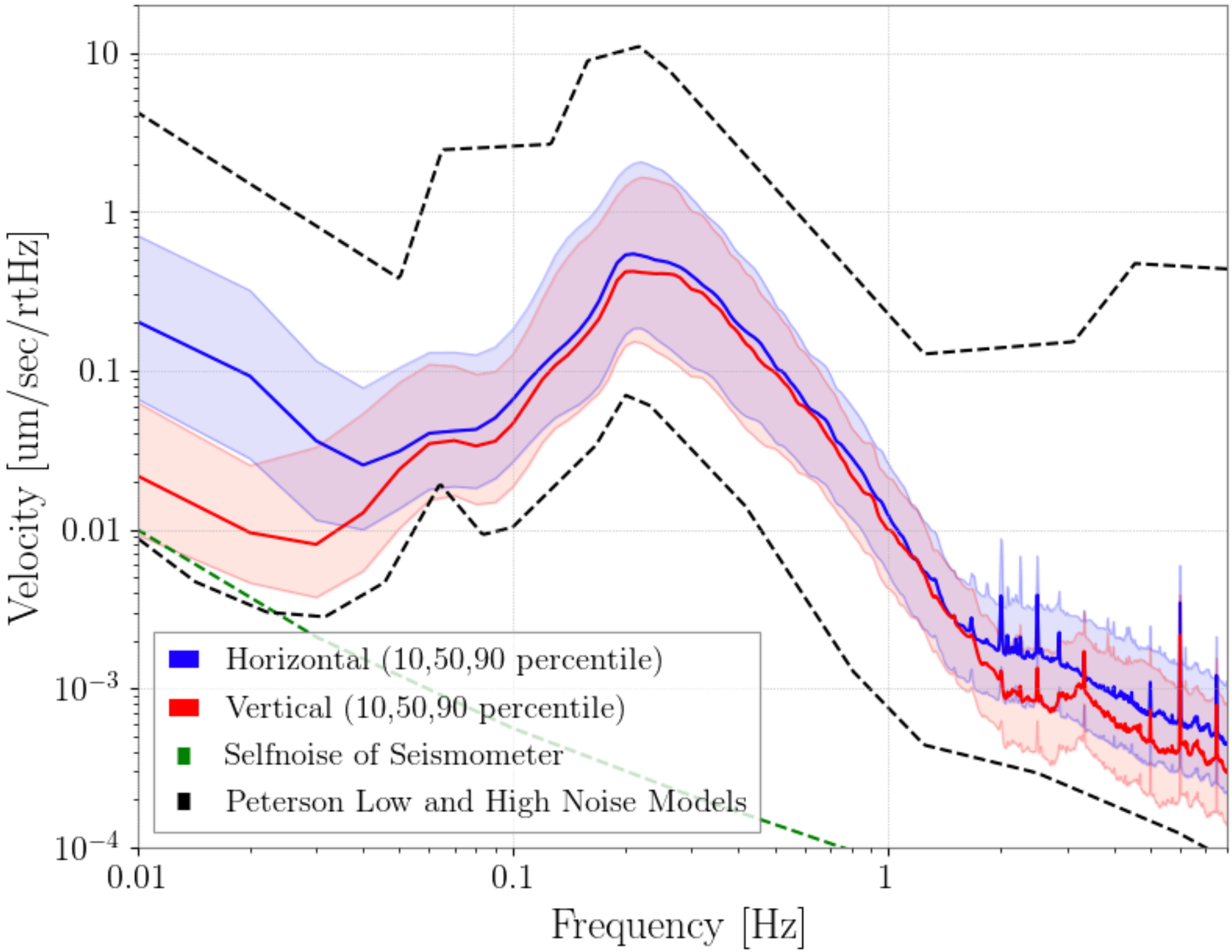
Detail (Tex Document)

These are ongoing topics.

Please give me comments!

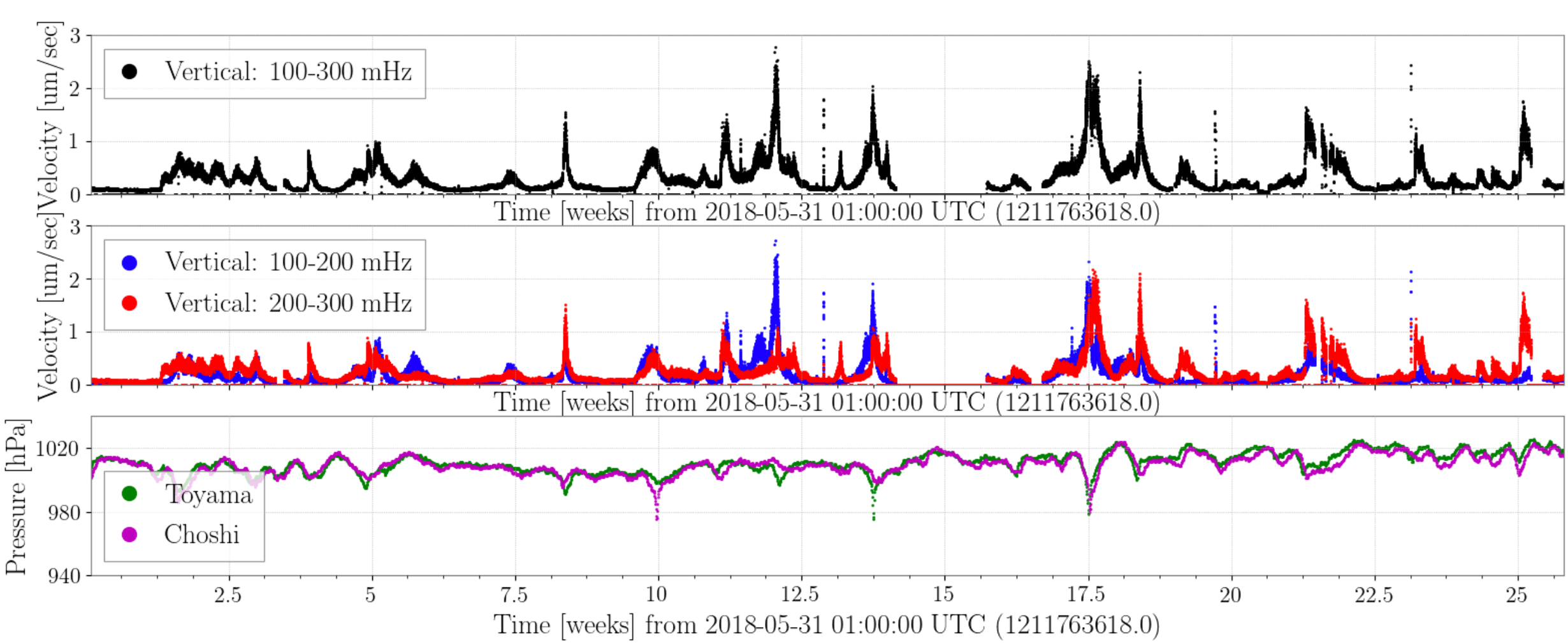
① Long Term Seismic Noise

Detail (Github#92) GIF animation

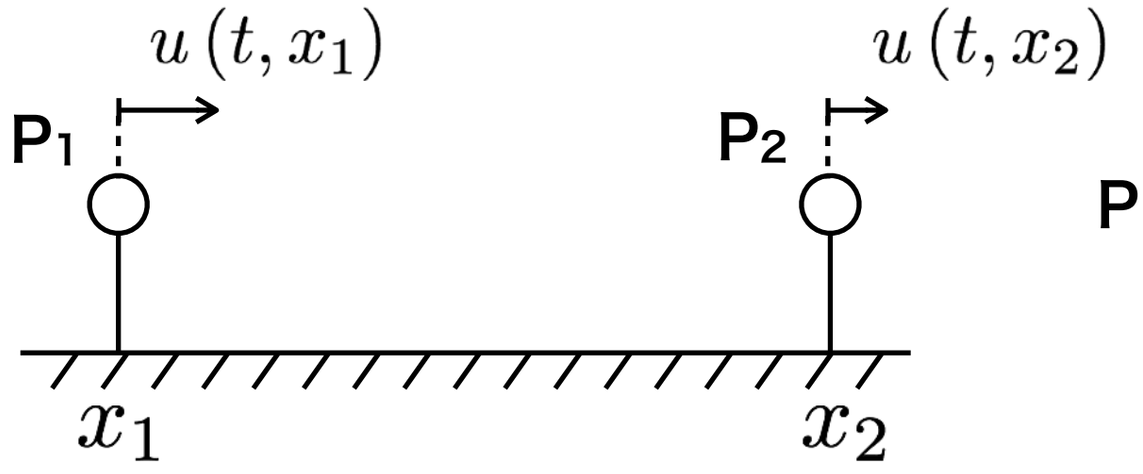


② Weather Correlated Seismic Noise

[Detail (Github#93)]



③ Differential Motion Reduction



P1, P2 : Power Spectrum Density

coh : Coherence from 1 to 2

Assuming that $P_1 = P_2 \equiv P$,

$$P_{\mathrm{diff}} = P\sqrt{1 - \mathrm{Re}[\mathrm{coh}]}$$

$$P_{\mathrm{comm}} = P\sqrt{1 + \mathrm{Re}[\mathrm{coh}]}$$

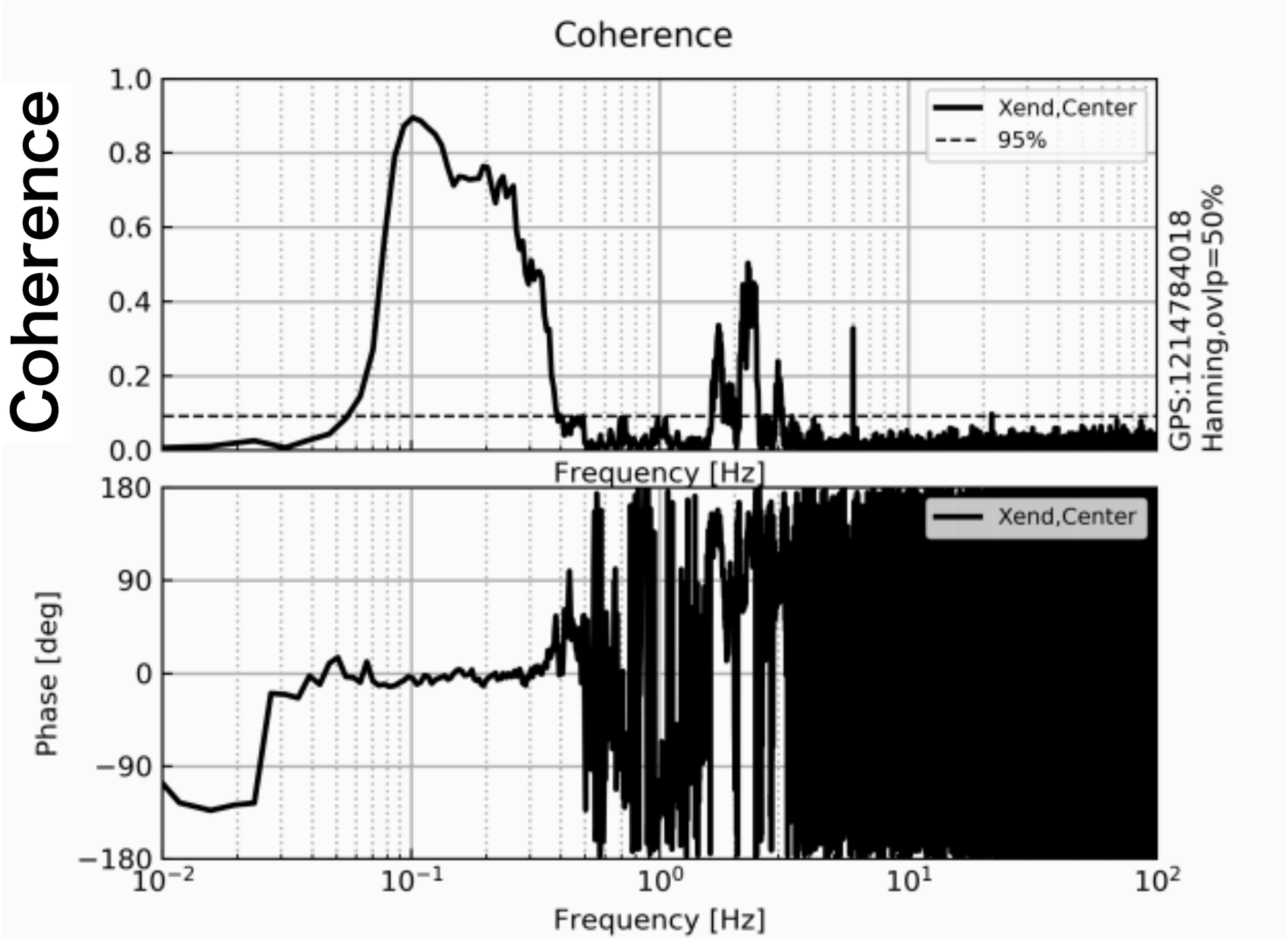
Detail

If coherence is 1, diff < comm.

If coherence is 0, diff = comm.

Reduction is estimated with the coherence

Coherence in X-arm

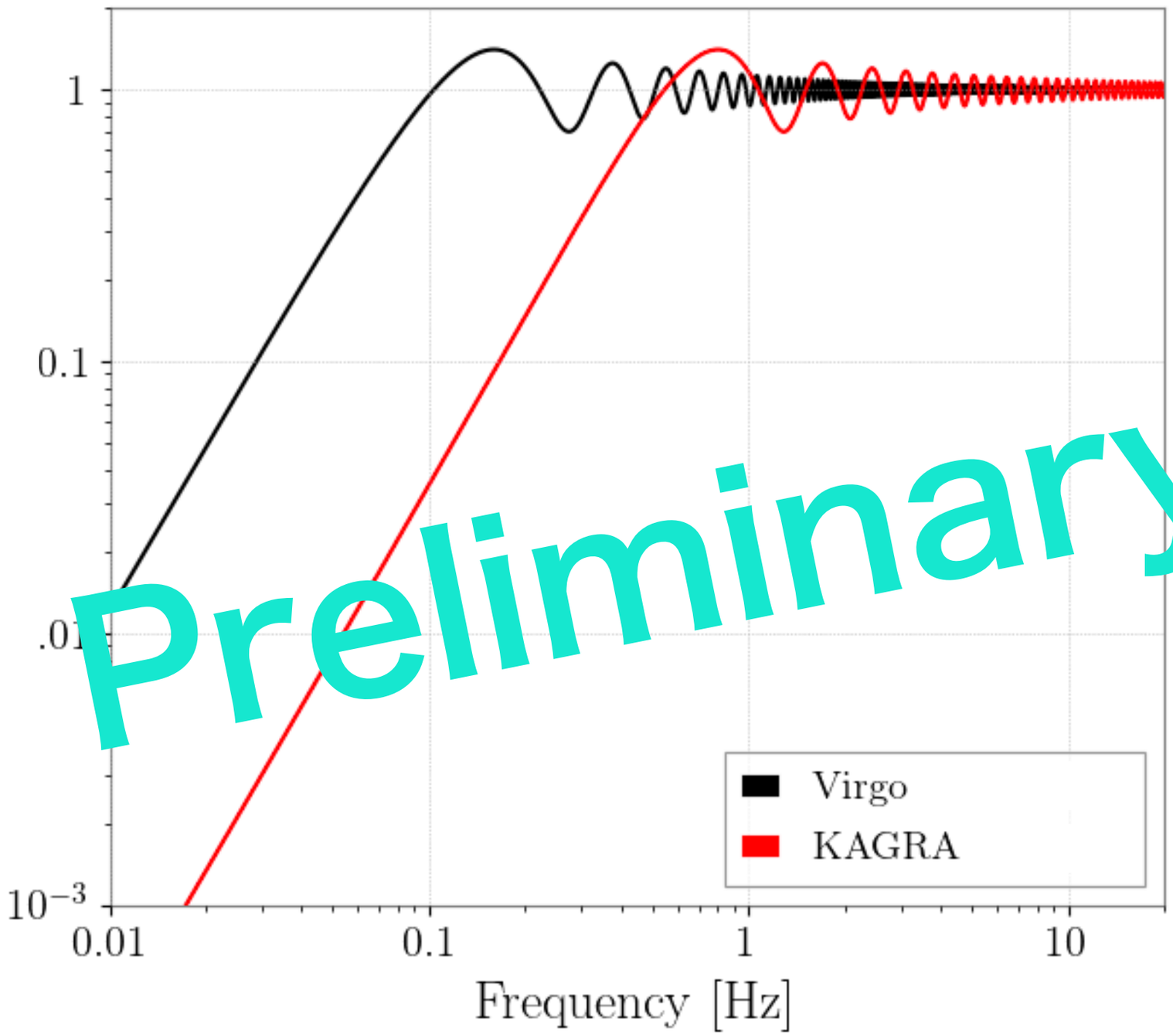


Good “coherence” in microseismic band.

Good “reduction” in microseismic band.

Comparison with other site

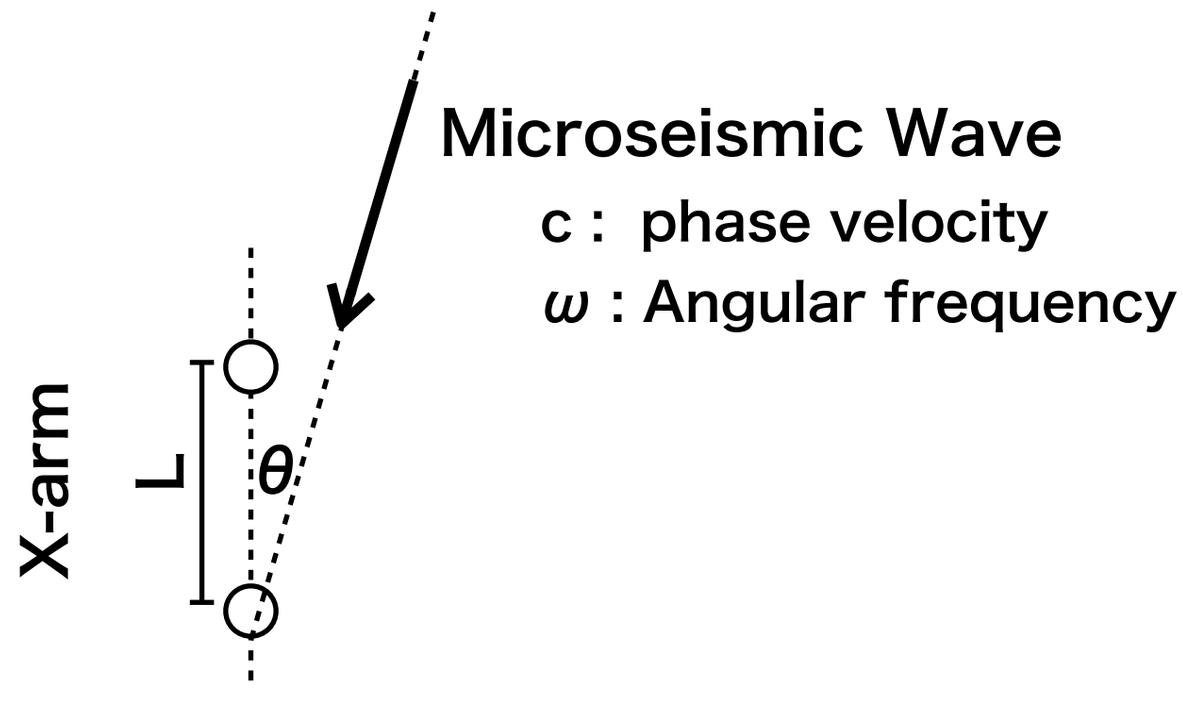
P_{diff}



↑ is assumed the coherence model

Model

Microseisms come from any direction.



$$\mathrm{coh} \;=\; \frac{1}{2\pi}\int_{-\pi}^{\pi} e^{i\frac{\omega}{c}L\cos\theta}d\theta \;=\; J_0\left(\frac{L\omega}{c}\right)$$

Bessel functions of the first kind

Ref. $P_{\mathrm{diff}} = P\sqrt{1-\mathrm{Re}[\mathrm{coh}]}$

e.g. c_{virgo} **= 1200 m/sec @0.1Hz** ← **Ph. D thesis of Dr. Mark Beker**

c_{kagra} **= 3000 m/sec @0.1Hz** ← **preliminary**

KAGRA will reduct the differential motion in microseism band.