

The 22nd Advanced ICFA Beam Dynamics Workshop on Ground Motion in Future Accelerators

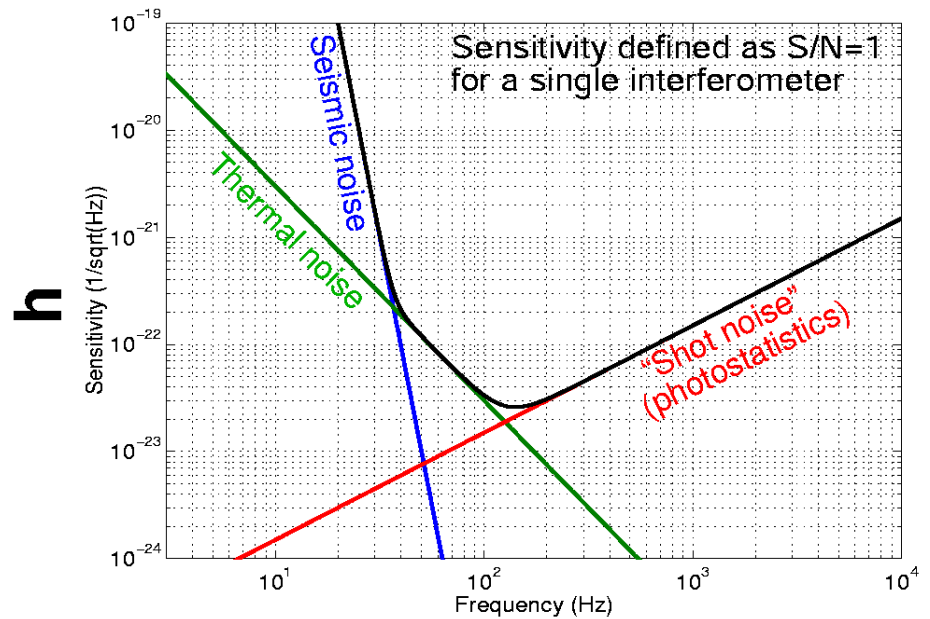
Slow Ground Motion Observed by 
Preliminary Results

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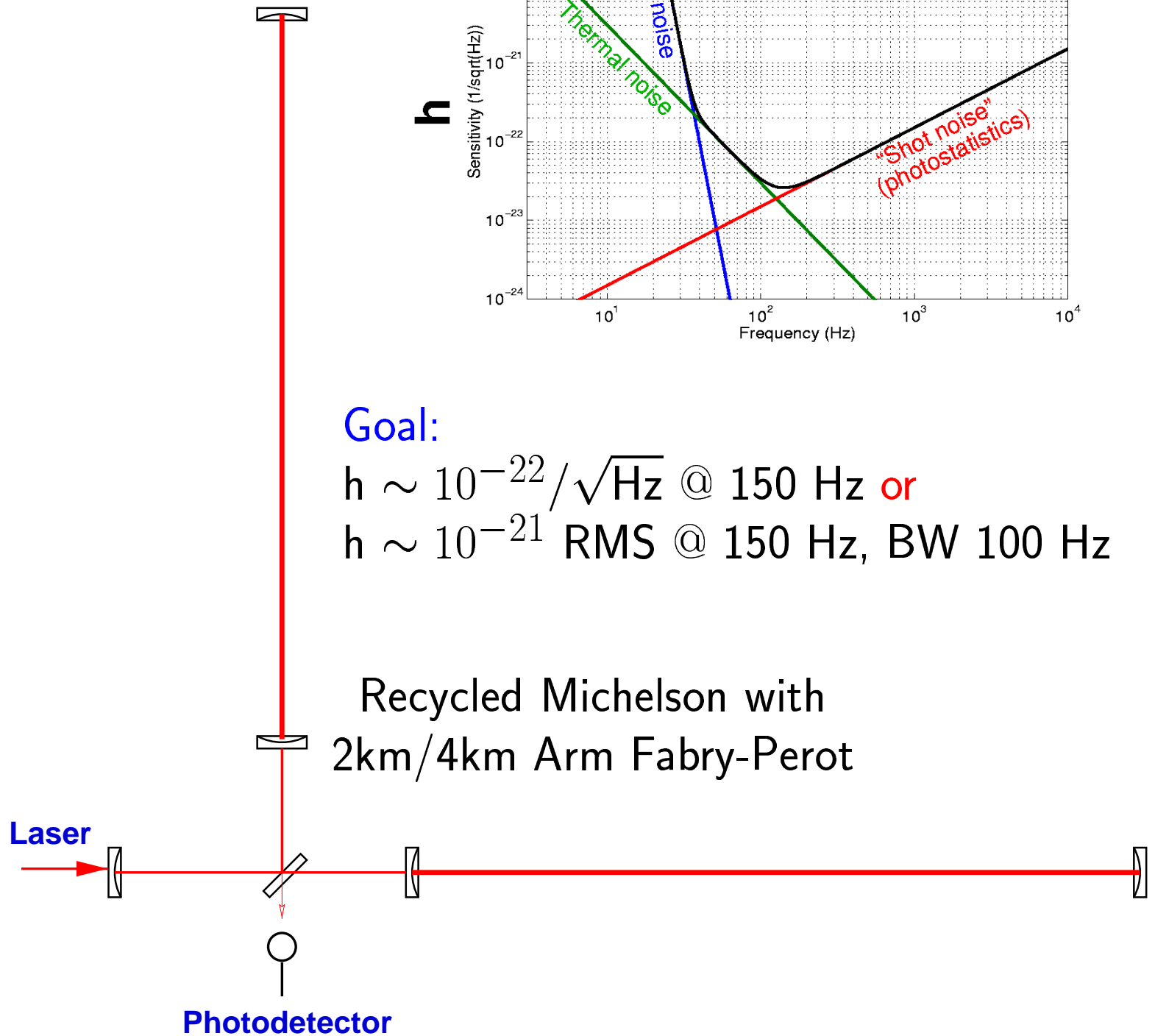


Goal:

$$h \sim 10^{-22} / \sqrt{\text{Hz}} @ 150 \text{ Hz or}$$

$$h \sim 10^{-21} \text{ RMS @ 150 Hz, BW 100 Hz}$$

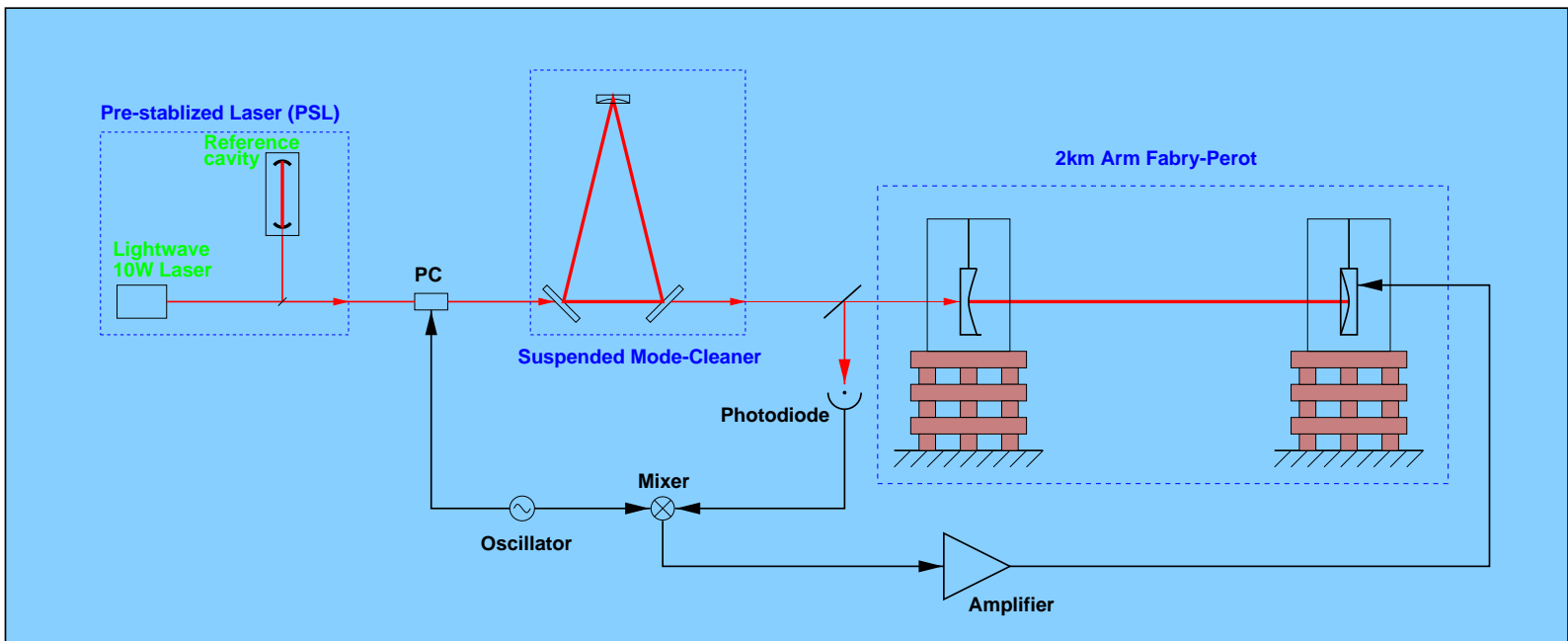
Recycled Michelson with
2km/4km Arm Fabry-Perot



April 2000: 2km X-arm

⇒ control signal monitored for 22 hours

Experimental Setup:



Locking technique:

Pound-Drever-Hall ⇒ phase modulated beam

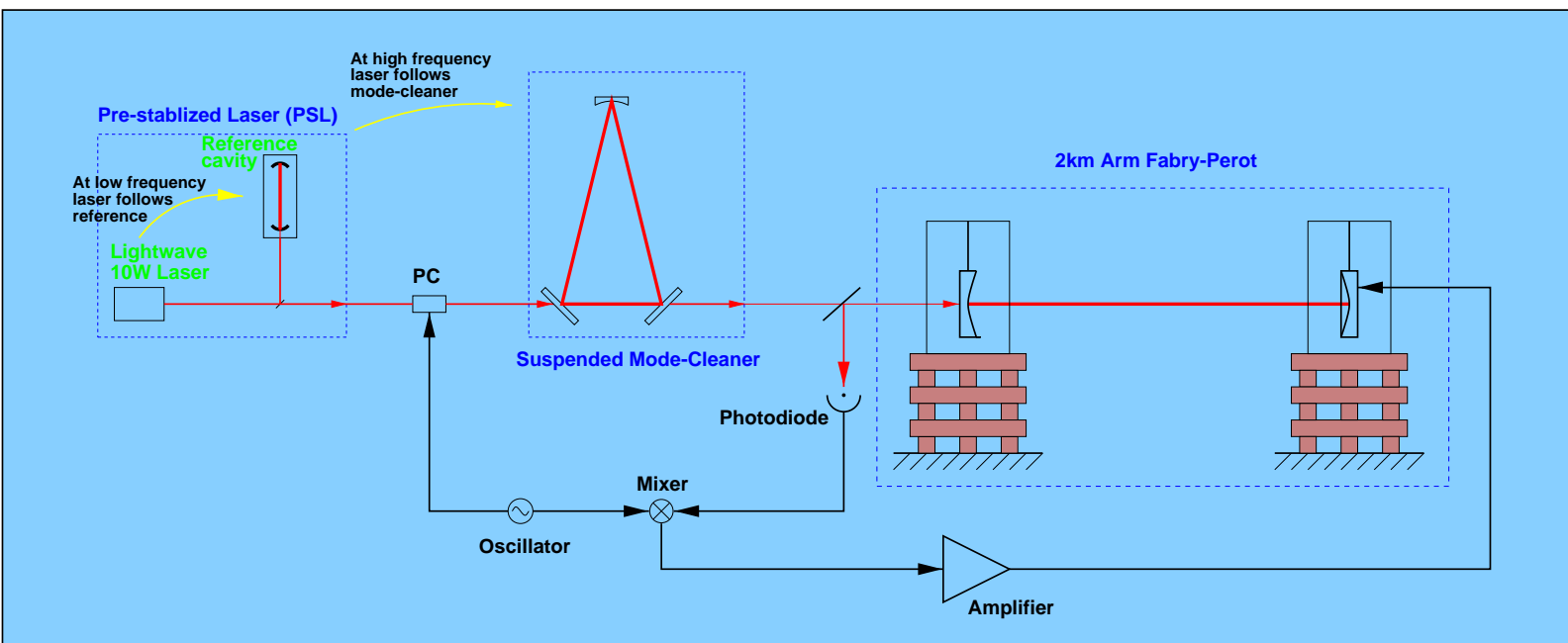
What are we measuring?

- Phase $\propto k \times L$

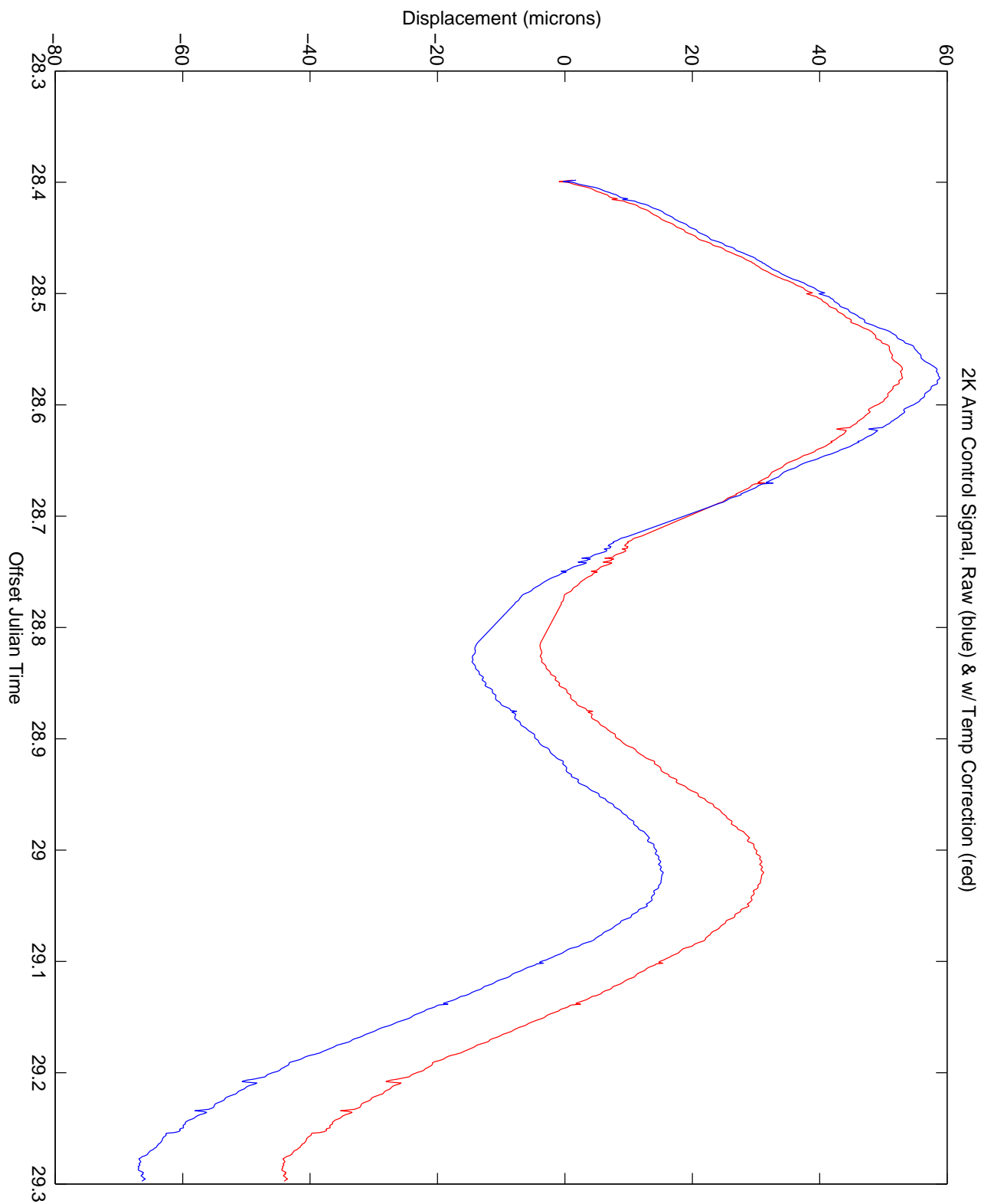
\Rightarrow necessary to **stabilize** laser frequency

Goal: $3 \times 10^{-7} \text{ Hz}/\sqrt{\text{Hz}}$ @ 150 Hz

More than **one** stabilization stage:

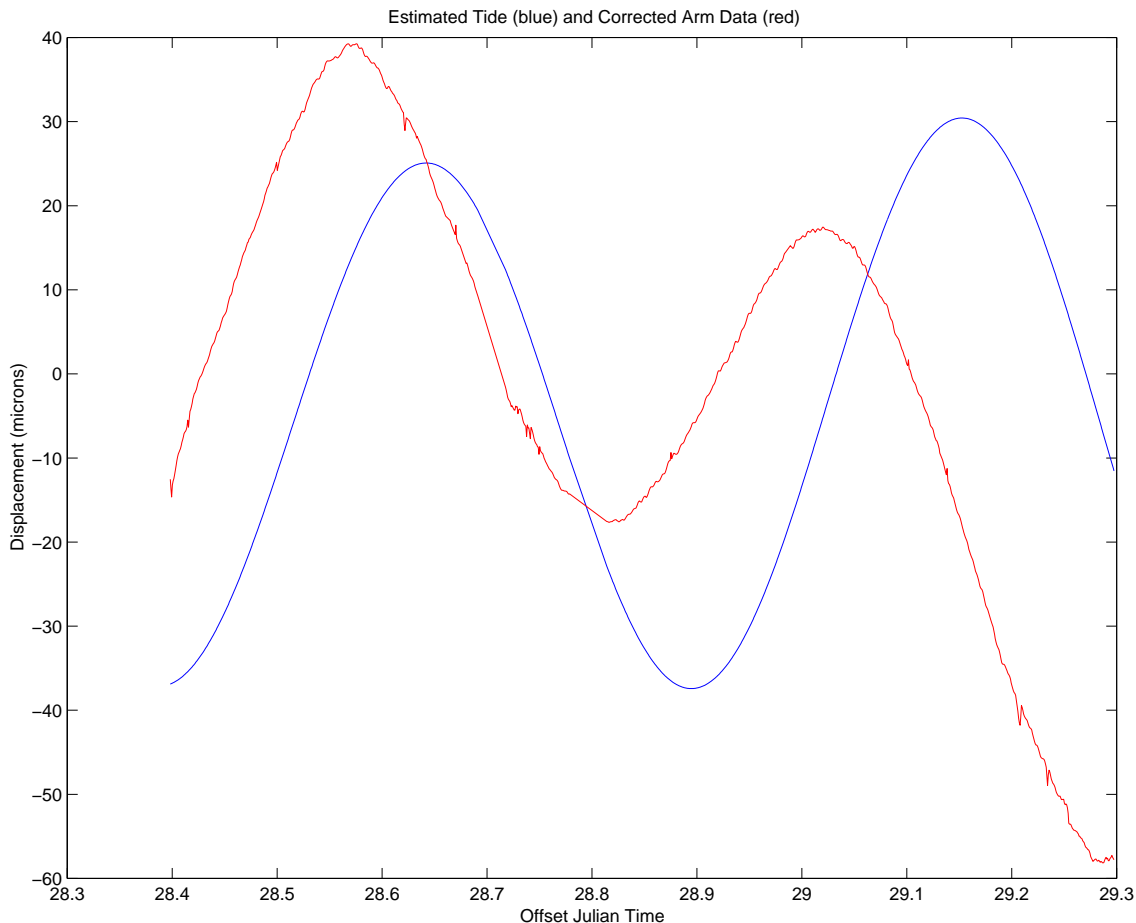


@ low frequencies, the laser **follows** the reference cavity
 \Rightarrow to study the ground motion, the behavior of the reference cavity must be taken into account



E. Morganson: model for tidal strain at LIGO sites (P. Melchior)

- induced by **Moon** and **Sun**
- but never compared to experimental data



- offset of 150 min
- qualitative **agreement**
- slow drift of the cavity length observed?

Conclusions:

- correction signal \Rightarrow cavity length drifted by $\sim 100 \mu\text{m}$;
- observable period of **12 hrs**;
- temperature drift of reference cavity to be taken into account;
- qualitative **agreement** between model and data;
- 150 min offset?
- cavity slow drift?