



Lavender team

Constitutional meeting:
Isola d'Elba
May 24, 2013
midnight – 3am CEST

GWADW
La Biodola,
Isola d'Elba, Italy

LIGO-Gxxxxxxx

May 2013
Lisa Barsotti,
Matt Evans,
Nergis Malvalvala,
Stefan Ballmer

Long is good

- Coating noise
 - Gain: $L^{1.5}$
 - Cryogenic/Crystal: **no need**
- Displacement noise
 - Gain: L
 - Newtonian N. **irrelevant**
- Radiation pressure
 - Becomes **irrelevant**
- Shot noise
 - Gain: $\sim\sqrt{L}$
 - Freq. **indep.** Squeezing
- Vertical susp. Thermal
 - Gain: constant





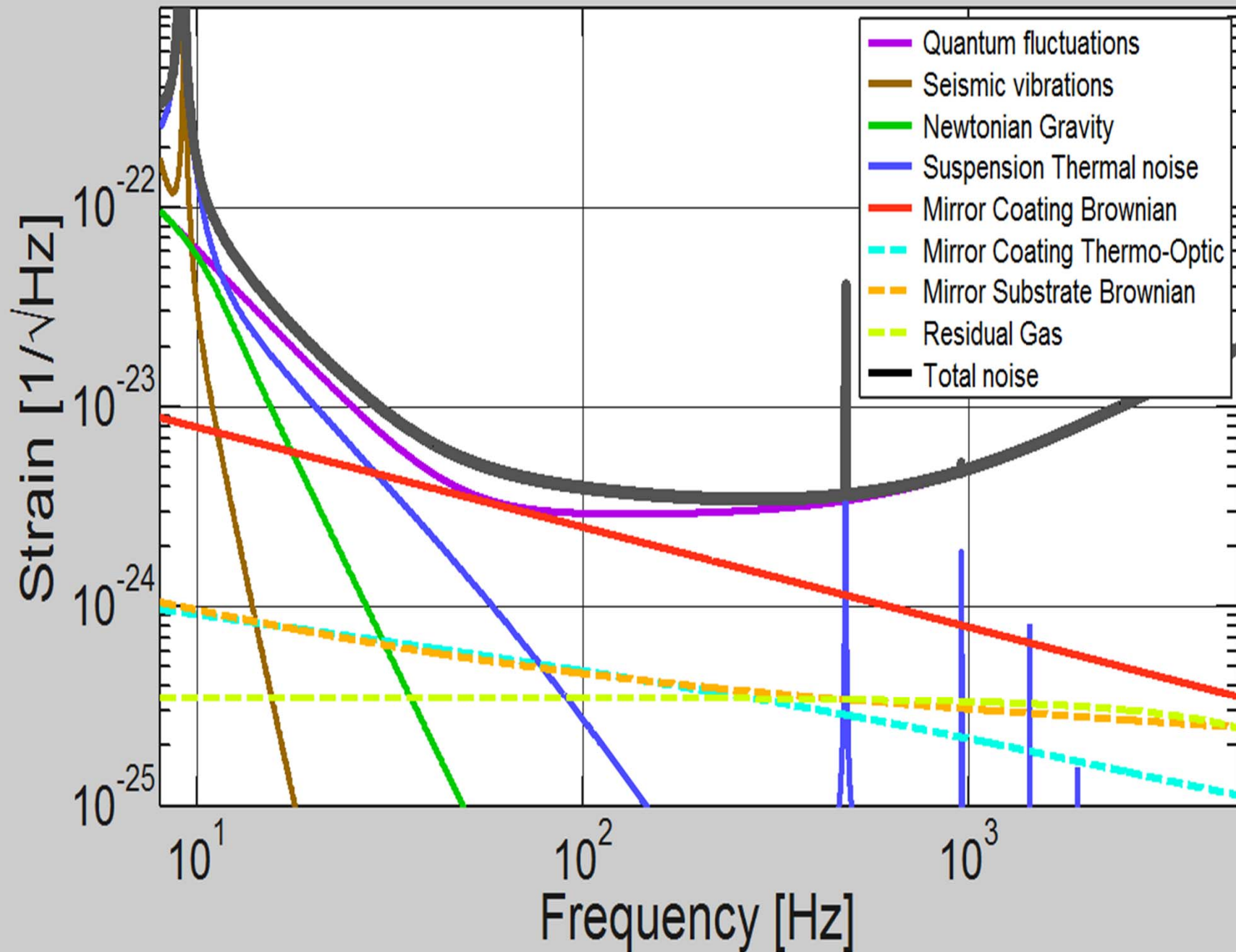
Long Uncomplicated
Next-Generation
Gravitational-Wave Observatory
LUNGO

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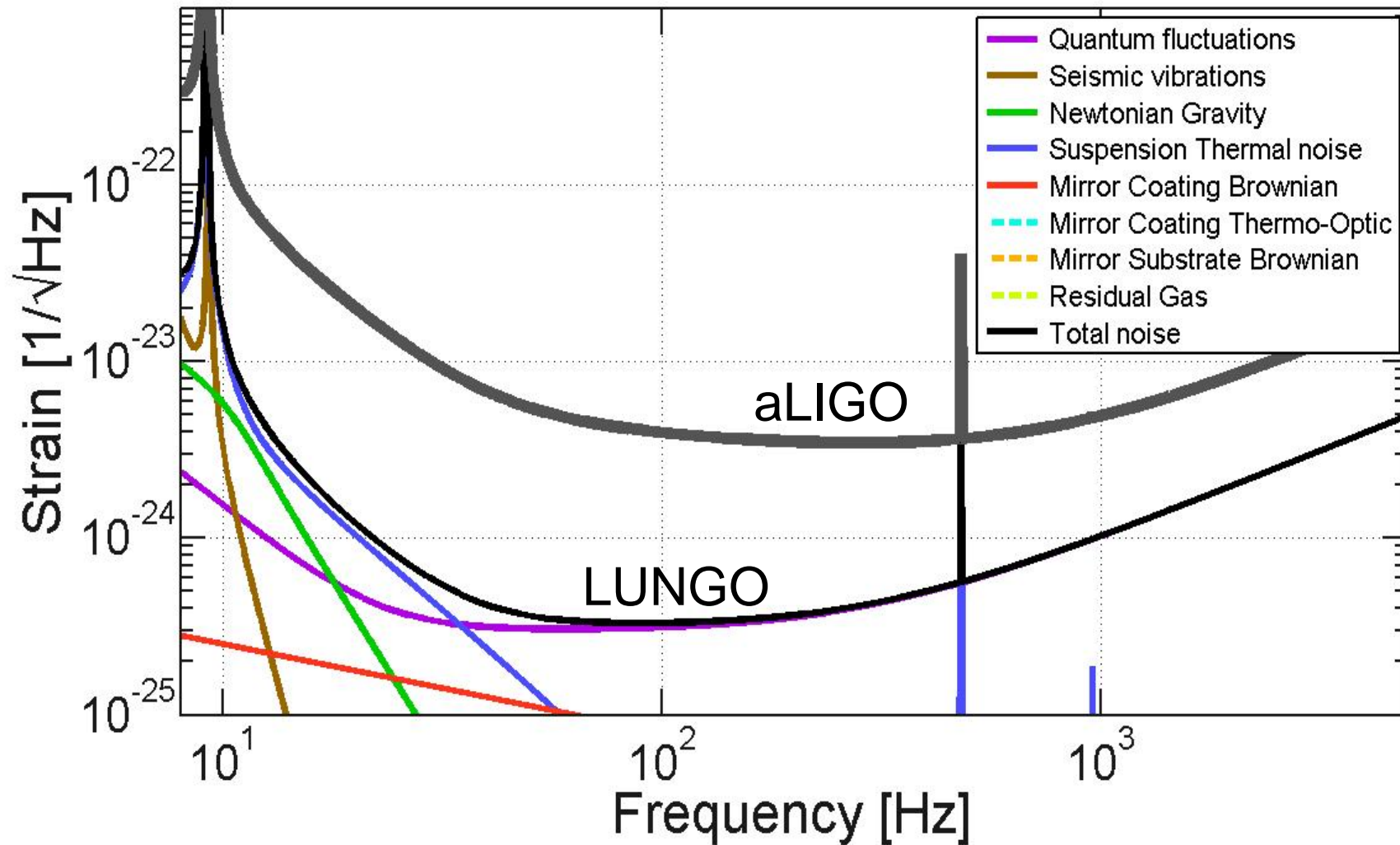
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Range: 190Mpc; L: 4 km (aLIGO: 178 Mpc)



The range for 40km

Range: 2557Mpc (aLIGO: 178 Mpc)



Cost - Benefit

- Vacuum cost
 - ~\$300M per site for 40km arms
 - ~\$3.75M/km per site
- NS/NS range ~2.5Gpc
 - 70Mpc/km
 - 19Mpc / \$1M
- Risk
 - Site selection and characterization
 - ...other than that...maybe steel price?

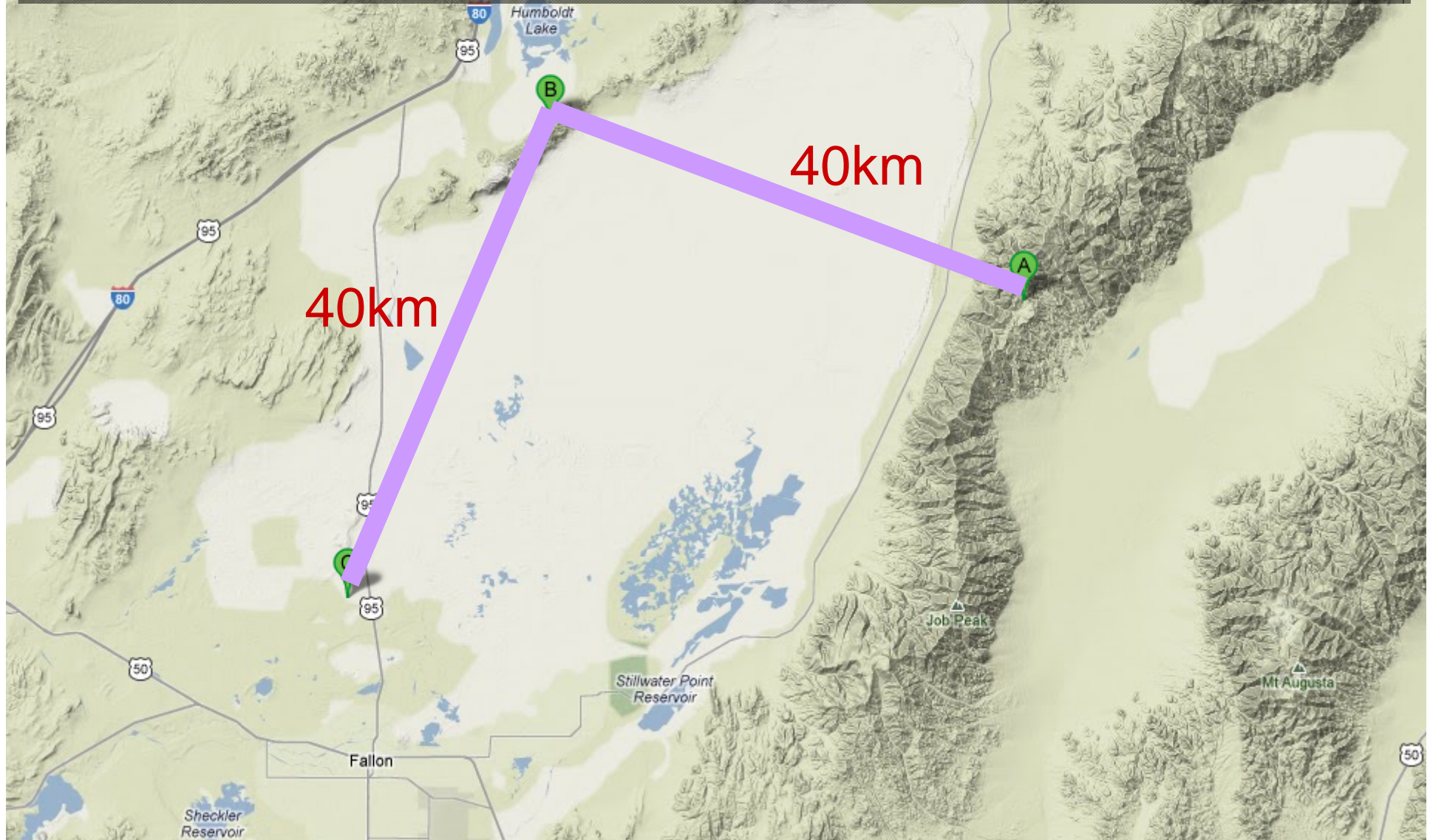
Site selection

- End stations into **mountains**, otherwise as **flat** as possible
- **Height difference** due to earth curvature
 - About 31 m, any basin curvature helps
- Can we fit such a thing on earth? ...

N39°35.31' W118°48.15'



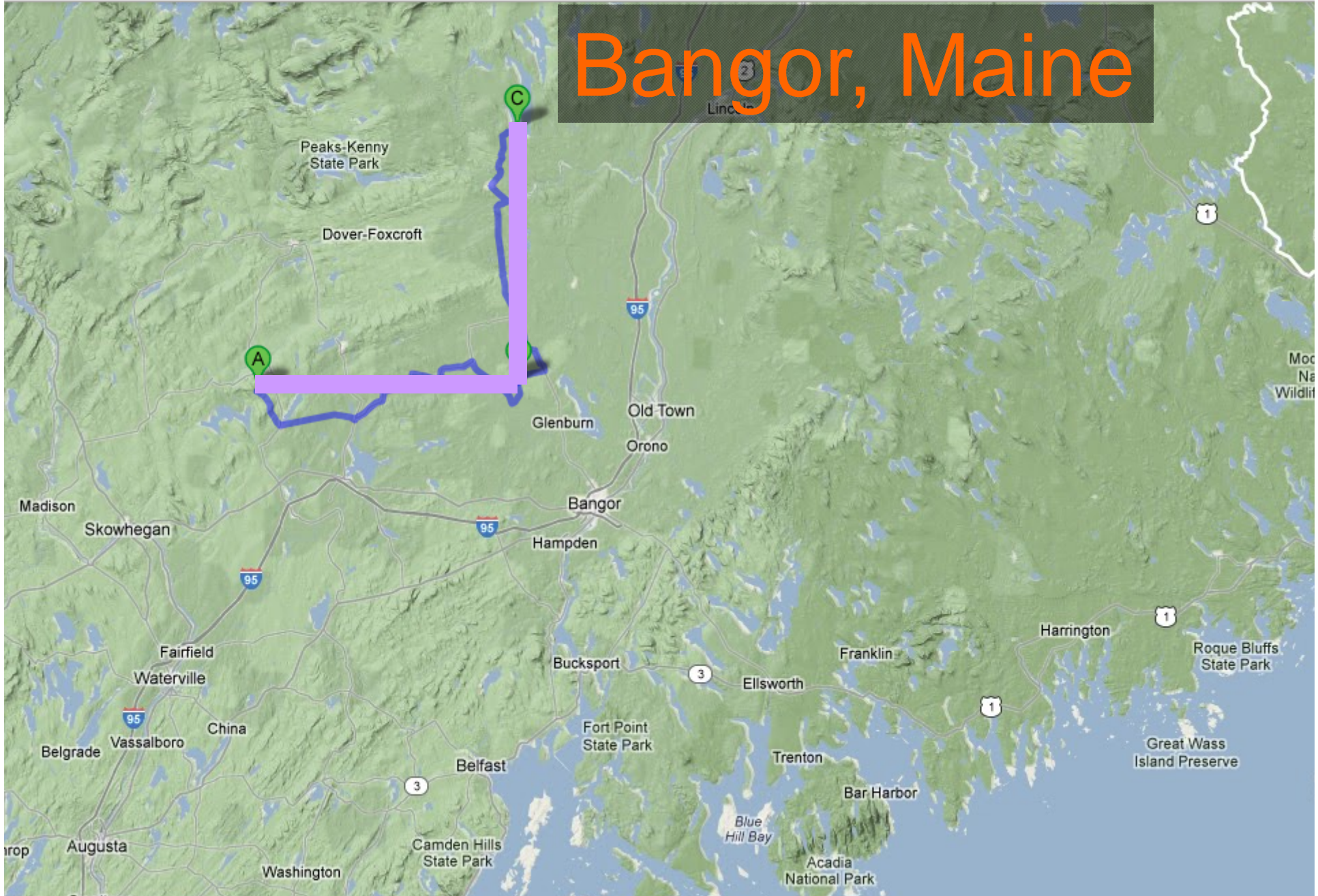
Carson Sink, Nevada (Alkali flat)



from:N44°58.22' W69°27.55' to:N44°58.57' W68°56.24' to:N45°20.01' W



Bangor, Maine



The Message

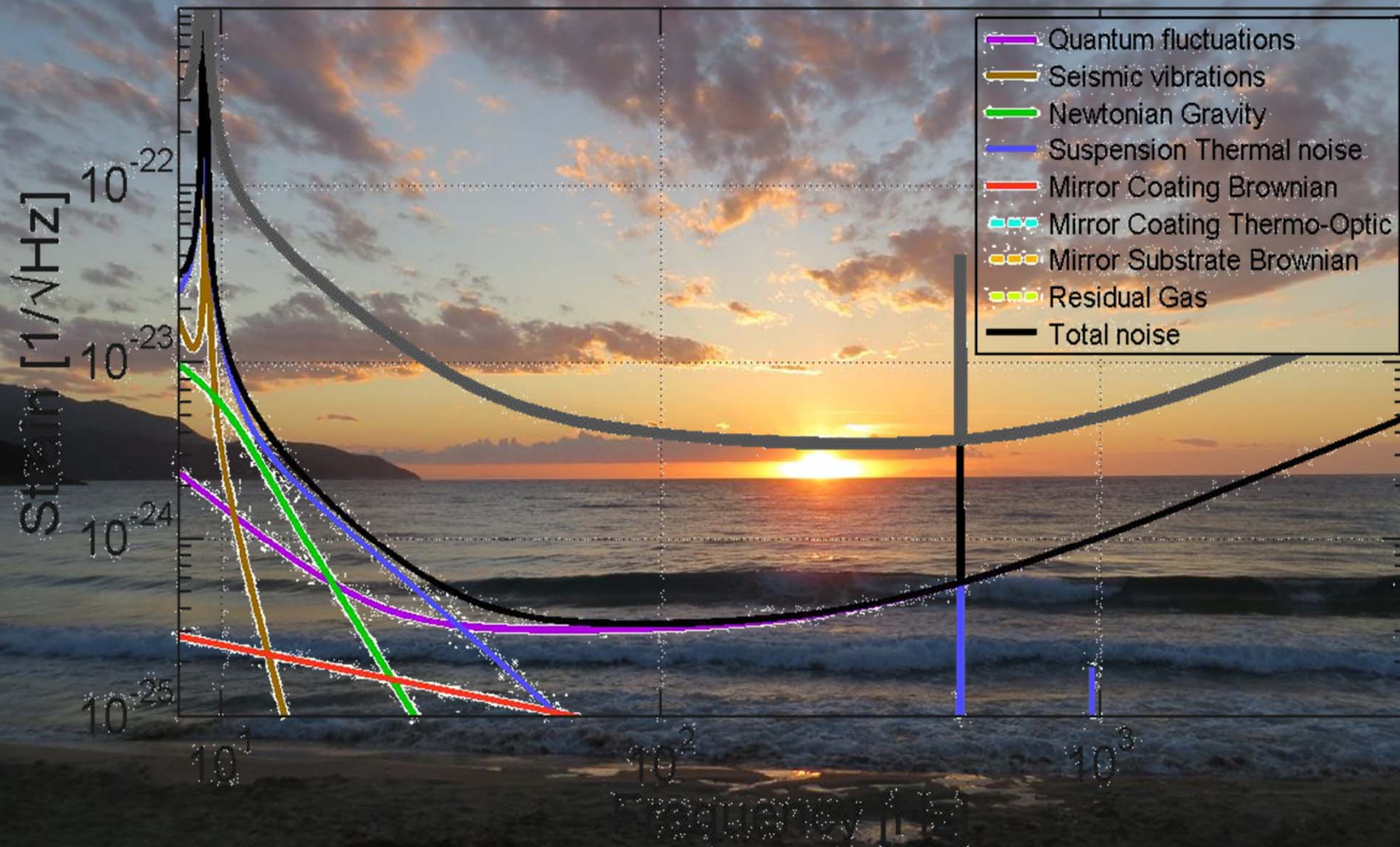
- Yes, you guessed it...

MAKE IT LONG!

- Invest in steel...
- Make the 4km **LUNGO** prototype (aLIGO) work

LUNGO

Range: 2557Mpc (aLIGO: 178 Mpc)



World Hi Enroute H-3 Enroute L-11 Enroute L-9 CG-18 WAC World Lo



Flight Plan

00:17:23 Z N45°9.83' W69°2.54'

Layers

World Hi

Enroute H-11

Enroute L-32

CF-19 WAC

World Lo

