



# ***Portable sensors for rotational ground motion***

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All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident. — Arthur Schopenhauer (1788 – 1860)

**Brace yourselves, here comes stage two ...**

# Good News, Bad News: *Finally hitting the big time*

“Suddenly” we have a plethora of new instruments

- Either in late-stage development ...  
(maybe available now if you have friends);
- In the “production prototype” stage (ditto); or
- Fully available within months

**You will hear talks about these and others:**

- Kozák and Jedlička have a clear path to a production prototype
- Brokešová and Málek have a production prototype now in use
- Multiple high-precision FOGs available now or soon (iXBlue, Li, ...)
- RLGs coming up fast
- Clever new idea and improvements (Barak, Velikoseltsev, ASL, ...)

**Most of today’s talks and some of tomorrow’s are about this; examples follow but listen to the talks:**

# New iXBlue FOG

## BlueSeis-3A manufacturer specifications:

- Interferometric FOG
- Flat from DC to 100 Hz
- Principally broadband weak motion ( $20 \text{ nrad/s}/\sqrt{\text{Hz}}$  so  $\sim 60 \text{ nrad/s}$  over 100 s to 10 Hz and  $\sim 1 \text{ }\mu\text{rad/s}$  from 10 to 100 Hz)
- Covers much of the strong-motion range too, though we know the Earth limit poorly (100  $\text{mrad/s}$  clip)
- 20 kg; three axes
- IP66 (IP67 ideal, difference is hose *versus* 1-m immersion)
- miniSEED output *via* Internet at up to 200 sps
- However, 20 W at 24 V and fairly costly (but not too bad for broadband; cf., G-ring)

# Rotaphone: *Ready to go*

## Three “Model D” now vaulted in Long Valley

- Data from The Geysers in a later talk
- Looking at source effects, site nonlinearity, site characterization, etc.
- Based on 4.5-Hz geophones (Netherlands); lower useful corner ~2 Hz
- Power (mainly the Linux box portion) is to be lowered soon for reduced heat and easier deployment (i.e., batteries)
- Parts cost about 8000 USD
- Talk and poster coming

# Fluid Torus of Kozák and Jedlička (and Evans):

*Almost ready*

Paper is back to *BSSA* one week ago

- Describes results for existing prototypes

Production-prototype design identified

- **Within a year** will construct in Prague and fully test at ASL against both rotation and translation

**Unfortunately Jan and Petr cannot be here  
so I will give their talk**

**FOGs have hit the big time**

**RLGs are making progress**

**Magnetometers?**

**Far better MEMS in sight**

**ATA high-frequency sensor (no Hg)**

**Translational-sensor arrays are perfecting**

**Better testing facilities in several places**

**So now it is time for lots of applications ...  
and for naysayers to get aboard**

- **Wider availability of instruments**
- **More opportunities to deploy**
- **More opportunities to demonstrate efficacy**
- **More chances to develop and prove applications**
- **Better test facilities**
- **More fun ...**

**... so let the good times roll !**