Listening to Earth Whispers with Optical Fiber Interferometry at Camp Elliott, Miramar

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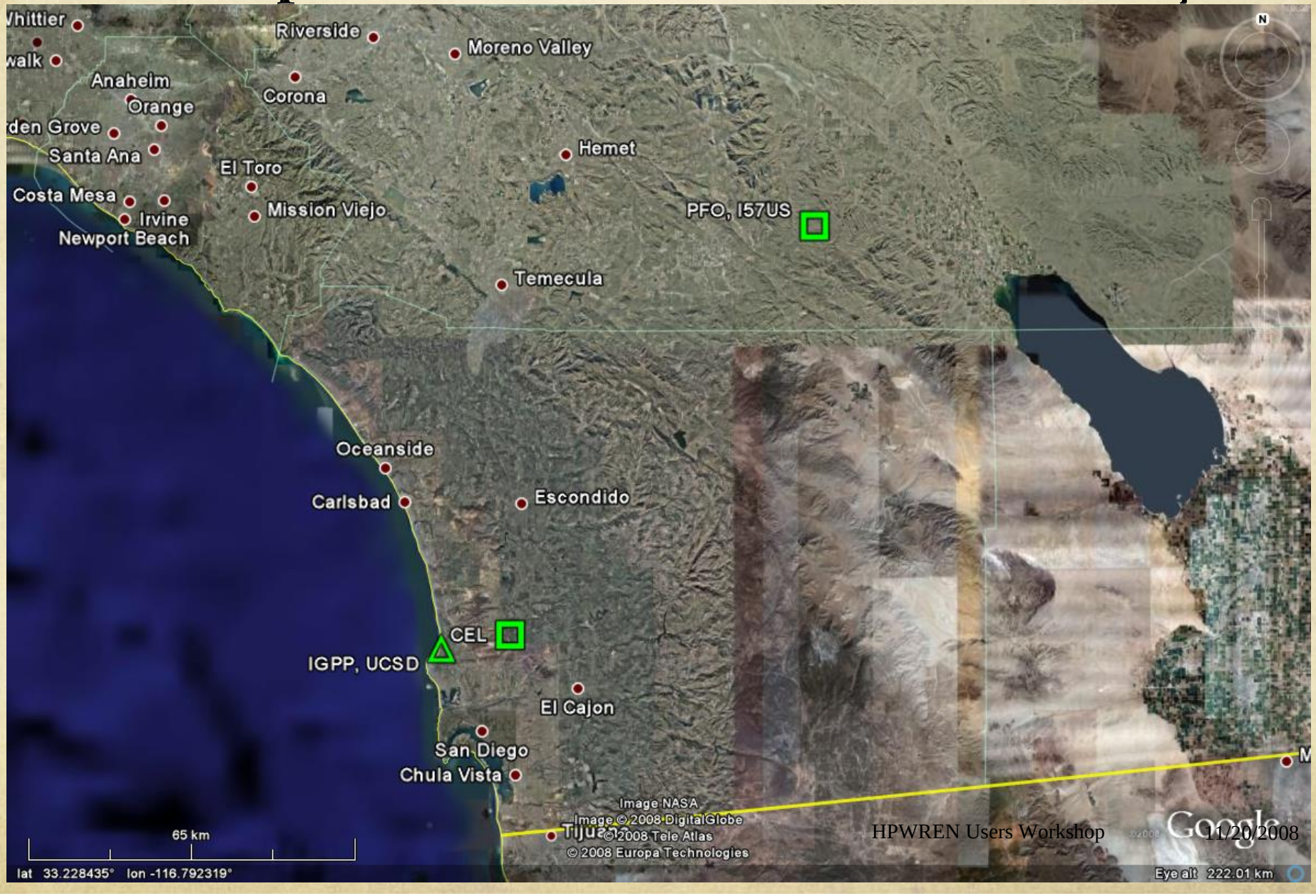
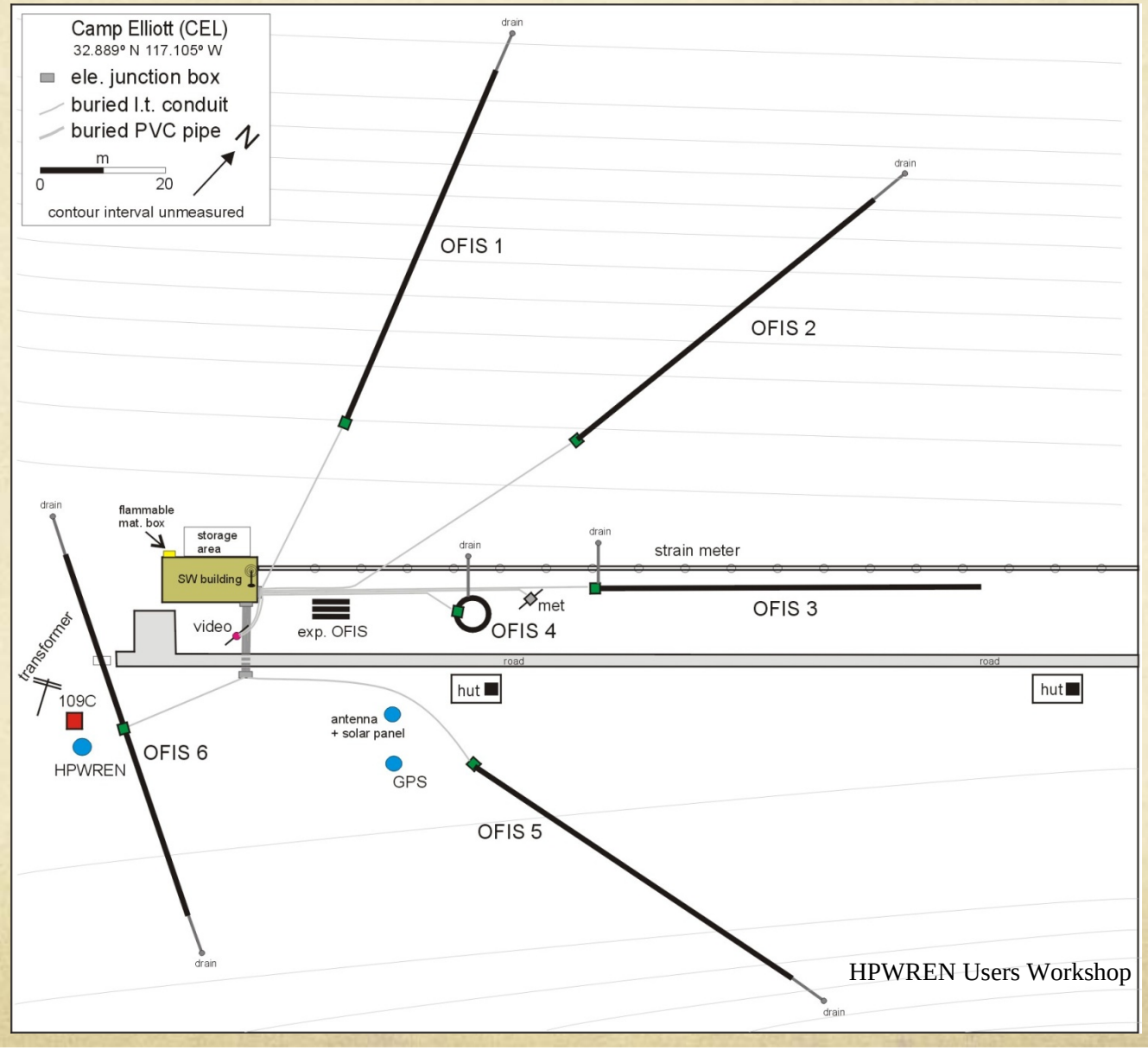
What Do I Do?

- Atmospheric acoustics in the 1 mHz to 100 Hz range.
  - Sensor development
  - Signal processing algorithms (detection and direction-finding)
  - Source location: natural (eq, meteors, surf, volcanoes, etc.) and man-made (aircraft, explosions, etc.)
  - Seismic-acoustic coupling
- Why is HPWREN useful?
  - Data rates are about 20 kB/s and currently there is no alternative phone or cable service at our remote sites.

Camp Elliott (CEL) OFIS Array



Camp Elliott Layout



Camp Elliott OFIS Array

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Installed Jan. 2008

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OFIS 2 - NNE

OFIS 1 - NNW

OFIS 3 - NE

Camp Elliott OFIS Array

Camp Elliott OFIS Array

2 meters height

5 meters in front of the strain meter in this photo

1 Hz: wind speed, wind direction, pressure, humidity, rain

Camp Elliott OFIS Array

Camp Elliott OFIS Array

Camp Elliott OFIS Array

Watch large and small (e.g., F-18) aircraft land at Miramar Marine Corps Air Station

Will be used to compare with real-time DOA estimation from the OFIS array

Meteors: 1 per month in Ontario using standard sensors

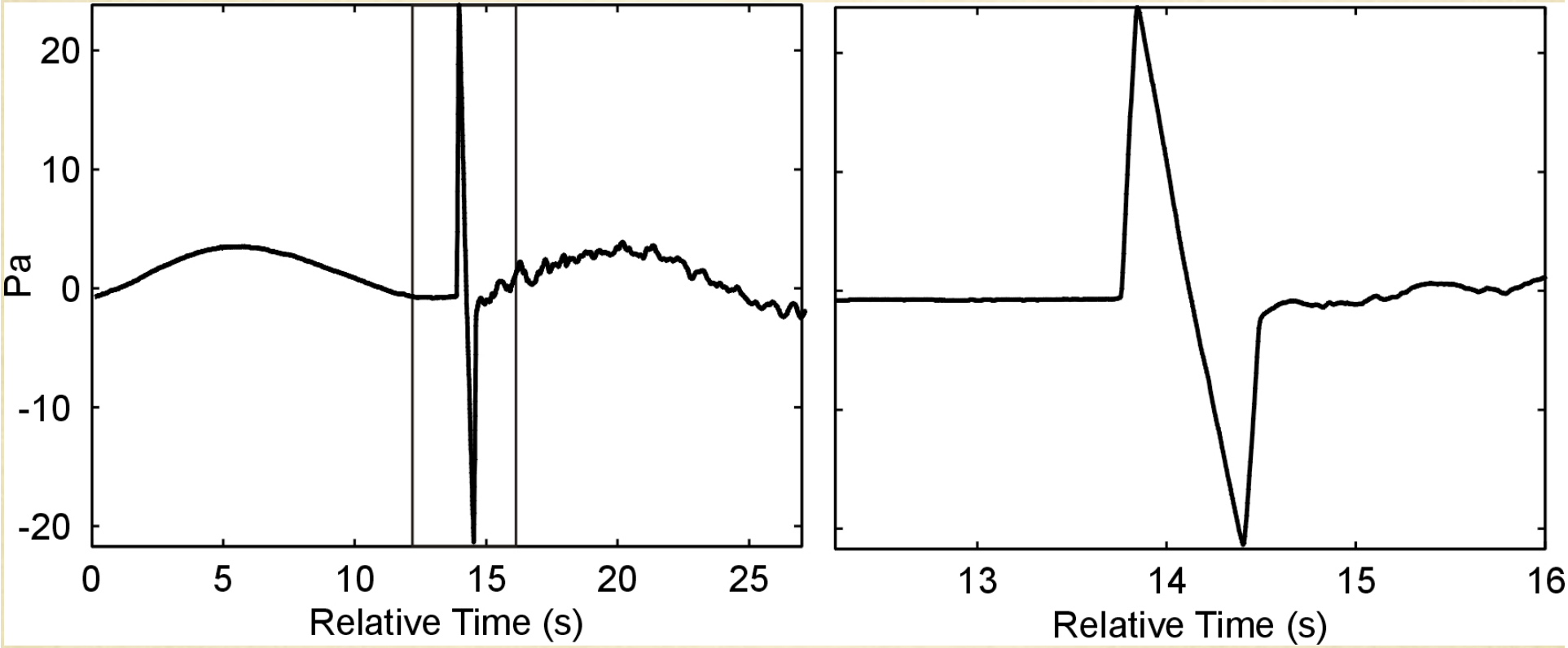
Camp Elliott OFIS Array

STS-2 broadband seismometer (109C)

Good potential for seismic-acoustic studies

Camp Elliott Array

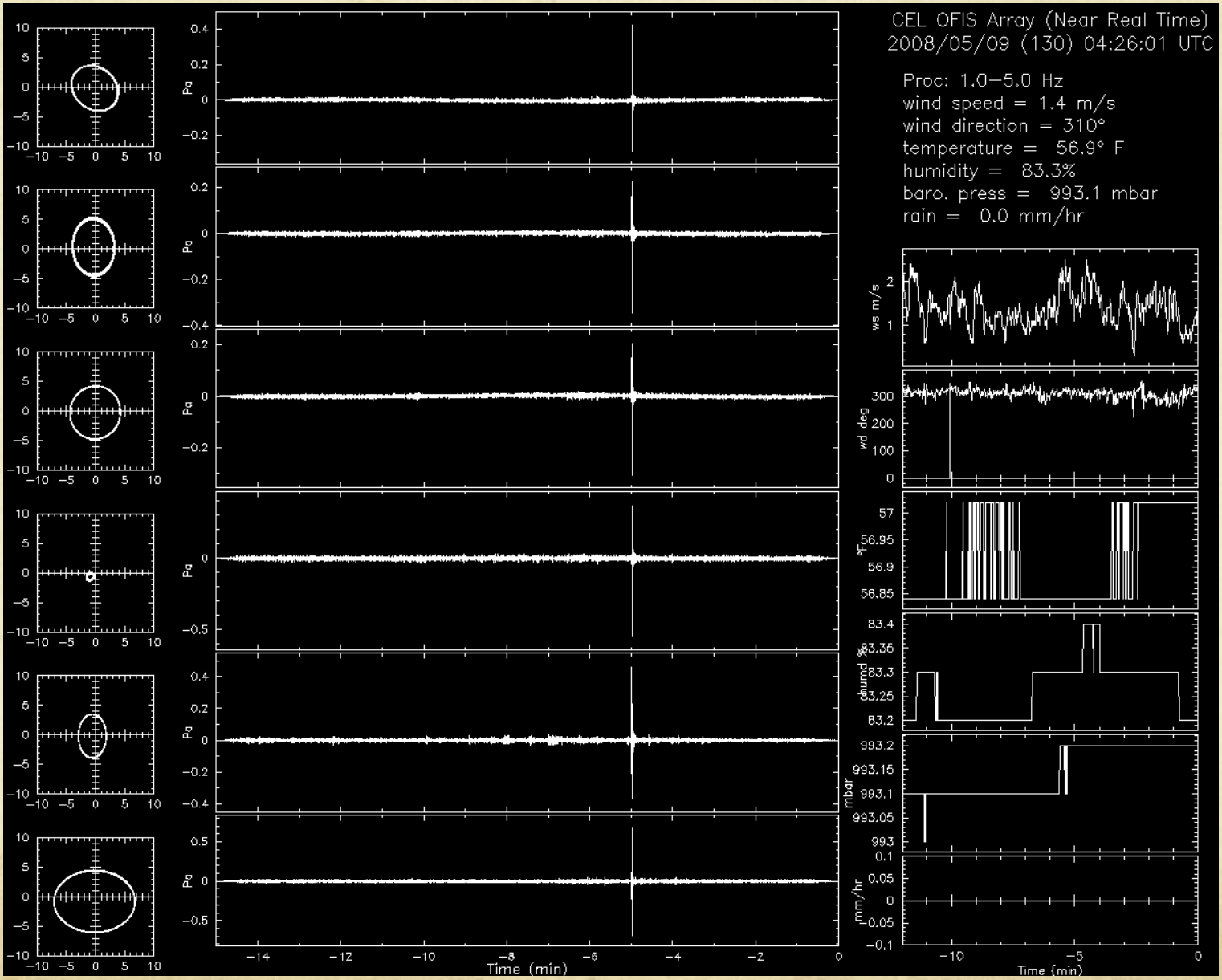
60- m OFIS Recording of Atlantis Reentry at Camp Elliott
(June 2007, before the array was constructed)



Shuttle was nearly overhead, so broadband signal recorded by the OFIS, which averages pressure along its length. See Hedlin et al. (2008)

Camp Elliott Array

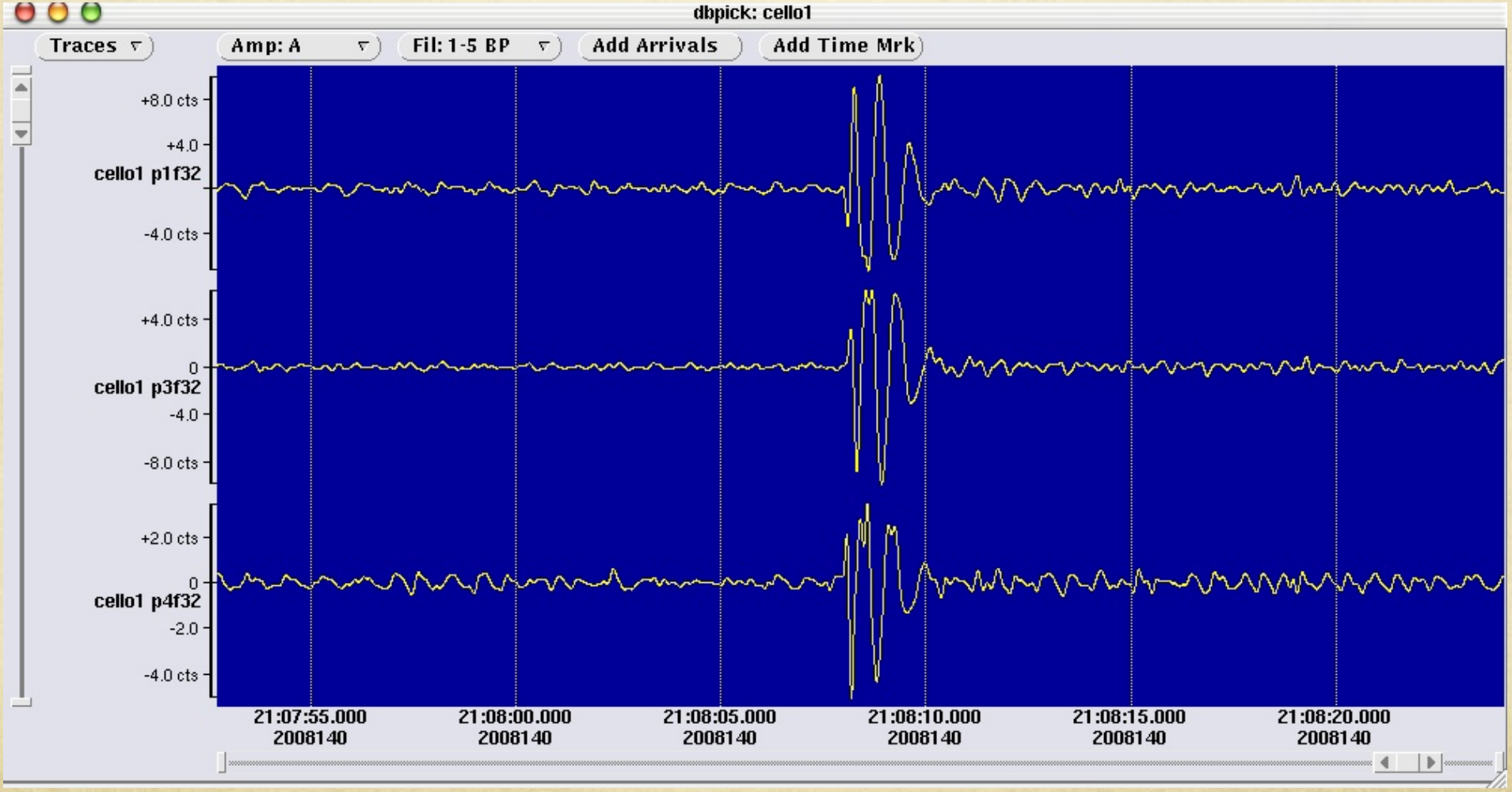
May 9, 2008: Night signal (1.0 Pa p-to-p)
Onsite NRTS website image



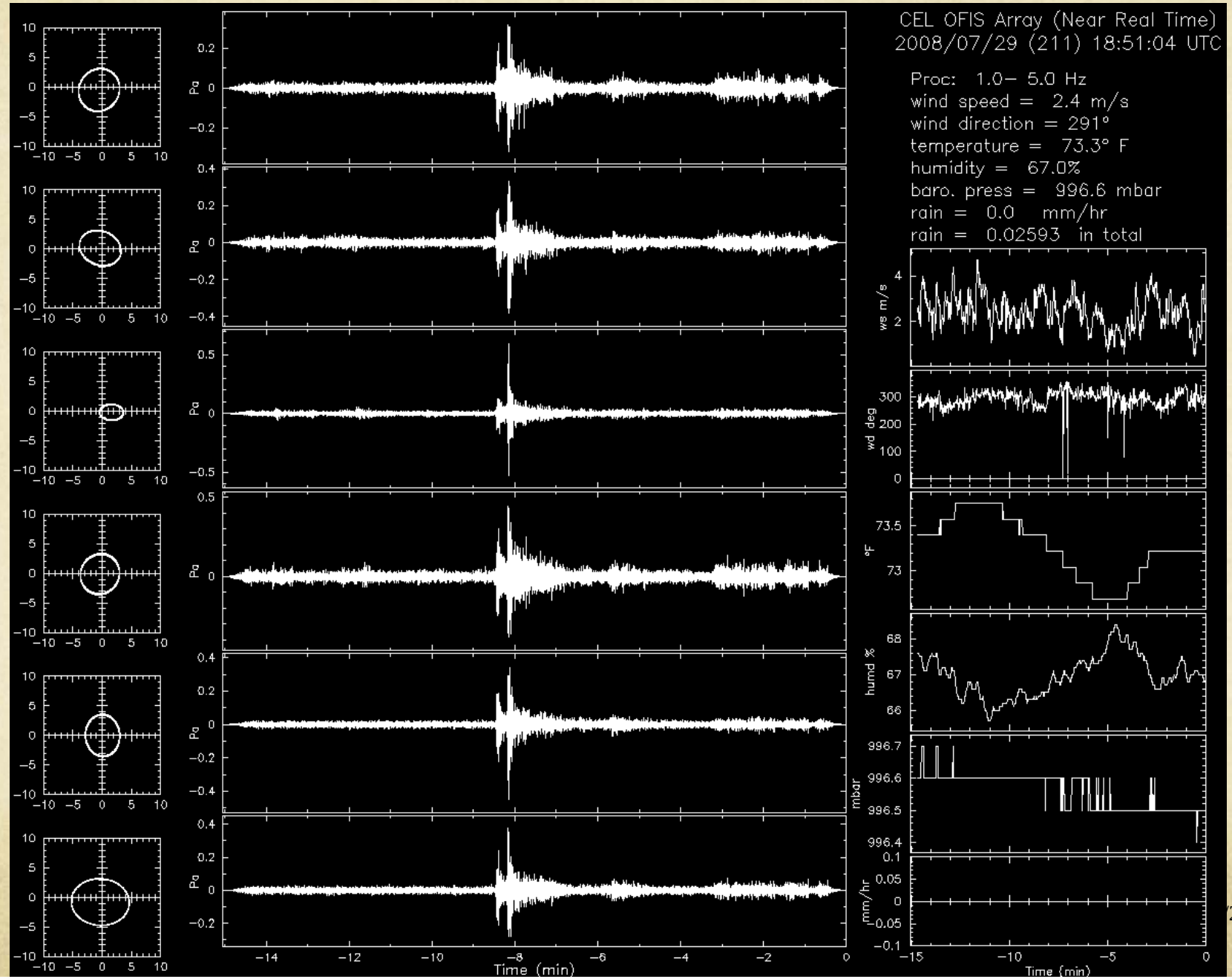
http://sail.ucsd.edu/~ofis/

Camp Elliott OFIS Array

May 19, 2008: Natural Gas Explosion in San Diego Hotel (0.6 Pa p-to-p; daytime)

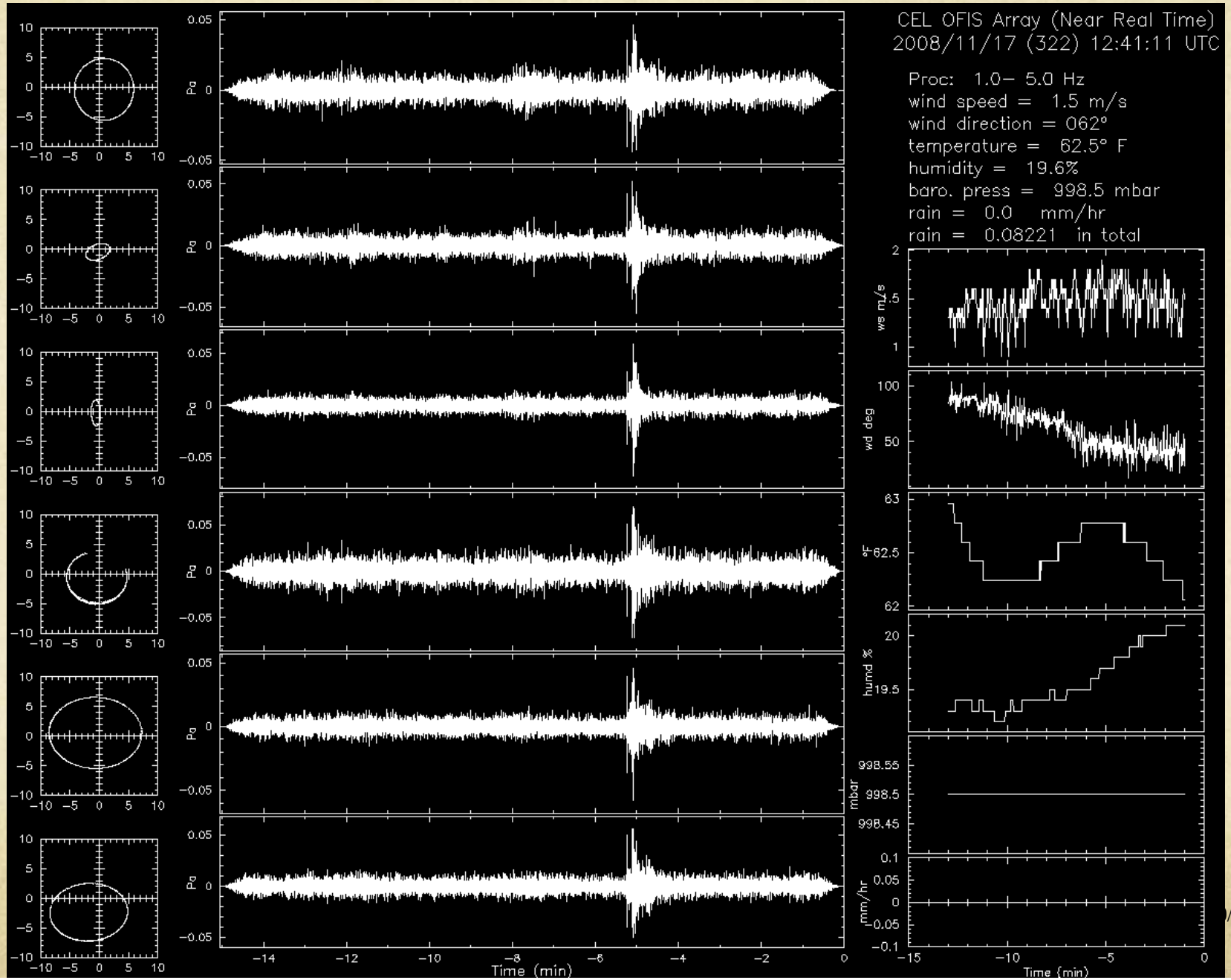


July 29, 2008 M 5.4 Chino Earthquake

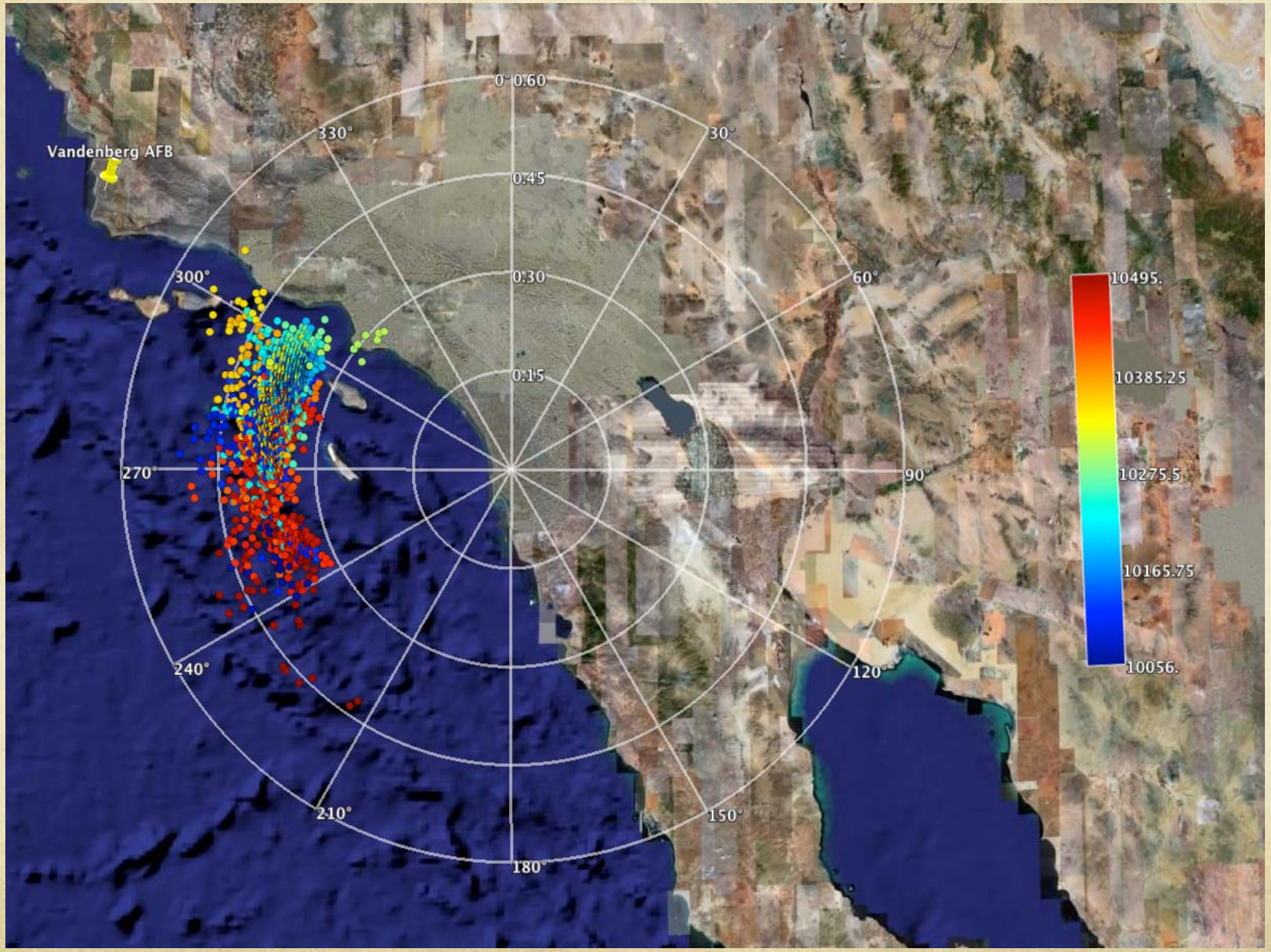


/2008

Nov. 17, 2008: Recent M 4.1 Palomar Earthquake

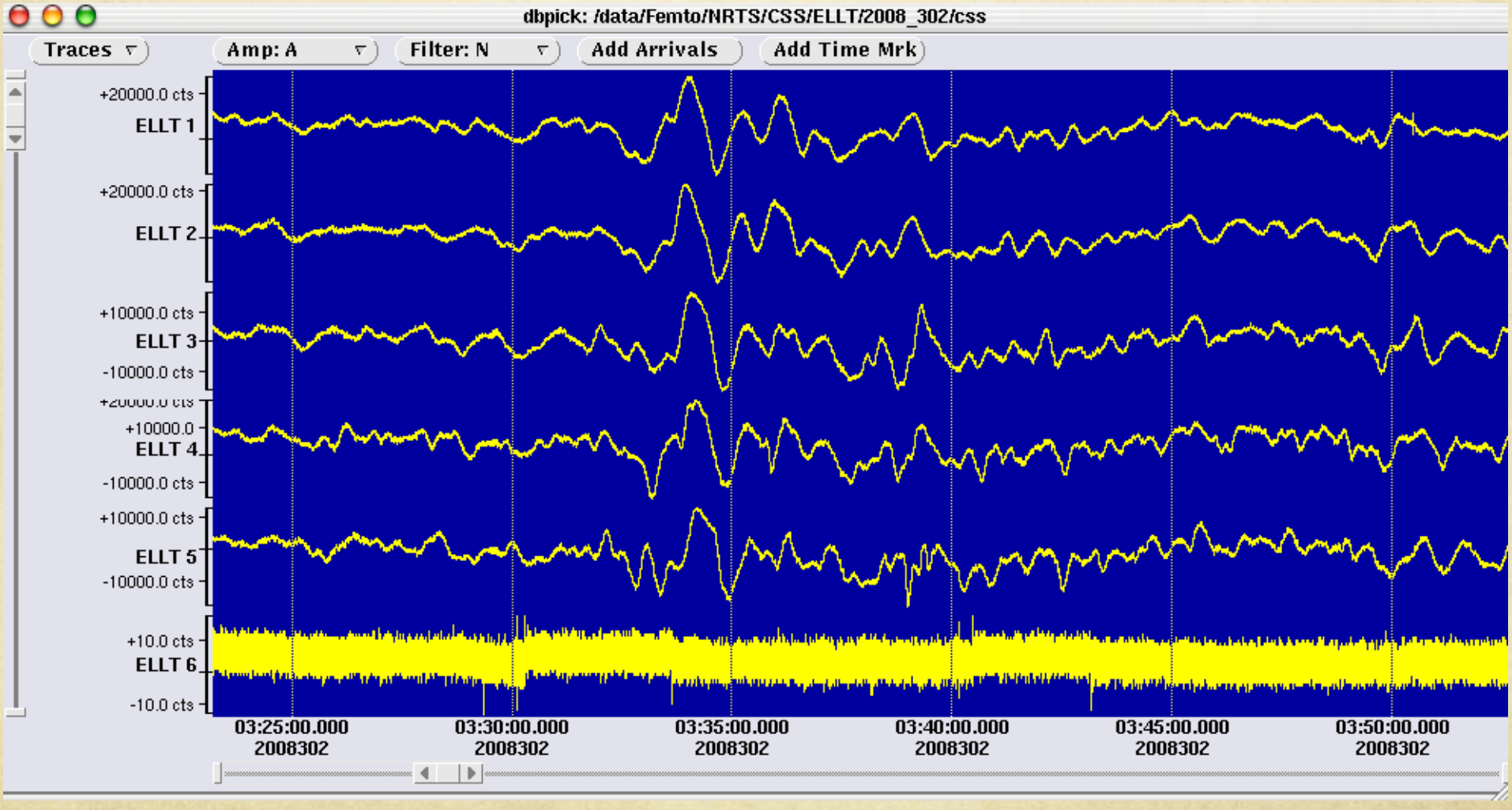


Delta II Rocket Launch from Vandenberg



11/20/2008

Internal Gravity Waves and Solitons



Conclusions

1. Lots of interesting whispers in San Diego county in the mHz to 100 Hz band

2. Earthquakes produce significant SoCal acoustic signals

3. Wind noise reduction is exceptional with long directional microphones

4. The physics of wind noise and optical fiber microphone development can now be adequately investigated near San Diego

5. HPWREN is an essential part of our research due to its high speed and high accessibility in San Diego county

6. Last five years of work has been published in Journal of Acoustical Society of America Publications: Walker et al. (2008) and Hedlin et al. (2008)