LISS

A new generation of pneumatic seismic sources increasing geophysical value and reducing environmental impact and operational cost

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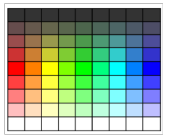
Stanford University and Low Impact Seismic Sources

SEG workshop W7

Thursday, 18 October 2018



W7 workshop “Cost effective …”

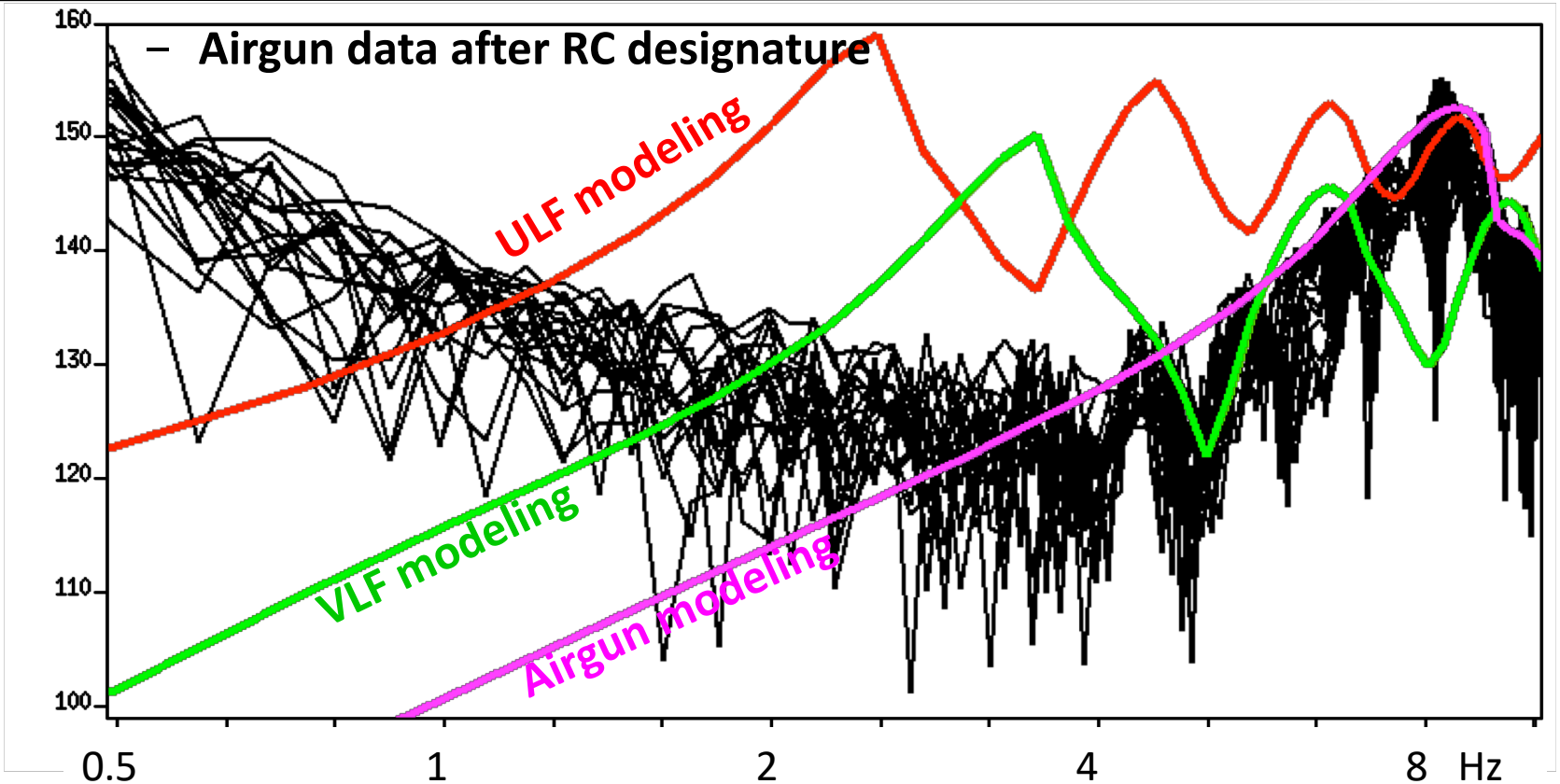
Question

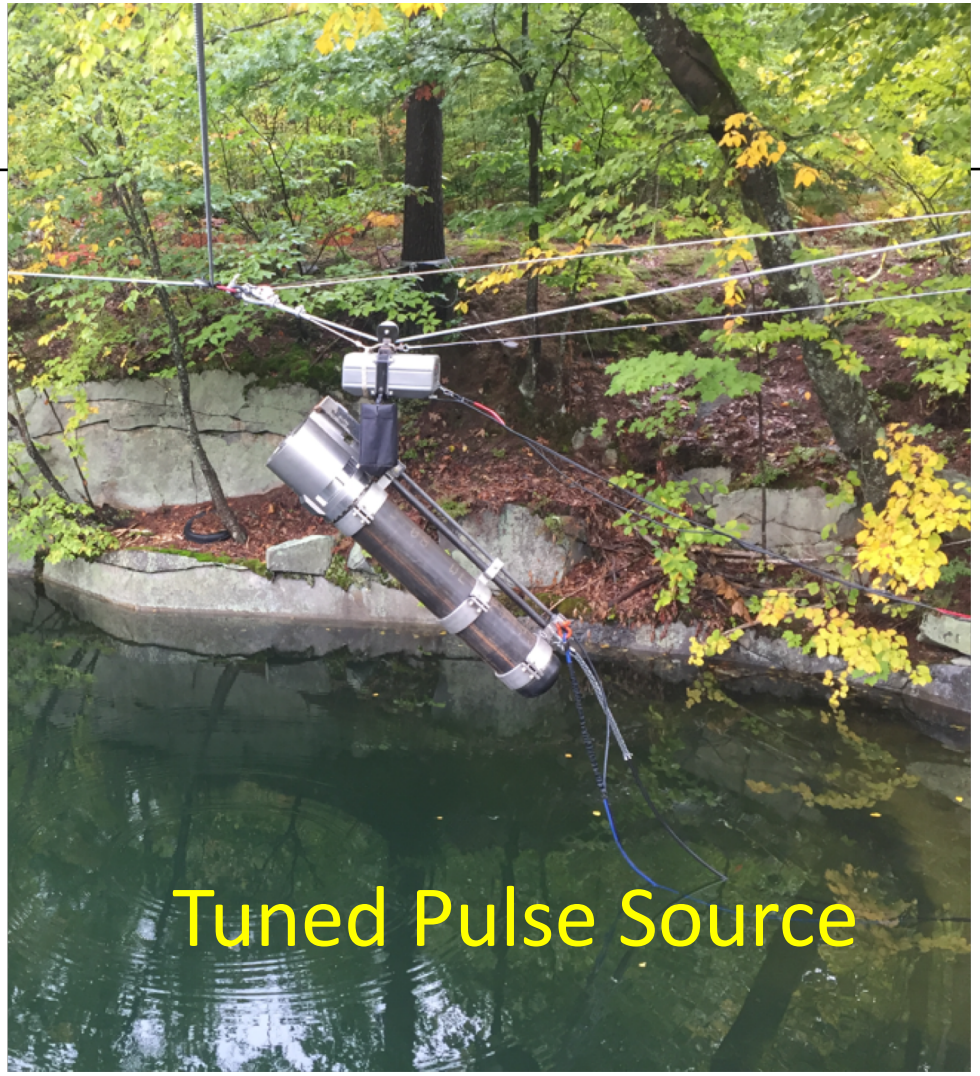
- **I am not proposing anything that will save money compared to what we are doing now (Airguns)**
- **Why was I invited to give a talk in this workshop?**

Answer

- **Don’t compare to airguns**
- **Low frequency and low environmental impact are not cheap**
  - **Low frequency ambition level: 2 octaves below Airguns**
  - **Environmental ambition level: 20 dB lower than Airguns above 80 Hz**

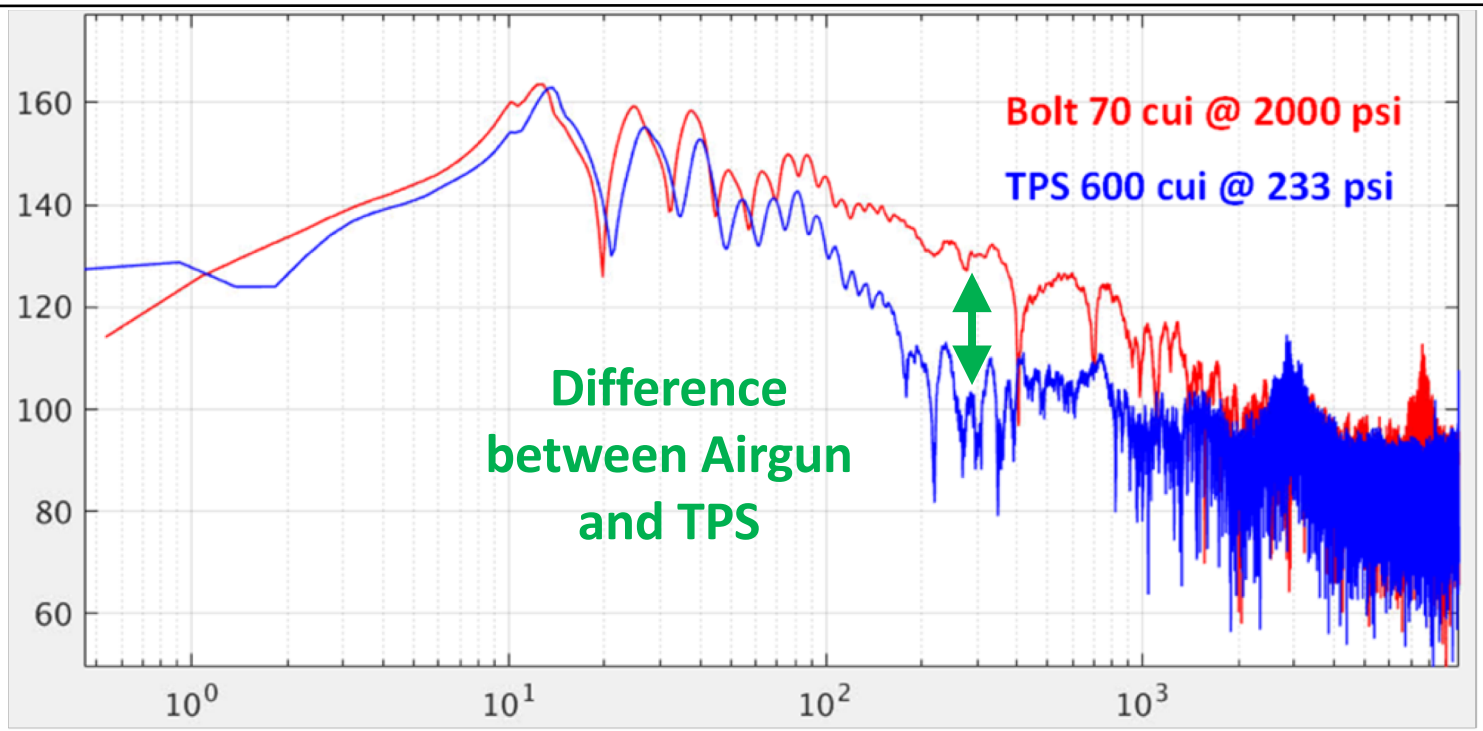
Compare modeled data to real data




Tuned Pulse Source


A quarry in NH.
Airgun

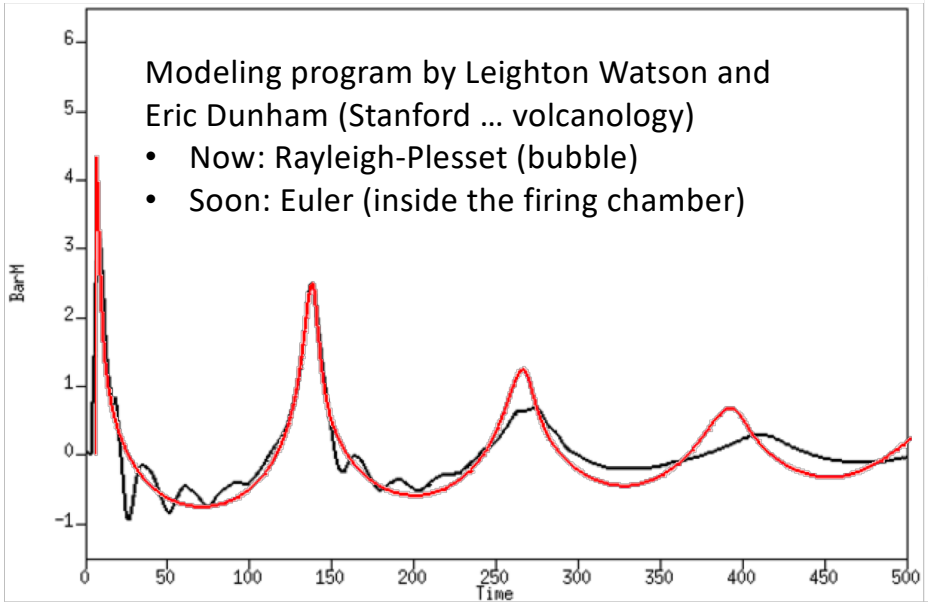
Tuned Pulse Source (TPS)—not just a giant Airgun

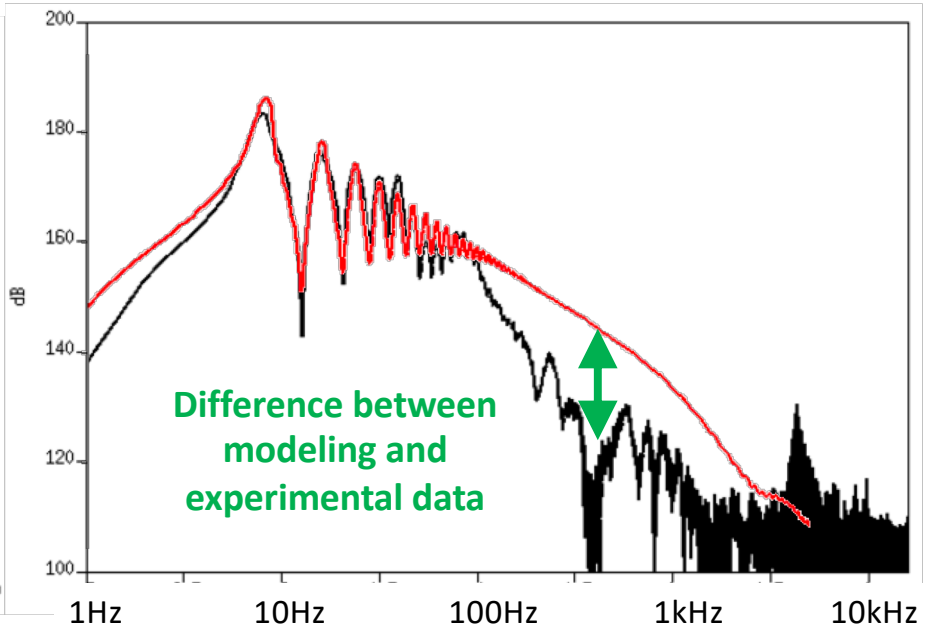




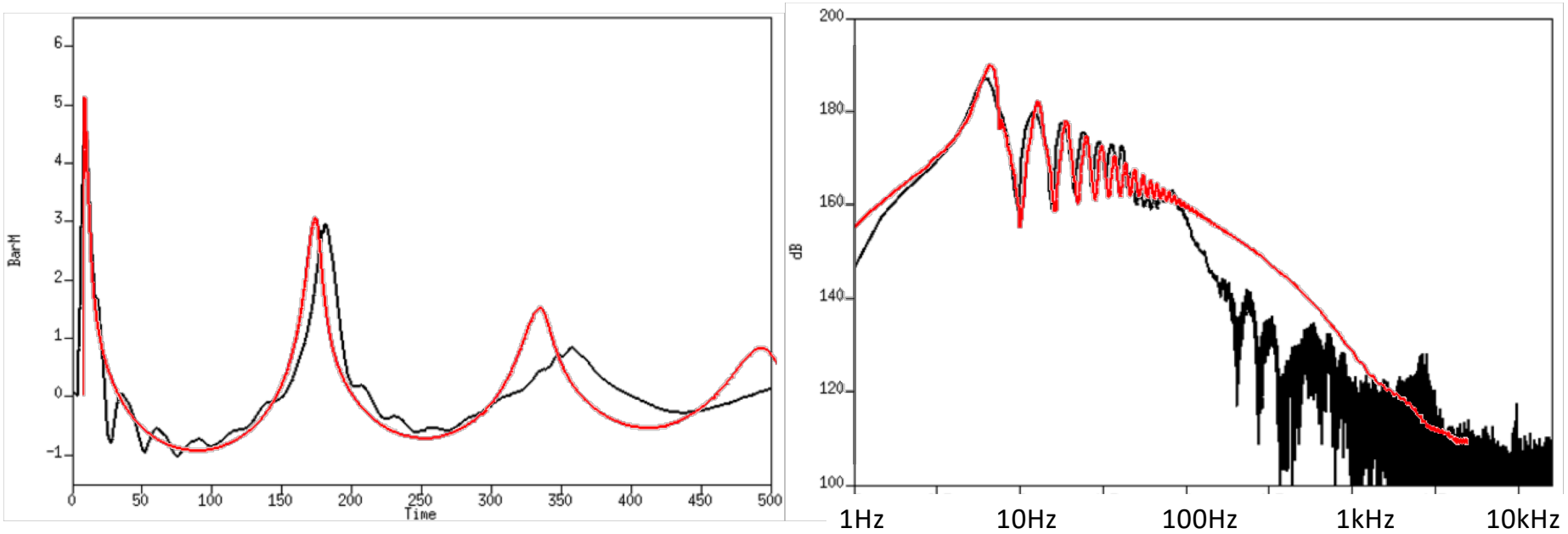
I thank Shell for clear geophysical and environmental requirements and for their support in funding and data analysis

Comparison of quarry data to modeling 600 cui (1000psi)





Comparison of quarry data to modeling 1200 cui



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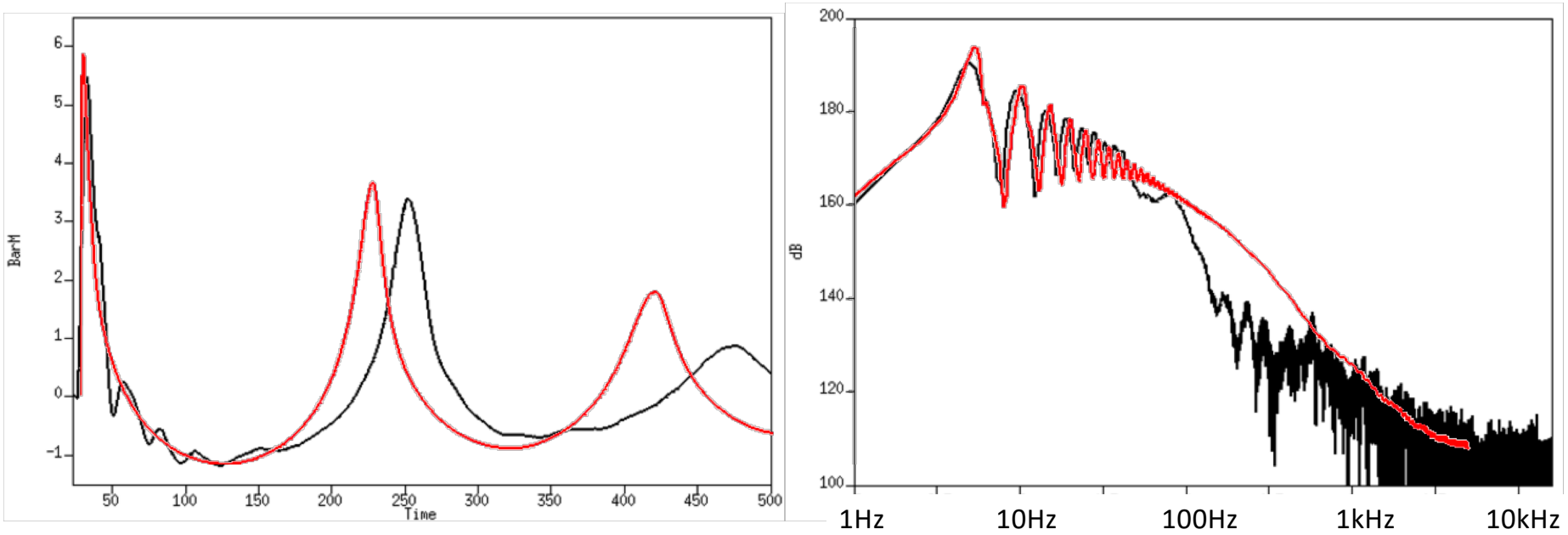
Comparison of quarry data to modeling 2400 cui



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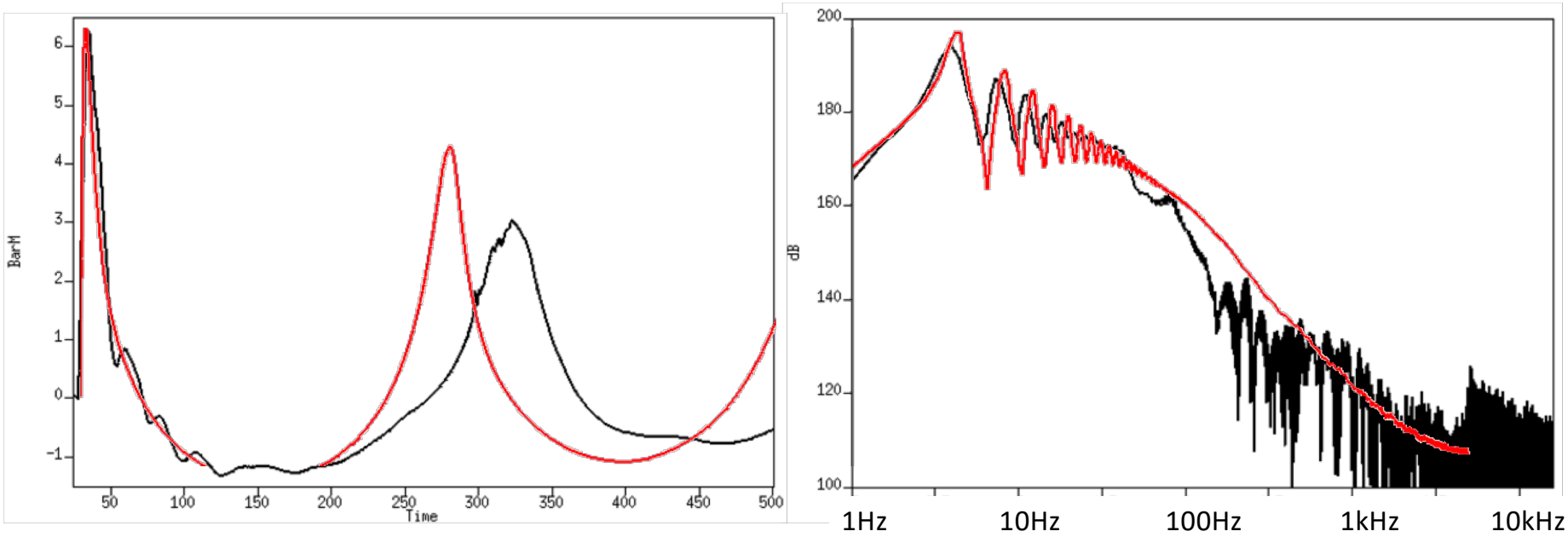
Comparison of quarry data to modeling 4800 cui



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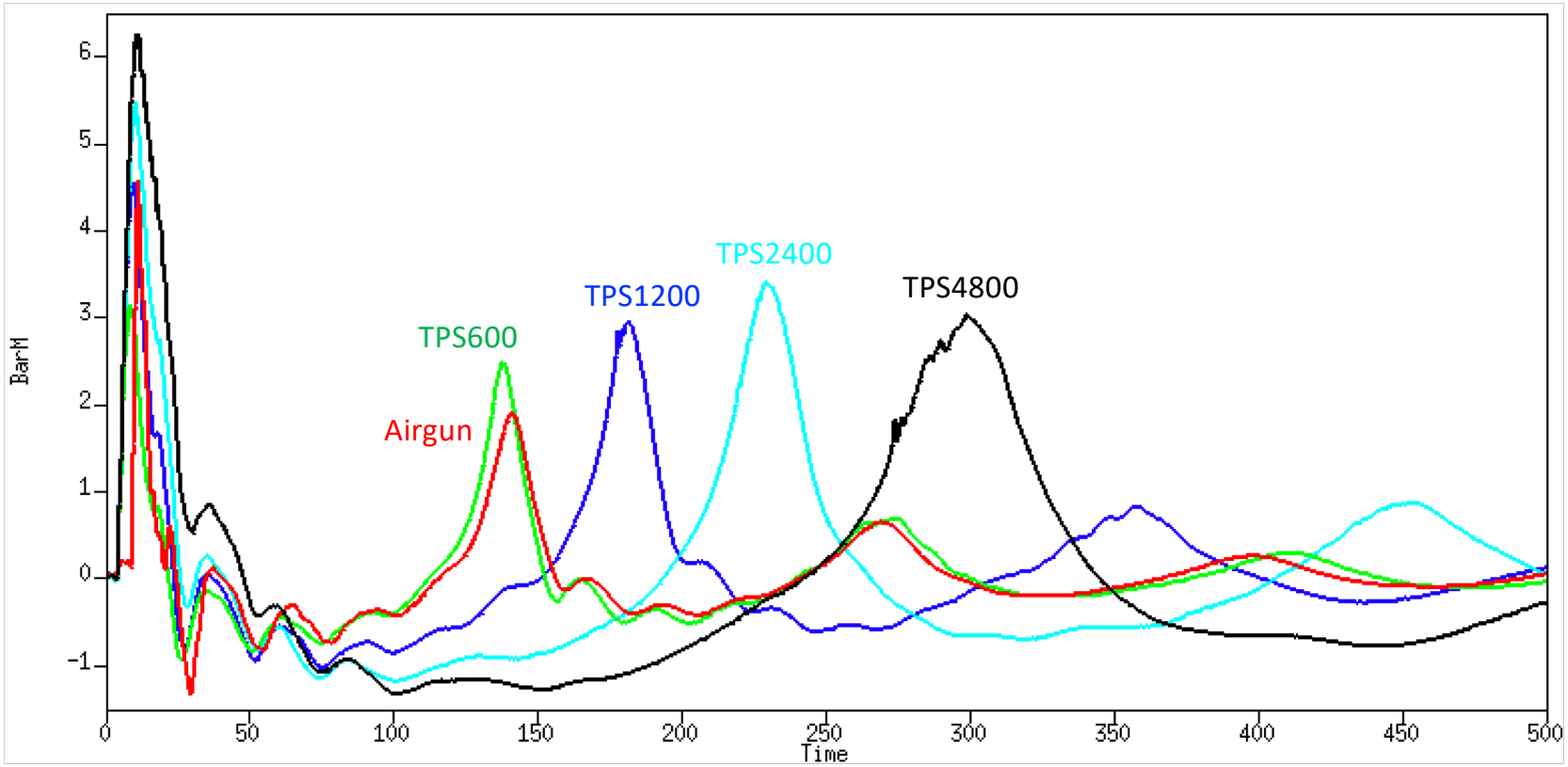
Time domain comparison—bubble period



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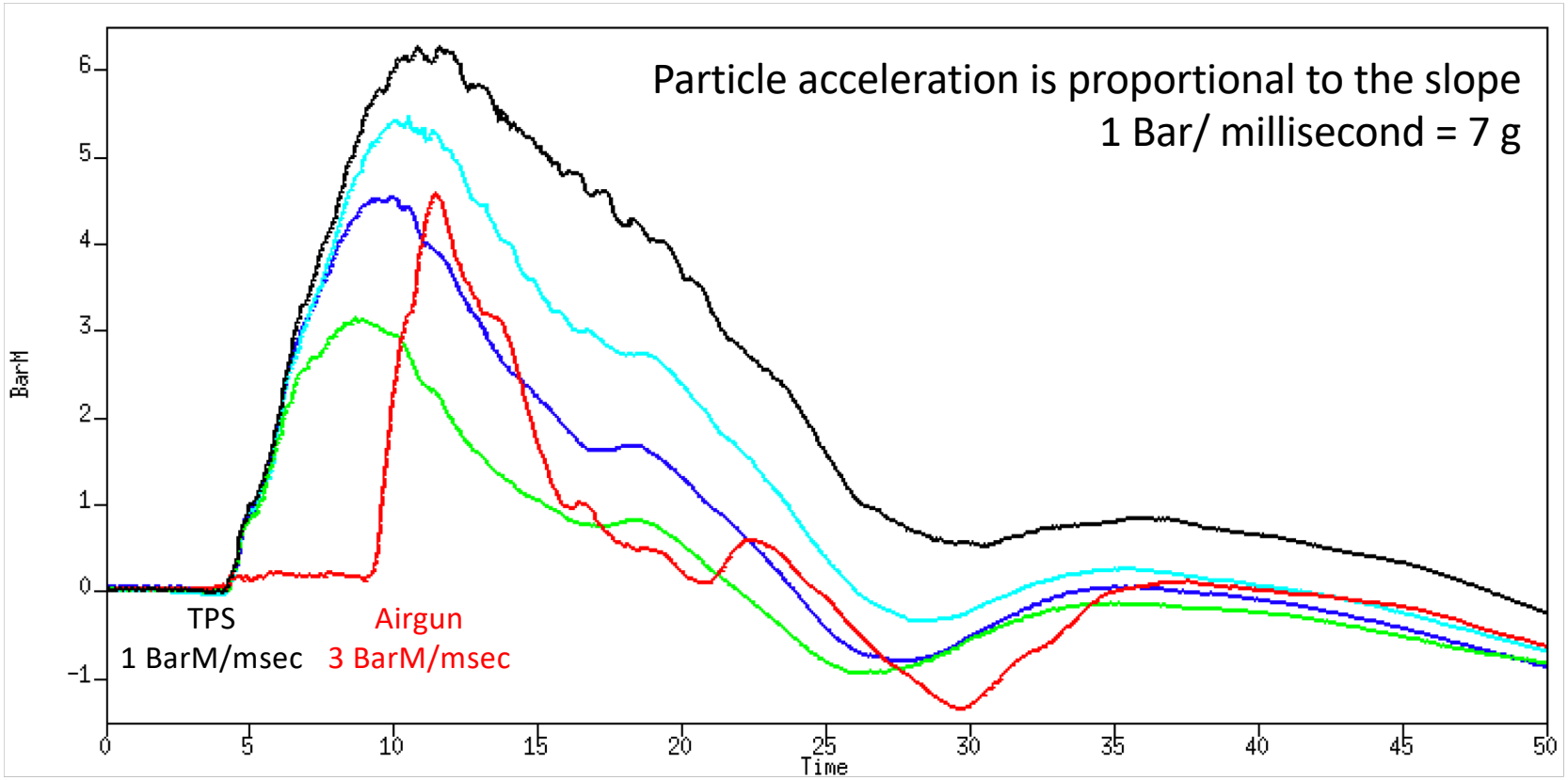
Time domain comparison—Slope



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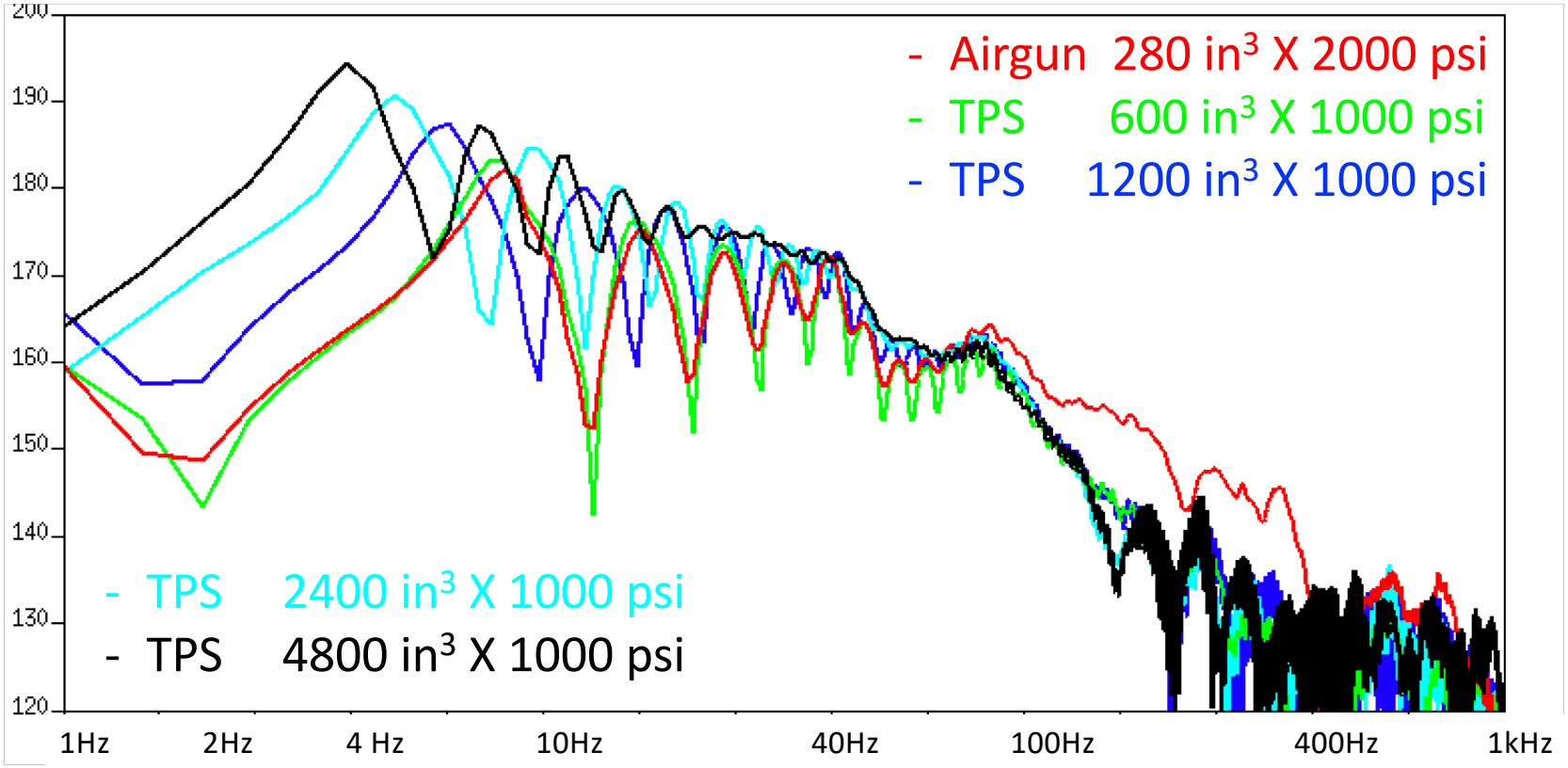
Frequency domain comparison



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Tested up to 4800, pending 20,000 cui

- Have manufactured one TPS operating head and 5 firing chambers 600, 1200, 2400, 4800, 9600, 20K
- Have tested 600-4800
- Planning to test the 9600 and the 20K soon

- VLF is 2X9600 cui
- ULF is 140Kcui



Summary

- A new generation of pneumatic seismic sources
  - Lower pressure than Airguns
  - Larger volumes than Airguns
  - Not “just huge Airguns”
    - ❑ Important differences in design: acceleration distance and more
  - Decreased high frequency content: reduced environmental impact
  - Increased low frequency content: increased geophysical value
- Acknowledgements
  - Shell oil company for funding the manufacturing and the testing and data analysis
  - Low Impact Seismic Sources for partial funding
  - Stanford University for the modeling program
  - Polarcus, Shearwater, and Sound Oceanics, for assistance in advice and equipment
  - Seabed Geosolutions for releasing the node data