

ZEN AND THE ART OF NETWORK MAINTENANCE

**Workshop on National Geophysical
Networks in Latin America**

Santiago, Chile

May 25-29, 2015

**David Simpson
President Emeritus
IRIS Consortium**

WORKSHOP - STRUCTURE & GOALS

■ Best Practices

- IRIS, UNAVCO and CSN experience
 - EarthScope, network operations and data exchange
- USGS
 - NEIC processes and practices
- New IRIS developments in *Quality Assessment* tools
 - Application to National Network operations
- USGS Training Sessions
 - W-Phase Moment techniques
 - Shake-Map



WORKSHOP - STRUCTURE & GOALS

- **Regional Clusters and Panels**
 - National and Regional Reports
 - Network Status
 - Scientific Challenges
 - Central America, North and Interior S America
 - Jay Pulliam and Marino Protti
 - Andean Region
 - Ray Russo and Klaus Bataille
- **Inventory of observational resources**
- **Opportunities for Collaboration**
 - National and regional opportunities
 - Future opportunities
 - National Network enhancement
 - Subduction Zone Observatory



WORKSHOP - STRUCTURE & GOALS

■ Posters

- Remain up throughout the week

■ Advice to IRIS and UNAVCO

- Future workshops
- Tools and Training
- Network enhancements

■ Breakout Groups

- Thursday and Friday – in parallel with USGS training
- Additional training

■ Tour of CSN – Wednesday afternoon



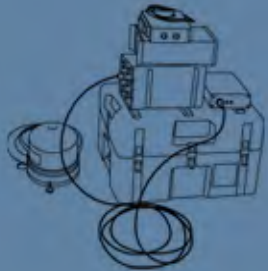
BEST PRACTICES

- **Operations, Quality Assessment & Data Exchange**
 - Presentations and break-out on Thursday and Friday
 - Mary Templeton, Andy Frassetto – IRIS Data & Instrumentation Services
 - Fran Boler - UNAVCO
 - Juan Reyes, Jennifer Eakins- UCSD - Array Network Facility
 - Sebastián Riquelme, Juan-Carlos Baez and others – CSN
 - Branden Christensen – OSOP - SeisComp3 – breakout
- **USGS**
 - Gavin Hayes
 - NEIC Operations and W-Phase
 - Dave Wald, Bruce Worden, Kuo-Wan Lin
 - ShakeMap, ShakeCast

BEST PRACTICES

■ International Collaboration

- Anne Meltzer: Lehigh University – Chair, IRIS Board of Directors
- Susan Beck: U. of Arizona - IRIS International Development Seismology
- Meghan Miller, Freddy Blume, UNAVCO



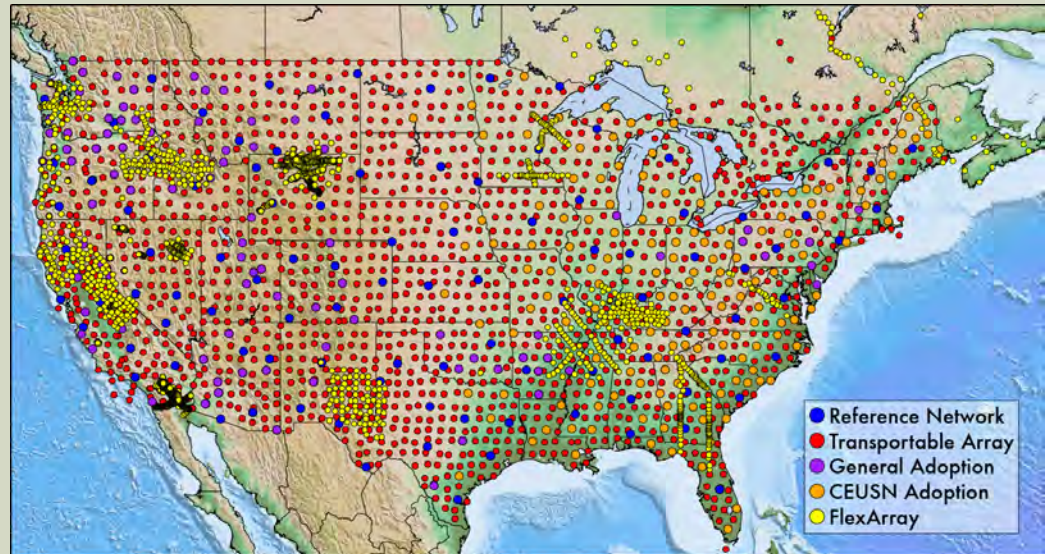
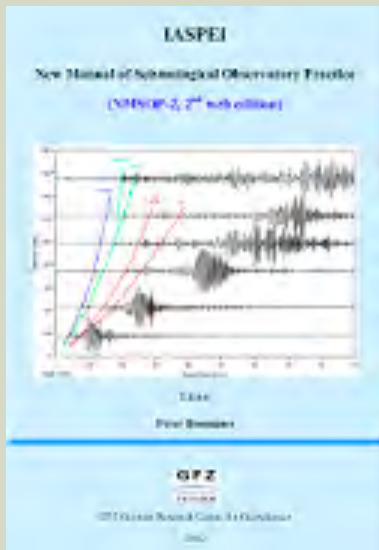
IRIS Mission

- **Facilitate and conduct geophysical investigation of seismic sources and Earth properties using seismic and other geophysical methods.**
- **Promote exchange of geophysical data and knowledge, both through use of standards for network operations, data formats and exchange protocols, and through pursuing *policies of free and unrestricted data access*.**
- **Foster cooperation among IRIS Members, Affiliates, and other organizations in order to advance geophysical research and convey benefits from geophysical progress to all of humanity.**



OVERARCHING THEMES

- “Modern Geophysical Networks” represents a fundamental shift in emphasis
 - *not just transition from analog to digital*
 - new avenues for societal application and collaboration
 - “It ain’t just research anymore”
- Shift from *stations* to *networks*



OVERARCHING THEMES

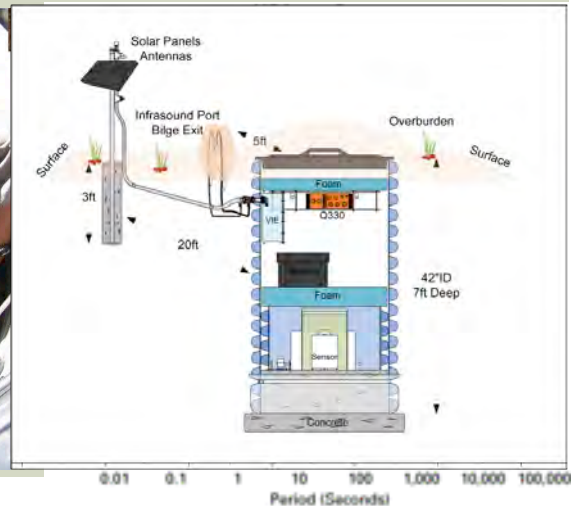
- **Observational networks are a national resource**
 - Multi-use applications in hazard assessment, research and education
 - Need to approach national governments (and international agencies) and present observational systems as a component of infrastructure essential for the safety of civil society

OVERARCHING THEMES

- Emphasis on network assessment and *quality*
 - Metadata are supreme
 - Diagnostic tools are being developed to monitor health and quality
- Natural progression for IRIS
 - 30 year history of IRIS program and project development
 - Science Plan ->
 - Design Goals ->
 - Technical standards ->
 - Specifications ->
 - Open commercial implementation ->
 - De facto instrumentation and data standards for international seismology
 - Appropriate to now turn to *quality*
- Open data can be a win-win experience for provider & consumer
 - enhances data quality and opportunities for collaboration
 - “well-exercised data are healthy data”

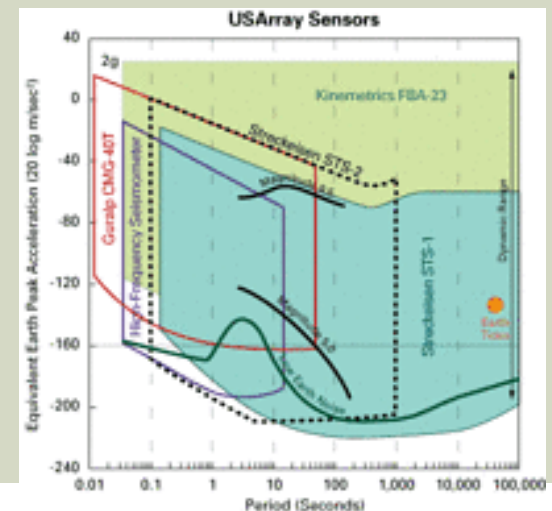
A NEW ERA IN NETWORK OBSERVATIONS

- With the evolution to modern digital networks
 - Most observational errors disappear
 - timing, station location, sensor orientation (via GPS and “octan”)
 - amplitude and phase response (via feedback sensors)
 - Many former impediments are minimized
 - Bandwidth and clipping (via feedback and 24-bit A/D)
 - Real time access (via satellite and cell networks)
 - Data collection and consolidation (real time recording and data archives)
 - Power systems (via solar panels and battery technology)



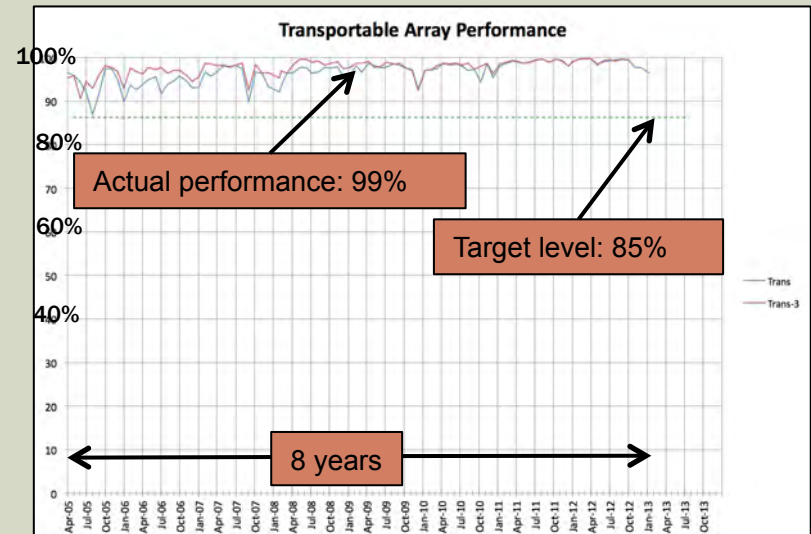
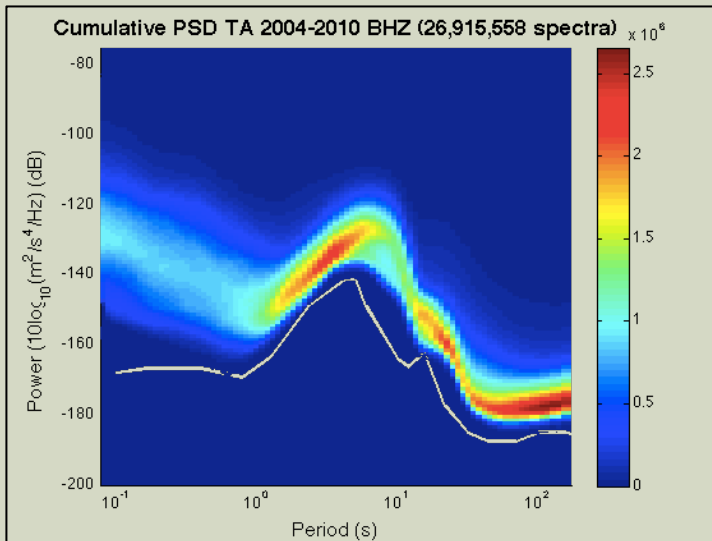
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Reliable operation of these “networks” depends on coordinated upkeep of hardware, software and metadata between you, the manufacturer and ISP

Why shouldn't modern geophysical networks be as stable and reliable?



DIAGNOSTICS AND “QUALITY OF LIFE”

■ Medical Diagnostics

- Visual clues
- Weight
- Temperature
- Blood Pressure
- Heart Rate
- Blood chemistry
- Electro-cardiogram

■ IRIS Network Diagnostics

- Quick look – noise and events
- Up-time - % data return
- Latency –time between recording and archiving
- Noise level – via PSD
- Metadata completeness
- Moment tensor residuals – from GCMT

■ Combined toolkits

- MUSTANG
 - Modular Utility for **ST**atistical **kN**owledge **G**athering
- LASSO
 - Latest Assessment of Seismic Station Observations

Routine use of standard diagnostics will catch most problems and help ensure quality of life. In depth forensics may be required for more difficult problems.

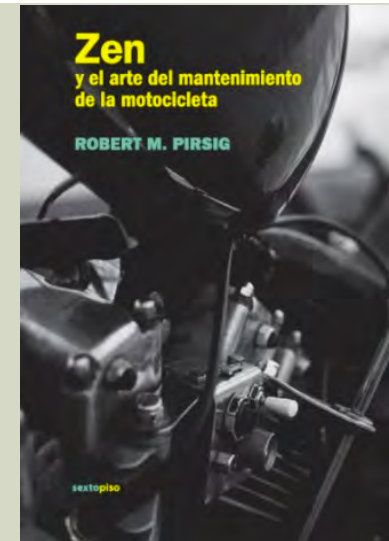


ZEN AND THE ART OF MOTORCYCLE MAINTENANCE

Robert Pirsig, 1974



... an inquiry into values



The Metaphysics of Quality would show how things become enormously more coherent

- - fabulously more coherent - -
when you start with an assumption that
Quality is the primary empirical reality of the world.

La Metafísica de la Calidad demostraría cómo las cosas se tornan enormemente más coherentes

- - fabulosamente más coherentes - - cuando se comienza con la suposición de que
Calidad es la realidad empírica primaria del mundo.