EarthScope's Transportable Array: A preposterous idea, realized.

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… and with heartfelt thanks to the entire TA Team!

The legacy of the Transportable Array is about thinking very big and, if given the opportunity, making that opportunity count. The founding concept was pretty simple – cover every part of the continent with seismometers in as big a grid as you can muster. This grid design would image rich and bland regions of the crust and upper mantle alike, turn up all kinds of seismicity patterns lurking unseen and also serve as a big beam-steerable array reporting in real-time. And so it has.

There were limits of course. Not every site could be occupied at once, or for long. It was figured ten years was the maximum one could plan for, with 18 months as the minimum occupation time to record sufficient events to produce a well-resolved image and a 70 km maximum spatial stretch between stations. The math works out to 400 stations (probably the most we could imagine operating) to cover the continent, sticking approximately to within US borders. The presumed method for telemetering data from widely spaced sites was to employ large VSAT dishes. And if all that worked, we'd go to Alaska.

In this talk, I will provide a background into some of the notable challenges and choices made during the execution of the TA experiment. A key theme of this project from inception, and still today in its 12th year, is the scale and speed at which operations take place, and the dedication and skill of those laboring to deliver the highest quality data possible. This places requirements on the manufacturability of a station, not just in the equipment, but also in the process and procedures from permitting, to installation and even removal. This scale also affords innovation to devise alignment tools, molded tanks, complex diagnostic monitoring and auxiliary electronics and pressure sensors to supplement the ground motion instrumentation. I will also briefly describe some of the newest innovations we have applied in the pursuit of the Alaska portion of the Transportable Array.

In addition to the some 30 terabytes of raw data, hundreds of presentations annually, and the growing library of student theses and dissertations, one of the legacies of the data set itself is very long continuous segments from well-oriented and uniform sensors. This data is seamed together from two separate sources, a telemetered volume and a locally stored volume, to produce the best overall continuity. This attribute makes possible many of the big data approaches to analysis, as numerous gaps and anomalies create challenges in utilizing automated software. We are working to produce a complete indexed volume for researchers to use in more advanced local processing environments.

Finally, a significant legacy of the Transportable Array is the continued operation of large numbers of stations within the Central and Eastern United States Seismic Network (CEUSN; 158 stations as the N4 network code), the Cascadia Initiative (27 stations), stations that augment the ANSS Backbone (20 reference network stations), ten demonstration stations in Chile, and 55 stations adopted by state agencies or universities. The Transportable Array has implemented several types of ancillary data: barometric pressure, infrasound, strong-motion, and soil temperature profilers that serve to broaden interest in the observational approach. These stations have lived on beyond the Transportable Array, which serves as a good reminder of what is possible when we allow ourselves to think big.