The Seismic Source Facility: Turnkey Seismic (Explosion) Sources for Active-Source Profiling

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The Seismic Source Facility (SSF) has been an IRIS funded facility since 2013. The SSF has the capability to provide artificial sources for seismic studies at scales from the critical zone to crustal scale and everything between. These sources can be used for seismic reflection/refraction imaging of the crust, high resolution profiling of outcrops or geotechnical layers, calibration shots for passive seismology (tomography) experiments, among others. The SSF provides turnkey service in that principal investigators can request sources and the SSF will arrange and execute the sources in the field. Under the current IRIS arrangement, PIs provide the funds for the sources from project-based funds through collaborative agreements or subcontracts.

For sources requested by a PI, the SSF provides these services:

(1) First, the facility provides proposal preparation support. For crustal scale studies, this is a more involved process, which includes cost estimates for drilling, explosives with delivery, stemming materials with delivery, reclamation, personnel time and travel. Drilling costs are highly dependent on the geology that will be drilled. Drilling costs are obtained by contacting drilling companies getting quotations for cost foot or meter and non-drilling costs such as moving from site to site. Explosive costs can be obtained in the same way in the U.S., however overseas getting the cost of explosives and delivery usually requires a meeting with the vendor. Stemming (filling the hole above the explosives) is necessary to hold the explosive pressure in the hole for a few seconds to maximize the seismic amplitude of the waves generated. Holes left after shooting must be reclaimed. For smaller studies proposal preparation as with other tasks is a less involved process.

(2) Once the proposal is funded, the facility’s second task is to provide regulatory compliance for the drilling and blasting. This includes obtaining blaster’s licenses to buy and use explosives, seismic licenses to conduct seismic operations, posting performance bonds to insure reclamation and even obtaining a professional geologist’s license to design shot holes and supervise drilling in accordance with state regulations.

(3) The third task of the facility is to do siting and permitting of shot sites. This involves finding sites that accessible by the drilling rig or non-explosive source and have the proper standoff from structures, wells, and utilities. In addition, sites on federal lands may require archeological and biological clearances before a permit will be issued. On private lands, landowners may require you to be insured and in some cases to insure them in order for them to give you a permit. The facility is insured to use explosives.

(4) The final task is to prepare the sources, this includes supervision of the drilling, loading and stemming of shot holes and the precise detonation of the shots. For non-explosive sources this includes positioning of the source and precisely timing its actuation. In addition to explosives, we have experience with vibrators and accelerated weight drop sources. Finally, for any type of source, the ground is always returned to its original contour and condition before leaving the project area.

Preparing to load a hole in Georgia.