

Notice of Interest

DE-SOL-0003766

February 29, 2012

This Notice of Interest concerning the release of a Broad Agency Announcement (BAA) to solicit research and development (R&D) regarding Nuclear Explosion Monitoring Research and Development (NEM R&D) is issued in accordance with CFR Part 35.016. Offerors should not submit a proposal in response to this Notice of Interest, but may submit a proposal after release of the solicitation.

Description: The United States Air Force Research Laboratory (AFRL) and the Department of Energy's National Nuclear Security Administration (DOE/NNSA) will jointly solicit proposals for R&D to improve capabilities to detect, locate, and identify nuclear explosions. It is anticipated that this planned solicitation will be released on or about March 28, 2012 and close on or about May 23, 2012 seeking proposals with a period of performance of 1 to 3 years with awards starting in fiscal year (FY) 2013. Research products developed under this planned solicitation shall support Air Force requirements for improving the nuclear explosion monitoring capabilities, NNSA nuclear nonproliferation initiatives and U.S. verification needs.

The objective of this planned solicitation is to enhance U.S. capabilities in nuclear explosion monitoring primarily with ground-based systems. This will be achieved through advances in the state-of-the-art for nuclear explosion monitoring, basic and applied research that enhances understanding of the underlying phenomena, developing new methods of tackling monitoring problems, or gathering new data for use in nuclear explosion monitoring. Proposals that enhance U.S. capabilities that also benefit the international monitoring capabilities in the context of preparations for a Comprehensive Nuclear Test Ban Treaty may be submitted

Individual proposals should be directed to only one of the topic areas, or for Topic 3 only one of the subtopics, described below, but the Offeror may submit proposals in more than one topic or subtopic-area. All topic and subtopic-areas are of importance. However, depending on the proposals received and programmatic needs, funding may not be distributed evenly among the topic and subtopic areas.

Research is sought in the following topic areas:

TOPIC 1: Seismic Source Physics: Local and Regional Monitoring and Discrimination

TOPIC 2: Infrasound Source Physics and Propagation

TOPIC 3: Seismic Signal Propagation

TOPIC 4: Signal Analysis

TOPIC 5: Synthetic Seismograms

Topic 1: Seismic Source Physics: Local and Regional Monitoring and Discrimination

Proposals are sought that would produce new understanding of the properties of small seismic events and their seismic waveforms at local (200 km or less) and regional (2,000 km or less) distances. Of interest are: innovative methods of event detection and location that are appropriate for local events; methods for estimating yields of seismic events recorded at local distances with low uncertainty; new methods for discriminating explosions from earthquakes that have a firm physical and statistical

basis; methods that can discriminate chemical from nuclear explosions; and the physics of small seismic events, including the effects of emplacement conditions, such as depth, scaled depth, near source topography, and source media properties including heterogeneity. A subject of interest, closely tied to Topics 3a and 3b, is the impact on source characterization of the development, evolution, and stability of seismic phases as they propagate to local and regional distances through laterally-varying structures, including the effects of 3-D scattering.

Topic 2: Infrasound Source Physics and Propagation

Proposals that enhance capabilities to distinguish above ground, partially buried, and fully contained explosions are of interest. Because propagation is considered the largest and most poorly understood cause of infrasound amplitude variability, proposals are sought that characterize the effect of propagation on the distribution of infrasound amplitudes from seismo-acoustic sources with known signatures. Studies that provide predictive capability for propagation effects on infrasound amplitudes and their uncertainties, and physical understanding of the dependence of the predictive capability on the details of atmospheric models are of particular interest. Regarding proposals using repeating sources, preference will be given to those that include measurements at the source and that are well-recorded in distance and azimuth over multiple regions of the Earth and over all seasons. Understanding and prediction of propagation effects out to 1000 km, and especially within the zone of silence, are of particular interest. Understanding of other propagation effects that affect detection, location, and identification is also of some interest. Modeling and experimental studies focused on source generation are not being solicited at this time.

Topic 3: Seismic Signal Propagation

3a. Attenuation Models: Proposals are sought to develop local and regional attenuation models, with emphasis on their ability to match observed amplitudes of Pn, Pg, Sn, and Lg phases, their codas, and surface waves. A question of particular interest is whether shear phases will be seen above the P coda over a particular path and at what distances and useful frequency range. Proposals to develop new methods for measuring attenuation, to estimate uncertainty (confidence, resolution, and variance) in attenuation models and predicted amplitudes, and to develop models that fit multiple datasets (e.g. body wave and surface wave amplitudes), are of interest.

3b. Velocity Models: Proposals are sought that develop advanced models of the Earth's velocity structure that will improve location capability. Priority will be given to studies of poorly calibrated regions within Eurasia. Of particular interest are: new techniques of determining 3-D, spatially variable velocity models; new techniques for building models by fitting multiple datasets, especially of different types of data; techniques to estimate the uncertainty in geophysical models and assess the tradeoffs between different parameters of the models, as well as the uncertainty (confidence, resolution, and variance) in predicted observables, such as travel times; new techniques for determining velocity structure in aseismic regions; studies that compare different methods to show their strengths and weaknesses; and models that can predict structural effects on seismic amplitudes at 1 Hz and higher as well as travel times.

3c. Location and Discrimination Ground Truth: Proposals are sought for collection of ground truth at a GT5 level (absolute location and depth errors less than 5 kilometers) or better in uncalibrated or very poorly calibrated areas. Studies that generate new discrimination ground truth events, along with source geometry and other characterizing information are sought. Calibration of regional coda magnitude is of interest. Improved techniques for event location using models and/or ground truth at local, regional or near-telesismic distances, particularly methods that use more than a single type of data jointly are of interest. Techniques for accurately predicting P-wave travel times from surface wave based models are of interest. Robust estimation of uncertainty is an important consideration.

Topic 4: Signal Analysis

We seek new and innovative signal processing methods for data from local (less than 200 km) and regional (less than 2,000 km) distances that significantly lower the thresholds at which detection, location and identification functions can be performed at an acceptable false alarm rate. Methods that make use of more of the waveforms than simply arrival times and amplitudes are sought. Methods that make use of full waveforms, including waveform matching, are of particular interest. Studies should assess success and failure rates and the effect of less than perfect waveform matching. Estimating improvements in detection, including testing of detection processes using superposition of actual signals in increasing noise, is of interest. Tuning studies, either of specific arrays or of techniques in general, are not sought.

Topic 5: Synthetic Seismograms

Innovative methods of computing synthetic seismograms for local, regional, and near teleseismic distances are of interest. Some topics of particular interest are 3-D computations in large models, efficient methods for 2.5-D calculations, hybrid or approximate methods that have significant advantages over other methods, methods that calculate spectra or envelopes, and computations at frequencies of 1 Hz and higher.

*****END OF TOPICS*****

The BAA will solicit proposals from all responsible organizations (foreign and domestic) including industry, academic institutions, research institutions, and non-profit organizations.

The AFRL and the NNSA are strong advocates for the small business community and interested small businesses, small business-lead teams, and joint ventures that qualify as small businesses, are especially encouraged to submit proposals under this BAA.

Federal agencies may submit proposals as prime/lead contractors subject to appropriations language but may not partner with Federally Funded Research and Development Centers (FFRDC). FFRDCs, including NNSA national laboratories, cannot directly respond to this solicitation as prime/lead participants. FFRDCs, including NNSA national laboratories, may participate in this solicitation as team members; however, such participation must be consistent with the FFRDCs sponsoring agreement. The FFRDC effort for any proposal, in aggregate, shall not exceed 50% of the total effort of the project. Information will be provided in the solicitation on how to include FFRDCs, such as NNSA national laboratories, as a team member(s).

Enhancing programmatic value is encouraged. Low-cost proposals focused on validation or proof-of-principle issues will enhance programmatic value. Teaming is, also, an interesting way to add value, for example, teaming to facilitate integration of research products into the Knowledge Base will enhance programmatic value. Teaming which results in the training of graduate students (in particular university/industry teams working on real world problems with Ph.D. candidates) will enhance programmatic value. Programmatic value is addressed as part of selection criteria for proposals. If teaming arrangements are proposed, a clear statement of the intended benefit of teaming must be provided along with the proposed technical approach,

deliverables and costs clearly delineated for individual team members. The Government reserves the right to award to the team or to individual team members.

AFRL and NNSA will require an annual progress report and a final report of each award, and will actively facilitate a successful transition to national monitoring operations. Awardees are eligible to have an NNSA Product Integrator (subject matter expert) assigned at the time of award to help ensure the successful transitioning of research products to operations. Information about the NNSA NEM R&D program integration of research products into operational form for the Air Force can be found online at <https://na22.nnsa.doe.gov/KnowledgeBase>.

The funding organization reserves the right to determine which funding instrument shall be used. The funding instrument shall be appropriate to the scope of work and performing organization. In the event a contract is issued, acquisition regulations apply per 48 CFR, and a cost reimbursement type contract is anticipated. In the event a financial assistance instrument is issued, 10 CFR 600 applies, a cooperative agreement is anticipated.

The NNSA and AFRL each reserve the right to fund, in whole or in part, any, all or none of the proposals and to award without discussions between the funding organization and the awardee. Other Federal funding organizations may join this BAA action with signature of an appropriate federal official up to six months after the Source Evaluation Board meeting. This Notice of Interest is being issued in advance of passage of FY 2013 appropriations to provide more time for potential offerors to prepare and to allow awards to be made as early as practicable within FY 2013. The final number of topics and awards, however, are subject to the availability of funds.