

First SAFOD Core Samples Distribution

As a result of the very successful first ever recovery of cores from across the active San Andreas Fault, EarthScope/SAFOD received 28 coordinated proposals to work on SAFOD Phase 3 samples, representing 98 scientists from around the world. These proposals contained approximately 790 requests for SAFOD core and cuttings samples, reflecting the excitement and high level of interest in performing fundamental research on this rare and precious core. As might be expected, there is simply no way to accommodate all of the requests. In particular, requests for core from the most active regions of deformation greatly exceeded the available core.

All of the SAFOD core and sample requests were sent to the SAFOD Sample Committee (SSC) for consideration – not an enviable task! This first set of sample distribution recommendations strikes an admirable balance between dissemination of core materials for research and conservation of the core for future investigations. The SSC took a thoughtful and cautious approach based on an overarching philosophy that includes:

- Not more than 1/3 of the core from any given section should be available for research at this time (another 1/3 will be saved for archiving, with the remaining 1/3 to go out over the next several rounds of requests).
- Non-destructive research should be performed first.
- Inter-laboratory calibrations of measurements are necessary and should be performed first on non-core materials or cuttings from other phases of the SAFOD project. Prior to allocation of core from high demand areas, the GCR staff and the PI's should gain experience on sampling techniques and experiments done on sections of the core that are from less-critical intervals.
- Utilize "first do no harm" sampling procedures that provide samples with as much of the structure intact as possible while harming/destroying as little as possible of the surrounding core (In effect, this prohibits providing PIs with a 'larger than needed' piece to resample in their own labs).
- Postpone the most problematic (destructive) lab work until the safest possible sampling and testing procedures are in place.

The Committee recommended and NSF strongly endorses the following:

Friction experiments: The SAFOD sample committee endorses the idea that inter-laboratory calibrations should be done with standard materials selected by the investigators involved. We believe that these standard tests should be done before distributions of the core material are made for the purpose of friction measurements. Principal investigators who proposed or are planning to perform friction experiments in the future should coordinate with C. J. Marone and D. Saffer at Pennsylvania State University to obtain calibration materials and to discuss technical details. We recommend that the standard samples to be used include talc powder and powder derived from SAFOD cuttings, as well as other non-SAFOD materials. Once tests for inter-laboratory comparison are available from individual PI's, the SSC will entertain proposals for distribution of the core materials.

Other physical properties measurements: Triaxial strength, acoustic velocity, permeability, porosity and electrical properties: Investigators planning to measure physical properties, including permeability, intact strength, and electrical measurements groups, should also do inter-laboratory calibrations using a set of standard materials. Such standard materials might include Westerly granite, Fontainebleau sandstone, Berea sandstone, a uniform shale rock, and some material from an outcrop along the San Andreas that is competent and relatively uniform. Critical issues to be considered include choosing samples that span the range of permeability that is expected along the fault and insuring that the standard materials are truly homogeneous. We recommend that these investigators and others wishing to perform such tests coordinate with D. Lockner of USGS for technical information on standardization.

Dimpling experiments: One group suggested dimpling experiments along the entire length of the core. The SSC committee is not familiar with this technique and wondered if it were possible to demonstrate that the area of influence of the dimpler could be quantified before allowing access to the entire core. A possible demonstration might be carried out on cores from earlier exploratory wells with some detailed observation of the structure of the sediments before and after the dimpling process. If it can be clearly demonstrated that the SAFOD core material will not be compromised then, in principal, the committee would view this proposal favorably.

Curation: Sampling, distribution and curation will be done exclusively by staff at the Gulf Coast Repository (GCR), supervised by J. Firth, in consultation with the principal investigators. Firth and the GCR staff are authorized to approve and execute sampling using their considered judgment, acting in the best interests of NSF and the scientific community. Minor deviations in sampling are authorized, provided that the general philosophy of the SAFOD project is respected and that the ethics and research goals of NSF and USGS are advanced.

Additional Comments: We chose sections of the core that had fairly homogeneous textures over a section of 5 cm or longer, with rocks that visually appeared to be competent; we specifically avoided the gouge zones thought to be creeping. Portions of the core not used for physical properties measurements can be used for thin sections or geochemistry measurements. Each investigator making a thin section must make two sections, one for themselves and one for immediate return to the GCR for inclusion in the SAFOD library.

Over the next few weeks, researchers will be notified by NSF of the outcome of their sample requests. All are strongly encouraged to coordinate with the above named personnel as necessary. Information about all granted sample requests will be available via the EarthScope webpage once all researchers have been contacted. It is very important to note that C. Marone, D. Lockner, and D. Saffer have agreed to coordinate inter-laboratory comparisons and calibrations as a service to the community. They will not judge or arbitrate the results. Instead, they will work with the community to make results readily available to assist everyone in better understanding future SAFOD core and samples results. PIs are expected to provide the results of their inter-laboratory calibrations to J. Firth at the GCR (for inclusion in the online SAFOD core information system) and in any new requests for samples.

For the first set of approved samples, the GCR staff will begin by sending, as quickly as is possible, samples from cuttings that are necessary for establishing inter-laboratory calibrations of friction experiments to Chris Marone at Penn State Univ. Then GCR staff

will focus on sampling from the cores, and will communicate with each investigator during this process. Investigators may either arrange a visit to the GCR to work with the GCR staff on their samples, or communicate via phone and email.

The GCR has a high level of sampling and curatorial work for IODP cores, including regular visitors wishing to sample and analyze IODP cores. Thus, investigators for SAFOD sampling who wish to visit will be fit within the schedule of other visitors and activities. To contact the GCR, please visit this web site: <http://iodp.tamu.edu/curation/gcr/index.html>. To contact the IODP/SAFOD Curator, please visit this web site: <http://iodp.tamu.edu/staffdir/indiv/firth/>.

Requests for SAFOD core and cuttings samples will be entertained approximately every six months according to established target dates posted annually on the EarthScope and ICDP websites. The next target date is January 1, 2009. The SAFOD Data Manager (SDM) will organize and collate all requests received by these dates and forward them to the SSC, with a copy sent to the NSF, for detailed review and approval.

The SSC is comprised of experts in microstructures, mineralogy/geochemistry, rock mechanics and core handling and curation who are not personally involved in SAFOD research. Current membership is:

Co-Chairs: Brian Evans (MIT) and Jan Tullis (Brown)

Members: David Olgaard (ExxonMobil), John Firth (IODP GCR), Emi Ito (U MN), Andy Kronenberg (TAMU), John Logan (U OR), and Peter Vrolijk (ExxonMobil).

The SSC recommends how the SAFOD samples might best be allocated in a manner that maximizes the scientific return from the available samples while preserving adequate samples for future study. The GCR (where all SAFOD samples are stored) prepares and distributes samples to the requesting investigators. The GCR will maintain full records on sample distribution, which are regularly submitted to the NSF and entered into the EarthScope/SAFOD web site by the SAFOD Data Manager.

For further information, please contact the EarthScope Program Director at the National Science Foundation (kshedloc@nsf.gov).