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LLNL-TR-727297

Summary of the Atmospheric Test Data (Film Scanning and Re-Analysis) Project at LLNL

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March 21, 2017

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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The goal of the Atmospheric Test Data (ATD) Project is to preserve and make better use of scientific-quality films that were taken during the era of above ground nuclear testing. The project is being done in collaboration with Los Alamos National Laboratory, which is the custodian of the films. Our primary points of contact at LANL have been Alan Carr, Carla Breiner, and Randy Drake.

There were 210 atmospheric nuclear tests and another nine nuclear cratering tests performed by the United States during the 1950s and early 1960s. The tests were recorded by numerous high speed, motion-picture films, and short exposure still photographs. The movies and images were used to determine test yields and provide information about nuclear weapon effects. As such, the films are an invaluable, and irreplaceable, source of scientific information.

The organic material of the films is estimated to have a lifetime of at most 100 years. Many of the films show signs of decay ("vinegar syndrome"), and a few have already been irretrievably lost. Preserving the films is therefore a critical part of the project. While film-to-film transfers will save basic images, the resulting image will be altered in a way that cannot be predicted. Such copied films are, therefore, of no scientific value. The only way to preserve the film information indefinitely, and with scientific value intact, is high quality digital scanning.

Additionally, digitization allows us to use High Performance Computers to make much better use of the film data. The film analysis techniques available 50-60 years ago were very time-intensive, and so only a small fraction of the data in the films could be used. Modern computers, by contrast, allow us to study every frame of the ~10,000 films, and with higher fidelity and precision than were possible even a short time ago. As a result, the project will, for example, be able to measure yields with uncertainties reduced by up to an order of magnitude from legacy assessments. Other studies, such as cloud evolution, will be similarly improved.

The scanning procedure is laid out in an MOU with LANL. Initially, the films are shipped to LLNL, a leader is added, and they are sent to a film lab for cleaning. The latter process both improves scanning, and resets the decay clock on the films. The cleaned films are scanned twice, and returned to LANL. Copies of the high-quality scans (saved not as movies, but as individual frames) are stored at both LLNL and LANL.

As of 2017, the final ~3000 films have not yet been declassified, but because the yields have been publicly announced (NV-209), they are declassifiable. The MOU has therefore been amended to include the initial shipping of still-classified films, and their declassification prior to any work. The declassification is done for logistics purposes (the film lab is in an unclassified area and employs uncleared personnel), as well as the fact that the scans and their analyses will be unclassified.

The high quality scans are OUO, and therefore they are not publicly releasable. To deal with FOIA requests and project publicity, releasable QuickTime movies are being generated. The releasable movie files have reduced size, and lack timing information.

The ultimate goal of the project is to provide high quality information that can be used to validate weapon performance and effects codes. To that end, the LLNL team has plans to store the scans and analyses accessibly. Access at LLNL will be via the Restricted Zone computer network, thus automatically dealing with OUO protection. Numerous analysis tools have been developed by the team as well as by students who have worked on film analyses. Those tools are being standardized and converted to a standard set in Python. Both the analyses and the analysis tools will be available on the RZ machines. Additionally, the raw scans will be available from storage via scripts. Scientists both within and outside the Labs will therefore have straightforward access to the latest analyses of the films. They will also be able to perform new analyses, look for new information that can be learned from the films, and develop new analysis tools that can be added to the standard toolset.