

Archiving Impact Data: The LDEF IDE Database

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1. Introduction

After the retrieval of the NASA Long Duration Exposure Facility (LDEF), post-flight investigations started on the Interplanetary Dust Experiment (IDE). The time- and orientation resolved dataset was processed at the Institute for Space Science and Technology (ISST) in Gainesville, FL, residue chemistry analyses were conducted at the Analytical Instrumentation Facility at North Carolina State University (NCSU-AIF), Raleigh, NC, and system-level tests were performed at NASA Langley Research Center (LaRC) in Hampton, VA, among other investigators. With the end of the postflight investigation program it was considered compulsory to archive all data in a format that would facilitate future analyses. Also, an integration into the NASA LaRC Space Environmental Effects (SEE) archive (Wilson 1994 and Wilson 1995) was considered desirable. The decision was made in early 1994 to use a database format based on the now well-known Hypertext Markup Language (HTML) standard used in the World-Wide-Web Internet information network. Though lacking some features mainly concerning user interactiveness, the main advantages were computer hard- and software independence, and accessibility both via Internet and local from a CD-ROM.

2. Archival Methodology

Since the data format for the archival procedure had not been specified prior to the archival activity, a wide range of data formats had to be converted for use in a HTML-based system. These formats consisted of, among other:

- Proprietary computer data from a PC-controlled Secondary Ion Mass Spectrometer SIMS, EDX software from Macintoshes, and a miscellanea of other data formats
- Hardcopy photo prints
- Handwritten operator notes

The data was not simply transferred onto electronic media, rather, it had to be processed prior to public release to provide for sufficient information for those not involved in the investigations themselves.

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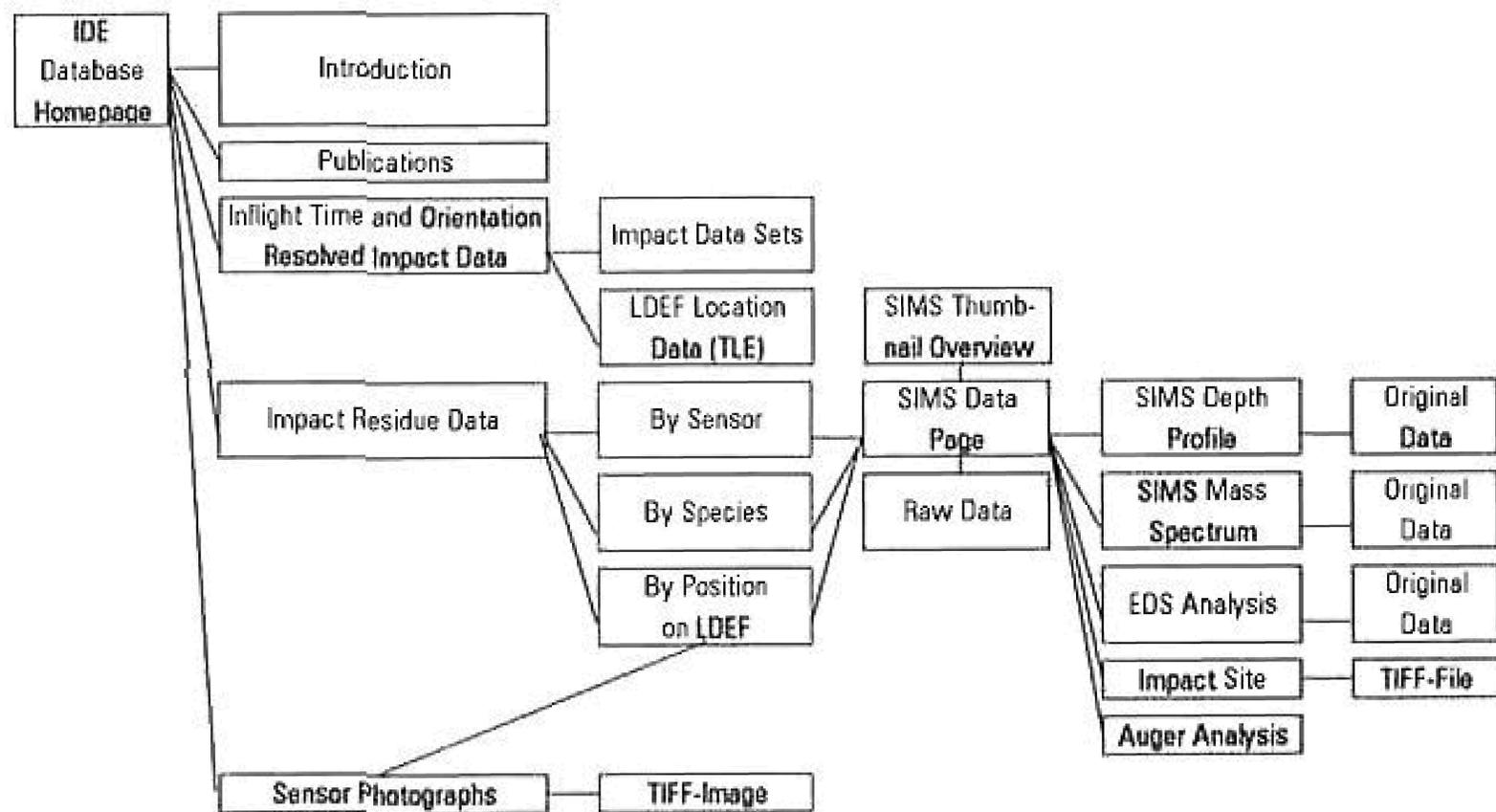


Figure 1. Diagram showing the structure of the main components of the IDE Database.

3. Database Contents

The database content structure is illustrated in figure 1. The bulk of the data are SIMS analyses performed on impacts sites on various sensors from surfaces from all major orientations of the LDEF satellite. These datasheets give all available information on instrument settings and conditions used for the analysis. Hyperlinks lead to reference pages explaining these parameters.

In addition to impactor residue analysis data, the complete inflight impact dataset is available together with major publications on this experiment. Additional data, such as stereoscopic red-blue images, MPEG animations and references to other services, such as the Office of the Curator's www located at Johnson Space Center (JSC), are available.

3.1. Inflight Data

The database contains the complete time- and orientation resolved inflight impact dataset, almost 13000 records on about 15000 impacts. Examples are given together with major publications and other documents explaining the dataset. More information can be found in (Oliver et al. 1995).

This dataset still poses open questions on the dynamics of microparticle impacts in near-Earth space. This part of the IDE database was prepared by J. P. Oliver and W. J. Cooke.

3.2. Postflight Analyses Data

The focus of the postflight contents is on impact residue chemistry. Almost 250 impact sites, contamination spots, laboratory impact test craters, and control areas were analysed using SIMS (see figure 3 for an example), EDX, and /

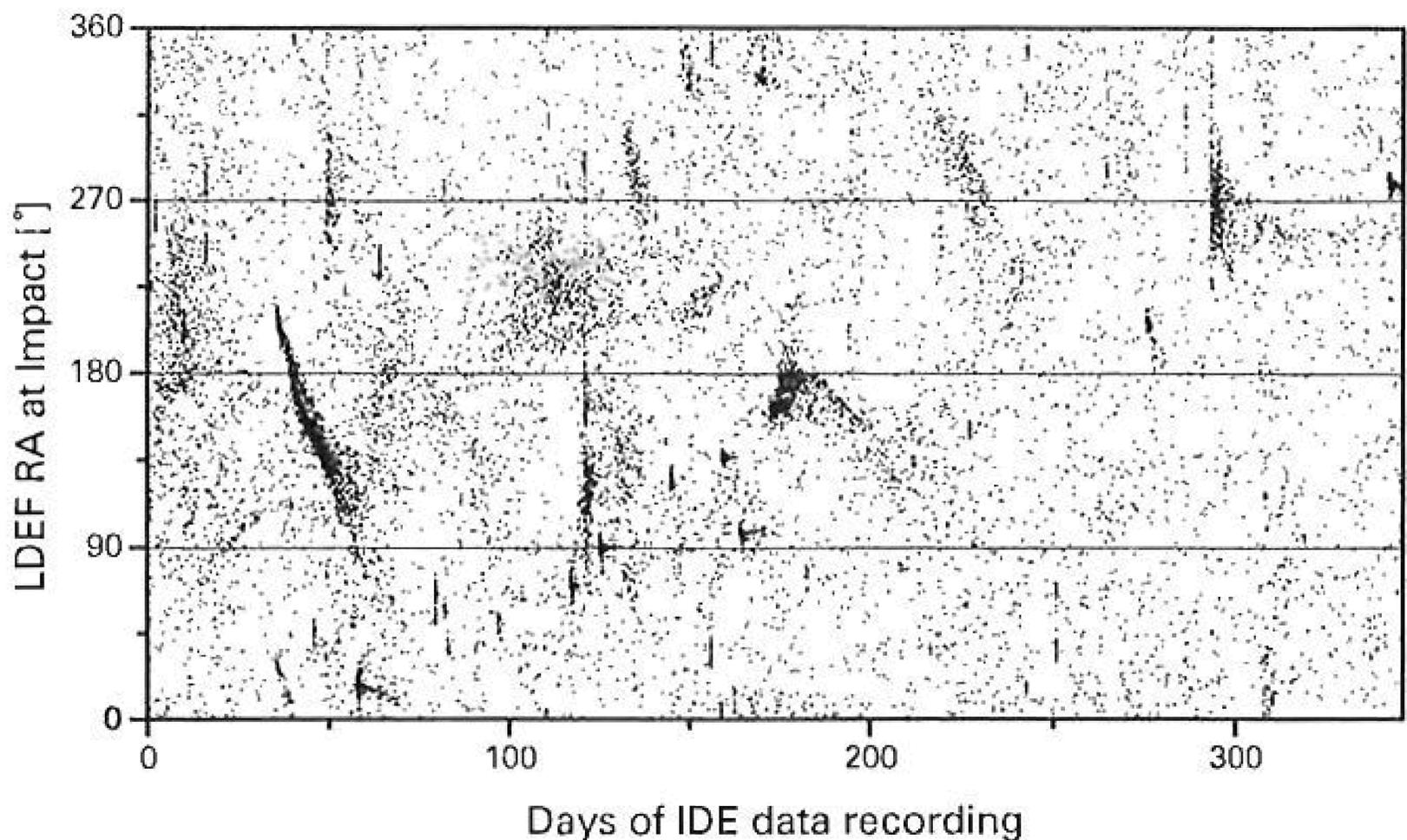


Figure 2. The inflight record of impacts registered by the LDEF-IDE.

Many impact photographs aid in the analysis of impactor characterization. SIMS depth profiles and mass spectra bargraphs complete the data on chemistry of satellite surfaces that were exposed to space conditions (Simon et al. 1995).

The SIMS data are accessible at various levels of processing and detail. Most data plots allow the access to the underlying values by simply clicking on the plot and saving the numbers as a text file. A SIMS datafile editor for PC's is included.

Database Access

The primary distribution media is a standard, ISO-9660-compatible CD-ROM which can be accessed from virtually every computer system. The only software required is a www-Browser — many can be obtained commercially or as freeware. Being part of the Space Environmental Effects (SEE) archive at NASA Langley Research Center (LaRC), the IDE Database can also be accessed directly via Internet. In addition to several bugfixes in the hyperlinks and one data entry at error, a patch file is available together with some new access paths to the database. The Uniform Resource Locator (URL) for this version is <http://dbdev.larc.nasa.gov/ldef/IDE/INDEX.HTM>. The CD-ROM version can also be accessed at <http://www.lrt.mw.tu-muenchen.de/IDE>, which may be of interest to central europe users.

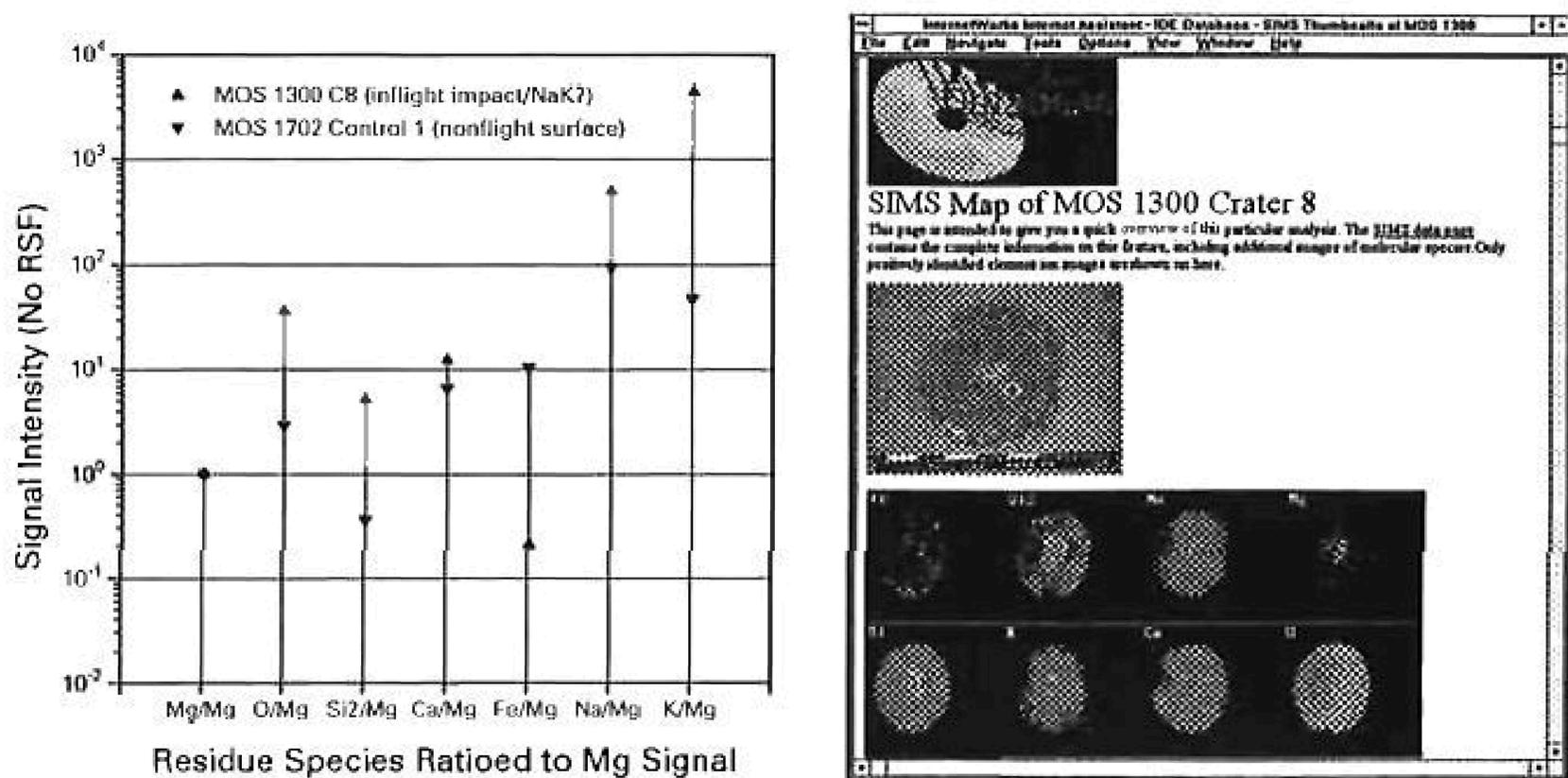


Figure 3. Impact site intensity plot (left) and thumbnail overview page for a NaK-rich impact.

5. Summary

Archiving data is crucial for future investigations of experiments. An important aspect of databases is not only the accessibility but also the new opportunities for investigators themselves to get more insight of their own data and to be able to access and process it at various levels of detail.

Though desirable, it is not necessary to change all data acquisition procedures to electronic data processing, rather, common notebooks provide a still excellent means of gathering data. The layout and content of such a database is best defined at the very beginning of the investigations to assure data integrity.

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