Updating the “IDC Processing of SHI Data” User Guide

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National Data Centre (NDC) staff need to interpret International Data Centre (IDC) seismic, hydroacoustic, and infrasonic (SHI) data processing results, which requires detailed knowledge of IDC SHI data processing. Similar understanding is needed by those that want to propose new IDC SHI data processing algorithms. To find the required information, NDC staff access the “IDC Processing of SHI Data” document, a comprehensive, detailed and accurate (at the time when it was written in 2002) user guide. Unfortunately, this document is currently outdated as many techniques recently adopted by the IDC are not described in it. Furthermore, not all technologies and techniques are described at the same depth and there are some inevitable errata. To significantly update this lengthy user guide and maintain the high overall quality is no trivial endeavor. Hence, in January 2020 a platform to note problems with the document and propose fixes was made available as an NDC Forum Topic, to take advantage of the considerable collective technical expertise of the NDC staffs. In this presentation we will provide an introduction to the platform, review results that have been entered so far, and discuss the path forward to producing an updated version of the document.
What is this Document & Why is it Important?

- This document describes comprehensively and in detail the processing of seismic, hydroacoustic, and infrasonic (SHI) data by the IDC.
- It is perhaps the best single reference for processing SHI data for nuclear explosion monitoring.
- Much of this information is not found in seismology textbooks.
- If you want to understand an IDC SHI data processing result, this is where you should look (reading source code is impractical, ~1M lines).
- Similarly, if you want to look for opportunities to improve IDC SHI processing, you should start here.
Known Issues With Document

• Errors
  o Creating this document was a huge undertaking.
  o Many algorithms are complex and highly specialized; some mistakes were made in text and/or equations (only experts reading carefully would be likely to notice).

• Omissions
  o There had to be choices made about what level of detail to include.
  o Some things were left out, particularly specific details about processing (e.g., actual filters applied for a data processing task).

• New Algorithms
  o New calculations have been added to the IDC system, some major (e.g., PMCC processing of infrasound).
  o Few of these have been added to the document.
Previous Efforts to Track Issues

• Working Group B Waveform Experts Group
  o The Chairman (David Bowers) has been compiling a list of issues from WEG members over many years.
  o Many of these are about omissions related to processing details.

• Geophysical Monitoring System (GMS) Development
  o GMS is the new data processing and analysis system being developed by Sandia Labs for the USNDC (a large portion of this code is being shared with the PTS).
  o To meet modernization standards, the GMS developers were directed to minimize re-use of existing code, hence virtually all the algorithms must be recoded.
  o The starting point for recoding each algorithm is a clear, concise description of how that algorithm works; much of the USNDC processing is similar to IDC, so Sandia has made extensive use of the IDC SHI document.
  o Coding algorithms means understanding them completely (every equation), so if there are mistakes in the document, Sandia will find them.
  o The result (in progress) is perhaps the most comprehensive, detailed review of the IDC SHI document to date.

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Opportunity for Collaborative Issue Tracking System

• Goals
  o Note issues with the document (all); fix document (IDC staff).

• Synergistic
  o GMS can benefit from IDC knowledge (including NDCs), and IDC can benefit from GMS development.

• How do we facilitate this?
  o Need a means to make sharing of information easy; needs to be a good fit for a global set of users (domain experts).
  o Should be self-guided (i.e. automated, requiring little if any supervision); limited resources available to set up (people, time, $).
Our Solution: NDC Forum Topic

- Document is a “Topic”; Chapters are “Sub-Topics”; anyone with NDC Forum access can contribute.

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Original issue entry (author noted), follows templated format.

Reply by another user (identity noted), discussing issue.
To get access to our Forum topic, access the NDC Forum website and request an account.

IDC website administrator reviews requests and will send notification via email.
• The “IDC Processing of SHI Data” Users Guide is an excellent resource for those that want to understand SHI nuclear explosion monitoring in general and particularly for those that want to understand IDC data processing results.

• However, the Guide has errors and omissions, hence it needs to be corrected and updated; this is a huge task given the breadth of topics covered and the level of detail.

• The IDC can update the document, but needs help from the combined pool of NDC experts to note problems and propose new text.

• We have created an NDC Forum Topic to facilitate this collaboration amongst NDCs.

• Our Forum Topic allows NDC staff to note issues and to make comments about issues already noted by other Users.

• Eventually our Forum Topic will be used by the IDC staff to update the Guide; in the meantime, our Forum Topic can be referred to by users of the Guide to alert them to known errors and omissions.