Seismic analysis of field data and transcript to the SEGY format

Renato Silveira, BDEP-ANP, Brasil
Cláudio Souza, BDEP-ANP, Brasil
Luciano Lobo, BDEP-ANP, Brasil
Zaque Araújo Jr., HALLIBURTON/BDEP-ANP, Brazil
Leonardo Penha, HALLIBURTON/BDEP-ANP, Brasil
Francisco V. Silva, HALLIBURTON/BDEP-ANP, Brasil

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Abstract

The Exploration and Production Databank - BDEP is the greatest national data repository of oil exploration in Brazil. Similar to other countries, BDEP stores and provides technical data generated by upstream activities as also data generated by potential methods. The total of pre-stack data in BDEP is 50,683 lines; 35,601 in SEGY format and 15,082 in SEGD format. Some field seismic data, in SEGY or SEGD formats, have different problems, among these is worth emphasizing the lack of information in the headers and inconsistency with the ANP1B standard used by the databank. As part of an initiative of the ANP, a project was initiated in 2007 for the recovery of such data. The objective of this work is to show how field data transcriptions from SEGD to SEGY format have been made to be in agreement of ANP1B pattern.

Introduction

The seismic data are part of a historical archive of ANP and are called pre-98, i.e. prior to any standard that is currently in use. Our goal is to read SEGD data tapes in 3590 IBM cartridges trying to correct the inconsistencies and transcript into the SEGY format on 3592 tapes also creating the geometry of each line recording inside headers. For this work, the program used was the SeisSpace/Promax™ (figure 1) of Halliburton Co., doing reading, quality control, creation of geometry and transcription to SEGY format data recorded into IBM 3592 tapes. The generation of navigation file (Ukoaa format), was done by Coordinate System Manager from GeoGraphix™ suite also from Halliburton Co. The correction and transcription of data, involves many details of geophysics, and data management, which requires knowledge of seismic acquisition and processing as well on the standards used by the databank.

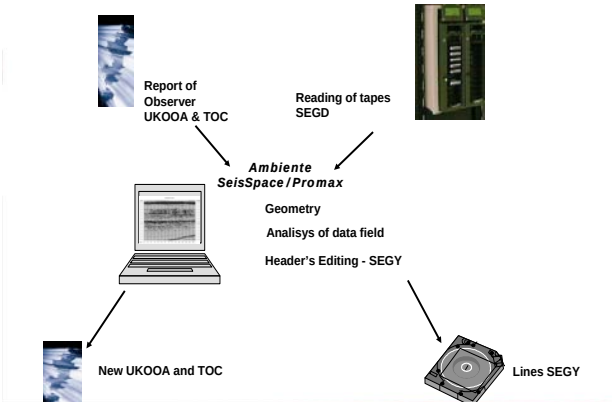

Figure 1: Simplified vision of flow.

Method

Reading the tape – Field data in SEGD format is within IBM 3590 tapes. In these files, a variable length in time of registration is present, which is detected mapping each trace inside reading logs (figure 2), usually occurs two lengths, in this case both parts are read separately, maintaining the sequence of records a junction of datasets within the software was made based on greater length time.

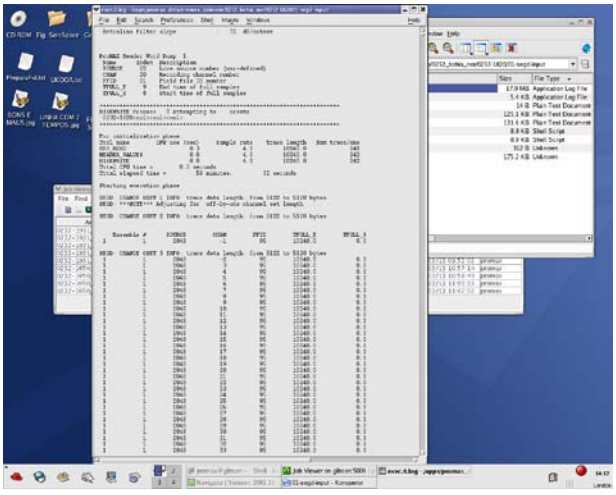

Figure 2: Reading data Log analysis.

Lack of channels in records – In some seismic records a lack of receptor channels was observed, being created in the relative position of these nonexistent offsets, thereby maintaining full georeferenced stations.

Mounting the geometry – For implementation of this phase in SeisSpace™, several information contained in documents, reports from observers, Ukooa files and Toc-file of the tape are needed. The observer report gives the array of information used in seismic acquisition, also the relationship between shot points and receivers, showing the occurrences of detonation failure during the acquisition. The navigation Ukooa file has information about each shot, as latitude, longitude, UTM coordinates, elevation or bathymetry. Finally the Toc-file shows the relationship between shot points and the written records. Figure 3 shows the spreadsheet where the geometry is mounted.

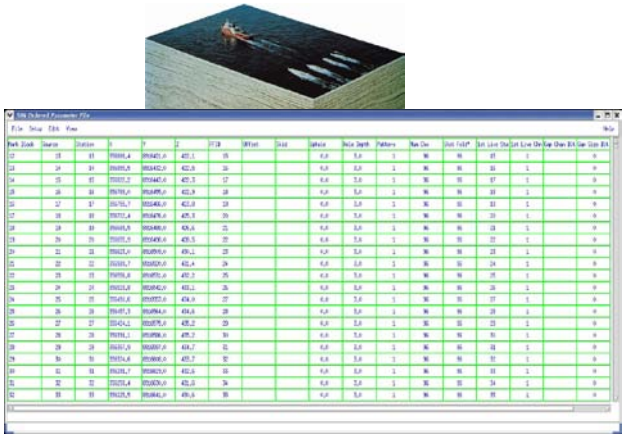

Figure 3: Geometry Spreadsheet.

Editing of Headers – In SEGY format we have EBCDIC, binary and trace headers. In this edition, all the information collected from observer reports, logs generated during the tape reading will be included in the last edition of the SEGY headers as seen in Figure 4.

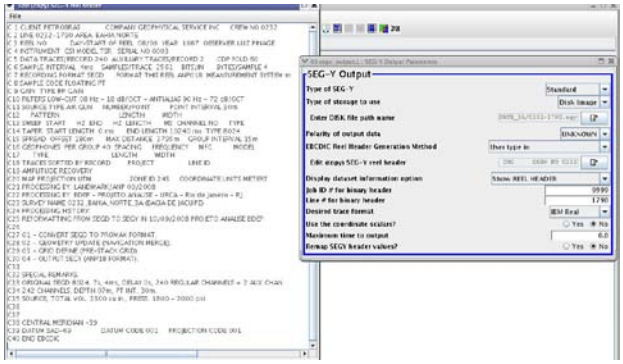

Figure 4: Example of new header EBCDIC.

Transcription – The transcription into SEGY format is made through a flow containing three steps as shown in figure 5. The first step is Disk Data Input where the dataset read now contains trace geometry; the second one is Header Values an important step to map some of the important trace header bytes, such as shot point, navigation, bathymetry or altimetry. After this, occurs the output for the SEGY format, still on disk. Finally the recording IBM 3592 tape and a dump of the data recorded as quality control are performed.

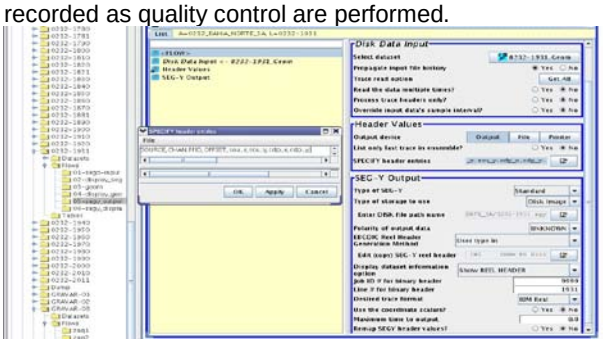

Figure 5: Transcription flow.

Creation of new Ukooa – In agreement to ANP standards a new navigation data was generated due to the corrections made in geometry phase. This was done by a reliable tool named Coordinate System Manager from GeoGraphix™ suite, used to transform UTM coordinates into geographic coordinates.

Examples

As an example among several seismic data analyzed, the seismic line 0232-1931 belonging to the survey 0232_Bahia_Norte_3A presented several problems such as different lengths of traces (figure 6) and Toc-File with wrong status showing bad records that were described as good ones (figure 7).

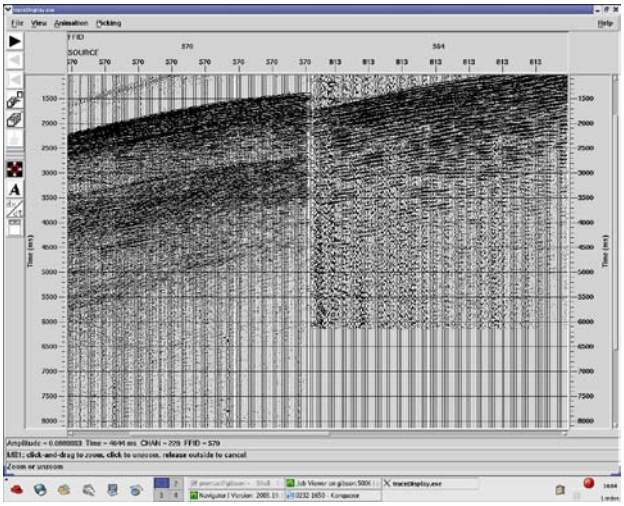

Figure 6: Display of 2 lengths records.

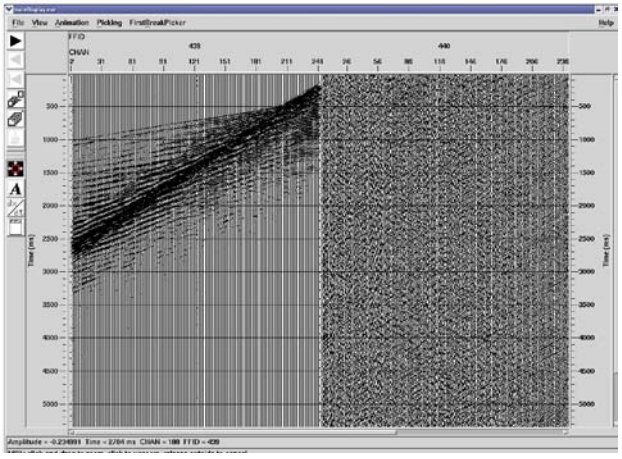

Figure 7: Display of bad records.

Results

This work was done in two surveys 0232_Abrolhos_1B with 9 lines and 0232_Bahia_Norte_3A with 87 lines. In most of the lines that transcription was performed, there were many problems, but all of them were resolved. Another benefit was the change from 3590 IBM tapes with a capacity of 20Gb to 3592 IBM with capacity of 500Gb, which allowed compression into a single cartridges of a survey with 87 lines that before was in more than 25 tape cartridges.

Conclusions

The ANP/BDEP in partnership with Halliburton performing the transcription field data work from SEGD to SEGY format, with necessary corrections and geometry recorded into the headers became an important aspect for future seismic processing works on these surveys. Also the correction of the erroneous description in the Toc-File on good and bad records could avoid a possible waste of data, which would cause lack of coverage of the data when processed (Severiano-Ribeiro, 2001). The SeisSpace/Promax™ was a reliable tool in the implementation of all stages of the detailed analysis of seismic data.

Acknowledgments

We would like to thank all that allowed the opportunity of having integrated the team and done an excellent project. We must also remember the important assistance provided by all BDEP staff, our managers, which always encouraged us in all phases of work.

References

Severiano-Ribeiro, H.J.P. (org.) (2001) Estratigrafia de Seqüências - Fundamentos e aplicações. São Leopoldo, RS, Editora UNISINOS, 428 p.

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