Australian Government
Geoscience Australia

Preservation of Historical Australian Seismograms, Magnetograms and Geomagnetic Absolute Observations

Hugh Glanville, Andrew Lewis, Jonathan Bathgate, Liejun Wang, Bill Jones, Matthew Gard, Patrick Burke, Yue Li

Introduction

Efforts are underway to digitally preserve historical Australian seismograms, magnetograms, earthquake analyses and geomagnetic absolute observations. These datasets are stored in original paper and film form, and although they are available on request, they are not easily discoverable or available at short notice to the public. The retrieval of analogue media is both time-consuming and labour-intensive and can cause further damage to deteriorating records.

Preservation examples

In this poster, we present examples of the preserved handwritten records, microfilm and paper records. These records date as far back as 1959 for magnetograms (Wilkes Geomagnetic Observatory), and 1902 for seismograms (Melbourne Observatory). Different generations of collected data have challenges associated with the preservation efforts, including: legibility, compression formats, stability of the original medium and preserved associated metadata. Additionally, costs and available expertise for creating digital copies vary greatly between the original mediums of data recording.

Handwritten Records

Handwritten records from the last 100 years have survived through various standards of storage conditions. While these records are now stored in an office based compactus environment with relatively stable conditions, they originated in challenging preservation environments. In some instances they were stored for decades in: seismic vaults, observatory buildings and Antarctic bases. The records have also been subjected to tough transport conditions when repatriated from locations of origin including; Southern Ocean and South Pacific shipping as well as Australian and South Pacific remote road, rail and air transport conditions. These conditions have led to inevitable deterioration in some records. Despite this, the original records show a relatively high level of legibility owing to the quality paper and inks used (Fig. 1-3).

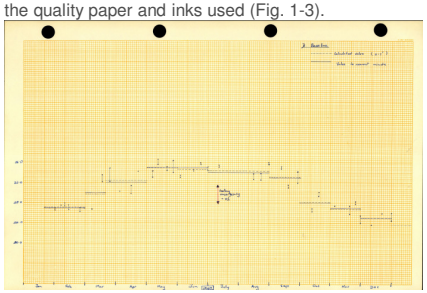

Figure 1: Scanned handwritten diagram of Geomagnetic Observatory Baseline, 1960

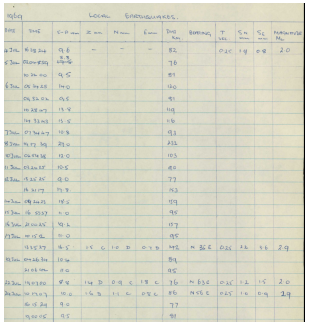

Figure 2: Scanned handwritten earthquake measurements, Mundaring Observatory, 1969

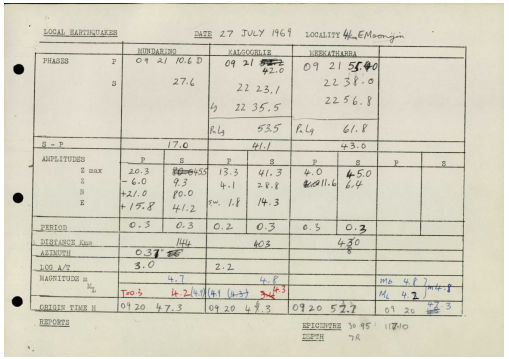

Figure 3: Scanned earthquake analysis sheet, Mundaring Observatory, 1969

Microfilm

Microfilm was used for various methods of preservation for geomagnetic, seismic and ionospheric records from the 1960s in Australia. Some data was directly written to film utilising a light beam, with many instances in our archive originating from the Alice Springs Seismic Array jointly operated by Australia and the United States. Other archived instances are images of seismograms, magnetograms and handwritten observations records. Some of these are contemporaneous to the microfilm production, and some older paper records were also preserved in this way. Transcription of microfilm records to digital records has proved to be more difficult than the preservation of paper records. It has also proved to be more vulnerable to storage conditions, and more costly to have digital copies made, due to the specialised equipment and expertise needed.

The quality of the original images captured in the film, as well as degradation effects has reduced the quality of the copies now preserved (Fig. 4-6).

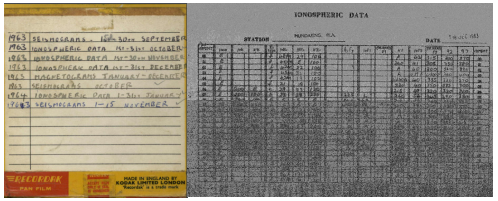

Figure 4: Scanned microfilm labels and microfilm images of original handwritten records, Mundaring Observatory, 1963

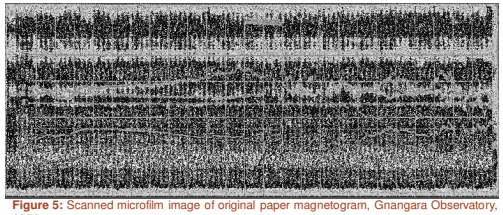

Figure 5: Scanned microfilm image of original paper magnetogram, Gnangara Observatory, 1968

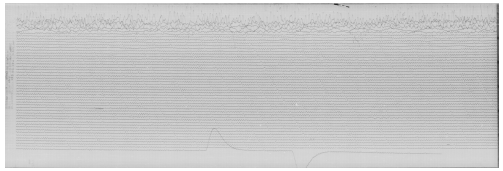

Figure 6: Scanned microfilm images of original paper seismogram

Paper records

Paper records of magnetograms, seismograms and early printed outputs are the most numerous and largest storage volume in our archives. The preservation quality of these records varies greatly depending on their original materials and storage conditions. Many thermal/smoke paper records have deteriorated to varying extents due to storage and stability of this medium. Records that have been stored in warmer environments have deteriorated further, some to such an extent as to be unreadable and unable to be recovered. While much of the impetus for digital preservation has been the degradation of records, the storage volume and manual retrieval for stakeholders and those associated costs has been an additional driver of preservation efforts (Fig. 7-9).

References:
Publically available record search: https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/home
Example records: https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/metadata/144152
https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/metadata/126044

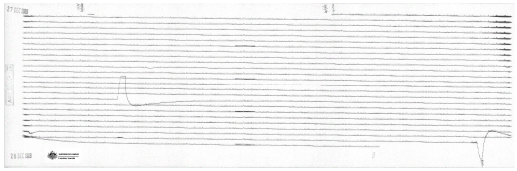

Figure 7: Scanned original paper seismogram, Station ASC, 1989.

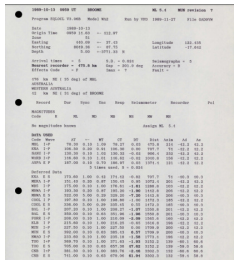

Figure 8: Scanned original earthquake analysis record, Mundaring Observatory, 1989

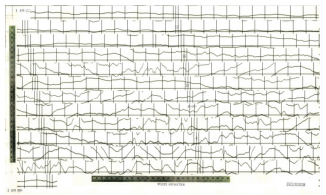

Figure 9: Scanned original paper magnetogram record, Wilkes Observatory, 1964.

Ongoing efforts

Our ongoing efforts have been targeted at prioritising digital copies of the originals to preserve the records from further deterioration, and making it available freely for download for improved data discoverability. We utilise a database to manage the seismogram image archive, due to volume of records. This allows us to simplify the search for locating specific records and once publically accessible will enable the self service of these records.

Data Access

These archival records are incrementally being made available via publically accessible data servers through Geoscience Australia. Long term efforts following this will then be focused on digitisation for use with modern data analysis techniques.

GA PP-145668 | eCat 145668

For Further Information: Hugh Glanville
Email: hugh.glanville@ga.gov.au
Ph: +61 2 6249 9010 **Web:** www.ga.gov.au