Shore Corrections in Magnetometer Editing

By Ken Aiken

When processing magnetometer data it is ideal to do shore corrections if you have the time and resources. This is the equivalent of doing tide corrections to your survey data. Just as the oceans have their ebb and flow, so does the sun's magnetic field. To correct for this, like tide stations, there are stations around the world to provide this data; IGRF is a model of the Earth's magnetic field as it changes based on position and time.

One of the reasons for using Shore Corrections is to evaluate the magnetometer data in different ways. The raw reading minus the $IGRF_{(boat)}$ data provides a Raw Anomaly against the earth's expected magnetic field at a place and time. The shore data is removed from the Raw Reading to create a Diurnal Component, which can be removed from the Raw Anomaly to calculate the Diurnal Anomaly. The Raw Reading is generally a value in the tens of thousands of gamma where the Raw Anomaly and the Diurnal Anomaly are generally in the range from 0 to a few thousand for a large target.

Sample IAGA File

```
Format                IAGA-2002                              |
Source of Data        Geological Survey of Canada (GSC)      |
Station Name          Ottawa                                 |
IAGA CODE             OTT                                    |
Geodetic Latitude     45.403                                 |
Geodetic Longitude    284.448                                |
Elevation             75.000                                 |
Reported              XYZF                                   |
Sensor Orientation                                           |
Digital Sampling                                             |
Data Interval Type    Average 1-Minute(00:30-01:29)          |
Data Type             variation                              |
# DECBAS              000000 (Baseline declination value in  |
#                     tenths of minutes East (0-216,000)).   |
# This data file was created by the Ottawa GIN from Reported data. |
# Final data will be available on the INTERMAGNET DVD.       |
# Go to www.intermagnet.org for details on obtaining this product. |
# CONDITIONS OF USE: The Conditions of Use for data provided |
# through INTERMAGNET and acknowledgement templates can be found |
# at www.intermagnet.org                                     |
DATE       TIME        DOY     OTTX      OTTY      OTTZ      OTTF |
2019-01-28 00:00:00.000 028    17932.16  -4298.16  50885.60  54127.46
2019-01-28 00:01:00.000 028    17931.38  -4297.70  50885.45  54127.00
2019-01-28 00:02:00.000 028    17932.08  -4297.77  50885.47  54127.27
2019-01-28 00:03:00.000 028    17931.29  -4297.43  50885.49  54127.00
2019-01-28 00:04:00.000 028    17931.60  -4297.51  50885.41  54127.03
```

Many stations report shore corrections through <u>Intermagnet</u> and you can download them from the IAGA format files. Alternatively, you can acquire your own shore corrections by placing a magnetometer somewhere in the field and recording its output. Enter date, time and gamma records in a text file so you can import the data to the MAGNETOMETER EDITOR.

FIGURE 1. *Importing Shore-based Corrections in the MAGNETOMETER EDITOR*

When you load your magnetometer data, choose the Shore Based Data + IGRF option under Final Corrections to apply the $IGRF_{(shore)}$ correction.

Click [OK] and the Shore Data Tools window displays for you to select your shore file(s). The latest versions of the MAGNETOMETER EDITOR autopopulates the position information when you select IAGA files. If your shore file is based in a different time zone, you can also apply a correction here.

NOTE: It is recommended to import, not only the files from the day of the survey, but also the day before and after to improve corrections.

FIGURE 2. *Loading your Shore Correction Files*
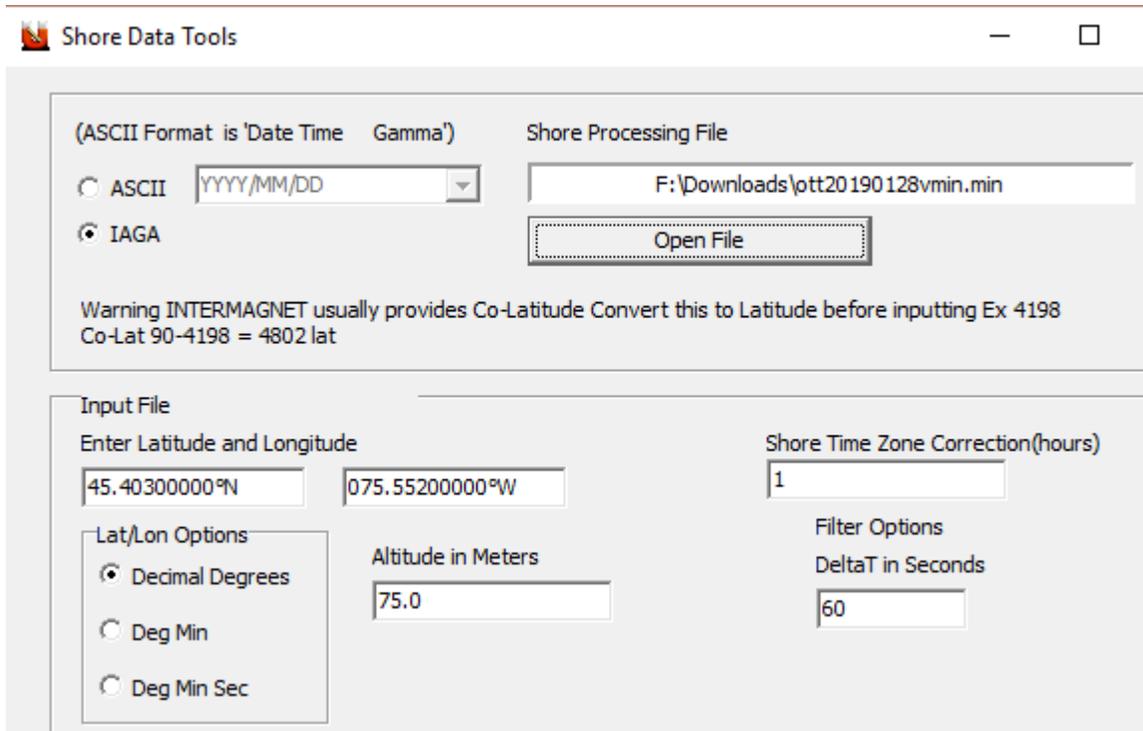
Once your data is loaded and corrected, you can see these corrections in the MAGNETOMETER EDITOR displays in a handful of places:

The **spreadsheet** allows you to customize the data displayed.

- **[Recommended Shore Layout]** configures the spreadsheet with the items pertinent to systems using shore-based corrections.
- **[Shore Value Highlights]** shades the columns with values used to calculate diurnal and total anomalies. Values highlighted in yellow have been time-shifted, values in the green columns have not.

FIGURE 3. *The Spreadsheet Using the Recommended Shore Layout and Shore Value Highlights*

| xTime Shift	xShoreValue	xShore Filter	xIGRF(Shore	xStation Cor	xDiurnal Cor	xUnShifted S	xUnShiftedFi	xAgitation C
19:14:24	48283.30	48283.05	48389.09	-112.50	6.46	48284.30	48283.63	0.67
19:14:25	48283.30	48283.05	48389.09	-112.50	6.46	48284.30	48283.63	0.67
19:14:26	48283.30	48283.05	48389.09	-112.50	6.46	48284.30	48283.63	0.67
19:14:27	48283.30	48283.05	48389.09	-112.50	6.46	48284.30	48283.63	0.67
19:14:28	48283.30	48283.05	48389.09	-112.50	6.46	48284.30	48283.63	0.67

Shore Data Table displays the shore raw (red) and shore filtered (blue) data. You can export the data to a text file.

FIGURE 4. *Shore Data Table*
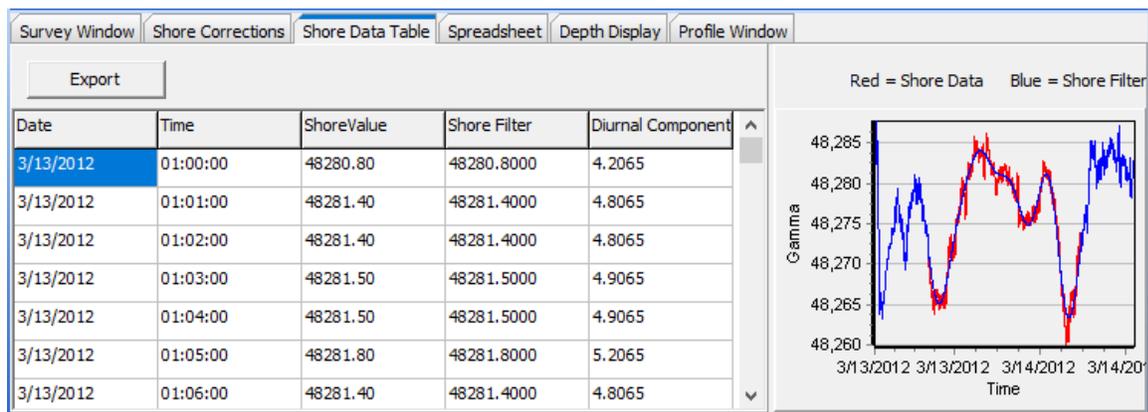
The **Profile window** shows the track line and gamma profile of each line.

FIGURE 5. *The Profile Window*
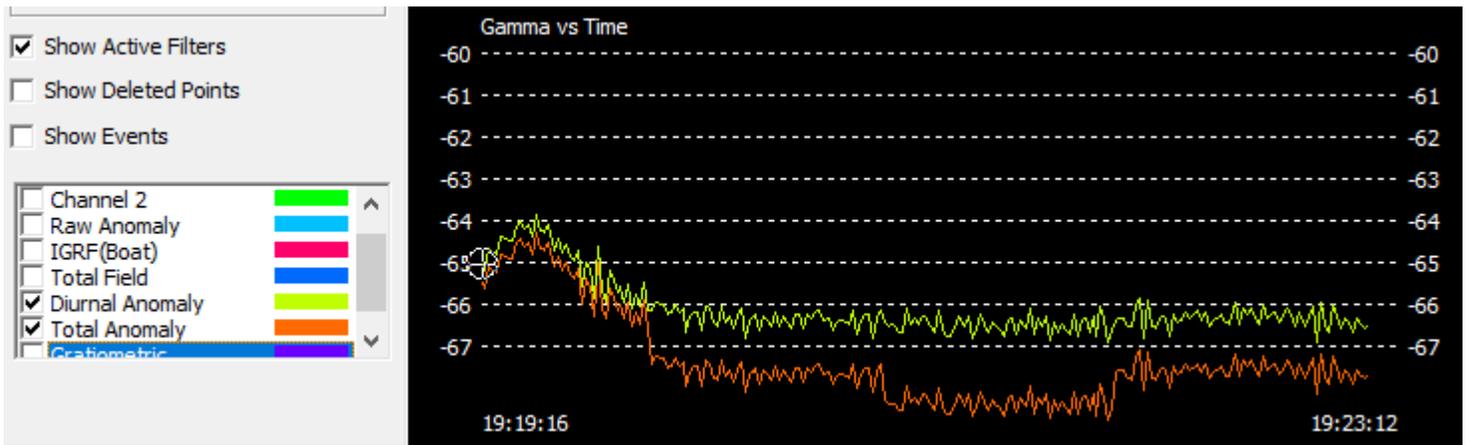
In the **Shore Corrections** Window, the Agitation Component is a high frequency read on the Shore and Filter data used to remove immediate shift in the data.

FIGURE 6. *Shore Corrections Window*