Geosoft Technical Note

# Reduction to the Magnetic Pole for High Frequency High Amplitude Anomalies

## Introduction

A necessary part of processing magnetic geophysical data is the reduction to pole filter (RTP). The method outlined in this technical note uses the **Oasis montaj™ MAGMAP Tool** to apply a RTP filter to a TMI grid. This filter is applied in the Fourier domain and it migrates the observed field from the observed magnetic inclination and declination, to what the field would look like at the magnetic pole. This aids in interpretation since any asymmetry in the reduced to pole field can then be attributed to source geometry and/or magnetic properties.

A limitation of the RTP filter is that it can introduce noise into the resultant grid where the grid contains high frequency high amplitude anomalies. If the half wavelength of these anomalies is comparable to the grid cell size in dimensions, a high frequency ringing similar to Gibbs' phenomenon will be propagated through the grid. This ringing has the effect of obscuring geological signal and being amplified by further enhancements or filters. Figures 1-3 show a TMI image containing high frequency anomalies, an RTP filter and vertical derivative of the RTP filtered grid.

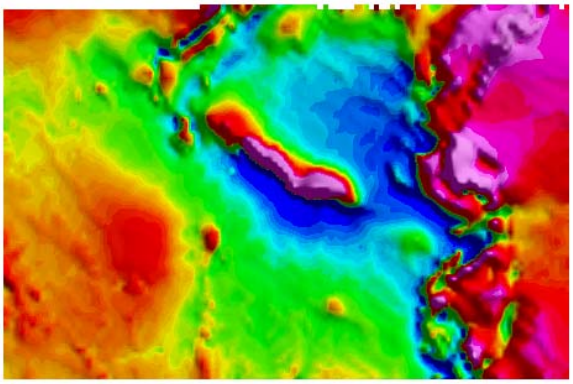

**Figure 1. TMI image**

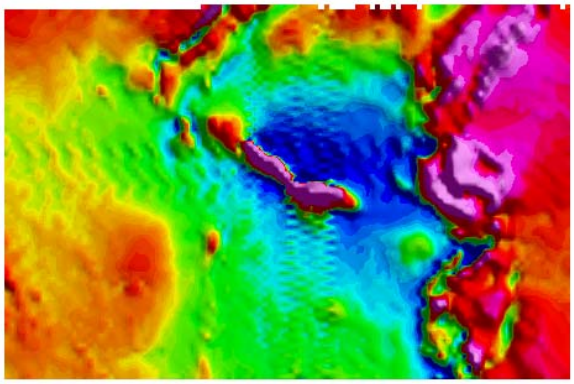

**Figure 2. RTP of figure 1 Inclination = -68 Declination = 12. Note the high frequency noise introduced by the RTP filter.**

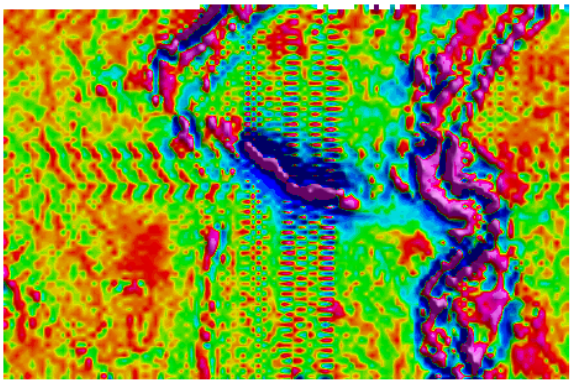

**Figure 3. Vertical derivative of RTP grid.**

A work around for this problem is detailed below. The goal is to push the spectra of the high frequency anomalies into the middle part of the filter rather than at the edges. This is achieved by resampling the original grid.

## Steps to Perform RTP Filtering for High Frequency - High Amplitude Anomalies

If the standard RTP and vertical derivative filters are showing noise similar to that in Figure 3 then re-grid the grid to approximately 25% of the original grid cell spacing.

The example grid used in this technical note has the following parameters:

- IGRF Inclination = -68
- IGRF Declination = 12
- Cell size = 250m
- Re-gridded cell size = 60m

1. On the *Grid* menu, click *Gridding/Re-grid a grid*. The *Re-grid a grid* dialog is displayed. Specify the *New cell size* as 60m.
2. Using the *MAGMAP|One-step filtering* menu. Perform RTP filtering on the re-gridded grid, specifying Inclination= -68 and Declination= 12.
3. You now need to re-grid the grid from Step 2 back to the original cell size, i.e. from 60m to 250m. On the *Grid* menu, click *Gridding/regrid a grid*. The *Re-grid a grid* dialog is displayed. Specify the *New cell size* as 250m.
4. Perform any other filtering or enhancements to the grid resulting from Step 3.

The results of this are shown in Figures 4 and 5.

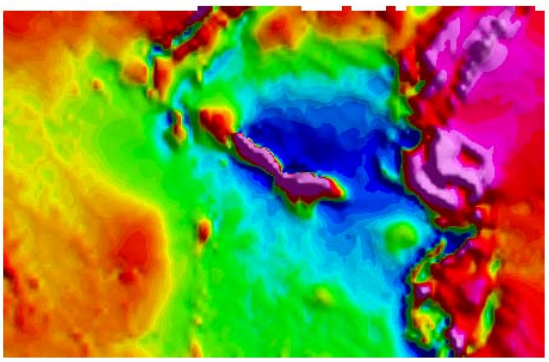

**Figure 4. RTP image of grid processed by algorithm described above.**

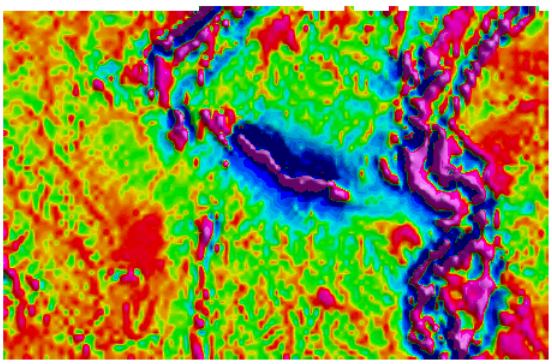

**Figure 5. Vertical derivative of grid presented in Figure 4. Note the lack of "ringing" noise in the low amplitude regions of the grid.**

## For more information, contact the Geosoft office nearest you:


### North America

**Geosoft Inc.,**
Queens Quay Terminal
207 Queens Quay West
Suite 810, PO Box 131
Toronto, ON Canada
M5J 1A7

Tel. (416) 369-0111
Fax (416) 369-9599

Email: tech@geosoft.com

### Europe and North Africa

**Geosoft Europe Ltd.**
20/21 Market Place, First Floor
Wallingford, Oxfordshire
United Kingdom
OX10 OAD

Tel: 44 1491 835 231
Fax: 44 1491 835 281

Email: tech.eu@geosoft.com

### South America

**Geosoft Latinoamerica Ltda.**
Av. Rio Branco, 156 - Gr. 2615
CEP 20043-900, Centro
Rio de Janeiro, RJ, Brasil

Tel: (55-21) 2111- 8150
Fax: (55-21) 2111-8181

Email: tech.sa@geosoft.com

### Australia and Southeast Asia

**Geosoft Australia Pty. Ltd.**
350 Hay Street
Subiaco, WA 6008
Australia

Tel. 61 (8) 9382-1900
Fax 61 (8) 9382-1911

Email: tech.au@geosoft.com

### South and Central Africa

**Geosoft Africa Ltd.**
Buren Building, Second Floor
Kasteelpark Office Park
c/o Nossob & Jochemus Streets
Erasmuskloof X3, Pretoria

Tel: 27 12 347 4519
Fax: 27 12 347 6936

Email: tech.za@geosoft.com