Old spectral domain grid filters (OldGridFFT) (T38)

Top

Note: We have created a new spectral domain grid filters tool, GridFFT. See Spectral Domain Grid Filters (GridFFT) for details. This chapter refers to the old version of the tool. Only use this chapter if you particularly want to refer to this older version.

You can use the INTREPID Spectral Domain Grid Filters to enhance a grid dataset by

- enhancing features so that you can analyse them to better effect,
- correcting the measured position of features,
- removing irrelevant features, patterns or 'noise' in the grid.

INTREPID Spectral Domain Grid Filters can

- Prepare and transform your grid dataset from the spatial domain to the spectral domain,
- Apply a range of geophysical, directional, noise removal and wavenumber dependent filters. It can apply filters singly or combine as many as you wish.
- Transform your grid dataset back to the spatial domain.

INTREPID spectral domain operations (OldGridFFT)

For full details of spectral domain operations and the spectral domain filters provided with INTREPID, see INTREPID spectral domain operations reference (R14)

Using the Spectral Domain Grid Filters tool (OldGridFFT)

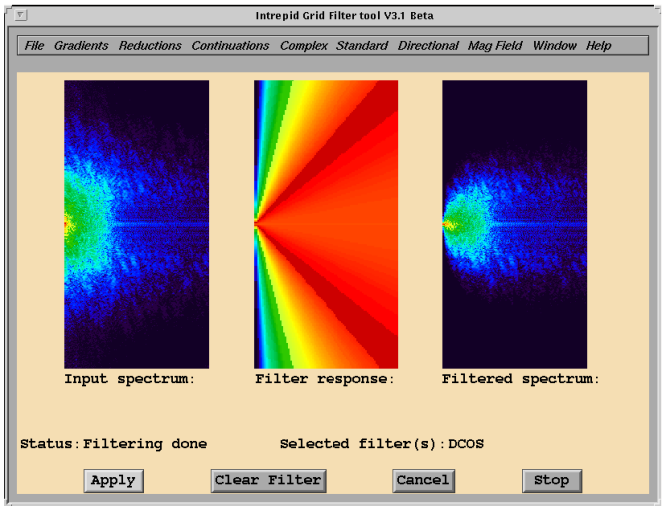
>> To use Spectral Domain Grid Filters with the INTREPID graphic user interface

1. Choose FFT_Filter from the Filter menu of the Project Manager or use the command **`gfilter.exe`**. INTREPID displays the Spectral Domain Grid Filters Main window.
2. If you have previously prepared file specifications and parameter settings for Spectral Domain Grid Filters, load the corresponding task specification file using Load Options from the File menu. (See Specifying Input and Output (Filtered) Datasets (OldGridFFT) below for detailed instructions.) If all of the specifications are correct in this file, go to step 9. If you wish to modify any settings, carry out the following steps as required.
3. Specify the grid dataset to be processed. Use Open Input from the File menu. (See Specifying Input and Output (Filtered) Datasets (OldGridFFT) below for detailed instructions.)
4. If the input data is in the spatial domain, INTREPID displays the Pre-Filter Transformation dialog box. Specify the pre-filter transformation and options as required, then choose OK. (See Pre-Filter Transformation (OldGridFFT) below for detailed instructions.)
5. Specify the output grid dataset. Use Specify Output from the File menu. (See Specifying Input and Output (Filtered) Datasets (OldGridFFT) below for detailed instructions.) INTREPID displays the Post-Filter Transformation dialog box.
6. Specify the post-filter transformation and associated options as required, then choose OK. (See Post-Filter Transformation (OldGridFFT) below for detailed instructions.)

7 If you wish to examine the colour display of the input dataset (after pre-filter transformation) in the Input Spectrum Display area and/or the Power Spectrum graph before applying any filters, choose Clear Filter, then choose Apply. INTREPID will carry out the transformation and display the input dataset. You can examine the power spectrum graph of the dataset as described below. See Previewing the transformed input dataset (OldGridFFT) below.

8 Use the filter menus and associated dialog boxes to select the filter options that you wish to use and specify their required parameters. As you specify the filters, INTREPID displays a colour representation of the effects of the filter combination in the Filter Response area of the Spectral Domain Grid Filters Main window. (See INTREPID spectral domain operations reference (R14) and the sections following for detailed instructions.)

9 Choose Apply. INTREPID will perform the filter process and display the results of the filter in the Filtered Spectrum area of the of the Spectral Domain Grid Filters Main window.



10 INTREPID will perform the post-filter transformation as specified and save the dataset. If you specified that INTREPID will regenerate the data gaps existing before the pre-filter transformation, specify the original spatial domain input dataset when prompted by INTREPID. (See Post-Filter Transformation (OldGridFFT) below for information).

11 If you wish to record the specifications for this process in a **`.job`** file in order to repeat a similar task later or for some other reason, use Save Options from the File menu. (See Specifying Input and Output (Filtered) Datasets (OldGridFFT) below for detailed instructions.)

12 If you wish to repeat the process, repeat steps 2–11, varying the parameters and/or data files as required.

13 To exit from Spectral Domain Grid Filters, choose Quit from the File menu.

After a Spectral Domain Grid Filters process is complete you can

- View a radially averaged power spectrum graph of the input and output datasets and
- Display slope, y intercept and Spector Grant depth estimate for any straight line segment in the power spectrum graph.

To view these displays choose Radial Power Spectrum from the Window menu. See The radially averaged power spectrum graph (OldGridFFT) below.

After using Spectral Domain Grid Filters you can carry out a more detailed inspection of the filtered grid using an INTREPID visualisation tool (See Visualisation (T26)).

You can choose options from the Help menu (See Help (OldGridFFT) below).

You can execute Spectral Domain Grid Filters as a batch task using a task specification (**`.job`**) file that you have previously prepared. See Using task specification files (OldGridFFT) below for details.

Spectral Domain Grid Filters display (OldGridFFT)

The Spectral Domain Grid Filters Main window has three spectrum display boxes. Each box shows a spectrum for all directions.

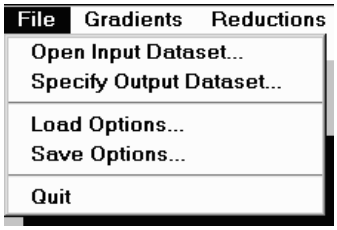
- The Input Spectrum box shows the spectrum of the input dataset in with energy shown using pseudocolour.
  - The input spectrum display box is a graph of frequency versus energy in Fourier space.
  - The colours represent the energy, or amplitude of each frequency, where red is high, blue is low and black is zero energy.
  - The origin (zero frequency) occurs half way up the left side of the display, and is typically coloured red or yellow. The plot is symmetrical about this vertical edge, which has the spatial orientation of North–South.
  - The maximum frequency in the display is the Nyquist frequency for the data.
  - The frequency range (zero to Nyquist) is normalised to fit the input spectrum display box.
  - Since the graph is radial, strictly speaking, you should view it as a semi-circle rather than as a rectangle.
- The Filter Spectrum box represents the weights of the current filter specification using pseudocolour.
- After you apply a filter the Filtered Spectrum box shows the spectrum of the filter results with energy shown using pseudocolour.

The Spectral Domain Grid Filters Power Spectrum window contains a power spectrum graph for the most recently applied filter. See The radially averaged power spectrum graph (OldGridFFT) below and "Power spectrum graphs" in INTREPID spectral domain operations reference (R14) for information about this.

Specifying Input and Output (Filtered) Datasets (OldGridFFT)

Before using any grid filters, you must specify input and output datasets.

Choose the options as required from the File menu.



In each case INTREPID displays an Open or Save As dialog box. Use the directory and file selector to locate the file you require. (See "Specifying input and output files" in Introduction to INTREPID (R02) for information about specifying files).

If you wish to apply Spectral Domain Grid Filters to a dataset on a number of occasions you can save a copy of the transformed version (i.e., the spectral domain version). You can specify this copy of the dataset as input in future sessions, and avoid unnecessary processing. See Storing the transformed input dataset for later use (OldGridFFT) below for more information.

Open Input Dataset Use this option to specify the grid dataset to be filtered. INTREPID will open the dataset file. If the data is in the spatial domain INTREPID displays the Pre-Filter Transformation dialog box. See Pre-Filter Transformation (OldGridFFT) below for further instructions.

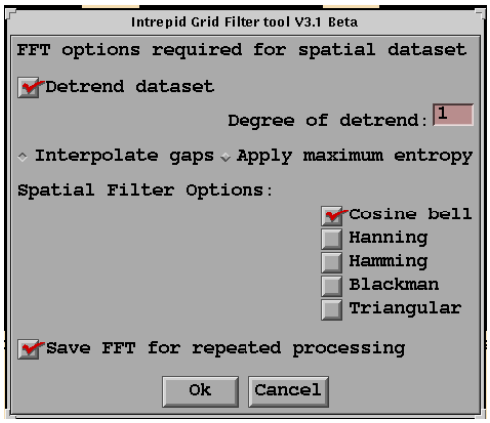
Specify Output Dataset Use this option to specify the name for the grid dataset you are creating with this process. INTREPID displays the Post-Filter Transformation dialog box. After you complete this dialog box INTREPID may require you to specify the original spatial dataset (or other mask file as required). See Post-Filter Transformation (OldGridFFT) below for further instructions.

Load Options If you wish to use an existing task specification file to specify the Spectral Domain Grid Filters process, use this option to specify the task specification file required. INTREPID will load the file and use its contents to set all of the parameters. (See Displaying options and using task specification files (OldGridFFT) below for more information).

Save Options If you wish to save the current Spectral Domain Grid Filters file specifications and parameter settings as an task specification file, use this menu option to specify the filename and save the file. (See Displaying options and using task specification files (OldGridFFT) below for more information).

Pre-Filter Transformation (OldGridFFT)

After you specify an input dataset, if the data is in the spatial domain, INTREPID displays the Pre-Filter Transformation dialog box.



>> To specify the pre-filter transformation for a normal spatial domain dataset:

1. Turn on Detrend dataset and change the Degree of Detrend parameter if required. See "Detrending data values" in INTREPID spectral domain operations reference (R14) for an explanation of this process.
2. Select the Interpolate Gaps or Apply Maximum Entropy option. See "Expanding the data area" in INTREPID spectral domain operations reference (R14) for information about the Interpolate Gaps and Apply Maximum Entropy options.
3. Turn on any edge region spatial filters that you require (Cosine Bell, Hanning, Hamming, Blackman, Triangular). See "Damping of dataset edges before spectral transform" in INTREPID spectral domain operations reference (R14) for an explanation of these options.
4. Turn on Save FFT for repeated processing if

- You will be performing another filter process in a subsequent Spectral Domain Grid Filters session or
- You wish to save the spectral domain version of the dataset for some other reason.

   See Storing the transformed input dataset for later use (OldGridFFT) below for details.

5. Choose OK.

You can use the pre-filter transformation for general processing of datasets. See Other uses of the pre-filter and post-filter transformations (OldGridFFT) below for details.

Storing the transformed input dataset for later use (OldGridFFT)

After INTREPID completes the pre-filter transformation it can retain the transformed input dataset for repeated grid filter processes.

If you wish to retain the transformed dataset for filtering on another occasion turn on the Save FFT For Repeated Processing check box.

INTREPID stores the results of the pre-filter transformation process as a grid dataset. The name of the dataset is the name of the input dataset with **FFT** appended to it.

These spectral domain grids have the same number of rows and columns as the expanded spatial domain grids before the transformation (See "Expanding the data area" in INTREPID spectral domain operations reference (R14)). INTREPID exploits the symmetry in the spectral domain transformed data to achieve this.

You can examine the spectral domain grids using visualisation tools in the same way as you would a spatial domain grid.

INTREPID stores the transformation parameters in a text file with the same name as the input dataset and the extension **.fft**. It stores these files in the same directory as the input dataset. See Fourier transform grid header files (OldGridFFT) below for details.

Fourier transform grid header files (OldGridFFT)

When you transform a grid to the spectral domain, INTREPID records information about the transformation in the **Fourier transform grid header file**. This is an INTREPID auxiliary file with the extension **.fft**. It contains an **fftdata Begin – fftdata End** block with a coefficient list and parameter values describing the transformed grid. The file contains information that INTREPID is unable to record in the *ERMapper* compatible **.ers** header file.

Here is an example of the file.

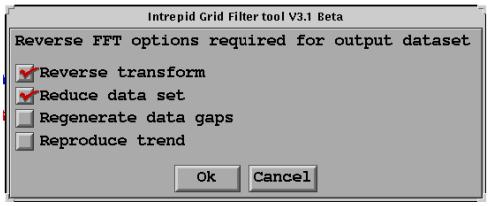
```
fftdata Begin
   coeff = {" 1972.614766  -0.006298246813
             -0.01090308443  0  0  0  0  0  0  0 " }
   m_extend = 0
   n_extend = 0
   o_numx = 150
   o_numy = 150
   window = 0
   fft_direction = r
   comment = {" Detrend  Expand  Fill  Ffft
                CNDN  Rfft  Red  Bool " }
fftdata End
```

Contact our technical support service if you require information about these files.

See "Grid dataset file and directory structure" in INTREPID database, file and data structures (R05) and "INTREPID Auxiliary files" in INTREPID database, file and data structures (R05) for general information about the corresponding topics.

Post-Filter Transformation (OldGridFFT)

After you specify an output dataset, INTREPID displays the Post-Filter Transformation dialog box.



>> To specify post-filter transformation

1. If you wish to transform the dataset from the spectral to the spatial domain, turn on Reverse transform.
2. If you wish to reduce an expanded dataset to its original size, turn on the Reduce dataset. (See "Reducing the dataset" in INTREPID spectral domain operations reference (R14) for information).
3. If you wish to restore to ***null*** the interpolated values in a dataset, turn on the Regenerate data gaps. (See "Regenerating the data gaps" in INTREPID spectral domain operations reference (R14) for information).
4. If you wish to replace the mean and restore any trend in the dataset that you had previously removed, turn on Reproduce trend. (See "Reproducing the trend" in INTREPID spectral domain operations reference (R14) for information).
5. Choose OK.
6. If you turned on Regenerate data gaps, INTREPID will need to refer to the original spatial domain dataset to locate them. It displays the Open original dataset for gap generation dialog box. Specify the original spatial domain input dataset.

If you wish only to examine the results of the pre-filter transformation, and you are therefore specifying an output dataset only as a formality, turn off all check boxes. This will speed up the pre-filter transformation process. See Previewing the transformed input dataset (OldGridFFT) below for further details about this technique.

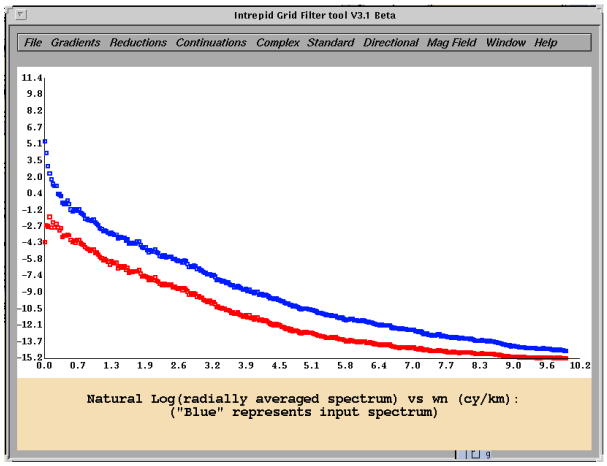
The radially averaged power spectrum graph (OldGridFFT)

See "Power spectrum graphs" in INTREPID spectral domain operations reference (R14) for an introduction to power spectrum graphs.Viewing the power spectrum graph

>> To view a radially averaged power spectrum graph of the input and output datasets with the current filter selection

Choose Radial Power Spectrum from the Window menu.

INTREPID displays the Spectral Domain Grid Filters Spectrum window containing the graph.



The input dataset power spectrum is shown in blue and the filtered dataset power spectrum in red.

>> To return to the Spectral Domain Grid Filters Main window

Choose Main from the Window menu.

Querying the power spectrum graph (OldGridFFT)

INTREPID can calculate and display the y intercept and the slope of the line joining any two points in the graph and the corresponding Spector Grant depth estimate[1]. You can use the intercept and slope in the Matched filter (See Matched Filter (OldGridFFT) below for details).

>> To display the y intercept and slope of the line joining any two points in the Power Spectrum graph and the corresponding Spector Grant depth estimate

Click the two points. INTREPID displays the data in a message box.

>> To display an intercept/slope/depth estimate report for another pair of points

Dismiss the message box if it is still present, click once anywhere on the graph to release the previous line segment selection, then click the two required points.

1. Spector, A., and Grant, F.S., (1970), Statistical methods for interpreting aeromagnetic data, *Geophysics* 35, 293–302

Clearing the power spectrum display (OldGridFFT)

After applying a filter, if you change the filter specifications and choose Apply again, the previous output power spectrum graph may remain in the display as well as the spectrum of the new filter results. This may continue happening until you clear all of the specifications. See Specifying and removing grid filters (OldGridFFT) below for instructions.

Previewing the transformed input dataset (OldGridFFT)

Before applying any filters you can view

- The colour display of the transformed input dataset in the Input Spectrum Display area and
- The Power Spectrum graph of the transformed input dataset

>> To preview the transformed input dataset

1. Specify the input dataset with pre-filter transformation as required by you.
2. Specify an output dataset. (You may delete this at any time after the session.)
3. Turn off all check boxes in the Post-Filter Transformation dialog box. This will speed up the output part of the process which is not required for your purposes at this time.
4. Choose Apply.

INTREPID will carry out the transformation and display the input dataset using pseudocolour in the Input Spectrum and Filtered Spectrum boxes. You can examine the power spectrum graph by choosing the Radial Power Spectrum from the Window menu.

If you have already applied filters and then wish to view the transformed input dataset without filters, choose Clear Filter, then Apply. To speed up the process you could also respecify the output dataset with all post-filter transformation options turned off.

The Spectral Domain Grid Filters (OldGridFFT)

Information about filters and parameters (OldGridFFT)

See "Spectral domain filters available" in INTREPID spectral domain operations reference (R14) for a complete list of the filters available, including a description and an explanation of the purpose of each parameter.

Specifying and removing grid filters (OldGridFFT)

You can specify a number of filters for INTREPID to use in the Spectral Domain Grid Filters process. INTREPID will apply the filters one after the other to the data when you choose Apply. You can modify your filter selection as required.

>> To specify a filter for the Spectral Domain Grid Filters process,

1. Choose the filter from its corresponding menu. INTREPID displays a dialog box for you to specify the filter parameters.
2. Specify the parameters and choose OK. INTREPID places a check mark against each filter you select in its corresponding menu.

>> To remove a filter from your filter selections

Choose the filter again from its menu. INTREPID will remove the filter and turn off the check mark in the menu.

If you have already applied the current set of filters, the previous output power spectrum graph will remain in the display as well as the spectrum of any new filter results.

>> To remove all filter specifications

Choose Clear Filter. INTREPID will clear all filter specifications and all output power spectrum curves, but retain your input/output dataset selection and pre- and post-filter transformation specifications.

>> To modify a filter specification

Remove the filter (see above), then respecify it with the new parameters.

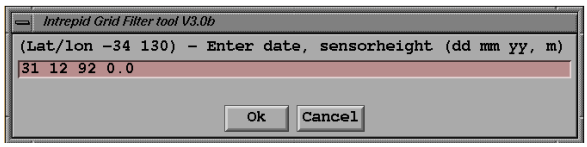
Specifying parameters in Spectral Domain Grid Filters dialog boxes (OldGridFFT)

The Spectral Domain Grid Filters dialog boxes generally have a single text box for parameters even if there are several of them.

>> To enter a number of parameters in a single text box

Separate the parameters with spaces and ensure that they are in the order required.

Here is an example of a dialog box with a number of parameters.



Frequency units and the Spectral Domain Grid Filters tool (OldGridFFT)

The INTREPID power spectrum graphs display frequency scale in cycles/km.

The Spectral Domain Grid Filters tool uses cycles/m for cutoff frequencies in its dialog boxes. If you use the power spectrum graph to assist you in choosing a cutoff frequency for a filter, divide the frequency by 1000 to convert it to cycles/m before specifying it in the filter dialog box.

Summary of menus, filters and parameters (OldGridFFT)

This table contains a summary of the filters, their variations and the menus in which you can find them.

Menu	Filter	Type	Parameters Required
Gradients	Derivative (gradient)	Vertical	order
		X (East)	
		Y (North)	
Reductions	Reduction	Equator	inclination, declination
		Pole	inclination, declination, latitude for amplitude limit
		Pole (low Latitude)	
Continuations	Continuation	Downward	level, central wavenumber (frequency), degree of rolloff
		Upward	level
Standard	Matched		4 filter coefficients b, h, B, H
	Low Pass		cutoff wavenumber (cutoff frequency)
	High Pass		
	Band Pass	Pass	low and high cutoff wavenumbers (frequencies)
		Reject	
	Cosine Rolloff	Pass	low and high cutoff wavenumbers (frequencies), degree of cosine function
		Reject	
	Butterworth	Pass	Central wavenumber (frequency), degree of Butterworth filter
		Reject	
	Gauss	Pass	standard deviation
		Reject	
	General Symmetric		wavenumber (frequency) increment, filter coefficients
Directional	Directional Pass	Pass	low and high cutoff angles
		Reject	
	Directional Cosine	Pass	filter direction, degree of cosine function
		Reject	

Menu	Filter	Type	Parameters Required
Complex	Pseudo Gravity		(Inclination, declination, field intensity,) susceptibility / density contrast ratio, altitude separation
	Susceptibility Map		(Inclination, declination, field intensity,) depth of continuation, latitude for amplitude limit, dimension of prism
	Decorrugation		line spacing, direction along striping
	Apparent Density		thickness of the Earth model

Specifying the Earth's core magnetic field direction and intensity (OldGridFFT)

If you wish to use a Reduction, Susceptibility or Pseudo Gravity filters (See Reduction Filters (OldGridFFT), Pseudo Gravity transformation (OldGridFFT) and Susceptibility filter (OldGridFFT) below) you must specify the direction and strength of the Earth's core magnetic field at the mid point of the dataset. You can use one of the following methods (with corresponding options in the Mag Field menu):

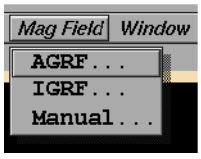
- Choose either the Australian or International Geomagnetic Reference Fields (AGRF and IGRF) and specify the survey date and sensor height. INTREPID will calculate the core magnetic field data for you.
- Manually specify the Earth's core magnetic field inclination, declination and intensity for the mid point of the dataset.

For general information about the GRF, see The geomagnetic reference field in INTREPID (R15).

Automatic calculation of field data (OldGridFFT)

>> To automatically calculate the core magnetic field data from the AGRF or IGRF model

1 Choose AGRF or IGRF from the Mag Field menu.



INTREPID displays the Enter Date and Sensor Height dialog box.

2 Enter the date and height in the form of four numbers: day, month, year, height (for example **12 10 92 60.0** represents 12 October 1992 and 60.0 metres). Choose OK.

3 INTREPID will automatically obtain the latitude and longitude of the mid point of the dataset.

4 INTREPID will calculate the core magnetic field strength, inclination and declination, then display them in a message box.

5 Note the values if required.

INTREPID will automatically retain the values and use them

- As default parameters for Reduction filters,
- As fixed parameters for the Pseudo Gravity and Susceptibility filters.

6 Choose OK.

Parameters

Parameter	Unit	Default value
Date (dd mm yy)		31 12 92
Sensor height	m	0

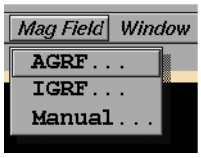
Values automatically calculated and reported by INTREPID.

Parameter	Unit
Latitude	°
Longitude	°
Inclination	°
Declination	°
Field Intensity	nT

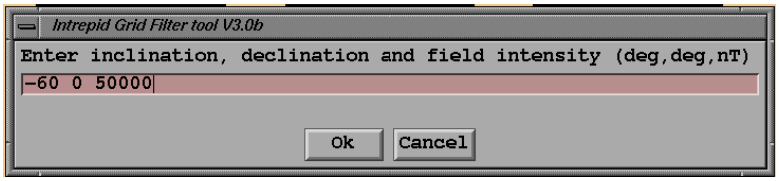
Manual specification of field data (OldGridFFT)

>> To manually specify inclination, declination and strength

1 Choose Manual from the Mag Field menu.



INTREPID displays the Magnetic Field Manual Entry dialog box.



2 Enter the Inclination, Declination and Field Intensity in the text box, separated by spaces, then choose OK.

Parameters

Parameter	Unit	Default value
Inclination	°	–60
Declination	°	0
Field Intensity	nT	50000

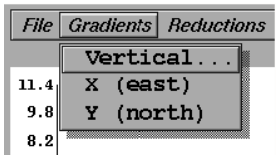
Derivative filters (gradient filters) (OldGridFFT)

INTREPID provides a vertical derivative (vertical gradient) filter and horizontal derivative filters with respect to the Easterly direction (Horizontal X–Derivative) and the Northerly direction (Horizontal Y–Derivative). You can specify a fractional order for the vertical derivative.

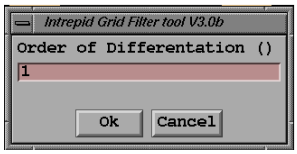
See "Single derivative filters" in INTREPID spectral domain operations reference (R14) for information about this filter.

>> To specify a Derivative (gradient) filter:

1 Choose one of the options from the Gradients menu.



2 If you choose Vertical, INTREPID displays the Order of Differentiation dialog box.



3 Edit the parameter as required and choose OK.

Parameters

Parameter	Unit	Default value
Order of Differentiation (Vertical derivative only)		1

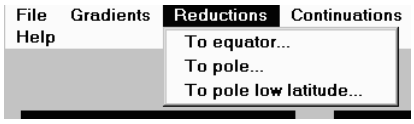
Reduction Filters (OldGridFFT)

See "Reduction filters (reference)" in INTREPID spectral domain operations reference (R14) for information about these filters.

>> To specify a Reduction filter:

1 Ensure that you have specified the Earth's core magnetic field data. (See Specifying the Earth's core magnetic field direction and intensity (OldGridFFT)).

2 Choose one of the options from the Reductions menu.

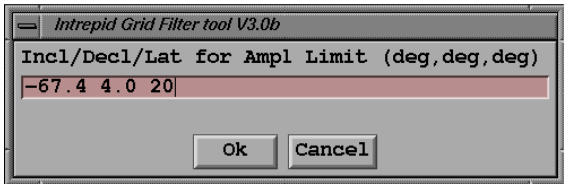


INTREPID displays a dialog box for entering parameters. The dialog box will already contain as defaults the Earth's core magnetic field data that you have calculated or specified.

3 Edit the parameters as required and choose OK..

Reduction to the pole (standard and low latitude) (OldGridFFT)

If you choose To Pole or To Pole Low Latitude from the Reductions menu, INTREPID displays the Reduction to the Pole Parameters dialog box.



Edit the parameters as required and choose OK.

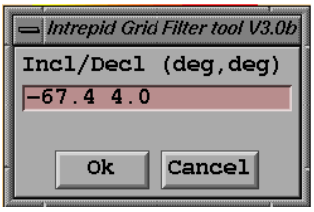
See "Reduction filters (reference)" in INTREPID spectral domain operations reference (R14) and, specifically "Reduction to the Pole (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
Inclination	°	calculated or specified
Declination	°	calculated or specified
Latitude for Amplitude Limit	°	20 (standard) 10 (low latitude)

Reduction to the Equator (OldGridFFT)

If you choose To Equator from the Reductions menu, INTREPID displays the Reduction to the Equator Parameters dialog box.



Edit the parameters as required and choose OK.

See "Reduction filters (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

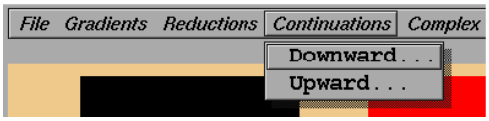
Parameter	Unit	Default value
Inclination	°	calculated or specified
Declination	°	calculated or specified

Continuation Filters (OldGridFFT)

See "Continuation filters (reference)" in INTREPID spectral domain operations reference (R14) for information about these filters.

>> To specify a Continuation filter:

1 Choose Downward or Upward from the Continuations menu.

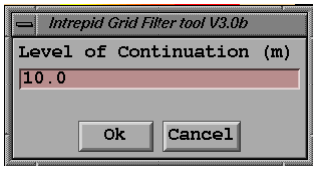


INTREPID displays the Level of Continuation dialog box.

2 Edit the parameters as required and choose OK.

Upward Continuation (OldGridFFT)

If you choose Upward from the Continuations menu, INTREPID displays the Upward Continuation dialog box.



Edit the parameter as required and choose OK.

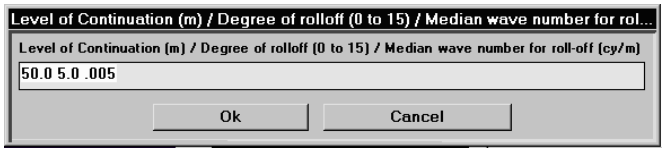
See "Continuation filters (reference)" in INTREPID spectral domain operations reference (R14) and, specifically "Upward Continuation filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
Level of Continuation	m	100

Downward Continuation (OldGridFFT)

If you choose Downward from the Continuations menu, INTREPID displays the Downward Continuation dialog box.



Edit the parameters as required and choose OK.

See "Continuation filters (reference)" in INTREPID spectral domain operations reference (R14) and, specifically "Downward Continuation filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

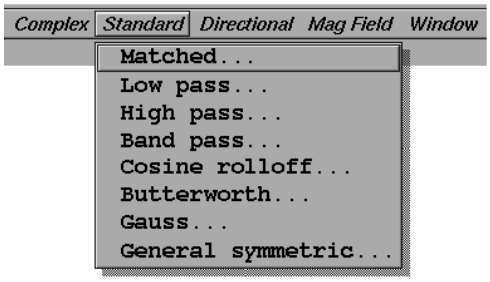
Parameter	Unit	Default value
Level of Continuation	m	50
Degree of Rolloff		5
Median Frequency of Rolloff (Median Wavenumber of Rolloff)	cycles/m	0.005

Standard Filters (for frequency ranges) (OldGridFFT)

See "Filters for frequency ranges (pass filters)" in INTREPID spectral domain operations reference (R14) for information about these filters.

>> To specify a Standard filter:

1 Choose one of the options from the Standard menu.

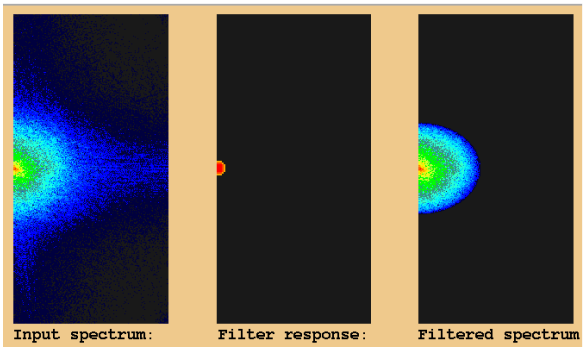


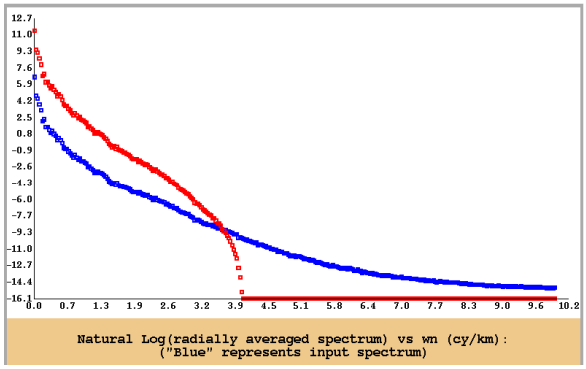
INTREPID displays a dialog box for entering parameters.

2 Edit the parameters as required and choose OK.

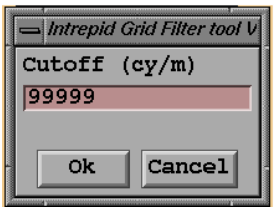
Low Pass (OldGridFFT)

Here is an illustration of the effect of a low pass filter:





If you choose Low Pass from the Standard menu INTREPID displays the Low Pass Parameters dialog box.



Edit the parameter as required and choose OK.

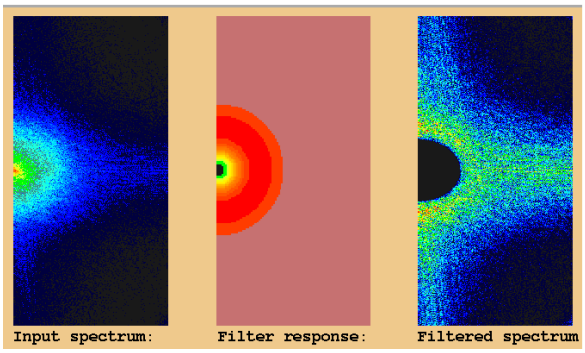
See "Filters for frequency ranges (pass filters)" in INTREPID spectral domain operations reference (R14) and, specifically "Low pass filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

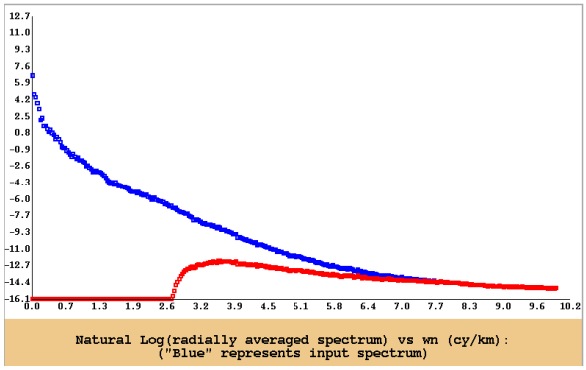
Parameters

Parameter	Unit	Default value
Cutoff wavenumber (frequency)	cycles/m	99999

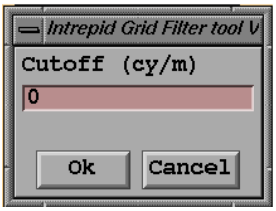
High Pass (OldGridFFT)

Here is an illustration of the effect of a high pass filter:





If you choose High Pass from the Standard menu, INTREPID displays the High Pass Parameters dialog box.



Edit the parameter as required and choose OK.

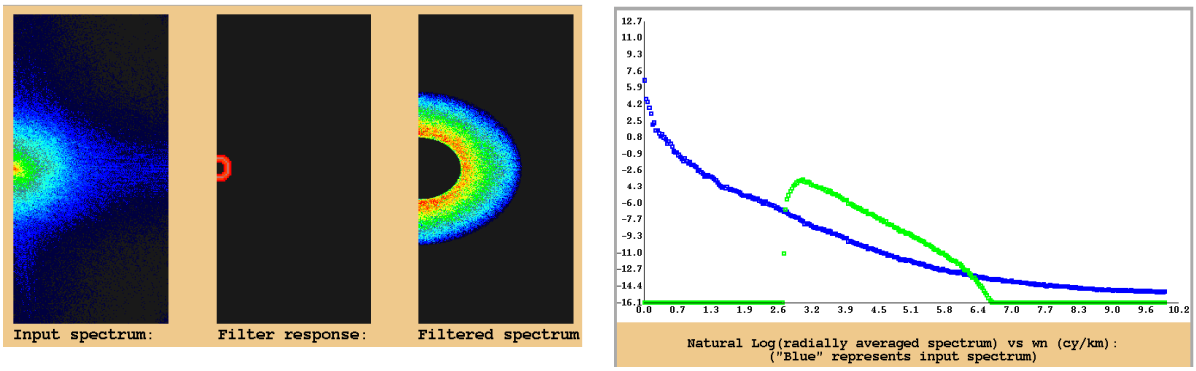
See "Filters for frequency ranges (pass filters)" in INTREPID spectral domain operations reference (R14) and, specifically "High pass filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

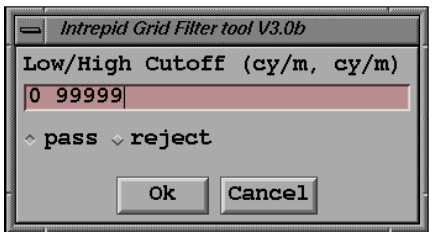
Parameter	Unit	Default value
Cutoff wavenumber (cutoff frequency)	cycles/m	0

Band Pass (OldGridFFT)

Here is an illustration of the effect of a band filter with the Pass option selected:



If you choose Band Pass from the Standard menu, INTREPID displays the Band Pass Parameters dialog box.



Edit the parameters as required and choose OK.

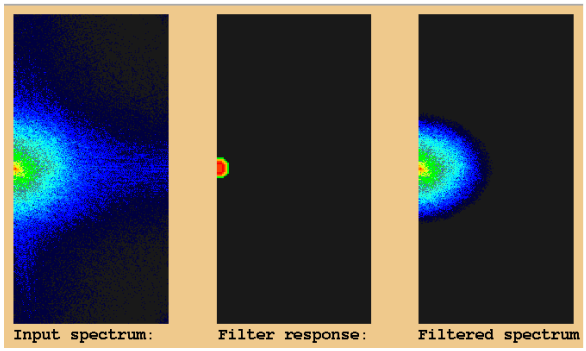
See "Filters for frequency ranges (pass filters)" in INTREPID spectral domain operations reference (R14) and, specifically "Band pass filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

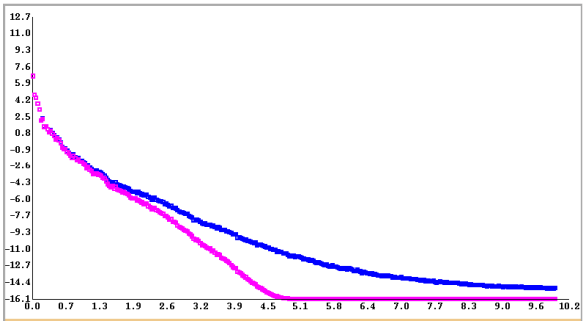
Parameters

Parameter	Unit	Default value
Low cutoff wavenumber (cutoff frequency)	cycles/m	0
High cutoff wavenumber (cutoff frequency)	cycles/m	99999
Pass / Reject (Pass = Pass the inside of the band)		Pass

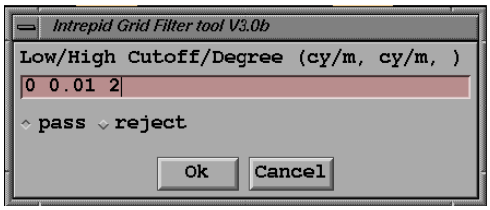
Cosine Rolloff Filter (OldGridFFT)

Here is an illustration of the effect of a cosine rolloff filter with the Pass option selected.





If you choose Cosine Rolloff from the Standard menu, INTREPID displays the Cosine Rolloff Parameters dialog box.



Edit the parameters as required and choose OK.

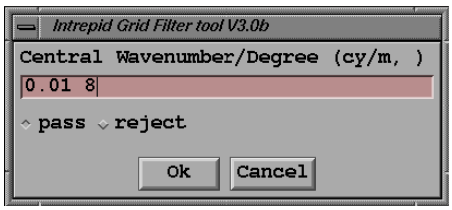
See "Cosine rolloff filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
Low cutoff frequency (for rolloff range)	cycles/m	0
High cutoff frequency (for rolloff range)	cycles/m	99999
Degree of cosine function		2
Pass / Reject (Pass=Pass the lower frequencies)		Pass

Butterworth Filter (OldGridFFT)

If you choose Butterworth from the Standard menu, INTREPID displays the Butterworth Filter Parameters dialog box.



Edit the parameters as required and choose OK.

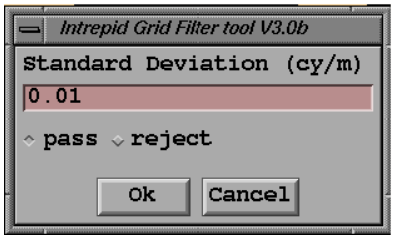
See "Butterworth filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
Central wavenumber (central frequency)	cycles/m	0.01
Degree of Butterworth function		8
Pass / Reject (Pass=Pass the lower frequencies)		Pass

Gauss Filter (OldGridFFT)

If you choose Gauss from the Standard menu, INTREPID displays the Gauss Filter Parameters dialog box.



Edit the parameters as required and choose OK.

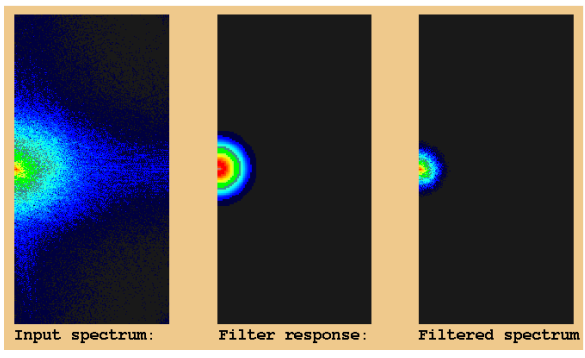
See "Gauss filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

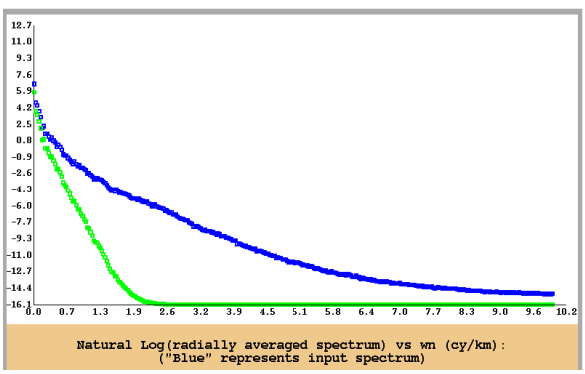
Parameters

Parameter	Unit	Default value
Standard deviation	cycles/m	0.01
Pass / Reject (Pass=Pass the lower frequencies)		Pass

Matched Filter (OldGridFFT)

Here is an example of a matched filter using the coefficients illustrated in the dialog box below.





>> To use the matched filter

1. If you wish to enter the matched filter coefficients directly without INTREPID assisting you to calculate them, go to step 5.
2. View the power spectrum graph for the input dataset (See The radially averaged power spectrum graph (OldGridFFT) above for instructions).
3. Obtain and make a note of slope and y intercept readings for the regional line segment (See The radially averaged power spectrum graph (OldGridFFT) above for instructions).
4. Obtain and make a note of slope and y intercept readings for the near surface line segment.
5. Choose Matched from the Standard menu. INTREPID displays the Matched Filter Parameters dialog box.

6. Edit the parameters as required and choose OK.

See "Matched filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
b (near surface slope)		0
h (near surface y intercept)	energy	1
B (regional slope)		0
H (regional intercept)	energy	1

General Symmetric Filter (OldGridFFT)

If you choose General Symmetric from the Standard menu, INTREPID displays the General Symmetric Filter Parameters dialog box.

Edit the parameters as required and choose OK.

See "General symmetric filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
Wavenumber increment (frequency increment)	cycles/m	0.001
Filter coefficients (8)		1, 1, 1, 1, 0.8, 0.5, 0.2, 0 (This is a low pass filter with a rolloff)

Directional Filters (OldGridFFT)

See "Directional Filters" in INTREPID spectral domain operations reference (R14) for information about these filters.

>> To apply Directional filters:

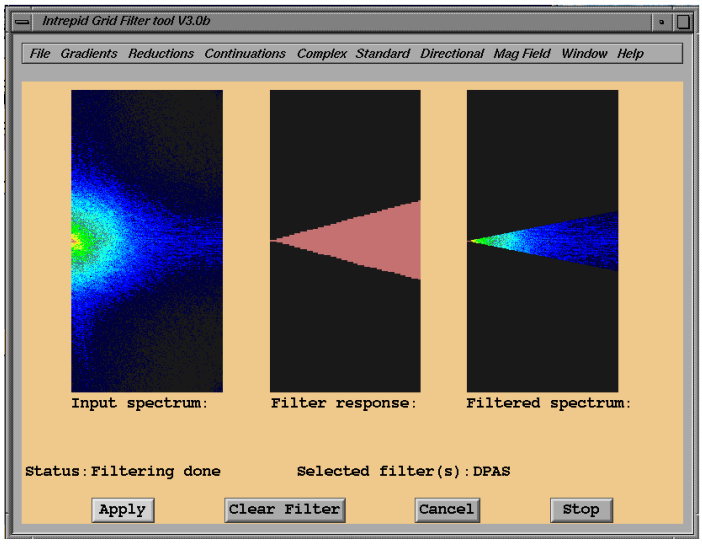
1 Choose Pass or Cosine from the Directional menu.

INTREPID displays the corresponding parameters dialog box.

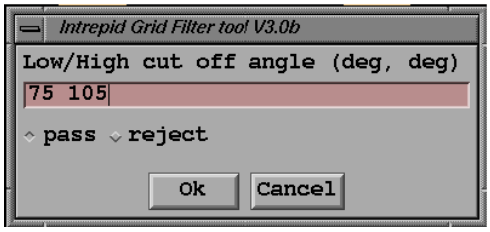
2 Edit the parameters as required and choose OK.

Directional Pass Filter (OldGridFFT)

Here is an illustration of the effects of a directional pass filter.



If you choose Pass from the Directional menu, INTREPID displays the Directional Pass Parameters dialog box.



Edit the parameters as required and choose OK.

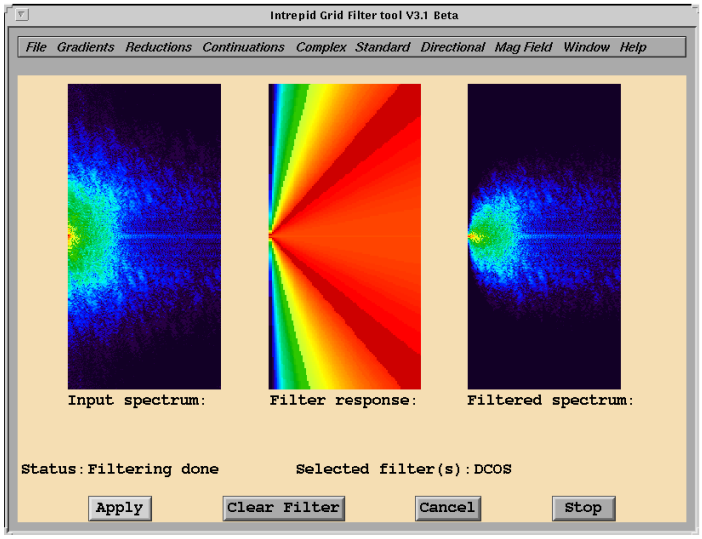
See "Directional pass filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

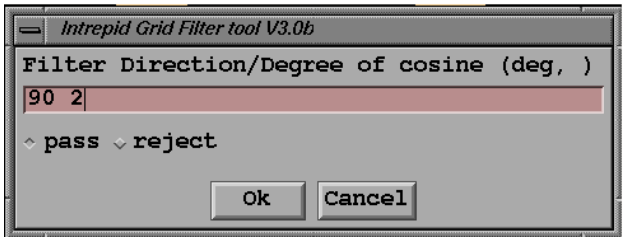
Parameter	Unit	Default value
Low cutoff angle	°	75
High cutoff angle	°	105
Pass / Reject (Pass=Pass the data between Low and High cutoff angles)		Pass

Directional Cosine Filter (OldGridFFT)

Here is an illustration of the effects of a directional cosine filter.



If you choose Cosine from the Directional menu, INTREPID displays the Directional Cosine Parameters dialog box.



Edit the parameters as required and choose OK.

See "Directional cosine filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
Filter direction	°	90
Degree of cosine function		2
Pass / Reject (Pass=Pass the data near the filter direction within the cosine function rolloff range.)		Pass

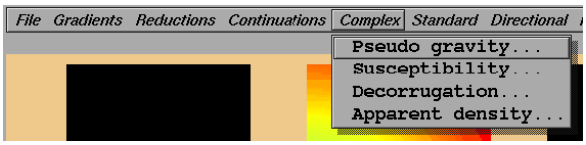
Complex filters (OldGridFFT)

The Complex filters are commonly used special combinations of filters.

>> To specify a Complex filter:

1 If you are using the Pseudo Gravity or Susceptibility filters, ensure that you have specified the Earth's core magnetic field data (See Specifying the Earth's core magnetic field direction and intensity (OldGridFFT) above).

2 Choose the option you require from the Complex menu.



INTREPID displays a dialog box for entering parameters.

3 Edit the parameters as required and choose OK.

Pseudo Gravity transformation (OldGridFFT)

>> To specify a Pseudo Gravity filter

1 Make sure you have specified the core magnetic field direction and intensity for the survey (See Specifying the Earth's core magnetic field direction and intensity (OldGridFFT) above for instructions.) INTREPID will automatically use these values for the filter.

2 Choose Pseudo Gravity from the Complex menu. INTREPID displays the Pseudo Gravity Parameters dialog box.

3 Edit the parameters as required and choose OK.

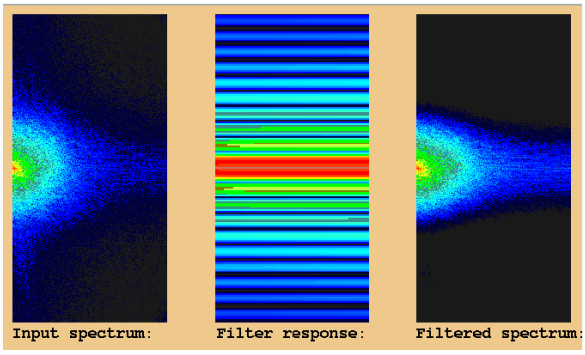
See "Pseudo gravity transformation (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

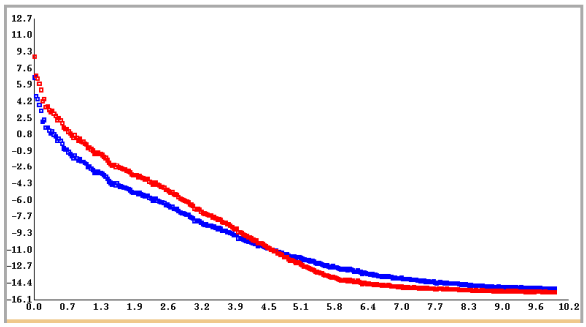
Parameters

Parameter	Unit	Default value
(Inclination)	°	
(Declination)	°	
(Field Intensity)	nT	
Susceptibility / Density Contrast Ratio		1
Altitude Separation	m	0

Susceptibility filter (OldGridFFT)

Here is an illustration of the effect of the Susceptibility filter:

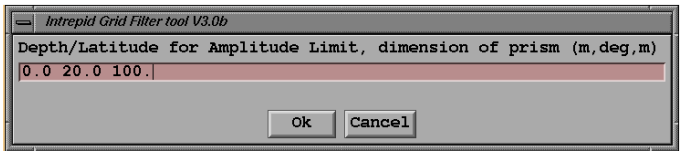




>> To specify a Susceptibility filter

1 Make sure you have specified the core magnetic field direction and intensity for the survey (See Specifying the Earth's core magnetic field direction and intensity (OldGridFFT) above for instructions.) INTREPID will automatically use these values for the filter.

2 Choose Susceptibility from the Complex menu. INTREPID displays the Susceptibility Parameters dialog box.



3 Edit the parameters as required and choose OK.

See "Susceptibility filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
(Inclination)	°	
(Declination)	°	
(Field Intensity)	nT	
Depth of continuation	m	0
Latitude for amplitude limit	°	20
Dimension of prism	m	100

Decorrugation (OldGridFFT)

If you choose Decorrugation from the Complex menu, INTREPID displays the Decorrugation Parameters dialog box.

Edit the parameters as required and choose OK.

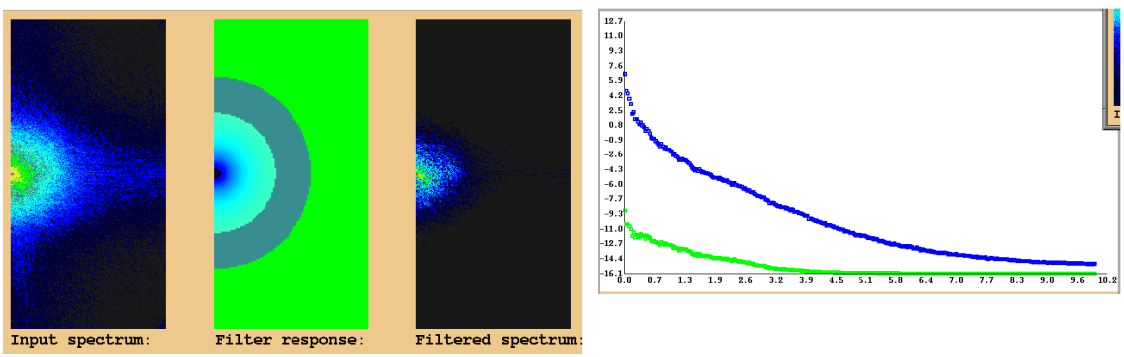
See "Decorrugation filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
Line Spacing	m	100
Direction Along Striping from North	°	90 (East–West)

Apparent Density (OldGridFFT)

Here is an illustration of the effects of an Apparent Density filter.



If you choose the Apparent Density from the Complex menu, INTREPID displays the Apparent Density Parameters dialog box.

Edit the parameters as required and choose OK.

See "Apparent density filter (reference)" in INTREPID spectral domain operations reference (R14) for information about this filter.

Parameters

Parameter	Unit	Default value
Thickness of the Earth Model	m	50

Apply (OldGridFFT)

When you choose Apply INTREPID will perform the processing that you have specified. Before you choose Apply, you must have specified the input and output dataset names, the type of processing you require and parameters that you wish INTREPID to use.

When INTREPID has completed the process it displays the Filtering process successfully completed message box.

Choose OK to dismiss the box.

Stop (OldGridFFT)

>> To abandon processing after it has started

Choose Stop from the Spectral Domain Grid Filters Main window.

Exit (OldGridFFT)

>> To exit from the Spectral Domain Grid Filters tool

Choose Quit from the File menu, INTREPID will exit from the Spectral Domain Grid Filters tool.

Other uses of the pre-filter and post-filter transformations (OldGridFFT)

You can perform any of the following pre-filter and post-filter transformation tasks separately on a dataset.

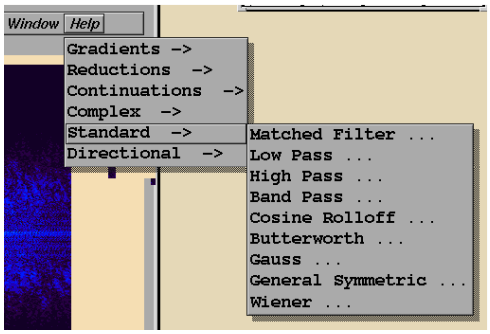
- Removing and restoring trends in datasets,
- Expanding and restoring the dimensions of data grids,
- Filling data gaps in grids by interpolation.
- Finding and removing interpolated values in grids.

>> To use the Pre-Filter and Post-Filter Transformations separately on a dataset,

1. Specify the input and output datasets with the pre-filter and post-filter processes you require. (See Specifying Input and Output (Filtered) Datasets (OldGridFFT), Pre-Filter Transformation (OldGridFFT) and Post-Filter Transformation (OldGridFFT) above for details).
2. Choose Apply without having chosen any grid filters. INTREPID will perform the pre-filter and/or post-filter processes you have specified, saving the results to the output dataset.

Help (OldGridFFT)

You can use the Help menu to display help text on the topics shown in the menu illustration below.



Displaying options and using task specification files (OldGridFFT)

Displaying options (OldGridFFT)

You can view a list of the filters selected in the status area at the bottom of the Spectral Domain Grid Filters main window.

Using task specification files (OldGridFFT)

You can store sets of file specifications and parameter settings for Spectral Domain Grid Filters in task specification (**.job**) files.

>> To create a task specification file with the Spectral Domain Grid Filters tool

1. Specify all files and parameters.
2. If possible, execute the task (choose Apply) to ensure that it will work.
3. Choose Save Options from the File menu. Specify a task specification file (INTREPID will add the extension **.job**) INTREPID will create the file with the settings current at the time of the Save Options operation.

For full instructions on creating and editing task specification files see INTREPID task specification (.job) files (R06).

>> To use a task specification file in an interactive Spectral Domain Grid Filters session

Load the task specification (**.job**) file (File menu, Load Options), modify any settings as required, then choose Apply.

>> To use a task specification file for a batch mode Spectral Domain Grid Filters task

Type the command **gfilter.exe** with the switch **-batch** followed by the name (and path if necessary) of the task specification file.

For example, if you had a task specification file called **surv329.job** in the current directory you would use the command

```
gfilter.exe -batch surv329.job
```

Task specification file example and notes (OldGridFFT)

Here is an example of a Spectral Domain Grid Filters task specification file.

```
Process Begin
   Name = GridFilter
   Input = /disk1/survey/mlevel_grid
   Output = /disk1/survey/vd_grid1
   Parameters Begin
      Date = "31 12 92 0.0"
      Elevation = 0.0
      Inclination = 0.0
      Declination = 0.0
      FieldStrength = 0.0
      Detrend = Yes
      DetrendValue = 1
      GridFill = Yes
      GridExpand = Yes
      MaxEntropy = No
      ReverseFFT = Yes
      Reduce = Yes
      Regenerate = No
      Trend = No
      CosineBell = Yes
      Hanning = No
      Hamming = No
      Blackman = No
      Triangular = No
      saveFFTbs = Yes
      Filter Begin
         Type = VERTICAL
         Order = ".75"
      Filter End
   Parameters End
Process End
```

Notes (OldGridFFT)

- To specify a different input grid for regenerating the data gaps, insert an **Input_Orig =** line before the **Parameters Begin – End** block. For example,

  Input_Orig = /disk1/survey/raw_grid

- You can specify a compound filter by adding **Filter1 Begin – End**, **Filter2 Begin – End**, ... blocks after the original **Filter Begin – End** block.

For example, the filter blocks could be as follows

```
      Filter Begin
         Type = VERTICAL
         Order = ".75"
      Filter End
      Filter1 Begin
         Type = UPWARD
         Order = "100"
      Filter1 End
```