Spectral domain grid filters tool (GridFFT) (T40)

Top

This chapter refers to the current Spectral Domain Grid Filters tool (GridFFT).[1]

You can use the INTREPID GridFFT 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.
- Transform the signal using the principles of physics.

The INTREPID GridFFT process has three basic steps:

1. Prepare and transform your grid dataset from the spatial domain to the spectral domain, using a Fast Fourier Transform (FFT).
2. Apply a range of geophysical, directional, noise removal and wavenumber dependent filters. It can apply filters singly or combine as many as you wish.
3. Transform your grid dataset back to the spatial domain, using a Reverse Fast Fourier Transform (ReverseFFT).

In this chapter:

1.We also support the previous tool, Old GridFFT. See Old spectral domain grid filters (OldGridFFT) (T38) for details.

How to use this chapter

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

In this section:

Chapter overview

Parent topic: How to use this chapter

This chapter describes the operation of the GridFFT tool. You can use the GridFFT both interactively and in INTREPID batch processing mode, using INTREPID task specification (**`.job`**) files.

Where needed in this chapter, there are separate Interactive and Task files sections. Some sections are marked *Interactive only* or *Task files only*.

You can find out how to use the tool and also get background information as follows:

- For instructions on using the tool interactively see Using the GridFFT tool (interactive only).
- For details about task specification (.job) files, see Task specification (job) files in GridFFT
- For instructions on using the tool in batch mode, see Using task specification files.
- For relevant information in other chapters, see Finding out more about spectral domain operations and The GridFFT Wizard.

Finding out more about spectral domain operations

Parent topic: How to use this chapter

This chapter briefly describes the GridFFT tool's operations.

INTREPID has a number of tools that perform spectral domain operations and use spectral domain filters. We have created a common reference chapter, which has detailed explanation of INTREPID spectral domain operations. It includes an explanation of pre-processing and post-processing, as well as details of the available filters.

NOTE: this tool now supports Full Tensor Gradient (FTG) and FALCON Partial Tensor Gradient grid operations (Curvature Gradients).

This takes the form of some Low, Band & High pass operations and Tensor Integration.

A Full Tensor Complex grid is created to support the FFT operations in this case.

See INTREPID spectral domain operations reference (R14) for full details.

The GridFFT Wizard

Parent topic: How to use this chapter

The GridFFT Wizard uses your answers to a set of questions to automatically generate a GridFFT task file. After generating the file, the GridFFT Wizard executes it in batch processing mode.

See Spectral domain grid filters (GridFFT) wizard (T39) for further information.

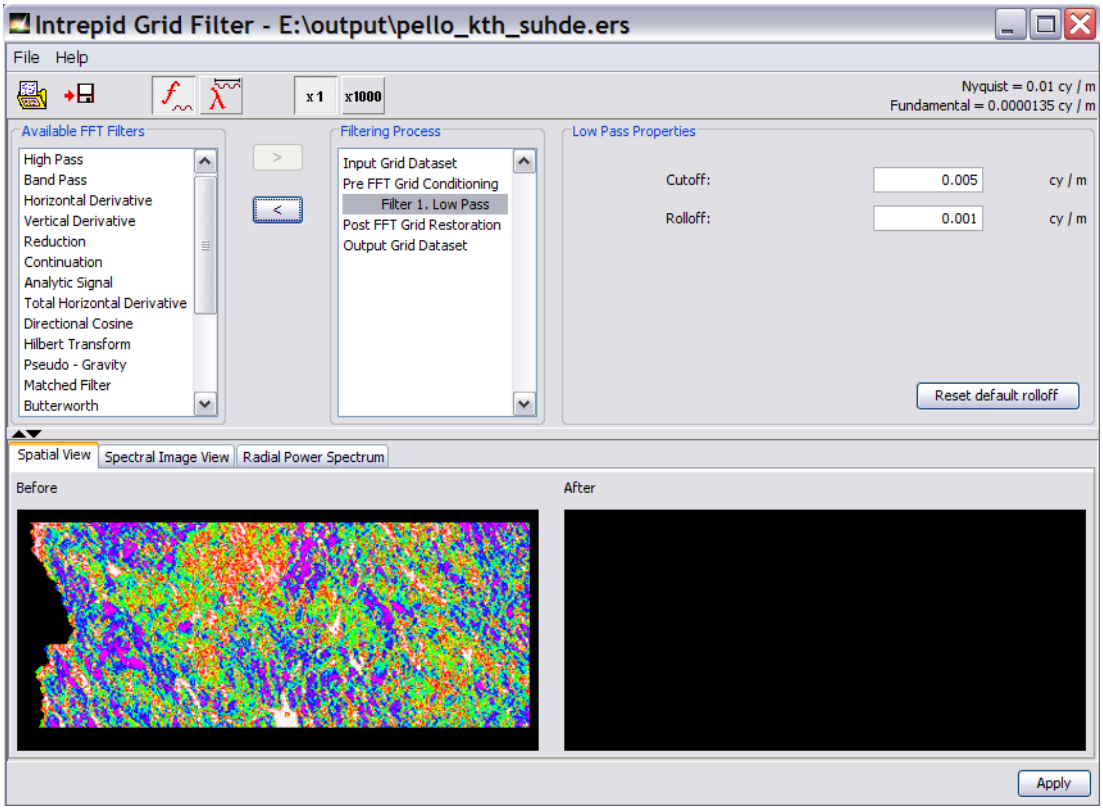
Using the GridFFT tool (interactive only)

Parent topic:
Spectral domain grid filters tool (GridFFT) (T40)

Interactive

>> To use GridFFT with the INTREPID graphic user interface

1 Choose GridFFT from the Filter menu of the Project Manager or use the command **`gfilt.exe`**. INTREPID displays the GridFFT window.



2 If you have a task specification file, load it using Load Options from the File menu. (See Specifying Input and Output (Filtered) Datasets below for detailed instructions.) If all of the specifications are correct in this file, go to step 8. If you wish to modify any settings, carry out the following steps as required.

3 Specify the input grid dataset to be filtered. Use one of the methods in Specifying Input and Output (Filtered) Datasets.

4 If the input data is in the spatial domain (not already FFT-transformed):

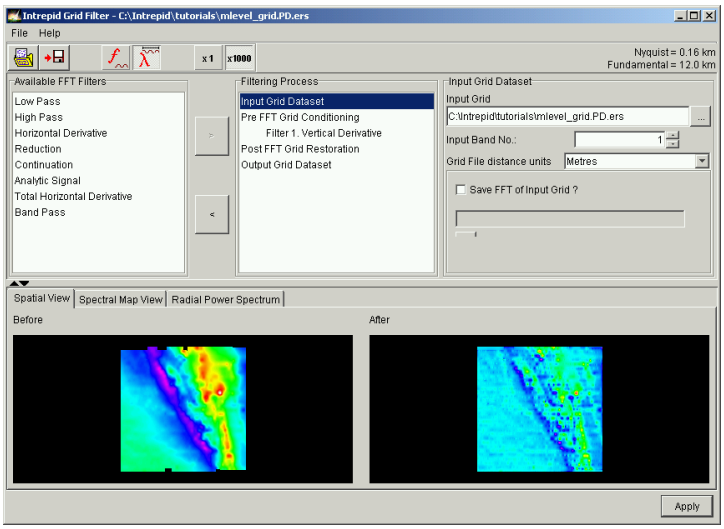
- If you want to save a copy of the FFT-transformed grid for future use to save processing time, specify this and the dataset name for this grid. See Saving FFT of input grid dataset below for detailed instructions.
- Use Pre FFT Grid Conditioning properties to specify the parameters for the transformation (See Pre FFT Grid Conditioning for detailed instructions.)

5 Select the filters to be used in the process from the Available filters list. For each filter, set its parameters. See GridFFT filters overview and INTREPID spectral domain operations reference (R14).

6 Use Post-FFT Grid Restoration properties to set parameters for the post-filter reverse FFT transformation (See Post-filter transformation options below for detailed instructions.)

7 Specify the output grid dataset for the results of the filtering. Use one of the methods in Specifying Input and Output (Filtered) Datasets.

8 Choose Apply. INTREPID performs the filter process, saves the output dataset and displays the results graphically in the Data display tabs.



9 Examine the graphical display of the filter process and results in the Data display tabs. (See Data display tabs below for information).

10 If you wish to record the specifications for this process in a **`.job`** file, so that you can perform a similar task later, use Save Options from the File menu. (See Specifying Input and Output (Filtered) Datasets below for detailed instructions.)

11 If you wish to repeat the process, repeat steps 2–10, varying the parameters and data files as required.

12 To exit from GridFFT, choose Quit from the File menu.

After using GridFFT 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 (interactive only) below).

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

The GridFFT window

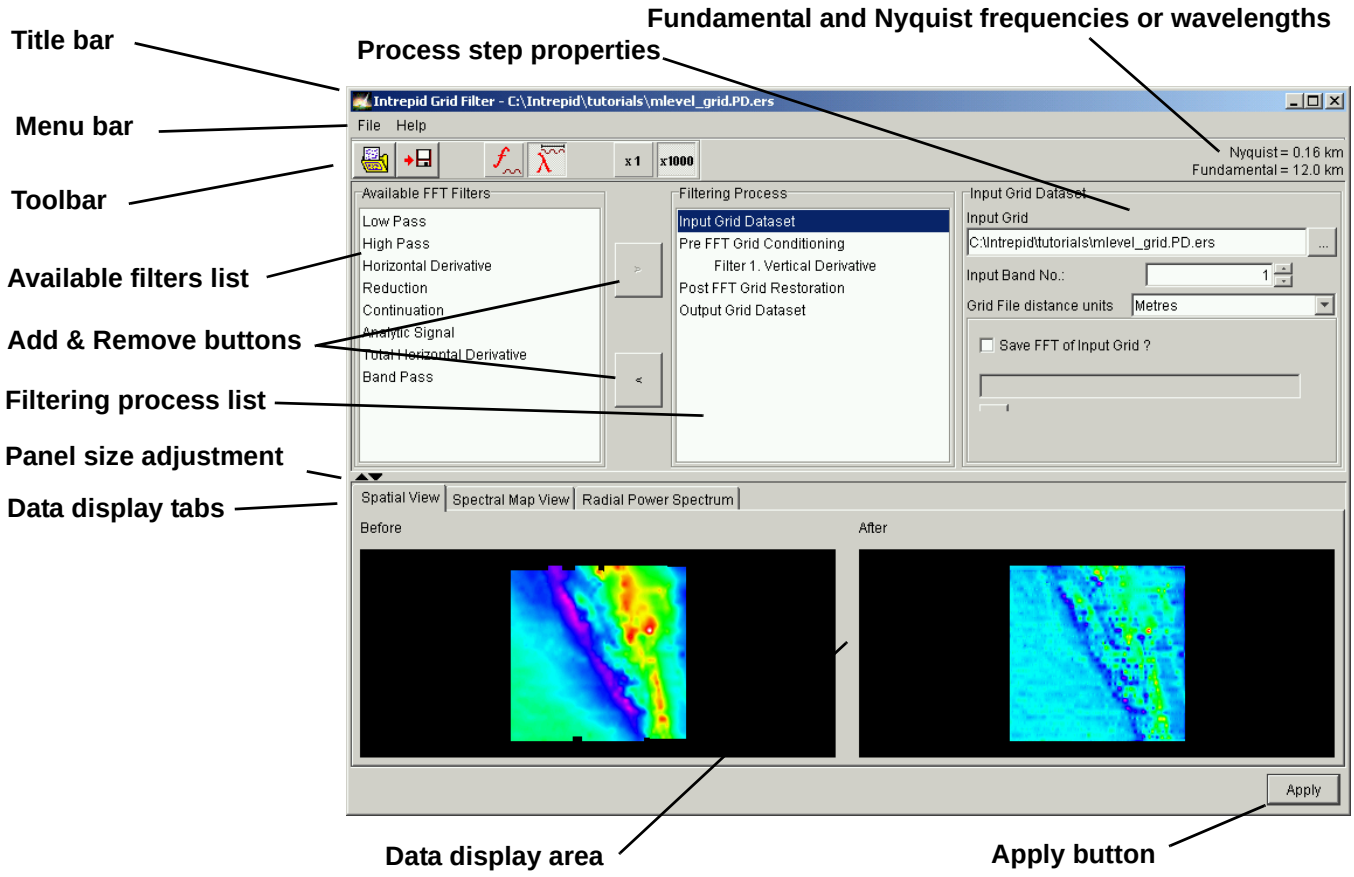
Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

In this section:

Elements of the GridFFT window

Parent topic: How to use this chapter

Here is a diagram of the GridFFT window.



The following table describes the screen elements.

Element	Purpose
Title bar	Shows the name of the tool and the input grid dataset.
Menu bar	Enables you to specify input datasets, output datesets, job files and to view on-line help.
Toolbar	Buttons for specifying input and output datasets as well as units and multiples for the filter parameters.
Fundamental and Nyquist frequencies or wavelengths	Fundamental and Nyquist frequencies for the input dataset. This also shows the units and multiples you have selected and whether you have selected frequency or wavelength mode

Element	Purpose
Available filters list	A list of filters available. You can select filters from this list.
Filtering process list	Sequence of steps in the filtering process. When you click an item in the list, INTREPID displays the step's properties in the Process step properties area.
Add & Remove buttons	Use these buttons to add and remove filters from the Filtering process list
Process step properties	Properties of the currently selected Filtering process step
Apply button	Click this button to run the filtering process
Data display tabs	Use these to select the data display you require. See Data display tabs.
Data display area	Graphic display of data from the filtering process
Panel size adjustment	Use this to change the relative size of the data display area and the lists and properties area

Changing the display panel size

Parent topic: How to use this chapter

Use the panel size control to change the relative size of the data display area and the task control area.

>> To adjust the size of the data display and task specification areas

- Drag the panel size control up or down OR
- Click the up and down arrow icons to make the data display or task specifcation area occupy the whole wondow. Click the icons again to restore the display so that both areas are visible.

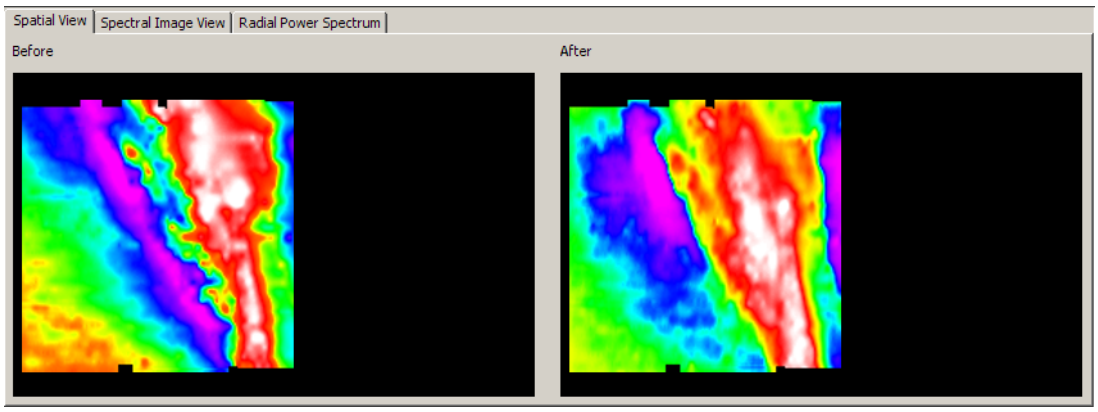
Data display tabs

Parent topic: How to use this chapter

After you have applied a filter, you can view the results graphically using the data display tabs.

Spatial view tab

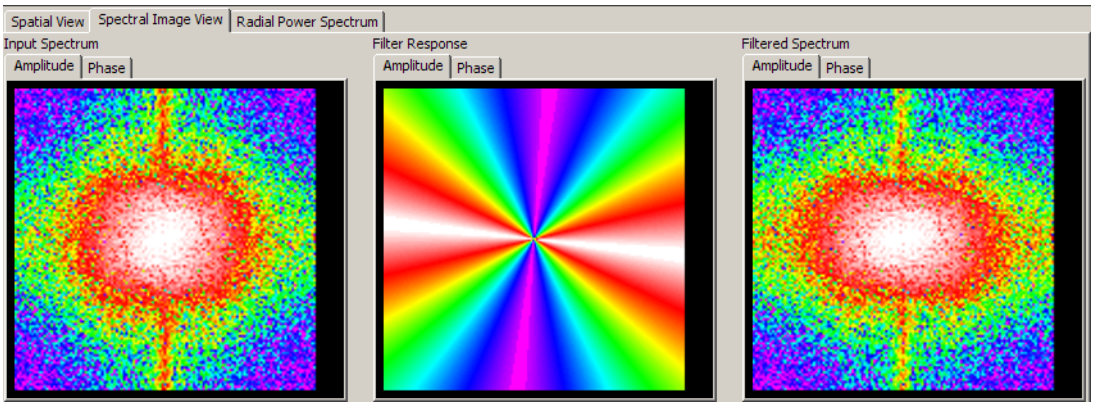
This tab shows the input and output grid in pseudocolour in the spatial domain. The display shows the input grid and the final result.

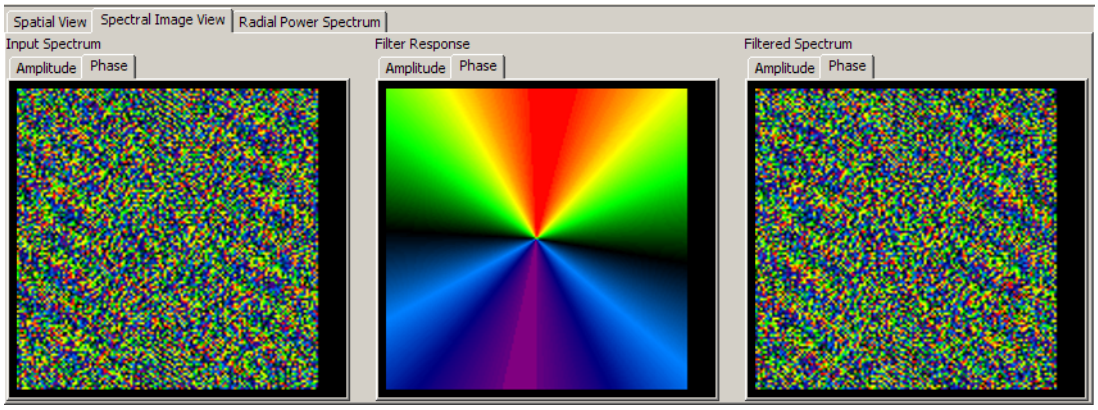


Spectral Map View tab

This tab shows graphically the spectral amplitude and phase maps of:

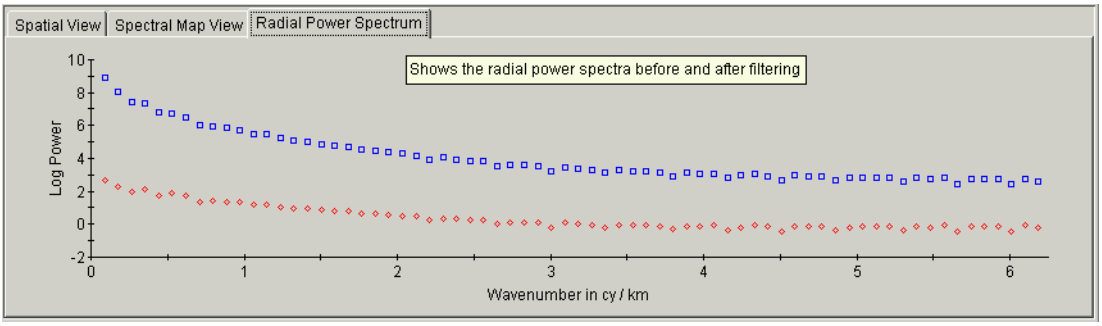
- The input dataset
- The filter applied
- The output dataset





Radial Power Spectrum tab

This tab show the radially averaged power spectrum graphs of the input dataset (blue) and the output dataset (red). See "Power spectrum graphs" in INTREPID spectral domain operations reference (R14) for more information about these graphs.



Specifying Input and Output (Filtered) Datasets

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

In this section:

Specifying input and output (filtered) datasets overview

Parent topic: Specifying Input and Output (Filtered) Datasets

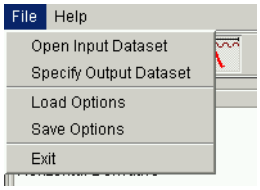
The GridFFT process involves an input grid dataset, an output grid dataset and a number of intermediate datasets.

When using GridFFT, specify the following:

- Input grid dataset (and band number if not band 0)
- *(Optional)* Detrended, expanded and filled input dataset
- *(Optional)* Rolled-off input dataset
- *(Optional)* FFT-tranformed input dataset
- Output dataset (and precision if not **`IEEE4ByteReal`**)

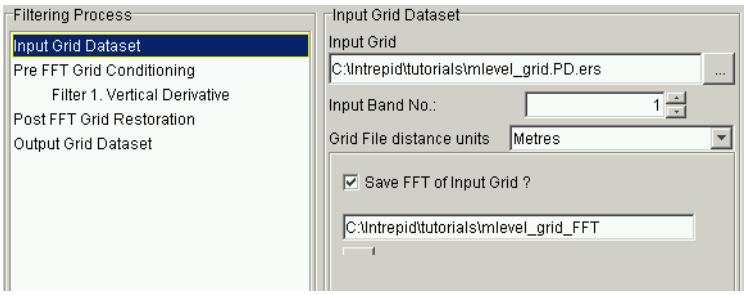
Filenames can have paths attached. Paths can be relative or absolute.

The following diagram show the ways of specifying input and output datasets in interactive mode.

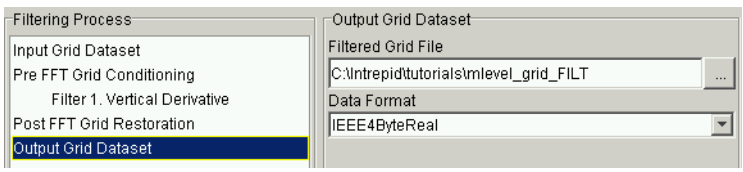


File menu

Input and output dataset toolbar buttons



Input dataset properties



Output dataset properties

If you choose a toolbar button, menu option or browse [...] button, 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).

You can also type the path and filename of the dataset in the text boxes in the Properties area.

Input grid dataset

Parent topic: Specifying Input and Output (Filtered) Datasets

GridFFT can directly input and process the following grid dataset types:

- INTREPID/ERMapper grid files (***.ers**)
- Geosoft grid files (***.grd**)

You can specify already FFT-transformed datasets as input. GridFFT automatically detects that they are transformed and skips the pre-processing steps.

You can specify an INTREPID grid dataset as if it is an ERMapper grid file. Specify the **.ers** file.

The default band for filtering is 1. If you are filtering a single band grid or want to filter the first band of a multiband grid, you don't have to specify the grid band.

Interactive

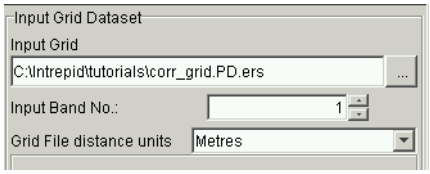
Input grid dataset—*interactive*

You can specify the input grid dataset interactively using:

- Open Input Grid Dataset from the File menu
- Input Grid Dataset toolbar button
- Input Grid text box in the Input Grid Dataset Properties area (type in the filename and path).
- Input Grid Dataset browse button [...] in the Input Grid Dataset Properties area

>> *To specify the input grid dataset*

1. Click Input Grid Dataset in the Filtering Process list. INTREPID displays the Input Grid Dataset properties.



2. Specify the input grid dataset filename using one of the methods described above.
3. Specify the input grid band number for filtering using the Input Band No spin box.
4. Specify the distance units for unit labels in the display (See Grid file distance units).

If you load a tensor grid, GridFFT configures itself to show the available filters.

Task files

Input grid dataset—*task files*

In the task file, use the **InputGridName** keyword with the path and name of the input grid header or marker file. For example:

```
InputGridName = C:\dfa_jobs\input_grids\dargo3061.ers
```

There is no default value for **InputGridName**. You must include this statement.

Use the **Band** keyword to specify the band to be filtered. For example:

```
Band = 3
```

Grid file distance units

This drop-down list in the Input Dataset Properties specifies unit labels for the display. It does not affect any data or the value of any data display.

For projected grids, the default unit is metres. GridFFT labels distances as m and frequencies as cycles/m. You can also choose feet and 'distance units'

For geodetic grids, the only distance unit available is degrees º. GridFFT labels distances as º and frequencies as cycles/º.

Expanded and filled input grid dataset

Parent topic: Specifying Input and Output (Filtered) Datasets

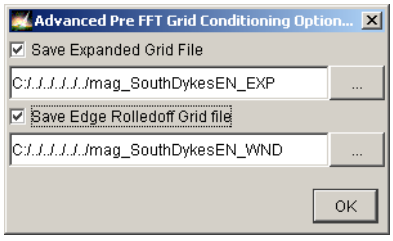
During the pre-FFT processing, GrifFFT saves a copy of the input grid after it has detrended, expanded and filled the new cells. After use, GridFFT normally deletes this grid. It is sometimes useful to keep this grid. See "Saving pre-FFT and FFT grid processing products for later reference" in INTREPID spectral domain operations reference (R14) for details.

Interactive

Expanded and filled input grid dataset—*interactive*

>> To specify saving the expanded and filled input grid dataset:

1. Click Pre FFT Grid Conditioning in the Filtering Process list. INTREPID displays the Pre FFT Grid Conditioning properties.
2. Click Advanced. INTREPID displays the Advanced Pre FFT Grid Conditioning dialog box.



3. Tick Save Expanded Grid File
4. Use the Save Expanded Grid File text box or browse button[...] to specify the name of the expanded input grid dataset.

Task files

Expanded and filled input grid dataset—*task files*

To keep the expanded and filled grid, use the **`ExpandedGridName`** keyword and assign a filename for the grid. Example:

```
ExpandedGridName = dargo_exp
```

If you leave out this statement, GridFFT deletes the grid during the post-filtering file clean-up.

Expanded input grid after edge damping

Parent topic: Specifying Input and Output (Filtered) Datasets

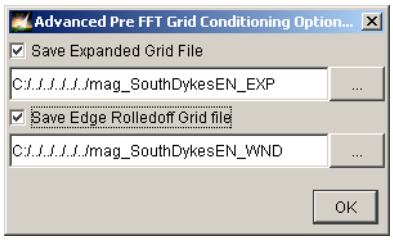
During the pre-FFT processing, GrifFFT saves a copy of the input grid after it has coompleted the edge roll-off process. After use, GridFFT normally deletes this grid. It is sometimes useful to keep this grid. See "Saving pre-FFT and FFT grid processing products for later reference" in INTREPID spectral domain operations reference (R14) for details.

Interactive

Expanded input grid after edge damping—*interactive*

>> To specify saving the expanded and edge rolled off input grid dataset:

1. Click Pre FFT Grid Conditioning in the Filtering Process list. INTREPID displays the Pre FFT Grid Conditioning properties.
2. Click Advanced. INTREPID displays the Advanced Pre FFT Grid Conditioning dialog box.



3. Tick Save Edge Rolled Off Grid File.
4. Use the Save Edge Rolled Off Grid File text box or browse button[...] to specify the name of the expanded and edge rolled off input grid dataset.

Task files

Expanded input grid after edge damping—*task files*

To keep a copy of the grid after the edge roll-off process, use the **`WindowedGridName`** keyword and assign a filename for the grid. Example:

```
WindowedGridName = dargo_wind
```

If you leave out this statement, GridFFT deletes the grid during the post-filtering file clean-up.

Saving FFT of input grid dataset

Parent topic: Specifying Input and Output (Filtered) Datasets

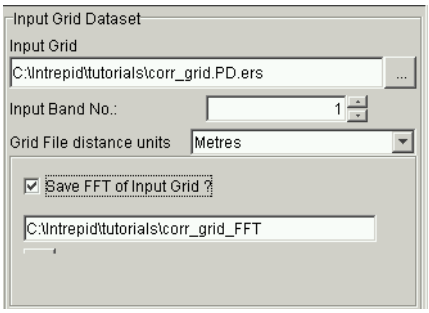
GridFFT saves the spectral domain–transformed grid in a grid datsaset, to use as input for the filtering operation. After use, GridFFT normally deletes this grid. It is sometimes useful to keep this grid. See "Saving pre-FFT and FFT grid processing products for later reference" in INTREPID spectral domain operations reference (R14) for details.

Interactive

Saving FFT of input grid dataset—*interactive*

>> To enable saving the FFT of the input grid and specify a filename

1 Display the Input Grid Dataset Properties area (click Input Grid Dataset in the Filtering Process list).



2 Tick the Save FFT of Input Grid? checkbox.

3 The default filename for the FFT grid is input grid name with **_FFT** appended. *If you want a different name*, specify it using:

- FFT of Input Grid text box
- FFT of Input Grid browse button [...]

Task files

Saving FFT of input grid dataset—*task files*

To keep the spectral domain–transformed grid, use the **FftGridName** keyword and assign a filename for the grid. Example:

```
FftGridName = dargo_fft
```

If you leave out this statement, GridFFT deletes the spectral domain input grid during the post-filtering file clean-up.

Output grid dataset

Parent topic: Specifying Input and Output (Filtered) Datasets

GridFFT can directly create filtered output datasets in the following formats:

- INTREPID grid datasets (***..GRID**)
- ERMapper grid files (***.ers**)
- Geosoft grid files (***.grd**)

The file extension you use (**..GRID**, **.ers** or **.grd**) determines the format of the output grid.

The default output grid precision **IEEE4ByteReal**. If you want a different precision, you need to specify it.

Interactive

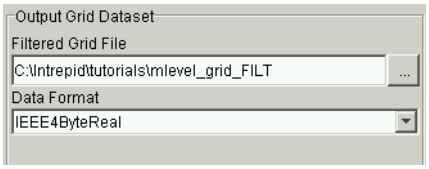
Output grid dataset—*interactive*

Specify the output grid dataset for the filtered grid data using one of the following:

- Specify Output Grid Dataset from the File menu
- Output Grid Dataset toolbar button
- Output Grid text box in the Output Grid Dataset Properties area.
- Output Grid Dataset browse button [...] in the Output Grid Dataset Properties

>> To specify output grid dataset and its properties

1. Click Output Grid Dataset in the Filtering Process list. INTREPID displays the Output Grid Dataset Properties area.



2. Specify the output grid dataset filename using one of the methods described above. If you do not specify an output grid dataset, GridFFT generates an output dataset name based on the input grid name.
3. Use the Data Format drop-down list to specify the precision you require. See "Data Types in INTREPID datasets" in INTREPID database, file and data structures (R05) for the available numeric data types.

Task files

Output grid dataset—*task files*

Use the **FilteredGridName** keyword with the path and name of the output grid header or marker file. For example:

```
FilteredGridName = C:\dfa_jobs\gfilt_test\dargo_HorDerivN..GRID
```

If you leave out this statement, GridFFT generates an output dataset name based on **InputGridName** and filters applied.

You can specify the data type of the output grid. Use the **OutputPrecision** keyword with the precision you require. See "Data Types in INTREPID datasets" in INTREPID database, file and data structures (R05) for a list of data types available and their notation. Example:

```
OutputPrecision = Signed32BitInteger
```

If you leave out this statement, GridFFT creates the output dataset with the data type **IEEE4ByteReal** (4-byte real)

Load options

Parent topic: Specifying Input and Output (Filtered) Datasets

If you wish to use an existing task specification file to specify the GridFFT process, use Load Options from the File menu. INTREPID uses the file to set all of the parameters. (See Task specification (job) files in GridFFT for more information).

Save options

Parent topic: Specifying Input and Output (Filtered) Datasets

If you wish to save the current GridFFT file specifications and parameter settings as a task specification file, use Save Options from the File menu to specify the filename and save the file. (See Task specification (job) files in GridFFT

Frequency, wavelength and distance unit multiples

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

In this section:

Frequency, wavelength and distance unit multiples overview

Parent topic: Specifying Input and Output (Filtered) Datasets

GridFFT accepts parameters and displays data in a variety of modes and units depending on the dataset and the options you select. You can select from the the following sets of options:

- Distance units (seeGrid file distance units in Input grid dataset)
  - With a projected grid you can work in metres, feet or 'distance units'. GridFFT labels its display with the unit you select.
  - GridFFT always uses degrees ° with geodetic grids.
- Distance multiples (see Distance unit multiples x 1 and x 1000)
  - Using the [x 1] or [x 1000] multiple button with a projected grid you can specify parameters in your selected distance unit singly or in multiples of 1000.

    For example, you can specify metres as the distance unit but use the x 1000 multiple. In this case, GridFFT accepts parameters and displays data in kilometres. (**Note:** It does not change the unit of the output data—this is still in metres)
- Frequency and wavelength modes (see Frequency or wavelength units)
  - Using the Frequency  and Wavelength  buttons in the spectral domain, you can specify parameters and view results using frequencies or wavelengths

When you switch between multiples and modes, GridFFT automatically converts all parameter settings. If you switch distance units, GridFFT changes labels, but this does not affect values or calculations.

These settings affect the following parameters and displays:

- Fundamental and Nyquist (see Fundamental and Nyquist Frequencies of the Input Grid)
- Pass filter parameters (see Entering parameters for pass filters (interactive only))
- Continuation filter parameters (see Continuation filter (GridFFT))

The following table summarises the results of distance unit, multiple and mode selections for projected and geodetic grids.

		Projection, selected multiple and distance unit						
		Projected [x 1]			Projected [x 1000]			Geodetic
		m	ft	du	m	ft	du	º
Domain and mode	Spatial	m	ft	du	km	kft	kdu	º
	Spectral (frequency)	cy/m	cy/ft	cy/du	cy/km	cy/kft	cy/kdu	cy/º
	Spectral (wavelength)	m	ft	du	km	kft	kdu	º

Frequency or wavelength units

Parent topic: Specifying Input and Output (Filtered) Datasets

You can specify and view spectral domain values as frequencies or wavelength. Use the Frequency and Wavelength buttons on the Toolbar to select the system you require. See Frequency, wavelength and distance unit multiples for more information about units display and input.

>> To use frequency values in the spectral domain

Click the Frequency  button.

>> To use wavelength values in the spectral domain

Click the Wavelength  button.

Distance unit multiples x 1 and x 1000

Parent topic: Specifying Input and Output (Filtered) Datasets

You can specify and view distance units as single units (m, ft, distance units dU) or x 1000 multiples (km, kft, kdU). Use the [x 1] and [x 1000] buttons on the Toolbar to select the multiple you require. See Frequency, wavelength and distance unit multiples for more information about units display and input.

These buttons are disabled when your input grid is geodetic.

>> To use single distance units

Click [x 1] to use single distance units (m, ft, dU).

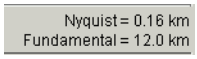
>> To use x 1000 distance units

Click [x 1000] to use x 1000 multiple distance units (km, kft, kdU).

Fundamental and Nyquist Frequencies of the Input Grid

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

GridFFT automatically displays the fundamental and Nyquist frequencies of the input grid dataset at the right end of the Toolbar.



It displays the values using the units and multiple you have selected. See for Frequency, wavelength and distance unit multiples for instructions.

For information about the fundamental and Nyquist frequencies, see "The spatial and spectral domains" in INTREPID spectral domain operations reference (R14).

Pre FFT Grid Conditioning

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

You can specify how GridFFT prepares the input grid for FFT. This section briefly describes the steps in the process and the parameters. For detailed discussion, see "Preparation of data for spectral transform" in INTREPID spectral domain operations reference (R14).

In this section:

- Pre-FFT Grid Conditioning Overview (Interactive)
- Expanding the grid
- Detrending
- Fill method
- Edge damping rolloff options

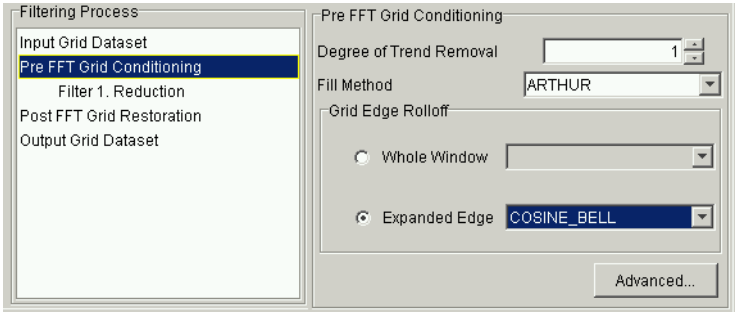
Pre-FFT Grid Conditioning Overview (Interactive)

Parent topic: Frequency, wavelength and distance unit multiples

Interactive

>> *To specify Pre FFT Grid Conditioning*

1 Click Pre FFT Grid Conditioning in the Filtering Process list. INTREPID displays the The Pre FFT Grid Conditioning properties.



2 There are no options to select for expanding the grid. See Expanding the grid.

3 Specify the Degree of trend removal using the corresponding spin box. See Detrending.

4 Specify the Fill method using the corresponding drop-down list. See Fill method.

5 Select the edge damping method (Whole window or Expanded edge) using the Grid edge rolloff option buttons. For the method you choose, select the filter type from its drop-down list. See Edge damping rolloff options.

6 If you want to save the expanded and filled or expanded and rolled off version of the input grid, use the Advanced button. See Expanded and filled input grid dataset and Expanded input grid after edge damping.

Expanding the grid

Parent topic: Frequency, wavelength and distance unit multiples

GridFFT always expands the grid to dimensions suitable for FFT. There are no parameters attached to this process. See "Expanding the data area" in INTREPID spectral domain operations reference (R14) for an explanation of this stage.

Detrending

Parent topic: Frequency, wavelength and distance unit multiples

GridFFT always detrends the grid. See "Detrending data values" in INTREPID spectral domain operations reference (R14) for information. The value you select or assign to the keyword corresponds to the degrees in this reference topic.

Interactive

Detrending degree—*interactive*

Select the degree required from the Degree of Trend Removal drop-down list.

Task files

Detrending degree—*task files*

You can specify the degree of the detrending using the **`DetrendDegree`** keyword. Example:

```
DetrendDegree = 1
```

If you leave out this statement, GridFFT detrends the grid with degree 0.

Fill method

Parent topic: Frequency, wavelength and distance unit multiples

After expanding the grid, GridFFT assigns values to the new cells in the grid using an extrapolation process. You can choose one of two available methods See "Estimating values for data gap cells" in INTREPID spectral domain operations reference (R14) for details.

Interactive

Fill method—*interactive*

Select Arthur or MEM (Maximum Entropy) from the Fill Method drop-down list.

Task files

Fill method—*task files*

To select a fill method, use the **`FillType`** keyword. The following methods are available:

Fill method	Value to assign
Linear interpolation (Arthur)	**`ARTHUR`**
Maximum entropy	**`MEM`**
Source fill	**`SOURCE_GRID`**

Example:

```
FillType = ARTHUR
```

If you leave out this statement, GridFFT uses the linear interpolation (Arthur) method.

Edge damping rolloff options

Parent topic: Frequency, wavelength and distance unit multiples

For best results from the FFT, the edges of the grid must be set to zero, but without sudden changes from the data within the grid. The grid data needs to 'roll off' to zero at the edge. See "Damping of dataset edges before spectral transform" in INTREPID spectral domain operations reference (R14) for details of this process.

GridFFT has two main roll-off methods, each of which has a number of filters. It is normal to only use one of the methods.

Method	Description	Filters available
Expanded edge roll-off	Rolloff operation only on the edges of the grid	Cosine Linear
Whole window roll-off	Rolloff operation across the whole grid	Cosine bell Hanning Hamming Blackman Triangle

Expanded edge roll-off

See "Expanded edge rolloff" in INTREPID spectral domain operations reference (R14) for an explanation of this method and its options.

Interactive

Expanded edge roll-off—*interactive*

>> To specify Expanded Edge rolloff

1 Select the option button for the method you require

2 Select the filter you require from the Expanded Edge drop-down list.

Task files

Expanded edge roll-off—*task files*

To specify an expanded edge roll-off filter, use the **`RolloffType`** keyword and assign a value to it. If you specify a rolloff method, you normally do not specify a window roll-off (**`WindowType`**) method as well (See Whole window roll-off below):

Roll-off method	`RolloffType` value	Required `WindowType` value
Linear	**`LINEAR`**	**`NONE`**
Cosine	**`COSINE`**	**`NONE`**
No roll-off	**`NONE`**	as required

Example:

```
RolloffType = LINEAR
WindowType = NONE
```

If you leave out this statement and specify a window rolloff method, GridFFT uses the window rolloff method.

If you leave out this statement and don't specify a window rolloff method, GridFFT uses a cosine edge rolloff method.

Whole window roll-off

See "Damping of dataset edges before spectral transform" in INTREPID spectral domain operations reference (R14) for an explanation of this method and its options.

Interactive

Whole window roll-off—*interactive*

>> To specify Whole Window rolloff

1 Select the option button for the method you require

2 Select the filter you require from the Whole Window drop-down list.

Task files

Whole window roll-off—*task files*

To specify a the whole window roll-off method, use the **WindowType** keyword and assign a value to it. GrifFFT provides five window roll-off methods, as shown in the following table. If you specify a whole window rolloff method, you normally do not specify an expanded edge roll-off (**RolloffType**) method as well (See Expanded edge roll-off above):

Window roll-off method	WindowType value	Required RolloffType value
Linear	**COSINE_BELL**	**NONE**
Cosine	**HANNING**	**NONE**
Hamming	**HAMMING**	**NONE**
Blackman	**BLACKMAN**	**NONE**
Bartlett or Triangular	**TRIANGLE**	**NONE**
No roll-off	**NONE**	as required

Example:

```
RolloffType = NONE
WindowType = BLACKMAN
```

If you leave out the **WindowType** statement, GridFFT uses an expanded edge rolloff method.

If you leave out this statement and don't specify an expanded edge rolloff method, GridFFT uses a cosine expanded edge rolloff method.

Post-filter transformation options

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

After applying the filters, GridFFT restores the filtered grid to correspond with the input grid.

The post-filter transformation operations are as follows:

- Apply reverse FFT to return the grid to the spatial domain.
- Remove the expanded edge of the grid.
- Reapply the trend (optional).
- Restore ***null*** to cells that were originally ***null*** (optional).

See "Post-filter transformation" in INTREPID spectral domain operations reference (R14) for details.

In this section:

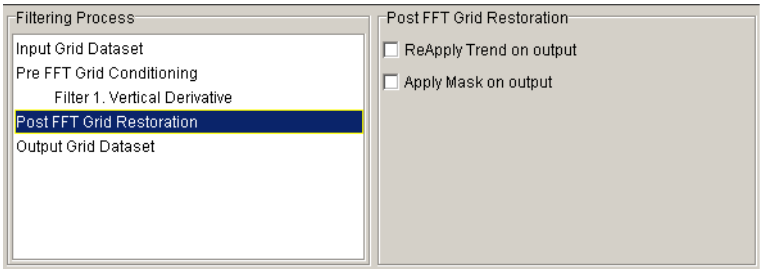
Post-FFT transformation options overview (Interactive)

Parent topic: Post-filter transformation options

Interactive

>> *To specify Post-FFT transformation options*

1 Click Post-FFT Grid Restoration in the Filtering Process list. INTREPID displays the The Post-FFT Grid Restoration properties.



2 There are no options to select for the reverse FFT process. See Reverse FFT and removing the expanded edge.

3 If you want to reapply the trend that you removed before the FFT, tick the Reapply Trend on Output check box. See Reproducing the trend.

4 If you want to restore ***null***s that existed in the grid before the Pre-FFT process, tick the Apply Mask on Output check box. This refers to ***null***s within the grid, not in the expanded edge. See Regenerating the data gaps.

Reverse FFT and removing the expanded edge

Parent topic: Post-filter transformation options

GridFFT always applies reverse FFT and removes the expanded edge of the dataset after reverse FFT. See "Reducing the dataset" in INTREPID spectral domain operations reference (R14) for details.

Reproducing the trend

Parent topic: Post-filter transformation options

GridFFT can reapply the trend that it removed when preparing for FFT. See "Reproducing the trend" in INTREPID spectral domain operations reference (R14) for an explanation.

Interactive

Reproducing the trend—*interactive*

If you want to reapply the trend that you removed before the FFT, tick the Reapply Trend on Output check box.

Task files

Reproducing the trend—*task files*

You can specify whether to reproduce the trend using the **`ReApplyTrendAfterReverseFft`** keyword. Assign the value **`YES`** or **`NO`** (or **`1`** for yes, **`0`** for no). Example:

```
ReApplyTrendAfterReverseFft = YES
```

If you leave out this statement, GridFFT does not reapply the trend.

Regenerating the data gaps

Parent topic: Post-filter transformation options

GridFFT can restore ***null*** values to cells that had this value before FFT. See "Regenerating the data gaps" in INTREPID spectral domain operations reference (R14) for an explanation. This only refers to cells within the grid. INTREPID always removed the expanded edges of the grid during the post-FFT process.

Interactive

Regenerating the data gaps—*interactive*

If you want to restore ***null***s that existed in the grid before the Pre-FFT process, tick the Apply Mask on Output check box.

Task files

Regenerating the data gaps—*task files*

You can specify whether to restore the ***null*** values using the **`ApplyMaskAfterReverseFft`** keyword. Assign the value **`YES`** or **`NO`** (or **`1`** for yes, **`0`** for no). Example:

```
ApplyMaskAfterReverseFft = YES
```

If you leave out this statement, GridFFT does not restore the ***null*** values.

GridFFT filters overview

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

GridFFT provides:

- Filters that you can combine with other filters in the same task:
  - Continuation (downward and upward)
  - High pass, low pass and band pass
  - Vertical derivative
  - Horizontal derivative
  - Reduction (to inclination and declination, including pole and equator)

  In task files these filters are within the **`CompositeFilter Begin – End`** block.
- Compound derivative filters. You can only apply one of these in any GridFFT operation:
  - Total horizontal derivative
  - Analytic Signal

  In task files these use single statements in the **`Parameters Begin – End`** block outside the **`CompositeFilter Begin – End`** block.

In interactive mode, if you load a tensor grid, GridFFT configures itself to show the available filters.

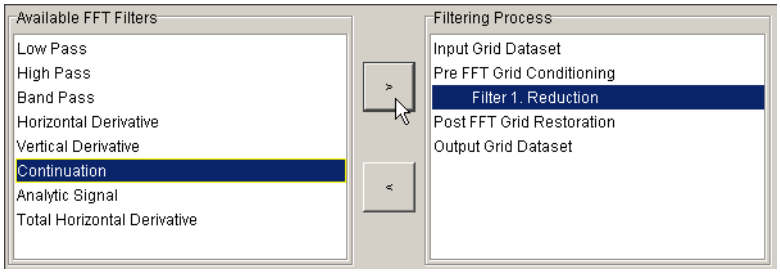
In this section:

Specifying a filter (interactive)

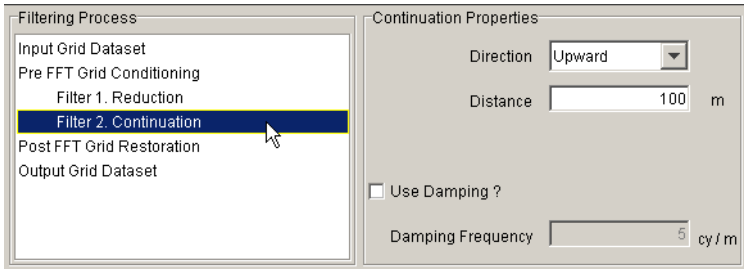
Parent topic:
GridFFT filters overview

Interactive ***>> To specify a filter***

1 Select a filter from the list of Available FFT Filters, and use the [>] button to add the selected filter to the Filtering Process. You may add further filters to create a composite filter.



2 In the Filtering Process list, select the Filter. INTREPID displays the Properties for the filter.



3 Specify the parameters for the filter. There is no OK button. When finished, continue to the next operation.

Specifying a combinable filter (task files)

Parent topic:
GridFFT filters overview

Task files

The **`CompositeFilter Begin – End`** block contains one or more filter definition **`Begin – End`** blocks.

You can only have one **`CompositeFilter Begin – End`** block in a task file.

If there are no filters in the **`CompositeFilter Begin – End`** block, you can leave it out.

The order of filters within the CompositeFilter block is generally unimportant. GridFFT combines the filters in a set order and then applies them to the spectral domain–transformed data. Downward continuation has an exception to this rule about order of filters. See Continuation filter (GridFFT) below.

Only use a particular filter definition **`Begin – End`** block once in a **`CompositeFilter Begin – End`** block. If you repeat a particular filter, GridFFT ignores the second occurrence. If you need to apply a filter twice, use two separate GridFFT tasks.

Specifying a compound derivative filter (task files)

Parent topic:
GridFFT filters overview

Task files

You can only use one of the compound derivative filters at a time. To specify one, include its statement set to **YES** in the **Parameters Begin – End** block outside the **CompositeFilter Begin – End** block.

Example

```
CalculateHorizontalDerivative = YES
```

Filter parameter tables

Parent topic:
GridFFT filters overview

The parameters tables in this manual show the parameters for each filter. They include parameters for both interactive mode and task files. These usually correspond and footnotes explain any differences. The following table explains the parts of the parameters table:

Heading	Purpose
Parameter	The INTREPID term for the parameter. This appears in the properties area in the interactive tool.
Mode	I = Interactive, T = Task files
Keyword	*(Task files only)* Keyword for specifying the parameter in a task file
Unit	Unit of the parameter value (for example, metres). This may depend on the grid data and on settings in GridFFT
Range	Acceptable range for parameter value
Default	*(Task files only)* INTREPID assigns this value if you leave out the statement *In interactive mode*, GridFFT shows the default value on the screen

Combinable filters

Parent topic:
Spectral domain grid filters tool (GridFFT) (T40)

This section describes the combinable filters available in GridFFT.

In this section:

Vertical derivative filter (GridFFT)

Parent topic: **Combinable filters**

This is a generalised vertical derivative filter. It calculates a vertical derivative with the degree that you specify. For example, degree 1 is the first vertical derivative. You can specify a fractional degree for the derivative. See "Single derivative filters" in INTREPID spectral domain operations reference (R14) and, specifically, "Vertical derivative filter (including fractional vertical derivative) (reference)" in INTREPID spectral domain operations reference (R14) for details.

Vertical derivative filter—parameters

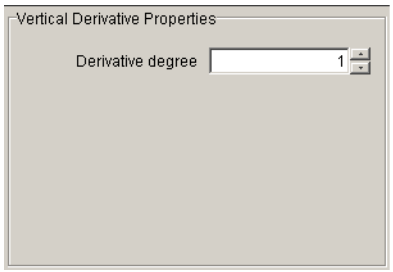
See Filter parameter tables for an explanation of parameters tables.

Parameter	Mode	Keyword	Unit	Range	Default
Order of differentiation	**IT**	**Degree**		**1..3**	**1**

Interactive

Vertical derivative filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive). The properties area is illustrated here.



Task files

Vertical derivative filter—*task files*

Here is an example **Begin – End** block:

```
VerticalDerivative2D Begin
  Degree = 1
VerticalDerivative2D End
```

Horizontal derivative filter (GridFFT)

Parent topic: Combinable filters

This is a generalised horizontal derivative filter. It calculates a horizontal gradient in any specified azimuth direction. See "Single derivative filters" in INTREPID spectral domain operations reference (R14) and, specifically, "Generalised horizontal derivative filter (reference)" in INTREPID spectral domain operations reference (R14) for details.

Horizontal derivative filter—parameters

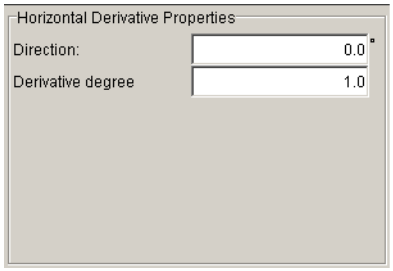
See Filter parameter tables for an explanation of parameters tables.

Parameter	Mode	Keyword	Unit	Range	Default
Direction	IT	**Azimuth**	°	**0..360**	**0**
Order of differentiation	IT	**Degree**		**1..3**	**1**

Interactive

Horizontal derivative filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive). The properties area is illustrated here.



Task files

Horizontal derivative filter—*task files*

Here is an example **Begin – End** block:

```
HorizontalDerivative2D Begin
   Azimuth = 0.0
   Degree = 1.0
HorizontalDerivative2D End
```

Reduction filter (GridFFT)

Parent topic: Combinable filters

The Reduction filter is a generalised reduction filter that can perform reduction to any orientation of the Earth's magnetic field. The most common reductions are to the Pole and to the Equator. You need to specify the target magnetic field orientation - you can input this manually or allow GridFFT to calculate it for you. If you are reducing to a low latitude, you can specify the IGRF field inclination limit for the amplitude calculation. There is also a special low latitude switch which uses a directional filter to suppress declination parallel striping. See "Reduction filters (reference)" in INTREPID spectral domain operations reference (R14) for further details.

GridFFT uses the International Geomagnetic Reference Field (IGRF) model to calculate the Earth's magnetic field for the mean position of the input grid. See The geomagnetic reference field in INTREPID (R15) for information about the IGRF.

For Reduction to the Equator, we recommend that the Declination angle should be set to that of your survey to minimise any horizontal offsets in the East/West direction

that may be caused during the calculation of this correction.

Reduction filter—parameters

See Filter parameter tables for an explanation of parameters tables.

Parameter	Mode	Keyword	Unit	Range	Default
Inclination for input dat[3]	IT	**FromInclination**	°	**0..90**	**(1)**
Declination for input data[3]	IT	**FromDeclination**	°	**0..360**	**(1)**
Date of input data [2]	T	**Date (task file and IGRF block)**		***dd/mm/yyyy***	today's date
Elevation of input data [2]	T	**Elevation**	m	**0..**	**0**
Target inclination [4]	IT	**ToInclination**	°	**0..90**	**90**
Target declination [4]	IT	**ToDeclination**	°	**0..360**	**0**
Taylor Expansion Order	IT	**TaylorExpansionOrder**		**1..3**	**1**
Inclination limit	IT	**AmplitudeLimit**	°	**0..+/-90**	**+/-20**

[1] INTREPID calculates default values from middling latitude and longitude, using the IGRF model. *In task files* it calculates the default values if you leave the statements out.

[2] *(Task files only)* If you specify a date and elevation, INTREPID uses them with the IGRF model for better (1) values

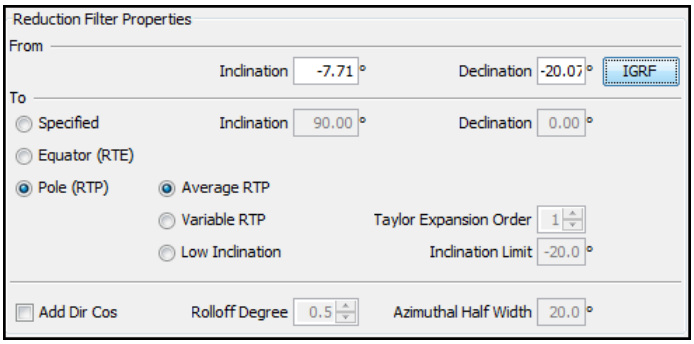
[3] *(Interactive only)* INTREPID calculates and displays default input values from middling latitude and longitude, using the IGRF model. Click IGRF to adjust these using the IGRF calculator.

[4] *In interactive mode* you can also select the Reduction to Pole, Reduction to Equator, Variable RTP and Low Latitude options. These have preset inclination and declination values.

Interactive

Reduction filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive). The properties area is illustrated here.



By default INTREPID calculates the IGRF inclination and declination at the input data centroid at 0 altitude using today's date and the latest epoch. To change this, do

one of the following:

- Enter your own values for Inclination and Declination
- Use the IGRF Calculator (See IGRF Calculator).
- Choose type of Reduction Equator or Pole.
- For RTPole, the normal option is the average correction for the middle of your grid.
- For large grids (100km extents), the approximation of using the inclination and declination at the grid centroid becomes inaccurate. In this case choose the Variable RTP option and the RTP calculation will be made using a Taylor series approximation for the gradient of the inclination and declination. In this case the IGRF field is used and inclination and declination values cannot be entered manually.

  The user can choose the order of the Taylor series expansion (1, 2, 3). The higher the order the more accurate the calculation
- For geomagnetic surveys near the equator (at low magnetic field inclinations <abs[20°]), the RTP tends to become numerically unstable particularly in the presence of noise. The problem usually presents as declination parallel striping in the transformed grid. Experience has found that this instability can be partially compensated for by using a pseudo field inclination ie (20°) when computing the amplitude component of the RTP transform while still preserving the phase. The user can choose the inclination limit at which the transform stabilises.

  The reduction filter also provides an option to apply a directional cosine roll-off to reduce the declination parallel striping in the output. This is considered a last resort solution and is untenable if there are real magnetic features with trends close to the IGRF declination direction.

  The directional cosine filter is always applied in the declination direction but the user can choose the Rolloff Degree and the Azimuthal Half Width Directional cosine filter—parameters so as to restrict the filter to a narrow corridor in the declination direction.

Task files

Reduction filter—*task files*

Here is an example **`Begin – End`** block:

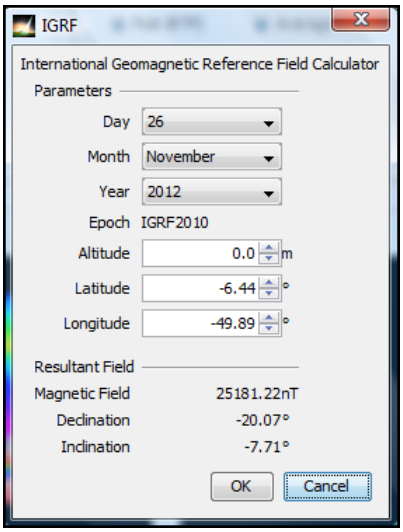
```
Reduction2D Begin
  FromInclination = -7.709789858562574
  FromDeclination = -20.067014031276116
  ToInclination = 90.0
  ToDeclination = 0.0
  AmplitudeLimit = -20.0
  LowLatitude = No
  Variable = No
  TaylorExpansionOrder = 1
  UseDirCos = No
  HalfWidth = 20.0
  RolloffDeg = 0.5
Reduction2D End
```

—

IGRF Calculator

>> *To use the IGRF Calculator*

1 In Reduction Properties, click IGRF. INTREPID displays the IGRF Calculator.



2 Set Day, Month, Year, IGRF Epoch, Altitude, Latitude and Longitude of the input data (see table below describing the parameters.

3 Note the calculated Field Strength, Declination and Inclination values

4 Click OK. INTREPID inserts the new calculated values into the To Declination and To Inclination text boxes.

IGRF Calculator—parameters

Parameter	Unit	Description	Default
Day		Day (Date of survey)	Today's Date
Month		Month (Date of survey)	
Year		Year (Date of survey)	
IGRF Epoch		IGRF Epoch [ie IGRF2010] - IGRF Model update year (every 5 years); a list of current & older models http://www.ngdc.noaa.gov/IAGA/vmod/igrf_old_models.html	Most recent epoch for the chosen survey date
Altitude	km	Specify the altitude of the survey	0
Latitude Longitude	°	Specify the latitude and longitude of the input data for the IGRF calculation	Midpoint of grid
Field Strength	nT	Output field strength from the IGRF model	
Declination	°	Output declination and inclination from the IGRF model	
Inclination			

Continuation filter (GridFFT)

Parent topic: Combinable filters

The continuation filter can calculate an upward or a downward continuation. The filter includes optional damping for controlling the stability of downward continuation. See "Continuation filters (reference)" in INTREPID spectral domain operations reference (R14) for further details.

Continuation filter—parameters

See Filter parameter tables for an explanation of parameters tables.

Parameter	Mode	Keyword	Unit	Range	Default
Direction	I			Upward or Downward	
Level of Continuation[1]	IT	**Distance**	m or °		
Use Damping? [2]	IT	**UseDamping**		**YES|NO**	**NO**
Median Frequency of Rolloff [2]	IT	**DampingFrequency**	cyc/m or cyc/°		auto
Degree of Rolloff [2]	T	**DampingDegree**		**0..15**	**10**

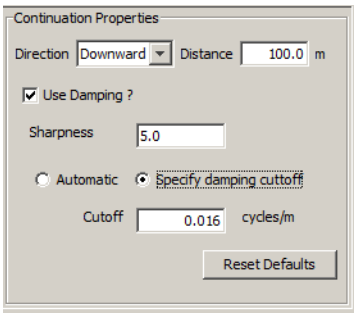
[1] *In task files:* Positive—upward continuation, Negative—downward continuation
Interactive: See Continuation filter—interactive

[2] *Downward continuation only* If you do not specify Median frequency of rolloff, INTREPID calculates a suitable value. This is based on the rate at which the continuation is increasing high frequencies. See also Suggested values for Degree of Rolloff

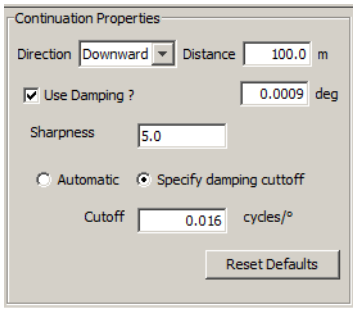
Interactive

Continuation filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive). The properties area is illustrated here.



Projected grid



Geodetic grid has choice of input in metres or degrees

If your input grid is geodetic, GridFFT displays both a metres and degrees text box for you to specify the Level of continuation. Whatever you enter in one of the text boxes, INTREPID automatically converts and displays the equivalent in the other text box, using Robin's formula. This conversion between metres and degrees is an approximation. INTREPID bases it on the mid-latitude of the grid.

Task files

Continuation filter—*task files*

Note: The sign of the Level of continuation parameter (**`Distance =`**) determines the direction. If it is positive, the continuation is upward; if negative, the continuation is downward.

Here is an example **`Begin – End`** block:

```
Continuation2D Begin
  Distance = -100.0         # +ve upward, -ve downward
  UseDamping = Yes
  DampingDegree = 5.0
  DampingFrequency = 0.016 # cycles/m (wavelength in metres 62.5)
Continuation2D End
```

Units for Level of Continuation

Specify the Level of continuation using the same distance units as the spatial version of the grid. For example, if the grid is in metres, then specify Level of continuation in metres. For geodetic grids, specify it in degrees.

(Interactive only) Remember that you can set GridFFT to display the correct units for the grid. See Frequency, wavelength and distance unit multiples for details. This may help avoid confusion.

Level of Continuation—examples

Enter the relative distance for continuation (the distance **by** which you want to change the effective height).

For example, you may have a survey flown at 90 m mean terrain clearance and recorded in metres. If you want to change its effective height to 60 m, specify a downward continuation of 30.

Specify the continuation in the same units as the grid. If you fail to do this, you will get incorrect results. The following examples describe grids with the same cell size, but measured in different units. If we specify a downward continuation of 30:

- For a projected grid in metres with 100 m cell size, the continuation distance will be 30 m.
- For a projected grid in feet with 300 ft cell size, the continuation distance would be 30 ft or 9.4 m.
- For a geodetic grid with 0.001° cell size, the continuation distance would be 30° or 3000 km!

Suggested values for Degree of Rolloff

Degree	Effect
2	Gradual
5–10	Moderately sharp
10	Recommended and default degree
30	Sharp
50 or more	Tending to a square cutoff

Entering parameters for pass filters (interactive only)

Parent topic:
Combinable filters

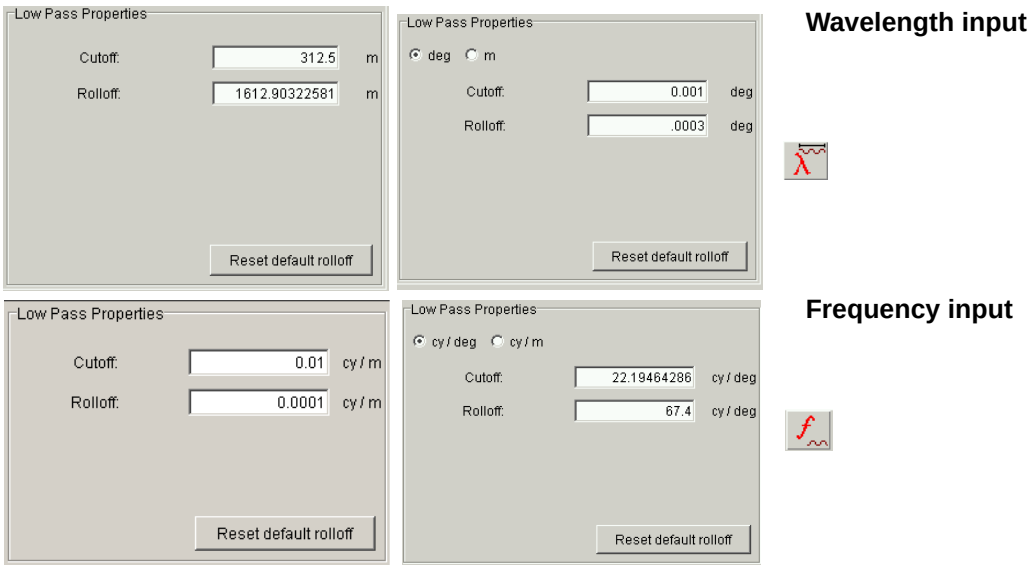
Interactive

You have a number of choices for entering spectral domain parameters the pass filters. These include frequency, wavelength and distance unit multiples (see Frequency, wavelength and distance unit multiples) and alternatives for geodetic grids:

- You can enter parameters as frequency or wavelength. See Frequency or wavelength units.
- For projected grids, you can enter distances in single or x 1000 multiple units. See Distance unit multiples x 1 and x 1000.
- For geodetic grids you can enter distances in metres or degrees.

Each time you enter a value, INTREPID checks that it is between the Fundamental and Nyquist value for the dataset (See Fundamental and Nyquist Frequencies of the Input Grid).

The following diagram shows the possible views of the Low Pass properties



If your input grid is geodetic, GridFFT displays option buttons for you to choose metres or degrees. Specify the unit you require, then use that unit to enter the parameter values. If you specify a value then select the other option button, INTREPID automatically converts and displays the value in the new unit, using Robin's formula. This conversion between metres and degrees is an approximation. INTREPID bases it on the mid-latitude of the grid.

Low pass filter (GridFFT)

Parent topic: Combinable filters

The low pass filter removes data with frequency above a level that you specify. You can specify the sharpness of rolloff or allow GridFFT to automatically apply rolloff. See "Low pass filter (reference)" in INTREPID spectral domain operations reference (R14) for further details.

You can apply this filter to a full tensor grid.

Low pass filter—parameters

See Filter parameter tables for an explanation of parameters tables.

Parameter	Mode	Keyword	Unit	Range	Default
Cutoff frequency OR Cutoff wavelength[1]	IT	**Cutoff**	cyc/m or cyc/° OR m or ° (1)		
Size of rolloff zone [1 2]	IT	**Rolloff**	cyc/m or cyc/° OR m or ° (1)		
Automatic rolloff zone size [3]	T	**AutoRolloff**		**YES|NO**	**YES**
Auto calculate rolloff zone [4]	I				

[1]Use the distance unit of your dataset (m shown here as an example)
In interactive mode you can specify wavelength and the x 1000 multiples (such as km).
In task files you can only specify frequency in single units (such as m or ft)

[2] *In task files* if present, sets **AutoRolloff** to **NO**

[3] *(Task files only)* If **YES**, sets Size of rolloff region to 0.5 x Cutoff frequency.
If **NO**, **Rolloff** statement is required

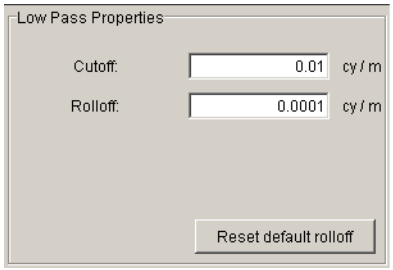
[4] *(Interactive only)* Automatically calculates a suitable rolloff region based on the dataset

Interactive

Low pass filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive).

The properties area is illustrated here. Depending on your tool settings and the grid, the properties area has different labels and options. See Entering parameters for pass filters (interactive only) for details.



Task files

Low pass filter—*task files*

Here is an example **Begin – End** block:

```
LowPass2D Begin
  Cutoff = 0.001
  Rolloff = 0.0001
  AutoRolloff = 0 or 1
LowPass2D End
```

High pass filter (GridFFT)

Parent topic: Combinable filters

The high pass filter removes data with frequency below a level that you specify. You can specify the sharpness of rolloff or allow GridFFT to automatically apply rolloff. See "High pass filter (reference)" in INTREPID spectral domain operations reference (R14) for further details.

You can apply this filter to a full tensor grid.

High pass filter—parameters

See Filter parameter tables for an explanation of parameters tables.

Parameter	Mode	Keyword	Unit	Range	Default
Cutoff frequency OR Cutoff wavelength[1]	IT	**Cutoff**	cyc/m or cyc/° OR m or ° (1)		
Size of rolloff zone [1] [2]	IT	**Rolloff**	cyc/m or cyc/° OR m or ° (1)		
Automatic rolloff zone size [3]	T	**AutoRolloff**		**YES|NO**	**YES**
Auto calculate rolloff zone [4]	I				

[1] Use the distance unit of your dataset (m shown here as an example)
In interactive mode you can specify wavelength and the x 1000 multiples (such as km).
In task files you can only specify frequency in single units (such as m or ft)

[2] *In task files* if present, sets **AutoRolloff** to **NO**

[3] *(Task files only)* If **YES**, sets Size of rolloff region to 0.5 x Cutoff frequency.
If **NO**, **Rolloff** statement is required

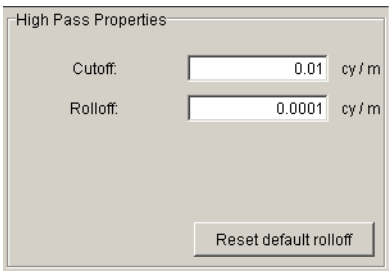
[4] *(Interactive only)* Automatically calculates a suitable rolloff region based on the dataset

Interactive

High pass filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive). The properties area is illustrated here.

Depending on your tool settings and the grid, the propoerties area has different labels and options. See Entering parameters for pass filters (interactive only).



Task files

High pass filter—*task files*

Here is an example **Begin – End** block:

```
HighPass2D Begin
  Cutoff = 0.001
  Rolloff = 1.0E-4
  AutoRolloff = NO
HighPass2D End
```

Band pass filter (GridFFT)

Parent topic: Combinable filters

The band pass filter has two cutoff frequencies and removes data with frequency outside the range defined by the two cutoffs. You can specify the sharpness of rolloff or allow GridFFT to automatically apply rolloff at the two cutoff frequencies. See "Band pass filter (reference)" in INTREPID spectral domain operations reference (R14) for further details.

You can apply this filter to a full tensor grid.

Band pass filter—parameters

See Filter parameter tables for an explanation of parameters tables.

Parameter	Mode	Keyword	Unit	Range	Default
Low cutoff frequency OR Low cutoff wavelength [1]	IT	**Low**	cyc/m or cyc/° OR m or ° (1)		
High cutoff frequency OR High cutoff wavelength [1]	IT	**High**	cyc/m or cyc/° OR m or ° (1)		
Size of rolloff zone (low) [1 2]	IT	**LowRolloff**	cyc/m or cyc/° OR m or ° (1)		
Size of rolloff zone (high) [1 2]	IT	**HighRolloff**	cyc/m or cyc/° OR m or ° (1)		
Automatic rolloff zone size [3]	T	**AutoRolloff**		**YES|NO**	**YES**
Auto calculate rolloff zone [4]	I				

[1] Use the distance unit of your dataset (m shown here as an example)
In interactive mode you can specify wavelength and the x 1000 multiples (such as km).
In task files you can only specify frequency in single units (such as m or ft)

[2] *In task files* if either rolloff statement is present, sets **AutoRolloff** to **NO**

[3] *(Task files only)* If **YES**, sets Size of rolloff region to 0.5 x Cutoff frequency. If **NO**, **Rolloff** statement is required

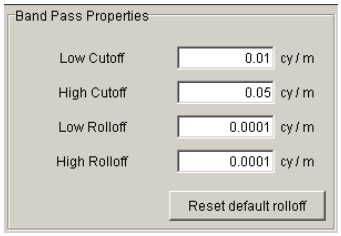
[4] *(Interactive only)* Automatically calculates a suitable rolloff region based on the dataset

Interactive

Band pass filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive). The properties area is illustrated here.

Depending on your tool settings and the grid, the propoerties area has different labels and options. See Entering parameters for pass filters (interactive only) for details.



Task files

Band pass filter—*task files*

Here is an example **Begin – End** block:

```
BandPass2D Begin
  Low = 0.0010
  High = 0.00276
  LowRolloff = 1.0E-4
  HighRolloff = 1.0E-4
  AutoRolloff = NO
BandPass2D End
```

Compound derivative filters

Parent topic: **Spectral domain grid filters tool (GridFFT) (T40)**

This section describes the compound derivative filters.

In this section:

- Total horizontal derivative filter (GridFFT)
- Analytic signal filter (GridFFT)

Total horizontal derivative filter (GridFFT)

Parent topic: **Compound derivative filters**

See "Total horizontal derivative filter (reference)" in INTREPID spectral domain operations reference (R14) for details about this filter. You cannot use it with the Analytic signal filter.

Interactive

Total horizontal derivative filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive). Note that there are no parameters for this filter

Task files

Total horizontal derivative filter—*task files*

The statement for this filter goes outside the **CompositeFilter Begin – End** block.

To calculate the total horizontal derivative, use the **CalculateHorizontalDerivative** keyord and assign the value **YES** (or **1**). Example total horizontal derivative statement:

```
CalculateHorizontalDerivative = YES
```

If you leave out this statement, GridFFT will not calculate the total horizontal derivative.

Analytic signal filter (GridFFT)

Parent topic: Compound derivative filters

See "Analytic signal filter (reference)" in INTREPID spectral domain operations reference (R14) for details for details about this filter. You cannot use it with the Total horizontal derivative filter.

Interactive

Analytic signal filter—*interactive*

Specify the filter as shown in Specifying a filter (interactive). Note that there are no parameters for this filter.

Task files

Analytic signal filter—*task files*

To calculate the analytic signal, use the **`CalculateAnalyticSignal`** keyord and assign the value **`YES`** (or **`1`**). Example analytic signal statement:

```
CalculateAnalyticSignal = YES
```

If you leave out this statement, GridFFT will not calculate the analytic signal.

Tensor compatible filters (FTG and FALCON)

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

- Continuation filter (GridFFT)

  Continued tensor grids can suffer from the Gibbs effect and phase busts may degrade results. A fix for this problem is currently being investigated.
- Low pass filter (GridFFT)
- High pass filter (GridFFT)
- Band pass filter (GridFFT)
- Butterworth filter (reference)
- Directional cosine filter (reference)
- Full Tensor Integration Query (FTG or other full tensor grids)
- FALCON Partial Tensor Transform Query

Butterworth filter for tensors

Apply the filters (interactive only)

Parent topic: Spectral domain grid filters tool (GridFFT) (T40)

Interactive

After you have specified the filtering task, click the Apply button. During execution, a speed-bar shows task progress. When the process is complete, INTREPID creates thumbnail images in the data display tabs.

You can change the task settings and click Apply as many times as you like.

Exit from GridFFT (interactive only)

Parent topic:
Spectral domain grid filters tool (GridFFT) (T40)

Interactive To exit from GridFFT, select Exit from the File menu.

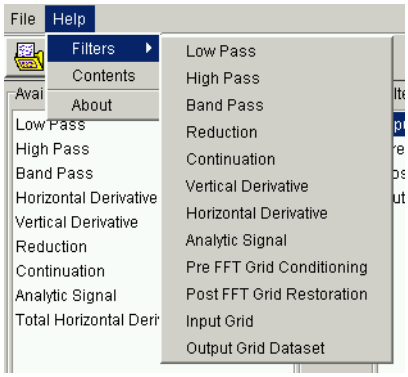
Help (interactive only)

Parent topic:
Spectral domain grid filters tool (GridFFT) (T40)

Interactive

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

Note: the Help system is available only from the CD installation, not the web install version. This is done to keep the web version small for downloading.



Task specification (job) files in GridFFT

Parent topic:
Spectral domain grid filters tool (GridFFT) (T40)

Task files

This section gives an overview, example and describes the syntax of GridFFT task specification files.

A GridFFT task specification (**`.job`**) file specifies:

- Input and output grid filenames
- Pre-filtering and post-filtering requirements
- The required filters and filter parameters

In this section:

Finding out more about task files and batch processing mode

Parent topic: Task specification (job) files in GridFFT

Use the following references:

Introduction to INTREPID auxiliary files, such as task files	"INTREPID Auxiliary files" in INTREPID database, file and data structures (R05)
Structure, syntax and use of INTREPID task files	INTREPID task specification (`.job`) files (R06)
Running INTREPID in batch processing mode	"How to start INTREPID—Overview" in Introduction to INTREPID (R02)

Main block structure of a GridFFT task file

Parent topic: Task specification (job) files in GridFFT

The following table shows the main block structure of a GridFFT task file. See Syntax table for more details.

Block definition	Contents
`Process Begin`	Task file outer block
`...`	—Tool name and date stamp
`Parameters Begin`	—Parameters block
`...`	——Filenames
`...`	——Pre- and post-FFT parameters
`...`	——Parameters for non-composite filters
`CompositeFilter Begin`	——Composite filter definition
`...`	———Filter parameter blocks
`CompositeFilter End`	——End
`Parameters End`	—End
`Process End`	End

Sample GridFFT task specification (job) file

Parent topic: Task specification (job) files in GridFFT

Here is an example of a GridFFT task.

```
Process Begin
   Name = gfilt
   Comments = “Intrepid Audit Stamp v3.5 Cut 110-11/ 5/2001”
   Parameters Begin
      InputGridName = C:\...\dargo3061.ers
      Band = 0
      FilteredGridName = C:\...\dargo_HorDerivN.ers
      OutputPrecision = IEEE4ByteReal
      FftGridName = dargo_fft
      ExpandedGridName = dargo_exp
      WindowedGridName = dargo_wind
      DetrendDegree = YES
      FillType = ARTHUR
      RolloffType = COSINE
      WindowType = NONE
      ReApplyTrendAfterReverseFft = NO
      ApplyMaskAfterReverseFft = YES
      ImagePresentation Begin
         DataTransformType = none
         HistogramStretchType = “none”
         Palette = none
      ImagePresentation End
      CompositeFilter Begin
         HorizontalDerivative2D Begin
            Azimuth = 0.0
            Degree = 1.0
         HorizontalDerivative2D End
      CompositeFilter End
   Parameters End
Process End
```

Syntax table

Parent topic: Task specification (job) files in GridFFT

This table contains the following sections:

- A complete task specification file outline with all possible statements and blocks, including:
  - File specifications
  - Pre-FFT process parameters
  - Post-FFT process parameters
  - The **CompositeFilter Begin – End** block
  - Compound derivative filters
- The possible filter description blocks for the **CompositeFilter Begin – End** block

Statement	Description	Unit	Default
GridFFT task specification (.job) file			
Process Begin	Task definition		
Name = gfilt	Specifies GridFFT as the application for this task.		
Parameters Begin	Start of parameters block		
	File specifications		
InputGridName = <path>	The input grid, with relative or absolute path if necessary. Can be a spatial or an FFT grid.		oblig
Band = <ord>	Band of grid to be filtered		1
FilteredGridName = <path>	The filtered output grid, with relative or absolute path if necessary.		calc
OutputPrecision = <datatype>	Precision of data in filtered output grid.	**IEEE4byteReal**	
FftGridName = <path>	FFT of the input grid for use in future tasks.		not saved
ExpandedGridName = <path>	Expanded and filled intermediate grid. INTREPID normally deletes it. Save it if required for debug check.		not saved
WindowedGridName = <path>	Expanded grid with rolloff applied to edges. INTREPID normally deletes it. Save it if required for debug check.		not saved
	Pre-FFT process		
DetrendDegree = <0|1|2>	De-trend the spatial grid using a polynomial of degree n (0 is a constant, 1 is a slope, 2 is curved).		1
FillType = <ARTHUR|MEM>	Fill type for dummy data in new cells of expanded grid		**ARTHUR**
RolloffType = <COSINE| LINEAR| NONE>	Roll-off type for the edge of the expanded grid. Use **RolloffType** OR **WindowType**, not both. Set **RolloffType** to **NONE** if you use **WindowType**		**COSINE**
WindowType = <COSINE_BELL| HANNING|HAMMING| BLACKMAN|TRIANGLE|NONE>	Roll-off method applied across the whole of the grid. Use **RolloffType** OR **WindowType**, not both. Set **WindowType** to **NONE** if you use **RolloffType**		**NONE**
	Post-FFT process		
ReApplyTrendAfterReverseFft = <YES|NO>	Restore the trend that was removed in pre-FFT grid conditioning .		**NO**
ApplyMaskAfterReverseFft = <YES|NO>	Use the input grid to restore all nulls in the filtered output grid.		**NO**
ImagePresentation Begin ... **ImagePresentation End**	GridFFT uses these statements in ArcView, but ignores them here.		
	Filter definitions		
CompositeFilter Begin	Composite filter definition Do not use with: **CalculateHorizonatlDerivative** or **CalculateAnalyticSignal**		
... Begin ... **... End**	Filter definition within composite filter (see 'Filter definitions' below)		
...	More filter definitions if required		
CompositeFilter End			

Statement	Description	Unit	Default
`CalculateHorizontalDerivative = <YES|NO>`	Total horizontal derivative Do not use with **`CompositeFilter`** or **`CalculateAnalyticSignal`**		**NO**
`CalculateAnalyticSignal = <YES|NO>`	Analytic signal Do not use with: **`CompositeFilter`** **`CalculateHorizonatlDerivative`**		**NO**
`Parameters End`			
`Process End`			
Filter definitions within `CompositeFilter` block			
`HorizontalDerivative2D Begin`	**Generalised horizontal derivative definition**		
`Azimuth = <number>`	Direction for horizontal derivative. 0 = grid Y 90 = grid X	°	0
`Degree = <number>`	The degree of the derivative. (1 = first derivative)		1
`HorizontalDerivative2D End`			
`VerticalDerivative2D Begin`	**Vertical derivative definition**		
`Degree = 1`	The degree of the derivative. (1 = first derivative)		1
`VerticalDerivative2D End`			
`Continuation2D Begin`	**Continuation filter definition**		
`Distance = <number>`	Continuation distance	m or °	oblig
`UseDamping = <YES|NO>`	Apply roll-off to higher frequencies? (downward continuation only)		**NO**
`DampingDegree = <0..15>`	Degree of damping roll-off		10
`DampingFrequency = <number>`	Median frequency for damping rolloff	cyc/m or cyc/°	calc
`Continuation2D End`			
`LowPass2D Begin`	**Low pass filter definition**		
`Cutoff = <number>`	Cutoff frequency for low pass filter	cyc/m or cyc/°	oblig
`Rolloff = <number>`	Frequency for start of rolloff. If this statement is present, it sets **`AutoRolloff = NO`**	cyc/m or cyc/°	oblig*
`AutoRolloff = <YES|NO>`	**NO** **`Rolloff =`** statement is required **YES** Automatic rolloff at 0.5 x **`Cutoff`** value		YES
`LowPass2D End`			
`HighPass2D Begin`	**High pass filter definition**		
`Cutoff = 0.001`	Cutoff frequency for high pass filter	cyc/m or cyc/°	oblig
`Rolloff = <number>`	Frequency for start of rolloff. If this statement is present, it sets **`AutoRolloff = NO`**	cyc/m or cyc/°	oblig*
`AutoRolloff = <YES|NO>`	**NO** **`Rolloff =`** statement is required **YES** Automatic rolloff at 0.5 x **`Cutoff`** value		YES
`HighPass2D End`			
`BandPass2D Begin`	**Band pass filter definition**		
`Low = <number>`	Cutoff frequency for low pass filter	cyc/m or cyc/°	oblig
`High = <number>`	Cutoff frequency for high pass filter	cyc/m or cyc/°	oblig
`LowRolloff = <number>`	Frequency for start of low end rolloff. If this statement is present, it sets **`AutoRolloff = NO`**	cyc/m or cyc/°	oblig*
`HighRolloff = <number>`	Frequency for start of high end rolloff. If this statement is present, it sets **`AutoRolloff = NO`**	cyc/m or cyc/°	oblig*

Statement	Description	Unit	Default
`AutoRolloff = <YES|NO>`	**`NO LowRolloff =`** and **`HighRolloff =`** statements are required **YES** Automatic rolloff at 0.5 x **`Low`** and 0.5 x **`High`** values respectively		YES
`BandPass2D End`			
`Reduction2D Begin`	**Reduction filter definition**		
`FromInclination = <number>`	Inclination of source data. INTREPID calcluates default from middling latitude and longitude, using IGRF model	°	calc
`FromDeclination = <number>`	Declination of source data. INTREPID calcluates default from middling latitude and longitude, using IGRF model	°	calc
`Date`	Date of source data in format *`DD/MM/YYYY`*		Epoch 2000
`Elevation`	Elevation of source data	m	0
`ToInclination = <number>`	Inclination of output data	°	90 (pole)
`ToDeclination= 0`	Declination of output data	°	0
`AmplitudeLimit= 20.0`	Latitude for amplitude limiting	°	20
`LowLatitude = <YES|NO>`	Turn on/off directional cosine filter		
`Reduction2D End`			

* If Auto**`Rolloff = NO`**, then this statement is required and you must assign a value.

GridFFT Wizard statements for third party products

Parent topic: Task specification (job) files in GridFFT

The GridFFT Wizard is mainly for use with third party products. It automatically inserts statements that allow the third party products to use GridFFT. The statements may include the following:

```
ImagePresentation Begin
   ...
ImagePresentation End
```

If you are editing a task file that the GridFFT Wizard has produced, ignore these statements. See Spectral domain grid filters (GridFFT) wizard (T39) for further information about them.

Using task specification files

Parent topic: Task specification (job) files in GridFFT

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

>> To create a task specification file with the GridFFT 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 GridFFT 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 GridFFT task

Type the command **gfilt.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

```
gfilt.exe -batch surv329.job
```