

# **Wavelet Toolbox Release Notes**

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## Summary by Version

This table provides quick access to what's new in each version. For clarification, see About Release Notes.

<b>Version (Release)</b>	<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
<b>Latest Version V3.1 (R2006b)</b>	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: P DF  Current product documentation
V3.0.4 (R2006a)	No	No	No bug fixes	No
V3.0.3 (R14SP3)	No	No	No bug fixes	No
V3.0.2 (R14SP2)	No	No	No bug fixes	No
V3.0.1 (R14SP1)	No	No	No bug fixes	No
V3.0 (R14)	Yes Details	Yes Summary	Fixed Bugs	No

### About Release Notes

Use release notes when upgrading to a newer version to learn about new features and changes, and the potential impact on your existing files and practices. Release notes are also beneficial if you use or support multiple versions.

If you are not upgrading from the most recent previous version, review release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the New Features and Changes, Version Compatibility Considerations, and Bug Reports for V1.1 and V1.2.

## New Features and Changes

These include

- New functionality
- Changes to existing functionality
- Changes to system requirements (complete system requirements for the current version are at the MathWorks Web site)
- Any version compatibility considerations associated with each new feature or change

## Version Compatibility Considerations

When a new feature or change introduces a known incompatibility with the previous version, its description includes a **Compatibility Considerations** subsection that details the impact. For a list of all new features and changes that have compatibility impact, see the Compatibility Summary for Wavelet Toolbox.

Compatibility issues that become known after the product has been released are added to Bug Reports at the MathWorks Web site. Because bug fixes can sometimes result in incompatibilities, also review fixed bugs in Bug Reports for any compatibility impact.

## Fixed Bugs and Known Problems

MathWorks Bug Reports is a user-searchable database of known problems, workarounds, and fixes. The MathWorks updates the Bug Reports database as new problems and resolutions become known, so check it as needed for the latest information.

Access Bug Reports at the MathWorks Web site using your MathWorks Account. If you are not logged in to your MathWorks Account when you link to Bug Reports, you are prompted to log in or create an account. You then can view bug fixes and known problems for R14SP2 and more recent releases.

The Bug Reports database was introduced for R14SP2 and does not include information for prior releases. You can access a list of bug fixes made in prior versions via the links in the summary table.

## Related Documentation at Web Site

**Printable Release Notes (PDF).** You can print release notes from the PDF version, located at the MathWorks Web site. The PDF version does not support links to other documents or to the Web site, such as to Bug Reports. Use the browser-based version of release notes for access to all information.

**Product Documentation.** At the MathWorks Web site, you can access complete product documentation for the current version and some previous versions, as noted in the summary table.

## Version 3.1 (R2006b) Wavelet Toolbox

This table summarizes what's new in Version 3.1 (R2006b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	Printable Release Notes: PDF  Current product documentation

New features and changes introduced in this version are

- “Multivariate De-noising Added” on page 6
- “Multiscale Principal Component Analysis Added” on page 6
- “New Demos” on page 7

### Multivariate De-noising Added

A new command-line function (`wmulden`) and a new GUI (**Multivariate Denoising** from the `wavemenu` initial window) for de-noising a matrix of signals have been added. Both the function and GUI take into account the signals themselves and the correlations between the signals. A two-step process is used. First, a change of basis is performed to deal with noise spatial correlation de-noising in the new basis. Then, a principal component analysis is performed to take advantage of the deterministic relationships between the signals, leading to an additional de-noising effect.

### Multiscale Principal Component Analysis Added

A new command-line function (`wmspca`) and a new GUI (**Multiscale Princ. Comp. Analysis** from the `wavemenu` initial window) for simplifying a matrix of signals have been added. Both the function and GUI take into account the signals themselves and the correlations between the signals. The multiscale principal component analysis mixes wavelet decompositions and principal component analysis.

## **New Demos**

The following new demos are added:

- Continuous and Discrete Wavelet Analysis
- Detecting Discontinuities and Breakdown Points
- De-Noising Signals and Images
- Data Compression using 2D Wavelet Analysis
- Image Fusion
- Detecting Self-Similarity
- Wavelet Packets: Decomposing the Details

## Version 3.0.4 (R2006a) Wavelet Toolbox

This table summarizes what's new in V3.0.4 (R2006a):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
No	No	No bug fixes	No



## Version 3.0.3 (R14SP3) Wavelet Toolbox

This table summarizes what's new in V3.0.3 (R14SP3):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
No	No	No bug fixes	No

## Version 3.0.2 (R14SP2) Wavelet Toolbox

This table summarizes what's new in V3.0.2 (R14SP2):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
No	No	No bug fixes	No

## Version 3.0.1 (R14SP1) Wavelet Toolbox

This table summarizes what's new in V3.0.1 (R14SP1):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
No	No	No bug fixes	No

## Version 3.0 (R14) Wavelet Toolbox

This table summarizes what's new in V3.0 (R14):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
V3.0 (R14)	Yes—Details labeled as <b>Compatibility Considerations</b> , below. See also Summary.	Fixed Bugs	No

New features and changes introduced in this version are

### Wavelet Design for CWT Tool Added

The **New Wavelet for CWT** tool designs a new wavelet adapted to a given pattern using least squares optimization. The new wavelet can be used for accurate pattern detection using the continuous wavelet transform (cwt). This new tool is useful for creating new wavelets for accurate 1-D pattern detection. From the command line, use the `pat2cwav` function.

### Image Fusion Tool Added

The **Image Fusion** tool performs fusion of two images. Image fusion using wavelets merges the wavelet decompositions of two original images using various fusion methods applied to approximations coefficients and details coefficients. Examples of uses of this tool are creating a new image from two different images and restoring an image from two fuzzy versions of an original image. From the command line, use the `wfusing` and `wfusmat` functions to fuse two images and fuse two matrices or arrays, respectively.

## Fractional Brownian Generation 1-D Tool Added

The **Fractional Brownian Generation 1-D** tool performs the random generation of fractional Brownian motion, which is a useful model for Internet traffic and financial series. From the command line, use the `wfbm` and `wfbmesti` functions to synthesize and perform parameter estimation of fractional Brownian motion, respectively.

## Lifting Methods Added

You can use lifting methods to design new wavelets. The new lifting methods also allow integer-to-integer wavelet transforms and transforms using different length decomposition high-pass and low-pass filters. Five groups of new lifting functions are included in the Wavelet Toolbox version 3.0:

- Key lifting scheme structures
  - `addlift`—Add primal or dual elementary lifting steps to a lifting scheme
  - `displs`—Display a lifting scheme
  - `lsinfo`—Information about lifting schemes
- Biorthogonal quadruplets of filters
  - `bswfun`—Compute and plot biorthogonal “scaling and wavelet” functions
  - `filt2ls`—Transform a quadruplet of filters to a lifting scheme
  - `liftfilt`—Apply elementary lifting steps on quadruplet of filters
  - `ls2filt`—Transform a lifting scheme to a quadruplet of filters
- Orthogonal or biorthogonal (“true”) wavelets and “lazy” wavelets.
  - `liftwave`—Provides lifting scheme associated to a wavelet
  - `wave2lp`—Provides Laurent polynomials associated to a wavelet
  - `wavenames`—Provides wavelet names available for LWT
- Direct and inverse Lifting Wavelet Transform (LWT)
  - `lwt`—1-D Lifting Wavelet Transform
  - `lwt2`—2-D Lifting Wavelet Transform
  - `lwtcoef`—Extract or reconstruct 1-D LWT wavelet coefficients
  - `lwtcoef2`—Extract or reconstruct 2-D LWT wavelet coefficients
  - `ilwt`—Inverse 1-D Lifting Wavelet Transform
  - `ilwt2`—Inverse 2-D Lifting Wavelet Transform

- Laurent polynomials and matrices (see Note below)
  - `laurmat`—Constructor for the class LM of Laurent Matrices
  - `laurpoly`—Constructor for the class LP of Laurent Polynomials

### Compatibility Consideration

If you saved `laurmat` or `laurpoly` objects using the names `lm` or `lp`, respectively, in the Beta release, you must rename them to `laurmat` or `laurpoly`, respectively, in this release of the Wavelet Toolbox 3.0.

### Speed Enhancements

Many functions, including those involving decomposition and reconstruction, have been enhanced so they run more efficiently.

### New Extension Modes for DWT

Four new extension modes are available for `dwt`, which allows specifying half- or whole-point symmetry, or half- or whole-point anti-symmetry. See `dwtmode`. These new extension modes are supported by both `wextend` to extend or truncate signal or images, and by the corresponding GUI tools: **Signal Extension** and **Image Extension**.

### New Supported Image Formats

Images stored using JPEG, TIFF, PCX, and others can be directly loaded into the Wavelet Toolbox GUI.

Images stored in `uint8` format can be used in all the 2-D tools.

Images stored in True Colour mode are converted automatically in indexed mode when loaded in the 2-D tools. See the Wavelet Toolbox documentation on working with images for more information.

## Fixed Bugs

### Complex Wavelets in fbsp and shan Families

Numeric values associated with the fbsp and shan wavelet families (in particular, the shanwavf, fbspwavf, and scal2frq functions) were incorrect and have been fixed.

### Density Estimation 1-D Normalization

An omitted normalization step has been added in the **Density Estimation 1-D** tool.

## Compatibility Summary for Wavelet Toolbox

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided with the description of the new feature or change.

<b>Version (Release)</b>	<b>New Features and Changes with Version Compatibility Impact</b>
<b>Latest Version V3.1 (R2006b)</b>	None
V3.0.4 (R2006a)	None
V3.0.3 (R14SP3)	None
V3.0.2 (R14SP2)	None
V3.0.1 (R14SP1)	None
V3.0 (R14)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: <ul style="list-style-type: none"> <li>• “Lifting Methods Added” on page 13</li> </ul>