

- \* Automated geodynamic diagnostics
- \* Analysis & Publication Mode
- \* Clear and focussed plot design
- \* Light & Dark Mode
- \* Scientific colour maps
- \* Publication-ready figures & movies

- ✓ Inclusive
- ✓ Free to use
- ✓ Easy to use
- ✓ Forward compatible
- ✓ Citable & reproducible

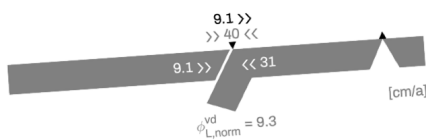
Crameri, F. (2017), StagLab, Zenodo, [doi:10.5281/zenodo.1199037](https://doi.org/10.5281/zenodo.1199037)

Crameri, F. (2018), Geodynamic diagnostics, scientific visualisation and StagLab 3.0, Geosci. Model Dev., 11, 2541-2562, [doi:10.5194/gmd-11-2541-2018](https://doi.org/10.5194/gmd-11-2541-2018)

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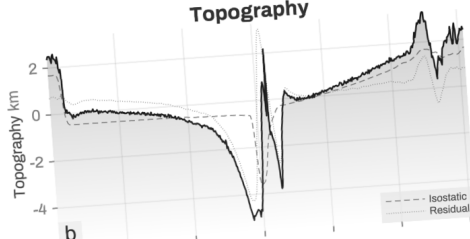
\* [www.fabiocrameri.ch/StagLab](http://www.fabiocrameri.ch/StagLab)

### Tectonics



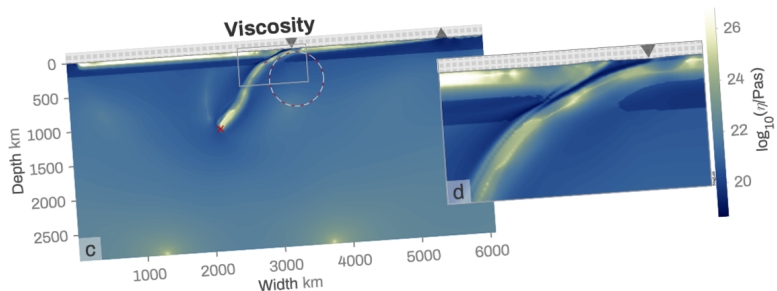
a

### Topography



b

### Viscosity



Geodynamic diagnostics & scientific visualization  
Made simple.

[www.fabiocrameri.ch/StagLab](http://www.fabiocrameri.ch/StagLab)



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## 1 Creators

Author: [Fabio Crameri](#)

Contributors: [Boris Kaus](#) – Original version of *f\_readStagYY* to read StagYY's binary output directly into MatLab

[Paul Tackley](#) – Original version of *f\_YYtoMap* to produce horizontal maps of fully spherical yinyang data

[Oliver Woodford](#) – The routine *export\_fig* to add more flexibility to figure saving

[Kirill K. Pankratov](#) – The routines *flowfun* and *cumsimp* to derive the stream function and to perform the Simpson-rule column-wise cumulative summation, respectively

[Fanny Garel](#) – Original version of *f\_readFluidity* to read Fluidity's CSV output into MatLab

[Kiran Chotalia](#) – Original version of *f\_readStagYYhdf5* to read StagYY's HDF5 output into MatLab

[Nima Moshtagh](#) – The routine *MinVolEllipse* to fit a minimum-volume ellipse around a point cloud

[Neil Tandon](#) – Original version of *hatchfill2* to fill areas with a specific texture

[Kelly Kearney](#) – Original version of *plotboxpos* to return the position of the plot more accurately and reliably

[Peter Kovesi](#) – A few routines including *equalisecolourmap.m* and *sin-eramp2.m* to provide the colour-map diagnostics

[Tobias Rolf](#) – Help with with StagLab's surface variation histogram plot

[Robert Petersen](#) – Help with StagLab's diagnostics of the radius of curvature for the plate bending

[Marcel Thielmann](#) – Help with StagLab's compatibility across different MatLab versions

[Anna Gülcher](#) – Help with StagLab's compatibility for StagYY's HDF5 output

Debugging: [Kiran Chotalia](#); [Antoniette Greta Grima](#); [Enrico Marzotto](#); [Rob Spaargaren](#)

## 2 Acknowledgement

! → Please acknowledge the free use of StagLab, its individual routines, or the included automated diagnostics.

*e.g., "The software StagLab (Cramerì 2017) is used in this study to post-process and visualise the geodynamic models (Cramerì 2018)."*

The software : **Cramerì, F. (2017), StagLab, Zenodo, [doi:10.5281/zenodo.1199037](https://doi.org/10.5281/zenodo.1199037)**

The research : **Cramerì, F. (2018), Geodynamic diagnostics, scientific visualisation and StagLab 3.0, Geosci. Model Dev., 11, 2541-2562, [doi:10.5194/gmd-11-2541-2018](https://doi.org/10.5194/gmd-11-2541-2018)**

## 3 Instructions

### 3.1 Prerequisites

StagLab necessitates a working version of **MatLab 2014b or later**.

StagLab works best with the latest version of MatLab as earlier versions might disable multiple StagLab features and might cause problems as compatibility is not carefully maintained any longer.

### 3.2 Installing

To install StagLab, simply execute the included `f_INSTALL`. This can be done in the MatLab terminal by typing:

```
cd <yourPath>/StagLab3
f_INSTALL
```

Alternatively, add all StagLab files manually to the MatLab search path (in MatLab go to: HOME > Set Path > Add With Subfolders).

! → It is best practise to delete old StagLab versions.

StagLab removes, however, file duplicates from the MatLab search path and so prevents confusion with old files.

### 3.3 Testing

To test StagLab on your system, simply execute the included `f_TEST`. This can be done in the MatLab terminal by typing:

```
cd <yourPath>/StagLab3
f_TEST
```

This automated test performs various core tasks of StagLab and produces a suite of test figures that are saved to `StagLab > Examples > ExampleFigures`.

### 3.4 Running

StagLab is run from parfiles (see folder `/Parfiles`). Use one of the parfiles included (e.g., `ParStagLab2D`) to set your parameters and to run one of the main StagLab Apps (`SL_FieldPlot` for parameter fields, `SL_RadialProfile` for radial profiles, `SL_TimeGraph` for time evolutions). See `f_Defaults`, `f_DefaultsRprof`, or `f_DefaultsTimedat` for all available options available with the corresponding parfile.

	Parameter fields	Radial profiles	Time graphs
Execution	ParStagLab2D ParStagLab3D ParStagLabYY	ParStagLabRprof	ParStagLabTimedat
Defaults	f_Defaults	f_DefaultsRprof	f_DefaultsTimedat
Routine	SL_FieldPlot	SL_RadialProfile	SL_TimeGraph

- \* *Tip:* The parfile can be run from any directory.
- \* *Tip:* You will always be able to re-use your old parfiles to run newer versions of StagLab.

Adjust file name, number and directory with:

```
IN.Name      =  {'test'};
IN.Number    =  [1];
IN.Folder    =  {'/work/stagyy/'};
```

- \* *Tip:* Given the above `IN.Folder`, StagLab checks automatically also for the following folder-structures to read:

```
/<YourFolder>/+op/<fileToRead>
/<YourFolder>/+op/<filename>/<fileToRead>
```

and write:

```
/<YourFolder>/+im/<fileToSave>
/<YourFolder>/+im/<filename>/<fileToSave>
```

- \* *Tip:* It is possible to plot or compare multiple files in the same figure by simply adding another file name.

`IN.Name` controls which and how many files are plotted. To plot three different files all for the first output number:

```
IN.Name      =  { 'test1' 'test2' 'test3'};
IN.Number    =  [ 1 ];
IN.Folder    =  {'/folder1/' '/folder2/' '/folder3/'};
```

To plot multiple time steps of one single model:

```
IN.Name      =  { 'test1' 'test1' 'test1'};
IN.Number    =  [ 1 2 3 ];
IN.Folder    =  { '/folder_test1/'};
```

If there is just one entry for either `IN.Number` or `IN.Folder`, it will take the same entry for all files specified in `IN.Name`.

Adjust the dimensional parameters in the parfile for correct dimensionalisation according to *f\_Dimensions*.

```
IN.Parameter =  [ 11 ];
```

StagLab saves the publication-ready figures and movies, if:

```
SAVE.Figure  =  logical(1);
SAVE.Movie   =  logical(1);
```

To specify a certain write directory change the default:

```
SAVE.writeDirectory =  'auto';
```

to e.g.:

```
SAVE.writeDirectory =  '/work/stagyy/';
```

### 3.4.1 Preparing Fluidity output

To make readable by StagLab, the original Fluidity output needs to be converted to a `.csv` file using e.g., Paraview. Adjust StagLab's *f\_readFluidity* to the specific details of the `.csv` file.

### 3.5 Making use of StagLab diagnostics

To make use of StagLab's extensive, automated geodynamic diagnostics, make sure to switch on `SWITCH.PlateDiagnostics` and/or `SWITCH.MantleDiagnostics`. StagLab offers multiple ways to easily access the resulting model diagnostics, which are performed on the fly during its execution.

MatLab terminal : The live terminal output offers a quick overview over the multiple numeric and geophysical characteristics of the current model snapshot(s).

StagLab output data files : StagLab optionally offers externally stored data files (optionally in various data file formats) that contain relevant geodynamic diagnostics. Using `SAVE.GeodynamicsDiagnostics`, data files are saved for each processed time step that allow, once created, to be replotted within StagLab using the `PLOT.CustomGraph`. The Custom Graph option allows to plot graphs of all StagLab diagnostics (e.g., trench position over time) in conjunction with all other field plots.

**\* Tip:** To save StagLab diagnostics over multiple model time snapshots, use `SWITCH.QuickMode` to more efficiently create all data files.

### 3.6 Troubleshooting tips

Error with writing cache : If an error occurs with writing the StagLab cache, it is likely due to two or more open MatLab sessions running multiple StagLab jobs that try to access the cache simultaneously. – Close both MatLab sessions and restart one, then try running only one StagLab job at once.

Plots exceed figure borders : If the plots (or subplots) run over the figure borders and/or overlap each other add and adjust the default values for the plotting settings in `f_Defaults.m`, section `%% SUBPLOT LAYOUT`.

Figure is too small or big : If the figure size is not optimal, adjust the default values in `f_SetupFigure.m`.

Bug reporting : If you encounter a bug, use `SWITCH.sendErrorLog = logical(1);` in the parfile, and run it once again, to send an automated bug report to the developer.

### 3.7 Acknowledging StagLab

! → Please acknowledge the free use of StagLab, its individual routines, or the included automated diagnostics.

Use, for example: "*The software StagLab (Crameri 2017) is used in this study to post-process and visualise the geodynamic models (Crameri 2018).*"

Crameri, F. (2017), StagLab, Zenodo, [doi:10.5281/zenodo.1199037](https://doi.org/10.5281/zenodo.1199037)

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### 3.8 More detailed information

See [Crameri \(2018, GMD\)](#).



## 4 Version history

- StagLab 6 :
- Introducing [StagLab-OpenSky](#) for developers
  - Deeper integration of StagYY's HDF5 output
  - Extended compatibility with StagYY's latest rprof.dat output
  - Compatibility testing measures for ASPECT's HDF5 output
  - Added Scientific categorical colour maps
  - Improved colouring for graph plots
  - Fix for usage with other system time formats
  - Fix for updated StagLab repository
  - Fix for rprof.dat output of latest StagYY version
  - Minor improvements for SL\_RadialProfile and SL\_TimeGraph
  - Bug fixes
- StagLab 5 :
- Introducing continent diagnostics
  - Introducing LLSVP diagnostics
  - Introducing slab-tip diagnostics
  - Introducing horizontal mantle flow diagnostics
  - Introducing panel
  - Introducing transparent figure background
  - Introducing automated error logging
  - Introducing categorical Scientific colour maps
  - Introducing journal-specific plot design
  - Introducing user guide
  - Additional StagLab-data output
  - Improvements and extensions to YinYang mode
  - Additional parameter field additions
  - Option to make difference plot with vector data
  - Less interruptive updating of old parfiles
  - Improved Windows compatibility
  - Special character fix for Windows
  - Improved code design
  - Stability and speed improvements for loop mode
  - Bug fixes
- StagLab 4 :
- Re-introducing multi-subduction-zone tracking
  - Introducing plume-mobility diagnostics
  - Improved Windows compatibility
  - Improved compatibility with latest StagYY version
  - Improved handling of 3-D spherical models

- Additional parameter fields
- Extended suite of Scientific colour maps
- Analysis mode for SL\_RadialProfile and SL\_TimeGraph
- Flexibility extensions to SL\_RadialProfile and SL\_TimeGraph
- Automatic fixing of corrupt time.dat files
- Stability improvements
- Bug fixes

- StagLab 3 :
- Introducing automated installation and testing
  - Introducing 2-D mode for 3-D
  - Introducing analysis mode
  - Introducing tracer plot
  - Introducing surface-variation histogram plot
  - Introducing topography diagnostics
  - Introducing perceptually-uniform colour schemes
  - Option to discretise colour maps
  - Option to set default figure position on screen
  - Option to shift or flip data horizontally
  - Support for partial cylindrical geometry
  - Magnifier support for cylindrical geometry
  - Additional parameter fields
  - Additional plate diagnostics
  - Major improvements to SL\_RadialProfile and SL\_TimeGraph
  - Compatibility with Fluidity output
  - Refined visual design
  - Improved file finder
  - Improved code design
  - Improved speed
  - Bug fixes

- StagLab 2 :
- Introducing mantle-dynamics diagnostics
  - Introducing tectonic diagnostics
  - Introducing topography components (isostatic,residual)
  - Introducing plot for up- and downwelling
  - Introducing parameter table
  - Introducing plot-in-plot mode
  - Introducing movies
  - Introducing fAlo
  - More parameter fields added

- Automatic detection of side-boundary v-condition
- Less-disruptive error handling
- Cleaner plot design and layout
- Improved colormaps
- Improved filefinder
- Improved display output
- Improved stability of design-routines
- Improved saving and plotting of tectonic data
- Convertibility improvements with other geodynamic codes
- Bug fixes

- StagLab 1 :
- Combining Apps to StagLab
  - Support of all available StagYY model geometries
  - Support of all available StagYY output
  - YinYang horizontal maps
  - Hot and cold plume tracking
  - Beta version of 3-D Cartesian plate-boundary tracking
  - Code speed optimisations: deriving lithosphere thickness
  - Horizontal residual temperature plot
  - Heat flux plot
  - Plot for temporal evolution of tectonic parameters
  - Option added to save figure to specific directory
  - Improved code design
  - Improved user friendliness
  - Bug fixed that led to empty plate sketch plot
  - Bug fixes and updates to the dimensionalisation

## 5 Reference

Crameri, F. (2018), Geodynamic diagnostics, scientific visualisation and StagLab 3.0, *Geosci. Model Dev.*, 11, 2541-2562, [doi:10.5194/gmd-11-2541-2018](https://doi.org/10.5194/gmd-11-2541-2018)

## 6 Contributing

Please forward contributions, bug reports, requests, and general questions to [Fabio Crameri](#).

## 7 License

**StagLab, its individual subroutines and the included Scientific colour maps are licensed under a [MIT License](#)**

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