

Reading output files with Matlab (examples)

Three different matlab functions can read sunfluidh output files. [download the files](#). Make sure the directory where you have untar these files is listed in the matlabpath¹.

1. **read_sunfluidh_data** reads res* or rst* files
2. **read_sunfluidh_probes** reads all probes files *_ins_*
3. **read-sunfluidh-namelist** reads check_namelist_data.dat

As for any matlab function, the documentation is built in. In the command window just type : **help** read_sunfluidh_data or **doc** read_sunfluidh_data.



Here, we assume you have already run the case [2D laminar channel flow with a constriction](#). Make sure the current directory for matlab is also the directory where you have the output files.

Instantaneous (or statistical) fields

Visualisation of U velocity component.

```
f = read_sunfluidh_data(7) % read res_00000_0000007.d. If you omit (7), the
function tries to read the lastest generated file.
pcolor(f.xu,f.yc,f.U') % Note the transpose ' for f.U
axis image
shading interp
```

Add a colorbar, labels and increase the font size.

```
colorbar
xlabel('x'); ylabel('y'), set(gca,'FontSize',16)
```

Add on the same figure the contour for the isovalue 0 for the U component. The isocontour is red with a thick line.

```
hold on
contour(f.xu,f.yc,f.U',[0 0],'r','linewidth',2)
hold off
```

Extract the profiles from the instantaneous field. For instance, the U profile as a function of x for the grid nodes 48 in the y direction.

```
plot(f.xu,f.U(:,48))
```

Add another profile for grid nodes 19, labels.

```
hold on
```

```
plot(f.xu,f.U(:,19))
hold off
xlabel('x'); ylabel('U(x)'), set(gca,'FontSize',18)
grid on
```

Add a legend retrieving the coordinates of the 19 and 48 grid nodes from f.yc.

```
legend(['y = ',num2str(f.yc(48))],['y = ',num2str(f.yc(19))] )
```

Plotting the profiles along the y direction is very similar. Here, the ghost cells are removed.

```
xind = 152; % pick an indice
plot(f.U(xind,2:end-1),f.yc(2:end-1))
xlabel('U(y)'),ylabel('y')
```

Retrieve from the namelists stored in check_namelist_data.dat the dynamic viscosity and the mesh size to make a title

```
nml = read_sunfluidh_namelist
nx = nml.DOMAIN_FEATURES.CELLS_NUMBER_I_DIRECTION;
ny = nml.DOMAIN_FEATURES.CELLS_NUMBER_J_DIRECTION;
Rey = 1/nml.FLUID_PROPERTIES.REFERENCE_DYNAMIC_VISCOSITY;
mystring = [' Profile at x= ',num2str(f.xu(xind)), ' Re = ',num2str(Rey),
...
           ', grid size = ' num2str(nx),'x', num2str(ny) ];
title(mystring)
```



For statistical fields you can use `read_sunfluidh_data`. You just need to add the 'stat' option (see **doc** `read_sunfluidh_data`). For statistical fields all data are centered on scalar grid points. It is also possible to center the instantaneous fields with the option 'center'. This can be handy in a post processing when computing quantities with different velocity field components

Temporal series

The `*ins*` files or more generally temporal series are ascii files in which the first column is time and the first line is a header. There is no special needs to have a script for these files. You can use directly builtin matlab functions that you can tailor to your needs.

Reading the file `resid_L2_Li.d` with builtin matlab function

```
s = importdata('resid_L2_Li.d');
time = s.data(:,1);
L2 = s.data(:,2);
Linf = s.data(:,3);
semilogy(time,L2)
grid on
```

```
xlabel('t','FontSize',16); ylabel('L2 norm','FontSize',16)
set(gca,'FontSize',16)
```

Plotting the U velocity component for the second probe with builtin matlab function

```
s = importdata('u_ins_00000.d',' ',1)
time = s.data(:,1);
u2 = s.data(:,3);
plot(time,u2)
grid on
xlabel('t'); ylabel('u probe2')
```

You can use **read_sunfluidh_probes.m** that attempts to read in the current directory all the **ins** files and build a structure with the variable names. It intends to make life a bit easier but it is however quite fragile and may fail.

Exemple:

```
s = read_sunfluidh_probes;
plot(s.time,s.u(:,2)) % to plot u velocity component for probe number 2
```

1)

For Unix system you can add the following command in *~/.bashrc* : *export MATLABPATH='directory_where_the_files_are_stored'*

From:

<https://sunfluidh.lisn.upsaclay.fr/> - **Documentation du code de simulation numérique SUNFLUIDH**

Permanent link:

https://sunfluidh.lisn.upsaclay.fr/doku.php?id=sunfluidh:sunfluidh_matlab

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