

Code Reference Summary

There are two main folders accompanying the paper.

"long"

It has all the data generated during the simulation presented in the paper "*Unsettling the settled: Simple musings on the complex climatic system*". It is available for download at <https://www.itia.ntua.gr/2537/>.

"short"

It contains three subfolders as follows:

"essential"

It contains essential files (density and temperature profiles, with which the profiles shown in the paper can be reproduced. The data about velocities, used for the construction of the velocity distributions, are just 15% of the data used in the paper.

"new"

This is a "fresh" folder that contains only the initial state of the system and the configuration parameters. It can be used to recreate the whole simulation and even extend it.

"source code"

It contains the C++ and Python source code of the simulation.

Running the simulation

Open a Windows Terminal.

Move to the folder where the file gravity.exe is.

Run: `.\gravity folder_name`

Replace `folder_name` with the actual folder where the configuration files are (`config.json`, `particles_config.json`, `particles_init.json`). If you want to recreate the whole simulation, select the folder `new`.

Continuing a stopped simulation

If, for any reason, the simulation has stopped, you can continue from the state it had just before stopping.

Open the file `config.json`

Change mode: "init" to mode: "continue"

Save the file `config.json`

Run: `.\gravity folder_name`

Analyzing Data

Open a python terminal and run the file `gravity3d.py`

Run the command

```
a = Analyzer(solution_folder="folder_name")
```

Replace "folder_name" with the relative or absolute path to the actual data output folder. Typically, this would be the folder "short". If you have downloaded the full data, replace it with "long"

Creating the full density profile

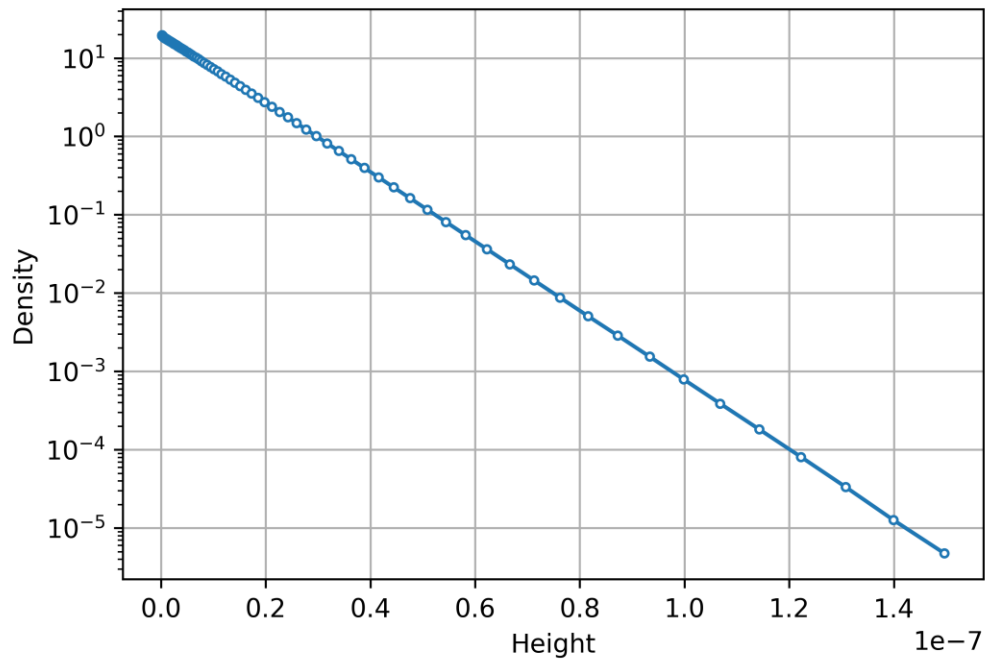
Run

```
a.plot_density_profile(base_index=0, end=100)
```

This will plot the profile of density. Bins are populated logarithmically, in order to have a significant amount of data in each bin. They are plotted linearly.

Density is shown on a logarithmic axis.

The barometric profile is reproduced.

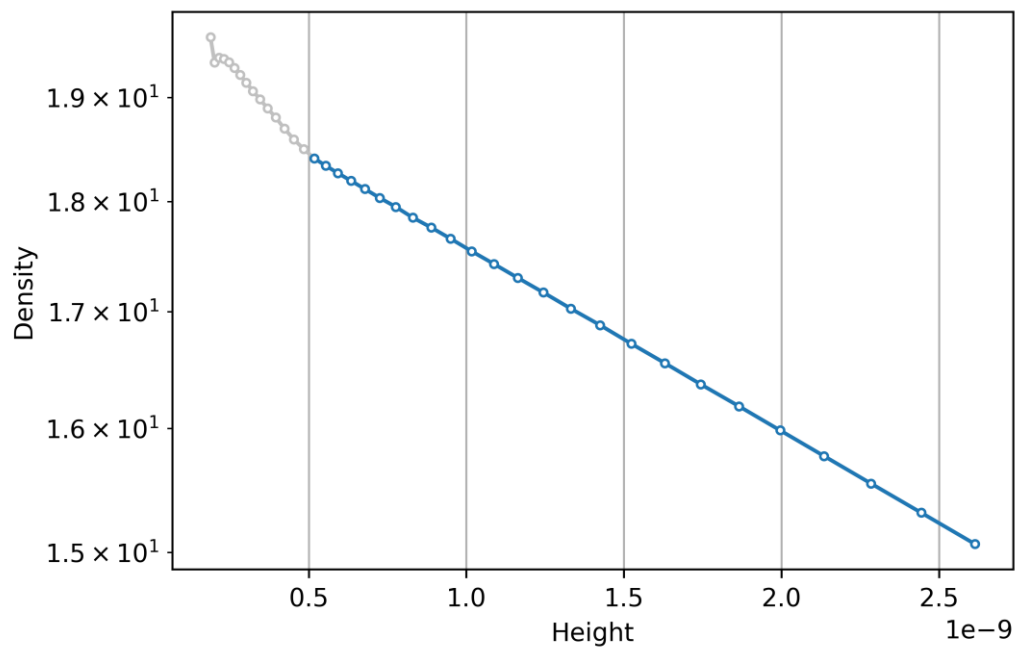


Identifying boundary effects

In order to focus on the left part of the profile, near the bottom specular boundary, run:

```
a.plot_density_profile(base_index=15, end=40)
```

This will produce the following diagram:

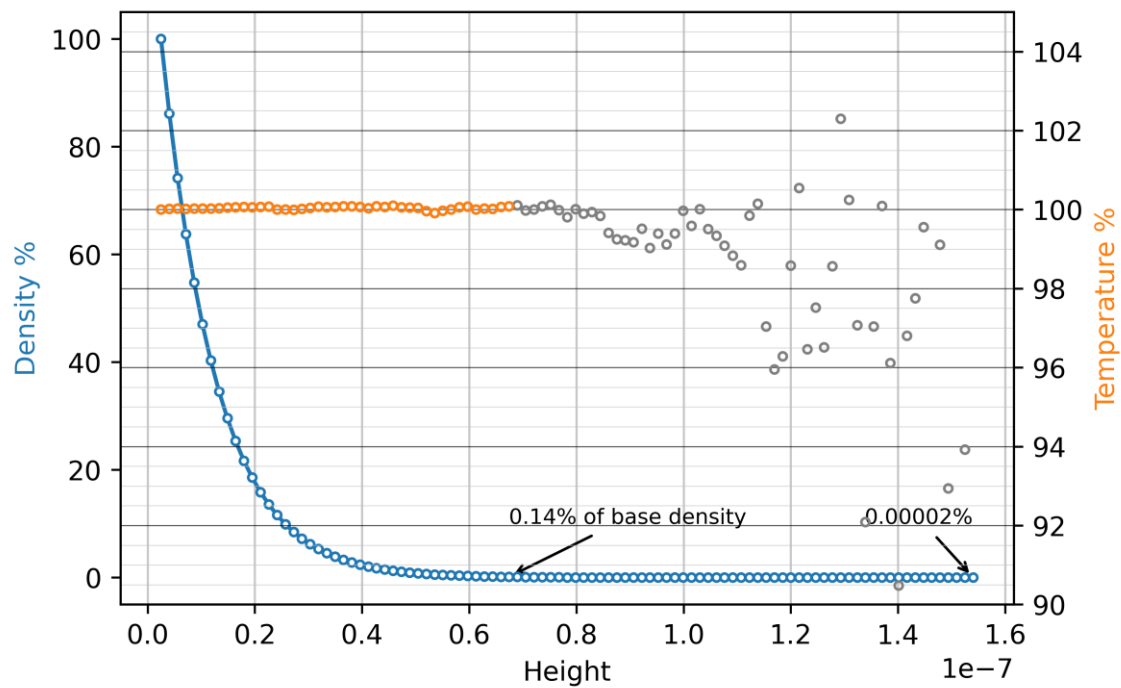


This is a zoomed in view of the profile. Boundary effects end at about the 15th bin.

Creating relative linear profiles

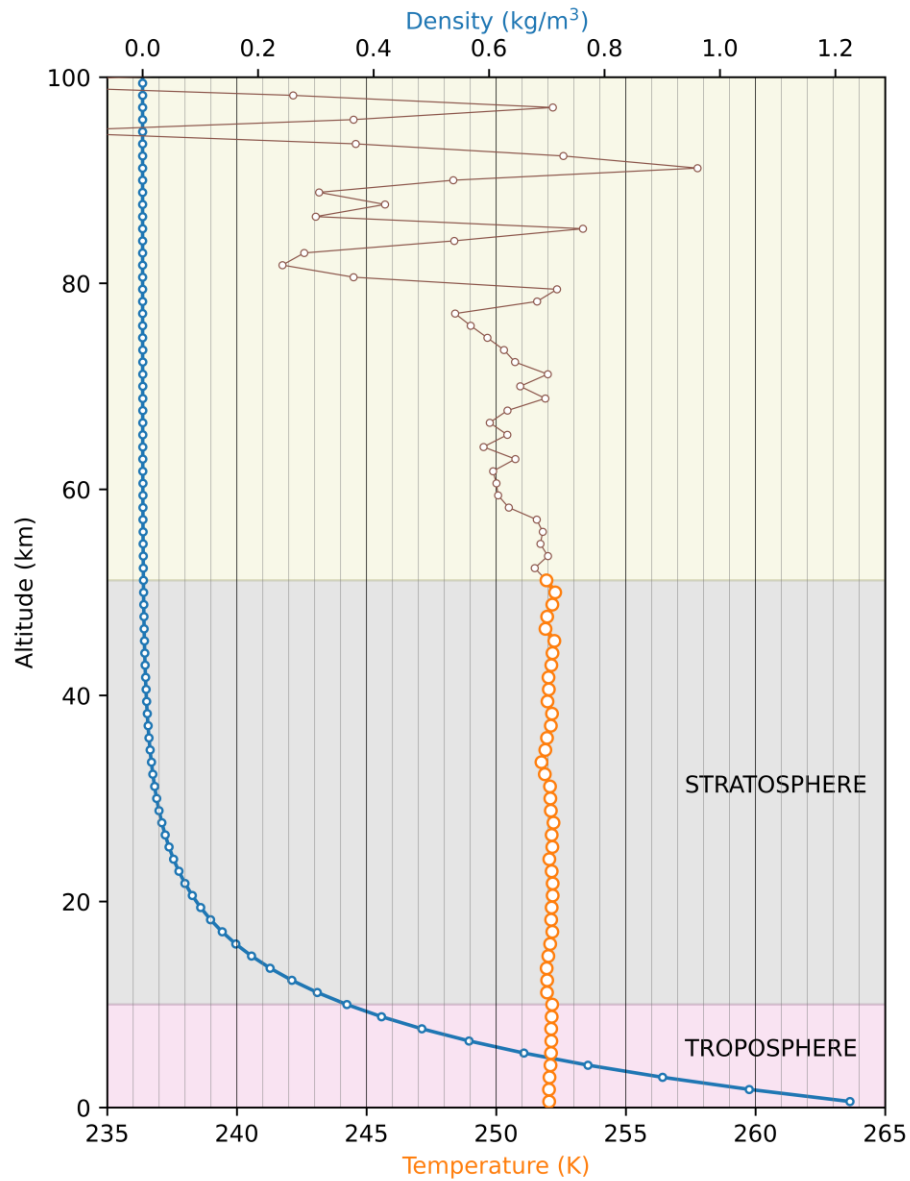
Run: `a.plot_relative_linear_profiles()`

This creates the following plot, explained in the paper.



Plotting simulated atmospheric profile

Run: `a.plot_earth()`



The plot is explained in the paper.

Analyzing velocity

Run:

```
s = SingleVelocityAnalyzer()
```

```
s.plot_x()
```

```
s.plot_z()
```

The velocity distributions per direction x and z will be plotted.

