Mission 1

Objectives

Understand the given data (basically plotting), and obtain Φ_{res} field from ω_{c_T} and $|\nabla c_T|$ fields. The most basic example code is given and mission is yours.

You will learn

- Get familiar with Google Colab - make sure everyone can use it (Teach each other)

- Plotting of simulation data

- Some post-processing of data (thresholding)

Data explanation

- "wtemp-slice-B1-0000080000" is Q/c_p, where Q is a heat release rate and c_p is a specific heat capacity at constant pressure.

- "nablatemp-slice-B1-0000080000" is $|\nabla T|$, where T is a temperature.

"slice" means $x-y$ plane at $z = 5$ mm, "B1" means case B1, "0000080000" means timestep$= 80000$ (basically a single timestep data of a simulation). $x \approx 0$ region might have crazy values due to boundary condition effect, you will see the effect when you plot.

Tasks

1. Start Google colab environment. (Open the given codes in google colab and upload the data into the google colab by your own research)

2. Make ω_{c_T} field, $\omega_{c_T} = Q/c_p/(T_b - T_u)$, where $T_u = 1500.00$ K and $T_b = 1623.47$ K

3. Make $|\nabla c_T|$ field, $|\nabla c_T| = |\nabla T|/(T_b - T_u)$

4. Plot the both ω_{c_T} and $|\nabla c_T|$ fields to check if they look good.

5. Make $\omega_{c_T}^*$ and $|\nabla c_T|^*$, where superscript "*" means $x^* = x/max(x)$ (so value of x becomes between 0 and 1). Maximum of each fields are (for case B1): $max(\omega_{c_T}) = 1996.8891$ and $max(|\nabla c_T|) = 3931.0113$. I will give you the unit of the fields later :)

6. Check $\omega_{c_T}^*$ and $|\nabla c_T|^*$ fields are between 0 to 1.

7. Use Equation 1 in the paper "Data driven analysis and ..." to obtain Φ_{res}, and plot it to compare with Fig.7.

If finished

1. Make the figure beautiful (important in later stage)

2. Try to write a Gaussian filter code for $\overline{\omega}_{c_T}$ for given filter size (as a parameter), and visualize it to see if it is working and have fun with it.

3. Report any mistake found in this document (just a list of corrections - for improvement)