Pymagicc: A Python wrapper for the simple climate model MAGICC

S M Arifuzzaman

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1 Introduction

Pymagicc[1] is a Python wrapper around the reduced complexity climate model MAGICC6[2]. Pymagicc runs on Windows, macOS and Linux and simplifies usage of the model by utilising DataFrames from the Pandas library (McKinney 2010) as a data structure for emissions scenarios. To read and write the text-based MAGICC configuration and output files in the Fortran Namelist format Pymagicc utilizes the f90nml library (Ward 2017). All MAGICC model parameters and emissions scenarios can thus easily be modified through Pymagicc from Python. MAGICC (Model for the Assessment of Greenhouse Gas Induced Climate Change) is widely used in the assessment of future emissions pathways in climate policy analyses, e.g. in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2014). Many Integrated Assessment Models (IAMs) utilize MAGICC to model the physical aspects of climate change. It has also been used to emulate complex atmosphereocean general circulation models (AOGCM) from the Coupled Model Intercomparison Projects.

In this project, I use one of preloaded RCP (Representative Concentration Pathway) scenario to create 1 plot, and another plot was created using all four (4) scenarios RCP.

[1] https://github.com/openscm/pymagicc
[2] http://magicc.org/

2 Methods

2.1 Dataset

The dataset used for this demonstration is the demo data provided by MAGICC under RCPs scenarios. The RCPs describe 4 different scenarios based on different assumptions about population, economic growth, energy consumption and sources and land use over this century. These scenarios are preloaded in Pymagicc, each RCP scenario describe alternative trajectories for carbon dioxide emissions and the resulting atmospheric concentration from 2000 to 2100.

3 Pymagicc for RCPs data visualization

3.1 Global Mean Temperature Projection

I have created a python script named Plot1_GlobalMeanTemperatureProjection.py to visualize the Mean temperature projection from the year of 1850 to 2100. After running this script it draws a plot.

3.2 Visualization with RCP26 data

This visualization is created with the data of RCP26 scenario. To make plot I have created another python script named Plot2_RCP26.py. After running this script, it draws the plot.

4 Results

The first figure successfully generated. It can be seen that on figure 1, along with the plot some data with legends. Also from the plot, it can be observed that global temperature increasing rapidly after the year 2000.

The second figure successfully generated. It can be seen that on figure 2, along with the plot some data with the legends of all carbon emissions elements. Also from the plot, it can be observed that the emissions period from year of 2000 to year of 2500.

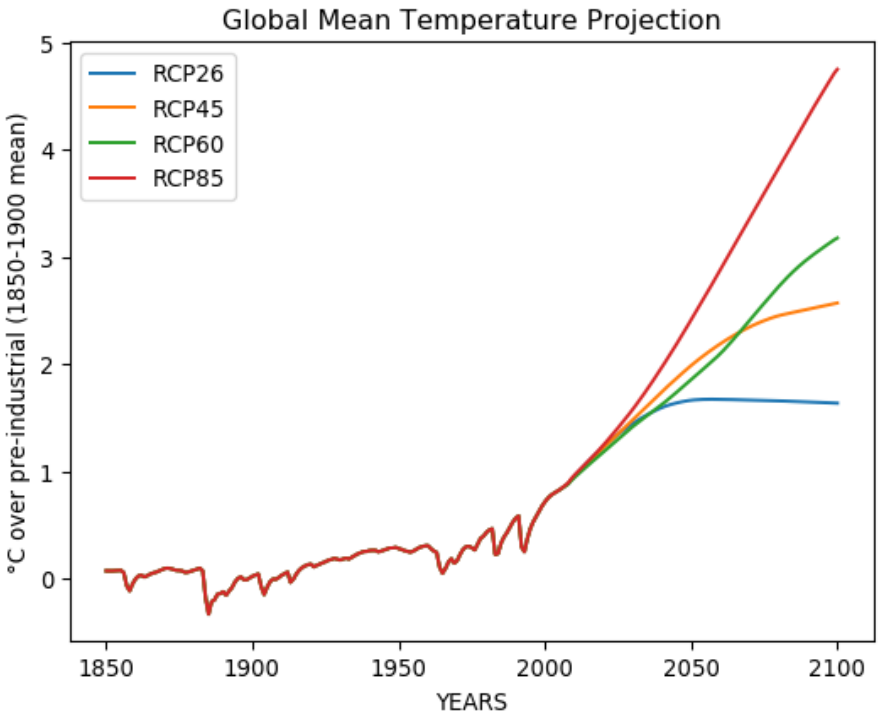

Figure 1: Global Mean Temperature Projection

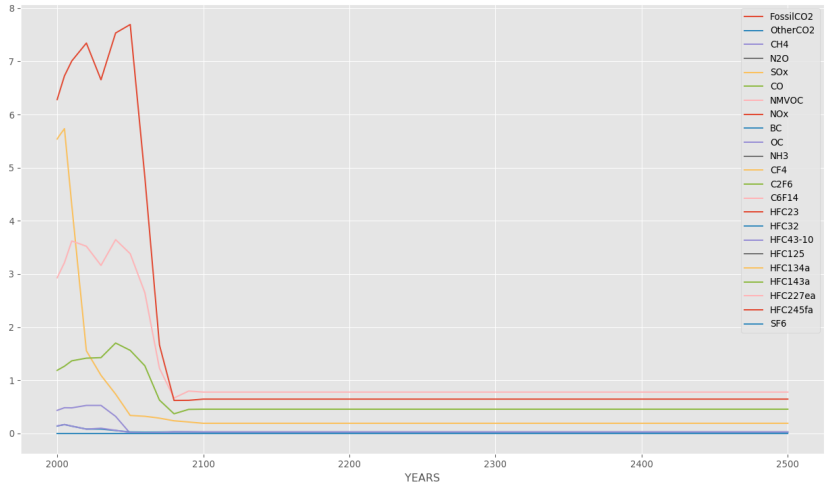

Figure 2: Plot with scenarios RCP26

5 Conclusions

After completion this project, I can conclude that I have tried to learn that how to utilize third party python library or framework such as Pymagicc to develop python software and how to generate useful plots using that framework.