CMSC 6950 Final Project - pymagicc

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1 Introduction

Pymagicc[1] is an open source python wrapper for the Fortran-based MAGICC climate model. It makes it simpler to use and run the MAGICC model Windows application. Pymagicc comes with several built-in data structures to model the several emission pathways. MAGICCData, is the core data structure that is used to model the Representative Concentration Pathways (RCP) and comes with Pandas DataFrame like functionality and also has the ability to make lineplots.

MAGICC which stands for Model for the Assessment of Greenhouse Gas Induced Climate Change is a climate model widely used for the assessment of future Greenhouse gas emissions in climate policy analyses. It is most prominently used by the Intergovernmental Panel on Climate Change (IPCC) for key scientfic publications and by a number of Integrated Assessment Models.

2 Tasks

This project utilises the Pymagicc module to achieve the below computational tasks and visualizations.

2.1 Task 1- Generate Greenhouse Gas Emissions

In this task, we read data from RCP2.6, RCP4.5, RCP6, RCP,8.5 scenario files, convert the data in MAGICData format to a pandas DataFrame, and then build visualizations to show Carbon Dioxide and Methane gas emission projections for RCP2.6 and RCP4.5 scenarios.

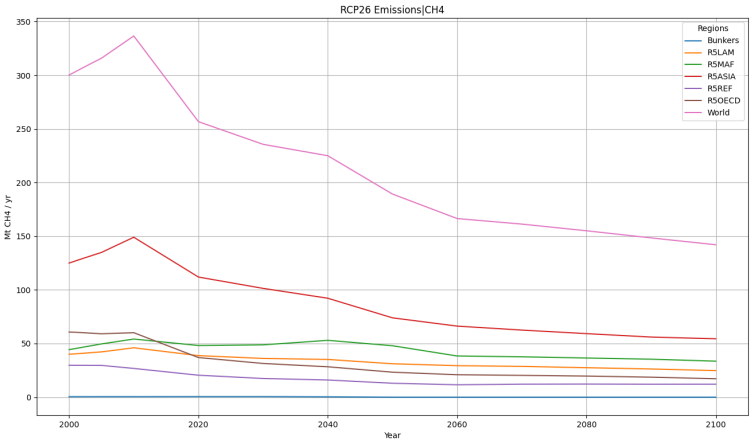

Figure 1: RCP26 CH4 Emissions Projections

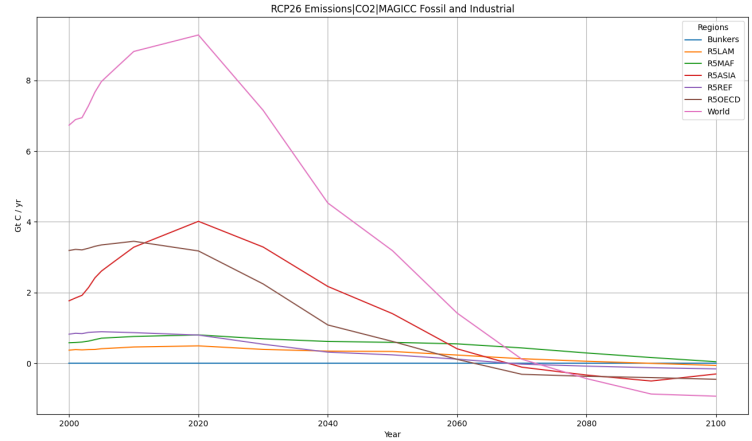

Figure 2: RCP26 CO2 Emissions Projections

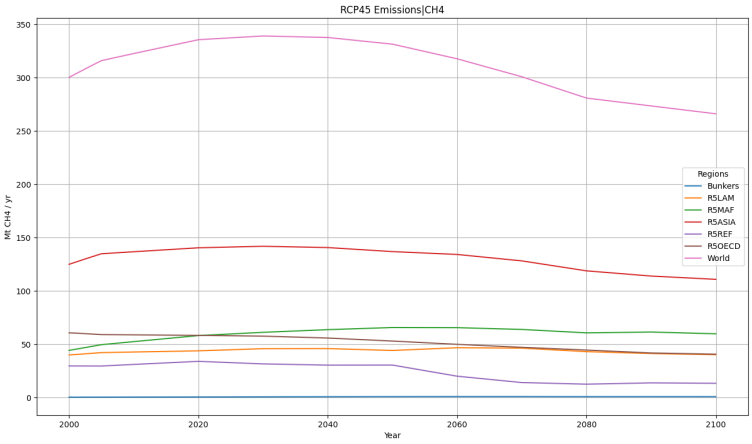

Figure 3: RCP45 CH4 Emissions Projections

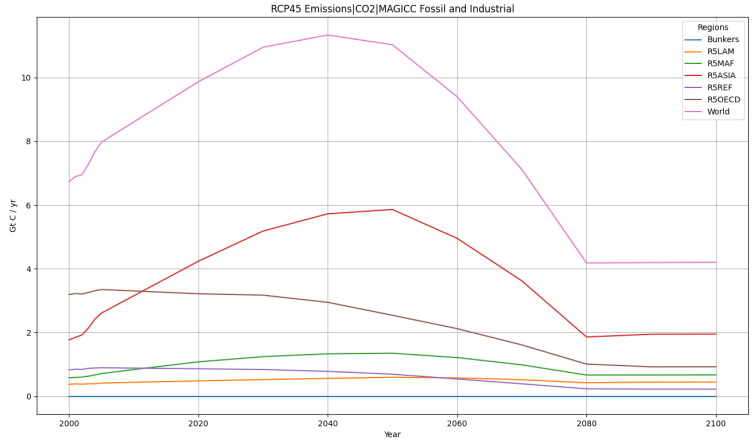

Figure 4: RCP45 CO2 Emissions Projections

2.2 Task 2- Generate plots on the MAGICC model data

In this task, we run the MAGICC model on RCP2.6, RCP4.5, RCP6, RCP,8.5 scenarios and visualize the Radiative Forcing projections for each of the given projections from 1765 to 2100.

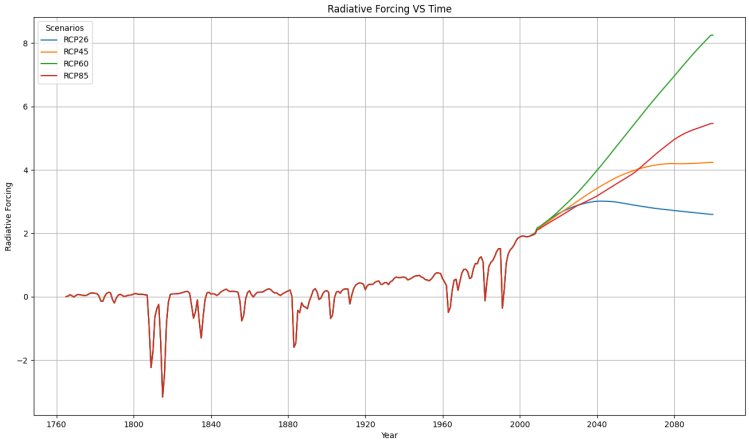

Figure 5: Radiative Forcing Projections

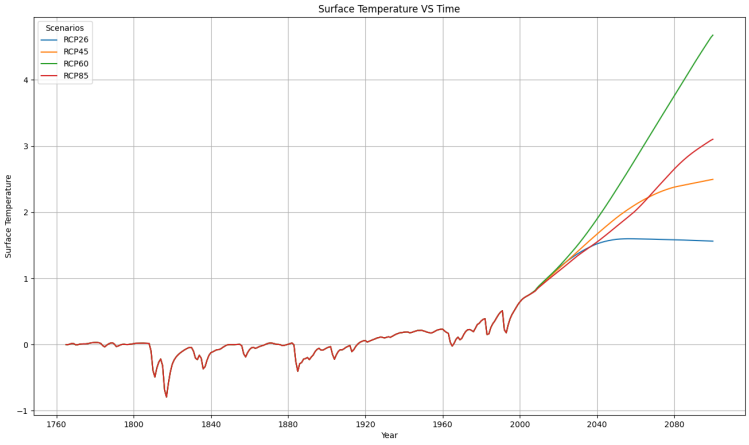

Figure 6: Surface Temperature Projections

References

[1] Robert Gieseke, Sven N. Willner, and Matthias Mengel. Pymagicc: A python wrapper for the simple climate model magicc. *Journal of Open Source Software*, 3(22):516, 2018.