

GISC405-22S1(C) (21 February to 03 June 2022)

GIS Programming and Databases

“Advanced Earth and Environmental Analytics”



Assignment 2

Due: Monday, 4th of April 2022, 10:00pm

For this assignment you will hand in your Jupyter Notebook into the Learn assignment Dropbox and rename it with your user code: **abc123_Ass02.ipynb**. Use commenting within your notebook to explain the objective of the scripts you write and rely on markdown to structure your notebook and include figure captions. This Assignment 2 will be **marked 25%**.

This assignment presents an opportunity to further develop on the last three Jupyter notebooks we discussed in the class. More specifically, you will demonstrate the ability to turn data into knowledge and construct climatological statistics for New Zealand. You are now a [NIWA \(https://niwa.co.nz\)](https://niwa.co.nz) employee and have the specific task to evaluate NIWA's climatological report outputs with similar analysis from MetService numerical model output. NIWA has produced national and regional climatological reports that you can find from <https://niwa.co.nz/our-science/climate/publications/regional-climatologies>. Navigate to the New Zealand wide and Canterbury region climatological reports and locate the links to the pdf files. Make yourself familiar with its content, especially the figures and tables with particular attention to the statistics used to derive the parameters that are displayed in the figures and tables. **Demonstrating the use of data chunking for optimizing the code is necessary whenever possible in your notebook. Do not forget to use geographic projections.**

Tasks

1. **Monthly and annual mean wind speeds.** Look at Table 1 from the Canterbury region report and reproduce the equivalent outputs but from the WRF data you have access to. Use the entire 20-year temporal period. Be creative in how you present the table within the notebook environment.
2. **Violin plots.** Explore how to produce violin distribution plots from <https://matplotlib.org/stable/gallery/statistics/violinplot.html> using the matplotlib library. Construct one violin plot for each of the town/city centres of table 1. The violin plot will use the hourly data outputs and not the monthly/annual means.
3. **Median annual average temperature.** Look at Figure 12 of the Canterbury region climate report and Figure 13 of the New Zealand wide climate report. Reproduce the median annual average temperature for both the New Zealand national scale and the Canterbury regional scale. Make sure you use appropriate figure sizes and choose a color scale and range that is as close as possible to the one shown in NIWA reports. You don't have to use a topographic data/map underlay, but try to crop for the terrestrial region of the data.
4. Repeat (3) but for **median annual total rainfall**. Please note that annual total rainfall is the sum of the hourly rainfall in millimetres.

For further information please contact the course coordinator/lecturer:

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