**Research Methods for Climate Science (2021)**

**Assignment 1**

**Task 1: Cluster Analysis (CA)**

The aim of this task is to study the characteristics of three CA algorithms. As discussed, use the provided climate dataset over African cities for the task. With “R” or “Python” or “Statistical” software, cluster the data matrix to explore the groping of ten Africa cities using a climate variable (precipitation, or temperature, etc). Show the sensitivity of the grouping to three cluster analysis algorithms (single linkage, average linkage, and Ward’s algorithm) and compare the results. Write a scientific report to summarise your findings. Give physical interpretations of your results.

**Task 2: Principal Component Analysis (PCA)**

The aim of this task is to study the characteristics of PCA and compare them with that of CA. As discussed, use the provided climate dataset over African cities for the task. With “R” or “Python” or “Statistical” software, perform PCA on the data matrix to explore the groping of ten Africa cities using a climate variable (precipitation, or temperature, etc). Identify the and retain the leading principal factors (PFs; i.e. processes). Test the sensitivity of your analysis to (i) rotated and (ii) non-rotated PCA methods. Write a scientific report (with appropriate diagrams) to discuss the temporal variation of the PFs over the study period. Give physical interpretations of your results. Compare the results with those obtained with Ward’s method in Task 1