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MATHEMATICS

**Time Series Analysis of Climatic Variations**  
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The aim of this project was to investigate the relationships between climatic variations in the South West Pacific region and other areas, particularly in the northern hemisphere. A significant preliminary issue is the incidence of tsunamis on the NSW and Queensland coasts during the Holocene. To analyse this, it is first necessary to accurately date tsunami events – this is usually done using Carbon-14 dating.

Accurately using  $C^{14}$  Dates is a difficult process, as there are a variety of sources of error that must be accounted for. This problem proved complex enough to warrant the majority of the time spent on the project.

The problem centred around two main issues: firstly, given a large number of observations of tsunami events, how can we determine which observations are of the same events, and secondly, how can we use this fact to try and make more accurate estimates of the calendar-date of the event in question. As calendar-dates must be estimated from  $C^{14}$  levels, calibration of estimated dates is necessary and non-trivial.

Various methods for treating this problem were investigated, using both standard and modified clustering algorithms on pre- and post- classification data. Advances were made on methods present in the literature by using more recent developments in classification analysis.

Numerical and Bayesian techniques were used for calibration, with considerable reading going into common models for approaching this problem.

Overall, this was a very interesting project, which I am glad that I was given the opportunity to undertake. I am grateful for the support of AMSI/ICE-EM and the University of Adelaide in allowing me to investigate this topic.