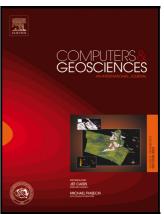
# Author's Accepted Manuscript

Detecting precursory patterns to enhance earthquake prediction in Chile

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### **ACCEPTED MANUSCRIPT**

#### Detecting precursory patterns to enhance earthquake prediction in Chile

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- Abstract The prediction of earthquakes is a task of utmost difficulty that has been widely addressed 17 by using many different strategies, with no particular good results thus far. Seismic time series of the four most active Chilean zones, the country with larger seismic activity, are analyzed in this study in order to discover precursory patterns for large earthquakes. First, raw data are transformed by removing 20 aftershocks and foreshocks, since the goal is to only predict main shocks. New attributes, based on the well-known b-value, are also generated. Later, these data are labeled, and consequently discretized, by the 22 application of a clustering algorithm, following the suggestions found in recent literature. Earthquakes 23 with magnitude larger than 4.4 are identified in the time series. Finally, the sequence of labels acting as 24 precursory patterns for such earthquakes are searched for within the datasets. Results verging on 70% on average are reported, leading to conclude that the methodology proposed is suitable to be applied in 26 other zones with similar seismicity.
- Key words: Seismic time series; earthquake prediction; pattern discovery; clustering.

## 29 1 Introduction

- 30 Chile stands out as the most seismic country in the world, as evidenced by the fact that in the last 450
- $_{\mbox{\scriptsize 31}}$   $\,$  years in the Chilean mainland a total of 38 earthquakes of a magnitude larger than 7.5  $\,M_s$  have taken
- place; 17 of them resulted in tsunamis [3].
- Moreover, the greatest magnitude earthquake occurred in history around the world and known as
- Earthquake of Valdivia (May 22, 1960) took place in Chile and reached a magnitude of 9.5  $M_s$ , producing
- a 10 meters high tsunami and reaching Hawaii [4].

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