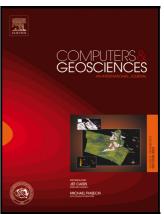# Author's Accepted Manuscript

Detecting precursory patterns to enhance earthquake prediction in Chile

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1   **Detecting precursory patterns to enhance earthquake prediction in Chile**

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17   **Abstract** The prediction of earthquakes is a task of utmost difficulty that has been widely addressed

18   by using many different strategies, with no particular good results thus far. Seismic time series of the

19   four most active Chilean zones, the country with larger seismic activity, are analyzed in this study in

20   order to discover precursory patterns for large earthquakes. First, raw data are transformed by removing

21   aftershocks and foreshocks, since the goal is to only predict main shocks. New attributes, based on the

22   well-known b-value, are also generated. Later, these data are labeled, and consequently discretized, by the

23   application of a clustering algorithm, following the suggestions found in recent literature. Earthquakes

24   with magnitude larger than 4.4 are identified in the time series. Finally, the sequence of labels acting as

25   precursory patterns for such earthquakes are searched for within the datasets. Results verging on 70%

26   on average are reported, leading to conclude that the methodology proposed is suitable to be applied in

27   other zones with similar seismicity.

28   **Key words:** Seismic time series; earthquake prediction; pattern discovery; clustering.

1   Introduction

30   Chile stands out as the most seismic country in the world, as evidenced by the fact that in the last 450

31   years in the Chilean mainland a total of 38 earthquakes of a magnitude larger than 7.5 M_s have taken

32   place; 17 of them resulted in tsunamis [3].

33   Moreover, the greatest magnitude earthquake occurred in history around the world and known as

34   *Earthquake of Valdivia* (May 22, 1960) took place in Chile and reached a magnitude of 9.5 M_s, producing

35   a 10 meters high tsunami and reaching Hawaii [4].

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