DETERMINATION OF CONCENTRATION OF EARTHQUAKES CLUSTERING

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ABSTRACT

Earthquakes arrive without previous warning and can destroy a whole city in a few seconds, causing numerous deaths and economical losses Nowadays, a great effort is being made to develop techniques that forecast these unpredictable natural disasters by using statistical methods

In most studies of earthquake spatial distribution prediction are used statistical estimation of the fractal spatial dimension Earthquake spatial distribution is very complex because of the depth inhomogeneity, the fractal character of spatial pattern, and various hypocenter location errors all make model parameterization difficult and create various biases in estimating parameters

However, these publications insufficiently consider the systematic effects which influenced estimation of the fractal or scaling dimensions of earthquakes Some of the above publications estimated several effects by using simulation catalogs; such simulations are insufficient for fully understanding various geometrical distributions

In this paper, Copulas methods are used for pattern recognition of earthquake distribution The study of copulas and their applications in statistics is a rather modern phenomenon

Copulas are of interest to statisticians for two main reasons: Firstly, as a way of studying scale-free measures of dependence; and secondly, as a starting point for statistical seismicity analysis with a view to simulation earthquake data catalogue

INTRODUCTION

Pattern recognition of Earthquakes distribution and aftershocks clustering is an important and complicated issue in seismology for investigation of the dynamics of earthquakes sources requires the use of advanced statistical methods

Pattern recognition technique has been shown to elegantly and powerfully realize solutions to problems in Seismology and earthquake prediction A few applications of advanced statistical methods to seismology have been carried out For example Alexander et al (1992), Leach et al (1993), Tsvang et al (1993), Taylor et al (1989), Allameh Zadeh and Nassery (1999) have applied artificial neural networks to the explosion seismology for discriminating natural earthquakes versus explosions

The goal of pattern recognition in seismology is to identify earthquake prone area using standard geological data Gelfand makes previous applications of pattern recognition to earthquake locations in 1972,