

## ON A POSSIBLE IMPORTANT GENESIS OF EARTHQUAKE SEQUENCE\*

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### Abstract

Based on the Asperity model and the Barrier model, another heterogeneous model—Obstacle model is proposed in this paper. The research of numerical modelling is taken for this model. The results show that on the fault plane where there are obstacles, the rupture expansion is related to the spreading speed of rupture, the area of initial rupture, crack types and the medium of the fault which contains obstacle. It also verifies that the rupture can cross or detour higher strength or/and bigger size obstacles, and then makes obstacle fracture again after a period of stress accumulation process under the condition of confining stress. Besides, it also proves the experiment results of imitated obstacle under uniaxial compression which we took before.

The possible genesis of the Haicheng and Xingtai earthquake sequences are explained, and some reasonable consequences are made through the research of the properties and effect on obstacle in earthquake source area.

### Proposition of Obstacle Model

In order to research the heterogeneous properties on the earthquake fault plane and inquire into earthquake genesis, seismologists proposed different source models, for example, Asperity model and Barrier model<sup>[1]</sup> which are noticeable in literature recently. Using these two model for reference, we inquire into a possible genesis of some types of earthquake sequences through researching heterogeneity of earth medium. It is important to judge the type of earthquake sequences for

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f. Recognizing tendencies of aftershocks.

2. Earthquake decision making functions

a. Providing optimal earthquake decision making before a main shock;

b. Providing optimal earthquake countermeasures just after a main shock under lacking prediction.

System constructions may be divided into two groups;

1. Earthquake recognition and prediction model group

a. Earthquake probability model set (EP);

b. Geological recognition model set for standard earthquake modes (GR);

c. Standard precursory model set for different areas and earthquake modes (SP);

d. Foreshock statistical model set for standard earthquake modes (FPM);

e. Earthquake recognition and prediction model set (ER);

f. Fore-main shock recognition and prediction model set (FM);

g. Aftershock recognition and prediction model set (AR);

2. Earthquake decision making model group

a. Optimal earthquake countermeasure set for standard earthquake modes (OE);

b. Optimal earthquake decision making model set (ED).

Historical earthquake data are clustered into several types according to the characteristics of geological conditions, seismicities, precursors of earthquakes, these data are called standard data of various earthquake modes and the earthquake modes are called standard earthquake modes in this paper. Comparing current earthquake data with "standard" earthquake data, the earthquake risks might be recognized.

The probability models, fuzzy mathematical models and mathematical models of grey system theory are applied to solve the undeterminacy and incompleteness of information of system. Selection of recognition items is refined from the earthquakes in Yunnan province.

The functions of model system might be more excellent than that of individual models or the sum of functions of every models.

## 论地震序列的一种可能的重要成因\*

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### 摘 要

本文在Asperity模式和Barrier模式的基础上,提出了另外一种不均匀体模式——障碍体模式,并对该模式进行了数值模拟的研究。结果除证实了我们以前做过的单轴压力下模拟障碍体的实验结果[6-8]以外,还表明在含有障碍体的断层面上,破裂的扩展与破裂的传播速度、始破裂区域的大小、裂纹的类型以及障碍体所在断层的介质有关。在有围压的情况下,破裂可以先越过或绕过强度较高或尺度较大的障碍体,经一段时间的应力积累过程后,再使障碍体发生破坏。

本文通过对震源区中障碍体的性质和影响的研究,解释了海城和邢台两个地震序列形成和发展的可能原因,得到一些较为合理的结果。

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