

# Variations of Quasi-electrostatic Field before Three Earthquakes Adjacent to Handan

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**Abstract:** This paper shows the abnormal variations of quasi-electrostatic field before three felt earthquakes adjacent to Handan recorded in 2000. Analysis and discussion about forecasting earthquake by quasi-electrostatic field are also made.

**Key Words:** Quasi-electrostatic Field Earthquake

## 1. Introduction

Three earthquakes occurred adjacent to Handan in 2000. Abnormal variations of quasi-electrostatic field before the three earthquakes were recorded by observatory station in Handan, and we made successful prediction for the three earthquakes by variations of quasi-electrostatic field. So we suggest that it is possible to predict earthquake by the use of quasi-electrostatic field.

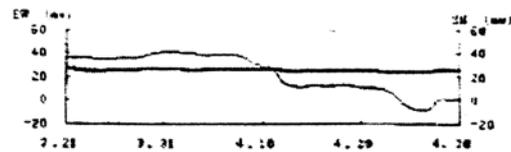
## 2. Measuring system and abnormality record

(1) Measuring systems: There are two sets of quasi-electrostatic field system in Handan observatory station. Each system consists of column electrodes (used as sensors and the polar distance is 40m) and a recorder including measuring direction of EW and SN.

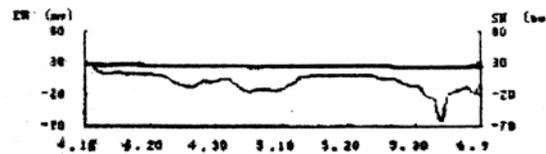
One of the two systems uses EWY-103 as Circle diagram potentiometer with its record range and paper feed speed not regulable. It was erected in October 1981 and only relative variations of quasi-electrostatic field could be recorded because of small scale.

Another uses Open Circuit Long Diagram Pen-Drawing recorder (3056) and was erected in April 1998 with its range and paper feed speed regulable. The real shape of rapid swimming on record diagram could be showed, so the absolute variations of quasi-electrostatic field could be recorded.

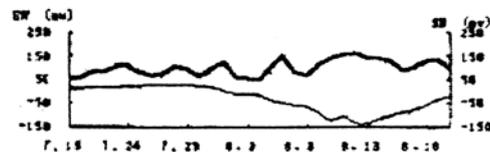
- (2) Abnormality records: Normally, the recorded curve is a beeline at a certain value. When sway or obvious deviation appear, we regard them as abnormal as following:
- Rising (falling): Recorded curve diverge from normal value in rising or falling, the changes of curve shapes could be divided into slow rising (falling), jump, sudden leap("V"), convexity(concavity), parabola shape etc.
  - Undulant changes: Like ripple with periods of 6-60 minutes.



(3.21~4.30)



(4.10~6.9)



(7.19~8.20)

Fig.1 Daily mean value curve of quasi-electrostatic Field for 2000

c. Pulse and pulse groups: sway in a few seconds. Pulse groups include two types. One is aggregation of some single pulses; the other is a compound wave.

### 3. Results and Analysis

What we measured is the electric potential difference between two poles. Because the distance between two poles is a fixed value, the parameter can reflect the quasi-electrostatic field. The three earthquakes are Chengde earthquake ( $M_L 4.0$ ) on 26, April, 2000. Anyang-Cixian earthquake ( $M_L 3.5$ ) on 3, June, 2000, and Mengzhou earthquake ( $M_L 3.6$ ) on 14, August, 2000. Abnormality complex in SN and EW direction before the three earthquakes are represented as Fig1.

According to the abnormal variations of quasi-electrostatic field recorded by Handan observatory station, we have:

- (1) Recorded curve shape of the three earthquakes behave with sudden changes including rising, falling, pulse group, undulance, jump.
- (2) Abnormal variations in EW direction are different from those in SN direction of the three earthquakes. Abnormalities appear in EW direction before Chengde earthquake and Anyang-Cixian earthquake, while no obvious abnormalities appear in SN direction. The change in EW direction before Mengzhou earthquake is much smaller than that in SN direction. Maybe they are related to inclination between measuring direction and principal stress.
- (3) Fig.1 also shows that, before earthquakes, the curve of electric potential difference between two poles in EW direction changes through falling-extreme-rising-earthquake-recovering, with pulse group, jump, "V" form, undulance etc appearing. Earthquakes always take place after bigish variations or in six weeks after a jump.

### 4. Conclusion

We find through 20 years observation the abnormalities of quasi-electrostatic field could be recorded before strong earthquakes or felt earthquakes. The recorded abnormalities of various earthquakes are much similar either in shape or in change process. On the basis of observation and analysis, we ever successfully predicted some earthquakes. We believe that, by the use of the monitoring system, along with the further study on earth quasi-electrostatic field, we may make breakthrough in forecasting earthquake in near future.

**Table.1** Abnormalities of the three earthquakes

Earthquake Survey				Abnormality									
Earthquake Magnitude Origin time	Location			Station Distance (Km)	Measuring direction	Beginning and ending time of abnormality	Type shape	Polarity	Extremum			Suspension Precursory signal and appearance time	Interval between suspending precursory signal and origin time(days)
	East longitude	North latitude	Azimuth						Peak Value (mw)	Date	Amplitude		
Cemengan M <sub>L</sub> 4.0 26/4/2000	114°33.6'	36°28'	155°	14	EW	10/4/2000 21:00~ 28/4/2000	Jump, Undulate pulses, group	-	-10	13/4	Fall 52	Undulate 24/4/2000	4days
Anyang -Ciklan M <sub>L</sub> 3.5 3/6/2000	114°01'	36°23'	240°	62	EW	13/4/2000 ~ 3/6/2000	Fall, Rise, Drop, Pulse, group	-	-122	3/6	Fall 96.4	Drop 3/6/2000	9hours
Mengzhou M <sub>L</sub> 3.6 14/8/2000	112°49.5'	34°57.5'	218°	237	EW	18/2000 03:00~ 15/8/2000 08:00	Drop, Fall, Jump, Pulse, group	-	-158	12/8	Fall 174	Falling Extremum 12/8/2000	2days