AN ATTEMPT TO PREDICT EARTHQUAKE WITH SATELLITE DATA

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1. INTRODUCTION

In 1980's Russian scientist Gorny found some short lived thermal anomalies from satellite image before earthquake in central Asia [1], Since then many scientists began to study this thermal anomaly with satellite data in China, Japan, India, Iran and Algerian earthquakes [2][3][4][5]. Ouzounov [6] used outgoing long wave earth radiation (OLR) data and studied the OLR anomalous variations prior to four large earthquakes including the M9.0 quake in Sumatra Island.

In 1997 another Russian scientist Morozova reported some abnormal linear clouds above an active fault [7]. A linear hole trace in a large thick cloud was observed by Russian satellite on 25 May 1984. She considered that the gas emitted from the earth rushed up to the sky, eroded the cloud, and formed the linear trace. Tadanori [8] observed an upward tornado-type cloud over the epicentre region before the M7.2 Nanbu earthquake of 17 January 1995. Shou[9] observed the strange clouds 5 days before the Bam M6.8 quake on Dec 26, 2003, and gave a warning to Iran scientists. Guo [10] made a detailed study about cloud anomaly before Iran, and found two cloud anomalies 67 and 64 day before the M6.0 and M6.3 quake respectively.

A big disadvantage of thermal anomaly method is that satellite thermal sensor can not penetrate thick clouds to retrieve surface temperature. So continuous temperature data can not be retrieved and some thermal anomaly information was lost. While the advantage of cloud anomaly method is that it can be applied in all kinds of weather, including in thick cloud days. So these two methods constitute a perfect combination. Here we used these two methods first and made an attempt to predict earthquake.

2. DATA AND METHOD

OLR data was provided by NOAA Climate Prediction Center. We subtracted OLR daily data with monthly mean average to eliminate the yearly and monthly weather variance. We ignored the longitudinally independent variations by removing the zonal mean around the epicentral area and computed the eddy daily field.

Cloud data is from our own FY2C and FY-2D geostationary satellite station. Cloud anomaly was recognized by human interpretation, if the cloud stayed there and did not move for hours, then it was considered as an anomaly. Because the normal cloud always moved with winds, while the earthquake cloud did not move with winds.

3. A PREDICTION EXAMPLE

On Sep 17, 2009 some linear clouds appeared at west China, Mongolia, and Russia border (Fig1), they spread from N47-50, E86-92. We considered them as cloud anomaly, because they stay there for about 6 hours and did not move. Another unusual character was that they lined orderly that we did not saw this cloud shape in the last 6 months.

On Sep 22, an OLR anomaly appeared at N46.5, E90.5, about 35w/m^2 bigger than the monthly mean value (Fig2). According to these two anomalies, we considered that there will be a small quake, maybe M4.0-5.0 at E91, N46.5, and reported the prediction to the earthquake bureau of our city.

3 days later, on Sep 25 a M4.5 quake occurred at N46.6, E90.2 with 6km depth. We can see that the OLR anomaly center and the epicenter were almost located together, their distance was only about 60km.

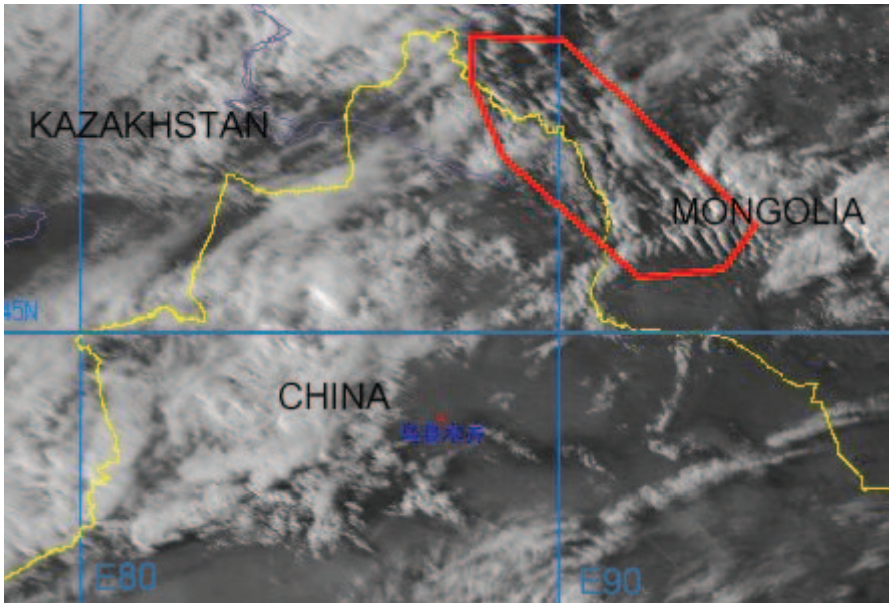

Fig 1. Cloud image of Sep 17, 2007 in west China

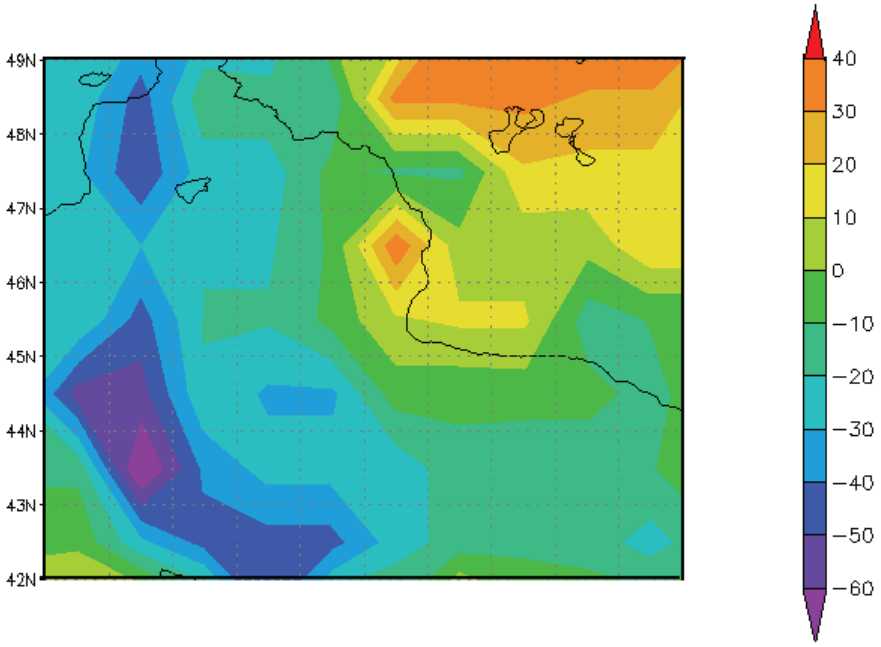

Fig 2. OLR anomaly map of west China on Sep 22, 2009

4. REFERENCES

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