

ANALYSIS ON THE WATER VAPOR ANOMALY BEFORE WENCHUAN EARTHQUAKE BASED ON MODIS DATA

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ABSTRACT

Remote sensing has become an effective method to monitor the anomalous changes associated with natural hazards. Recent study has shown anomalous changes in water vapor over the surrounding land and oceanic regions around epicentral region before and after the earthquake. The sudden increase in column water vapor in the atmosphere before the earthquake may be attributed to the increase in evaporation due to increase in surface latent heat flux (SLHF). In this paper, we have analyzed MODIS data of the land lying near the epicenter of Ms 8.1 Wenchuan earthquakes (happened on May 12, 2008), and anomalous water vapor content in the atmosphere over the epicentral and its surrounding regions has been computed during the period of Apr.1 to Mar. 19, 2008. The analytic results show following main features:

1) From Apr.1 to Apr.30, 2008, the concentration of the column water vapor around the epicenter was about 0.56g/cm². But in Mar. 1 the concentration increased abruptly to 1.1 g/cm², which was the highest in the period of from Apr.1 to Mar. 19, 2008. After Mar. 1, the column water vapor decrease gradually. On Mar.11(1 day Before the earthquake), the column water vapor diminished to 0.26 g/cm², which was the lowest in the period before 40 days and after 10 days of the shocking. The result showed that there were anomaly changes of column water vapor before the Wenchuan earthquake (see Figure 1).

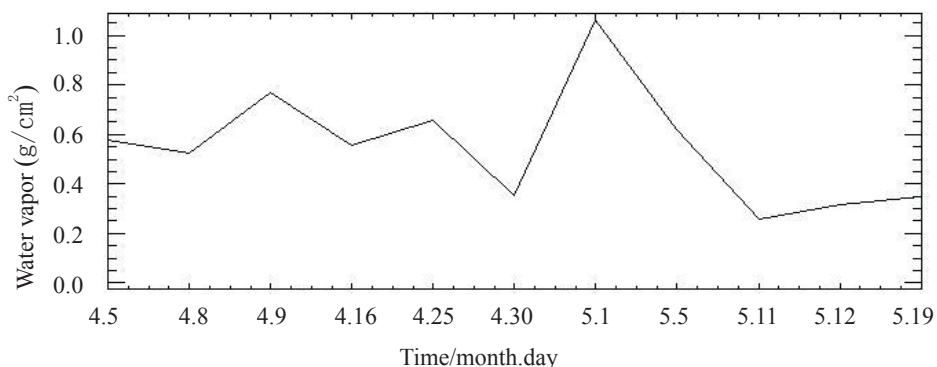


Fig.1 Change of concentration of the column water vapor at the epicenter with time

2) The region in which column water vapor increase was consistent with the active tectonics. The concentration of column water vapor was obviously higher in the Quaternary basin and the north-west fault of Sichuan Basin than that of the other region, which indicated that the anomaly of the water vapor was controlled by the active geological tectonics (see Figure.2).

3) The thermal infrared images of the Sichuan Basin before and after the earthquake showed the brightness temperature in Apr.30,2008 was the highest, which indicated that the thermal anomaly appeared before the water vapor anomaly.

The water vapor anomaly pattern may be attributed to the thermal anomaly appearing in advance. The past experimental results of infrared radiation measure for loaded rock showed that rock fracture and friction could produce thermal IR effect, and the heat caused by the fault friction and fracture may be a main source of TIR anomaly of earthquake. Thus the mechanism of water vapor anomaly before earthquake may be explained as following: The aggravating activity of tectonic stress before earthquake produced massive heat along the active tectonics. The heat accelerated the evaporation and overflow of the water vapor from the active tectonics, which result in the water vapor anomaly appearing before earthquake.

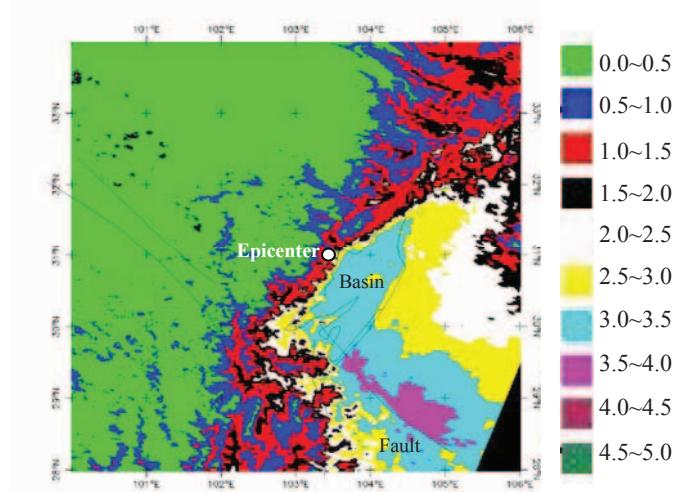


Fig. 2 Relation between distribution of column water vapor and geological tectonics