

引用本文(Citation):

何案华, 赵刚, 刘成龙, 范良龙. 青海玉树与德令哈地热观测井在汶川与玉树地震前的异常特征. 地球物理学报, 2012,55(4): 1261-1268,doi: 10.6038/j.issn.0001-5733.2012.04.021

HE An-Hua, ZHAO Gang, LIU Cheng-Long, FAN Liang-Long. The anomaly characteristics before Wenchuan earthquake and Yushu earthquake in Qinghai Yushu and Delingha geothermal observation wells. Chinese J. Geophys. (In Chinese), 2012, 55(4): 1261-1268, doi: 10.6038/j.issn.0001-5733.2012.04.021

## 青海玉树与德令哈地热观测井在汶川与玉树地震前的异常特征

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The anomaly characteristics before Wenchuan earthquake and Yushu earthquake in Qinghai Yushu and Delingha geothermal observation wells

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摘要

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摘要 本文较为系统地分析了青海省玉树与德令哈二口地热观测井自2007年以来的水温观测数据,发现这两口井对2008年5月12日四川汶川 $M_S 8.0$ 级和2010年4月14日青海玉树 $M_S 7.1$ 级地震前均有较明显的前兆异常,此外某些强地震前也有类似的异常信息,进一步对每口井的水温异常信息(诸如异常幅度、持续时间)进行了定量分析,以及每口井对应不同地震的异常曲线形态对比、异常数据的相关性分析,得出这两口井在不同地震前的水温异常形态表现出高度相似性;通过对这些曲线形态的认识与分析,为今后利用水温数据进行经验预报地震的探索开辟一条新路径.另外得出玉树井水温异常的幅度随震级与震中距的不同呈规律性变化,具体表现在震级越大、井震距越小,对应的异常幅度越大、异常持续时间也越长,且玉树井的异常主要是中长周期的异常,这种特性对利用水温异常特征判断未来地震的强度有重要意义;德令哈井则呈现出短临异常特性十分明显的特点,这种特性对利用该井水温数据来判断发震时间有着重要意义.

关键词 水温观测, 前兆异常, 玉树井, 德令哈井, 汶川地震, 玉树地震

Abstract: In this paper, the data of water temperature observed in Yushu and Delingha (Qinghai Province) geothermal observation wells since 2007 were analyzed systematically, by which precursory anomalies were found in both wells right before the Wenchuan Earthquake (Sichuan Province) and Yushu Earthquake (Qinghai Province) occurred on 12<sup>th</sup> May 2008 and 14<sup>th</sup> April 2010 respectively, and similar abnormal phenomena were also detected before other violent earthquakes happened. Furthermore, the information of the precursory anomalies such as anomaly amplitude and duration were analyzed quantitatively, the anomaly curves of each well for different earthquakes were compared in terms of shape, and the correlation of abnormal data was studied. It can be concluded that the shapes of precursory anomaly curves of the two wells for different earthquakes have many similarities. The exploration of the precursory anomalies and their curves will break new ground for earthquake prediction by means of water temperature. Besides, the author discovered that the water temperature anomaly amplitude of Yushu Well varied with earthquake magnitude and epicentral distance, which can be described in detail as follows: the greater the magnitude, the shorter the epicentral distance, while the greater the anomaly amplitude and the longer the anomaly duration. Also the Yushu Well is dominated by medium and long-term anomalies, which will have significant impact on predicting magnitude of earthquakes using water temperature anomalies. On the other hand, the anomalies of Delingha Well were short term and imminent, and this feature will be very useful when estimating the occurrence time of an earthquake by analyzing data of water temperature.

Keywords Water temperature observation, Precursory anomaly, Yushu well, Delingha well, Wenchuan earthquake, Yushu earthquake

Received 2011-10-25;

Fund:

中国地震局地壳应力研究所中央级公益性科研院所基本科研业务专项(ZDJ2011-07)、国家自然科学基金(41104051)资助.

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