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## 固体潮观测中的震颤异常波

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The tidal instruments recorded abnormal tremor wave

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摘要

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摘要 在地震与固体潮台站的日常监测中,常发现有一些异常“脉动”信号叠加在固体潮曲线上.这些异常“脉动”与宽频带数字地震计的观测在时间上同步、一致,其中的一部分由发生在西太平洋上的热带气旋引起,而其他的则大多与强地震相伴随,统称为震颤异常波.本文介绍了华中科技大学的地震与固体潮观测台站(HUST)的概况,报道了该台应用 DZW重力仪和VS-1倾斜仪观测记录到的大量震颤异常波事例.大量观测事实表明:中国固体潮台站记录的震颤异常波,绝大多数只在DZW重力仪和VS-1倾斜仪的低通滤波1通道(LP1)出现,而在其低通滤波2通道(LP2)和其他固体潮仪器中则罕有发现;震颤异常波的包络线大多呈“纺锤状”或“尾巴状”,持续时间多为1~3天.通过对震颤异常波和固体潮观测仪器的分析研究,得到以下结论:震颤异常波实际上就是一种来源复杂的地球脉动信号,响应范围广泛,可被宽频带数字地震计和固体潮仪器记录.由西太平洋上的热带气旋引起的震颤异常波的主要周期在3~7 s范围,而强震前的震颤异常波则除此外,还包含10~60 s及更长周期的信号.固体潮仪器对震颤异常波响应的差异是因为仪器的传递函数不同和特性所致. DZW重力仪和VS-1倾斜仪分钟值采样数据中的震颤异常波,只是真实信号的一种“混叠”或映射.强震前的震颤异常波是否与地震有关?是否是震兆?尚需做更深入细致的分析和研究.

关键词 固体潮, 重力仪, 倾斜仪, 地脉动, 震颤异常波, 汶川地震, 地震前兆

Abstract: In the observations of the earth tide, we often found that there are some abnormal microseisms in the tidal signals. These microseisms are also observed by the broadband digital seismograph in the same time. Some of the microseisms are aroused by the tropical cyclone in the Western Pacific, and others are mostly accompanied by strong earthquakes, called abnormal tremor wave. This article introduces the situation of HUST station, and covers the abnormal tremor waves recorded by DZW gravimeter and VS-1 tiltmeter. A lot of observations show that the abnormal tremor waves recorded by the low-pass 1 channel (LP1) of the DZW gravimeter and VS-1 tiltmeter, but these signals couldn't be recorded by the low-pass 2 channel (LP2) of the instruments and other tidal instruments; the envelope of the abnormal tremor waves is mostly "spindle" or "tail-like", and mostly have a duration of 1 to 3 days. According to the research of the abnormal tremor waves and the tidal instruments, we found out that abnormal tremor wave is actually micro-tremor signals whose source is complex, and the signals have a wide response, and they can be recorded by broadband digital seismograph and tidal instruments. The main periods of the abnormal tremor waves aroused by the tropical cyclone in the Western Pacific are about 3~7 s, and the tremor waves before the earthquakes not only have a main period of 3~7 s but also have 10~60 s or longer cycle signals in it. The differences of the response to the abnormal tremor waves are mainly decided by the transfer function and the features of the instruments. The DZW gravimeter and VS-1 tiltmeter are sampling per minute, so the abnormal tremor waves are the aliasing or mapping of the real signals. Are the abnormal tremor waves before the earthquake related to the earthquake? Is it earthquake precursor? We need to do analysis and research deeply.

Keywords Earth tide, Gravimeter, Tiltmeter, Micro-tremor, Abnormal tremor wave, Wenchuan earthquake, Earthquake precursor

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