

Deformation Method of Definition of Tsunamigenic and Not Tsunamigenic Earthquakes

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ABSTRACT

In the report the experimental results received at registration of tsunamigenic and not tsunamigenic earthquakes with the help of 52,5-meter laser strainmeter are discussed. At processing records of laser strainmeter, containing tsunamigenic earthquakes, it is revealed, that after the beginning of earthquake there is a deformation anomaly of the big size. The size of deformation anomaly registered by laser strainmeter is connected to size of mixture of a bottom in an epicenter of earthquake. The given displacement also results in formation of a tsunami. The deformation anomaly registered by our laser strainmeter after Indian earthquake on December, 26, 2004, has made 59 μm , that almost in 10 times more of size of high tide in a zone of an arrangement of installation.

Key words: laser strainmeter; earthquake; tsunami; foreshocks; deformation anomaly

INTRODUCTION

The wave of a tsunami which was formed as a result of action of earthquake on December, 26, 2004, has carried away lives more than 280000 people [Site of geophysical service]. After that terrible event the wave of opinions has risen about necessity of carrying out the monitoring observations in various areas of the globe, creation of a network of geophysical seismoobservatories and the sea stations equipped with broadband seismographs, tide-gauges, level gauges and other corresponding equipment. No doubt it is impossible to leave the monitoring observations in such condition. It is necessary to send great strengths and means for scientific researches on studying the nature of occurrence of various catastrophic events, development of a network monitoring points of observation, creation of essentially new technologies and hardware complexes. The issue remains open, on what way to go?

Now all conducting world services of warning of tsunamigenic and not tsunamigenic earthquakes are equipped by modern precision GPS-receivers and broadband seismographs. Best of broadband seismographs have a working range of frequencies approximately from 0,001 up to 10 Hz. It is enough of the given frequency range to register the fact of earthquake, but not to predict it. The various research groups of scientists using seismographs, try to find out indirect geodynamic foreshocks and on them to predict power, time and a place of

occurrence of earthquakes. Unfortunately, the given kind of activity could not result and has not resulted in success.

How to predict probability of occurrence of a tsunami now? They sound the alarm of a tsunami on the fact of having place powerful earthquake under a bottom of ocean (or the sea). We think that the given method is not only ineffective, but also harmful. Any other methods except the usage of seismographs can not be employed. Use of ground installations (level gauges, etc.) for tracking a tsunami is ineffectively because of small speed of distribution of a tsunami. Tsunami can not occur after powerful underwater earthquake as can not be motions of a bottom of piston type. In this case the declared alarm will be false. A false alarm harbors bad: 1) it results in economic damage of some managing objects in a zone of probable occurrence of a tsunami because of the discontinuance of their activity; 2) it relax people's vigilance and at the following real threat of a tsunami they can not react to the warning; 3) it creates pessimism whenever possible of the sure definition tsunami danger of occurring geodynamic processes. The urgency of the given work is connected to the decision of a problem by exact definition of an opportunity of a tsunami occurrence after underwater earthquakes and searches of ways of the decision problem of the forecast of any earthquakes.

LASER STRAINMETER

Deformation anomalies which cause a tsunami appear at various geodynamic processes. Basically they are connected to earthquakes. Oscillations which appear at earthquake in their center cannot cause a tsunami. They only "shake" a bottom in the frequency range corresponding to the periods from several seconds up to several tens of seconds. Deformation anomalies are in the extremely left frequency range and cannot be registered by anyone, even broadband, seismographs. Usually the distance between the tsunami source on a shelf and coastal residential areas is small and the effective tsunami warning using the initial tsunami wave is not done by the lack of enough time. Therefore the installation of hydrological sensors catching a tsunami profile is not suitable. Installations are the most perspective for these purposes which can register the deformation motions resulting in occurrence of a tsunami. It is connected that propagation velocity of the deformation motion extending in the elastic medium, more than on the order is higher than propagation velocity of a tsunami. Laser strainmeters of horizontal and vertical types are the best installations for their registration and direction finding. It is connected to their basic characteristics: accuracy of microdisplacement measurement of an