

GEOMETRICAL INTERPRETATION OF PLATE MOTIONS IN JAPAN DURING JUNE 2008 AND MARCH 2011 EARTHQUAKES

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ABSTRACT

History of multiple plate and intra plate tectonics have been continuously recorded in the region of Japan by the network of GPS stations called GEONET since 1979. The intra plate tectonics resulted in the June 14, 2008 and the plate tectonics resulted in the March 11, 2011 earthquakes have been studied in this research using the daily recorded accurate temporal 3-D geodetic coordinates of the GPS stations around the epicenters. Average vectors (both in magnitude and direction) of motions or horizontal partial displacements are derived from the partial displacements calculated for every epoch of time at the stations. The average directions all averaged again to determine the general direction of motion of the plate. The average vectors versus the corresponding epochs of time make up a time series containing the history of motion of the plate in a selected period of motion. For the intra plate tectonics resulting June 14, 2008 earthquake, two time series are used. One is built up using data from the stations located in the west bank and the other is built up using the data from the stations located in the east bank of the corresponding epicenter occurred inland Japan into the Pacific ring of fire. The time series used to plot the intra plate tectonics. It was a convergent tectonics with co-seismic horizontal displacement of about 1.5 m and 2 m vertical displacement. The famous March 11, 2011 earthquake was the effect of inter plate tectonics caused co-seismic displacement of 5 m in horizontal direction and 1 m in vertical direction across the Japanese trench and the disastrous tsunami afterwards.

INTRODUCTION

The tectonic phenomena happening in the region of Japan, is the North Pacific (NP) oceanic plate subducting underneath the North American (NA) plate, [Sagiya, T. 2004], creating what is called the Japanese Trench stretching across the Japan. These tectonics are continuously monitored by almost 1200 GPS stations the network of which is called the GEONET, [Kamiyama, M. et al., 2012]. The temporal positions of the stations are permanently observed and recorded at each station into files against the time of observations. The type of data processed is F3 [Kamiyama, M. et al. 2012, Djamour, Y., et al., 2010], the most accurate absolute 3-D coordinates given in ITRF05 coordinates system by Geographical Survey