Ground Motions along the Long-Point Fault Derived from Continuous GPS Observations (2013–2015)

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ABSTRACT

The Texas Gulf Coast region possesses numerous complex fault structures. This case study focused on the 20-km Long Point Fault, an active fault located in west Houston. The Long Point Fault is the longest fault within the Houston metropolitan region. This fault causes recurring damage to roadways, buried pipes, and buildings along the fault trace resulting in a financial burden for taxpayers. In order to precisely monitor surface fault motions, a dense continuous global positioning satellite (GPS) array was installed with 11 permanent GPS stations along the two sides of the Long Point Fault, 6 stations on the footwall block and 5 on the hanging-wall block. This study summaries 3-yr GPS observations from the GPS array. Daily GPS observations from 2013 to 2015 were processed using both relative (double differencing) and absolute Precise Point Positioning (PPP) methods. Preliminary GPS results indicate that there are no considerable coherent horizontal fault motions along the fault. There are considerable uneven land subsidence (5–10 mm/yr) occurring in the Long Point Fault area. Groundwater data within the Long Point Fault area were used to examine the correlation between subsidence and groundwater-level change. The groundwater levels in the Chicot and Evangeline aquifers have been continuously increasing since 2005 in the Long Point Fault area. At the end of 2015, the groundwater levels in the Chicot and Evangeline aquifers are about 50 m and 80 m below the land surface, respectively. However, both groundwater levels are still below the regional preconsolidation head (about -40 m). It is expected that the land subsidence will continue until the groundwater levels approach the regional preconsolidation head. A longer period of continuous GPS observations will be able to provide more information about the activity of the Long Point Fault.

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