Acceleration of the creep rate along the Western Valley Fault, Metro Manila

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Fault creep is a unique phenomenon known along only limited major active faults, such as the San Andreas Fault and the North Anatolian Fault. The Western Valley Fault (known also as the Marikina Fault) is one of them. The Western Valley Fault is a north-south trending active fault in the Metro Manila district, central Luzon. Buildings and road pavements are being damaged by vertical displacement of the ground where the central segment of the fault is passing through.

To monitor the slip rate of the displacement, repeated leveling surveys across the fault has been carried on since September 1999, periodically. Since there is no horizontal slip has been noticed, the survey follows a simple leveling survey method using an electronic digital level and bar-code leveling staff. Overall accuracy is estimated to be 2-3mm. Survey intervals were once in every three month at the beginning, and now once in every half a year. Though we set up eight survey lines at five locations, two survey lines at one location had been lost due to renovation of the ground.

Two survey lines show no creep dislocation even though an echelon cracks on the pavements are stile visible. Until the recent survey done in November 2005, four survey lines out of six show continuous creep dislocation. The average slip rate of these four survey lines since its beginning ranges 1.06cm/y to 2.15cm/y. Three out of these four survey lines show clear acceleration of the creep rate since November 2004. The accelerated rate reaches 4.55cm/y where average rate since the beginning is 2.15cm/y. Also, 2.25cm/y where 1.12cm/y and 2.05cm/y where 1.06cm/y are observed.

There are two possible hypotheses for the mechanism the creep of this Western Valley Fault. One of them is excess withdrawal of the underground water while the other one is tectonic. Even though we have no certain evidences to support either hypothesis, the accelerated creep rate has important implication with local communities.

If it is due to excess withdrawal of the under ground water, the creep dislocation may continue as long as withdrawal of underground water continues, and may cause further damages to the buildings and other infrastructures near by the fault.

If it is tectonic origin, regional tectonic strain along the creeping segment is being released by the creep. However, non-creeping segments of the fault have no such a mechanism to release the tectonic strain and the strain rate has been accelerated in these two years, as the creep rate has been accelerated.