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Geodetic determination of the gravitational potential difference for an optical lattice clock comparison in the Kanto region in Japan

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Recent advancements in atomic clocks have enabled us to measure gravitational potential differences with a precision which is applicable to geodetic uses, based on the gravitational red shift. In Europe, international fiber networks linking optical clocks have been developed for promoting the unification of height reference systems across countries, and 10 cm-level agreements in terms of the equivalent height difference to the gravitational potential have been achieved in the comparisons between chronometric and classical geodetic methods. In Japan, similar comparisons using two optical lattice clocks were carried out for i) a 15-km fiber connecting RIKEN in Wako city and the Hongo campus of the University of Tokyo and ii) a 450-m fiber link which vertically connected the observatory and the ground at the Tokyo Skytree. For the former comparison, agreement between chronometric and geodetic results was better than 10 cm, and for the latter, data are under analysis. A new clock site has been developed at the NTT Basic Research Laboratories in Atsugi City. Clocks in Wako, Hongo and Atsugi constitute an approximately 100-km-scale network. In this presentation, we report a preliminary result on the geodetic leveling survey to determine the gravitational potential difference between these three sites. To estimate uncertainties in the potential difference, we will compare the result partially with those determined from the geoid model and the GNSS ellipsoidal height. We will also consider the effects of crustal vertical motion, in addition to measurement errors.