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High precision absolute gravimetry. In and out laboratory measurements: the Jalisco Block (Mexico) changes in gravity 1996-2016

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We completed the measurement of nine first order gravity stations employing the reference FG5X-220 free-fall absolute gravity meter of the Leibniz Universität Hannover (LHU). The field campaign took place from February 22th to March 14th of 2016, exactly 20 years after the last absolute gravity campaign of NOAA was completed in Mexico. The measuring campaign started in the National Laboratory of micro-Gravimetry (LNG), with a mutual comparison between the LUH′s FG5X-220 and the CENAM′s FG5X-252, at the beginning and end of the field campaign, the later worked out as base station. Besides a successful instrumental comparison, we increased the existing network of gravity stations, four of which had been measured 20 years ago by NOAA in a tectonically active region of Mexico known as the Jalisco Block (JB). The JB stations, namely Chamela (CHA1), Guadalajara (UGG1), Manzanillo (MAN1) and Puerto Vallarta (UGP1), as well as the reference UNAM station (IGU1) in Mexico City were measured at the same bench mark points established by NOAA during the pioneering 1996 field campaign. In addition, we installed one more station in the JB northern border, in Tepic (TEP1) for future JB monitoring. The remaining three measured stations were located in Aguascalientes (AGS1) and in Queretaro States (CGE1 and CNM1), at the INEGI and at the geophysics laboratory of CGEO-UNAM, and the National Gravity Laboratory at CENAM, respectively. The latter two stations were already established with the FG5X-252 in August 2015 and have been re-measured as part of this work, although the observed differences are within the instrumental uncertainty. The changes in gravity values of the Jalisco Block stations (IGU1, CHA1, MAN1, and UGG1), were obtained with respect to the absolute gravity observations of 1996 (NOAA). Observed changes in gravity vary between -29 μGal to +23 μGal for the whole period. For the interpretation, the water load is regarded negligible because both campaigns (1996 and 2016) were carried out during the peak of the dry season. Here we discuss the results in terms of the tectonic activity in wester Mexico.