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Jupiter gravity field from the Juno mission first year of data

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Between its arrival at Jupiter, on July 4th, 2016 and September 1st, 2017, the Juno spacecraft has orbited the giant planet and performed eight close approaches at altitudes between 3500 and 4000 km above the cloud level. Three passes were dedicated to the determination of Jupiter's gravity field. The Deep Space Network (DSN) tracked the orbiter using a coherent, two-way radio tracking system at X-band (7.2-8.4 GHz) and - for perijove passes dedicated to gravity - at Ka-band (34.4-32.1 GHz), collecting very accurate measurements of the spacecraft range-rate. The goals of the gravity science investigation are to determine the zonal coefficients of the gravity field and the precession rate that will constrain interior structure models, to measure the response of Jupiter characterized by the k2 Love number, and to determine the depth of deep zonal flows in Jupiter's atmosphere.

Doppler data were first calibrated to remove the media effects, namely the Earth troposphere and ionosphere, and, where possible, the solar and interplanetary plasma and the Io plasma torus. Then they were combined using a multi-arc strategy to obtain the best determination of Jupiter gravity field. The data analysis was performed using two different orbit determination and parameter estimation codes: NASA/JPL's MONTE and University of Pisa's ORBIT14. We present and compare the gravity solutions computed using the two codes and analyze the improvement over the previous solutions.