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Recoverability of Callisto gravity field influenced by orbiter mission characteristics

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The exploration of Callisto is part of the extensive interest in the icy moons characterization. Indeed, Callisto is the Galilean moon with the best-preserved records of the Jovian system formation. Led by the National Space Science Center (NSSC), Chinese Academy of Science (CAS), the planned Gan De mission aims to send an orbiter around Callisto in order to characterize its surface and interior. Potential orbit configurations are currently under study for the Gan De mission proposal.

As part of a global characterization of Callisto, its gravity field can be inferred using radio tracking data from an orbiter. Mission characteristics such as orbit type, Earth beta angle and solar elongation will have a direct influence on the recoverability of its gravity field parameters. In this study, we will analyse this influence from closed-loop simulations using the planetary extension of the Bernese GNSS Softwareai.

A number of reference orbits with different orbital characteristics will be selected for the Gan De mission and, using an extended force model, will be propagated from different starting dates and different initial Earth beta angles. Realistic Doppler tracking data (2-way X-band Doppler range rate) will be simulated as measurements from ground stations, with a dedicated noise model. These observations will then be used to reconstruct the orbit along with dynamical parameters. The focus of this presentation will be on the quality of the retrieved gravity field parameters and tidal Love number k_2 .