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The high sensitivity accelerometer ISA during the BepiColombo spacecraft Earth flyby: data analysis, lessons learned, and expected signals for the next

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ISA (Italian Spring Accelerometer) is a high sensitivity, relative, mass-spring accelerometer. It flies as scientific payload on-board the Mercury Planetary Orbiter (MPO), module of BepiColombo ESA mission to Mercury. The accelerometer is sensitive to any acceleration, greater than $2 \cdot 10^{-8} \text{ ms}^{-2} \text{ Hz}^{-1/2}$, that changes the spacecraft motion from a pure free fall: the, so called, Non Gravitational Perturbations (NGP). ISA data will be added, at Mercury, to the orbit determination estimation in order to help reconstructing the orbit and to make the MPO an a-posteriori free-fall satellite.

After the first commissioning phase, performed in between November 2018 - August 2019, and that allowed to verify the functionality of the instrument itself, the first direct verification of the correct behaviour of the system was carried out during the BepiColombo Earth Flyby. Indeed, the spacecraft crossed the planet Earth shadow during the flyby and the direct Solar Radiation Pressure (SRP), the main contribution of NGP accelerations, dropped suddenly, marking a clear leap (gap) in the gathered data. The scientific team compared, on the base of the satellite surface exposition and radiative characteristics, the observed "drop" in the acceleration, once removed the on-board disturbances and inertial accelerations due to spacecraft rotations. In the talk, other ISA data recorded during the Earth Flyby are reported and expected signals for the upcoming Venus#2 Flyby and Mercury #1 Flyby are presented.