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Miniature ion mass analyzer for the BepiColombo and the Chandrayaan-1 missions

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Chosen to be included in the SERENA instrument package on-board the Mercury BepiColombo MPO mission as well as on the Indian Chandrayaan-1 mission to the moon, Miniature Ion Precipitation Analyzer (MIPA) is a, mass and power consumption wise, low budget sensor, optimized for monitoring of the ion precipitation flux. Working name on Chandrayaan-1 is SWIM (Solar Wind Monitor). The sensor envelope size is 53*85*30mm, and the weight is 150g (with an additional 150g for FEE and HVPS). The sensor head can be broken down into three main sub-units: An electrostatic deflector consisting of two 90º high voltage plates, for elevation sweeping, followed by a 128º electrostatic analyzer for energy resolution, followed by a time-of-flight (TOF) cell with post acceleration up to 1keV. Post-accelerated ions entering the TOF cell hit a START surface (monocrystal tungsten) and get reflected onto a STOP (MgO coated graphite) surface. Particles hitting the START or STOP surface will give rise to secondary electron emissions. The kinetic electrons are guided towards the START and STOP **c**eramic **c**hannel **e**lectron **m**ultipliers (CCEM), used for start and stop timing. The sensor also comprises a specially designed UV trap. The sensor with total field of view 180ºx9º provides ion measurements in the energy range 15eV-15keV with eigth azimuthal sectors, 7% energy resolution and mass resolution sufficient to resolve mass groups 1, 2, 4, 8, 16, >32. Using CCEM's enables operation in the extended temperature range, up to 100ºC, as well as a wide dynamical range.
We present the sensor design in detail as well as observational capabilities on-board the Mercury Planetary Orbiter and Chandrayaan-1.