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BepiColombo MPO SERENA: Search for Exospheric Refilling and Emitted Natural Abundances

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SERENA is an instrument approved to fly on board the BepiColombo/MPO, and it will investigate the Mercury's complex particle environment that surrounds the planet. Such an environment is composed by thermal and directional neutral atoms (exo-sphere) originating via surface release and charge-exchange processes, and by ionized particles originated through photo-ionization and surface release processes.

The crucial points for the knowledge of the environment of Mercury are:

1) Composition and vertical structure (search for noble gases, isotopes, molecules and atoms of crustal origin);

2) Dynamics: day to night circulation, active to inactive regions;

3) Surface release processes, sources: e.g. regolith, meteorites, etc.;

4) Search for ionosphere and its relation with neutral atmosphere;

5) Atmosphere/magnetosphere exchange and transport processes;

6) Escape, source/sink balance, geochemical cycles.

In order to fulfil the listed tasks, in-situ analysis of the environmental elements is also

necessary, and for such a purpose the SERENA instrument shall include four units: two Neutral Particle Analysers (NPA-ELENA and -STROFIO) and two Ion Spectrometers (IS-MIPA and -PICAM). In summary, SERENA is an instrument able to provide information on the whole surface-exosphere-magnetosphere system, as well as on the processes involved in this system, subjected to strong interaction with the solar wind and the interstellar medium.