SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration (5)

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THE SOLAR ORBITER MISSION

Abstract

Solar Orbiter is a leading candidate Medium-Class Mission in ESA's Cosmic Vision Programme. It will study in unprecedented detail how our Sun creates and controls the heliosphere. It is a medium-class mission to deliver first-class science, with launch planned for 2017.

Solar Orbiter builds on hugely successful missions such as SoHO Ulysses. Like those missions, it is a collaboration between ESA and NASA, including major scientific payloads from the United States, and the provision of a launch by NASA.

Solar Orbiter will study the role of the engine at the very centre of the solar system – our Sun. It will explore the origins of the solar wind, how acceleration of particles takes place, and how turbulence develops. It will trace the evolution of transient phenomena such as coronal mass ejections. Solar Orbiter will study the lifecycles of energetic particles – their sources, acceleration processes and distributions in space and time. It will increase knowledge of the solar dynamo that drives the connection between the Sun and heliosphere, especially at high solar latitudes.

We cannot do these things from close to the Earth, where scattering and mixing have changed the properties of the solar wind and magnetic field. Rather, we must be close to the Sun amongst those very fields and particles, at locations where we can view the Sun's high latitudes, and from which we can observe the links between the Sun's surface, its corona and heliosphere over dynamically important timescales.

Solar Orbiter will carry, resource protect a suite of complementary instruments that will measure the particles, fields and waves of the plasma through which it travels, simultaneously making multi-wavelength remote-sensing observations of the Sun's photosphere, corona heliosphere.

In-situ observations will target the ions and electrons of the solar wind, and populations of shock-accelerated particles. The magnetic field will be measured, together with the properties of waves in the solar wind plasma.

Remote sensing will map at high resolution the magnetic field distribution on the Sun's photosphere its line-of-sight motions, coronal structures in visible, UV EUV wavelengths coronal UV spectra. Flares will be studied by imaging X-ray spectroscopy, while wide-field contextual imagery will trace heliospheric features out to 40 degrees.