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SMILE: A new approach to exploring solar-terrestrial relationships

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SMILE (Solar wind Magnetosphere Ionosphere Link Explorer) aims to investigate the coupling of the solar wind with the Earth's magnetosphere, and the geospace dynamics that ensue, in a novel and global manner never tried so far. From a highly elliptical and highly inclined polar orbit, SMILE will simultaneously image the soft X-rays produced by solar wind charge exchange to delineate the Earth's magnetic boundaries and polar cusps, image the northern auroral oval in ultraviolet emissions, and measure the solar wind/magnetosheath plasma and magnetic field input.

SMILE measurements will inform the science underpinning our still limited understanding of solar-terrestrial relationships and of their fundamental drivers, and will validate both global empirical and first-principle models. For the first time we will be able to trace and link the processes governing magnetopause interactions to those causing charged particle precipitation into the cusps and the remainder of the auroral oval, mapping aspects of the global interaction including the evolution of energy and mass transport.

SMILE is a joint space mission between the European Space Agency and the Chinese Academy of Sciences due for launch at the end of 2021. This presentation will cover the science that will be delivered by SMILE and will provide an overview of SMILE's payload and mission development, demonstrating the scientific potential of SMILE through simulations of the data that it will return.