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Italian Space Solar Physics Programs within the International Living with a Star Initiative *

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Abstract.
The program 'International Living with a Star (ILWS)' is finalized to study the physical processes that are governing the Sun-Earth system as an integrated entity and to perform simultaneous and coordinated observations in the following fields: solar, heliospheric, magnetospheric sciences, space weather and global climatology. The main thrust is indeed on the understanding of solar variability and its effects on the Sun-Earth system.

Key words. space programs; Sun:corona: solar wind; space weather

1. Introduction

New perspectives are opening for the solar physics community with the approval of two major italian space projects within the NASA Living with a Star (LWS) program: SPECTRE (Spectroheliograph for the Transition Region), an instrument selected to fly in 2007 on the Solar Dynamics Observatory (SDO), cornerstone mission of LWS, and UVCI, an ultraviolet/visible light coronagraph–imager selected for a rocket flight in 2006 within the Helium Resonant Scattering in the Corona and Heliosphere program, HERSCHEL. The primary scientific objectives of the SDO mission is to understand how and why the Sun varies and determine how the Sun drives space weather and the global climate changes. SPECTRE, devoted to image the transition region on disk at high spatial and temporal resolution (0.6 arcsec pixel and 10 sec cadence), is included in a suite of eight instruments proposed to carry out the Solar and Heliospheric Activity Research and Prediction Program (SHARPP), lead by the Naval Research Laboratory, NRL (US). The SHARPP instruments are designed to trace with unprecedented coverage the flow of energy and mass from the chromosphere through the corona, and to reconstruct, in conjunction with the observations obtained with the instruments of the STEREO mission (NASA), the 3D structure of the coronal mass ejections directed toward Earth. HERSCHEL is a program devoted to test the coronagraph concept developed for the future ESA mission, Solar Orbiter. The coronagraph prototype UVCI uses the same optical compo-

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nents, except the detecting systems, to obtain coronal monochromatic images in the HI 1216 and HeII 304 lines, and in polarized visible light. This is achieved by using ad hoc multilayer mirrors. HERSCHEL also includes a He II disk imager developed by NRL. The detection with UVCI of the chromospheric He and H emission, resonantly scattered in the solar corona, allows us to obtain the first global coronal maps of the He outflow velocity, of the He/H abundance, and study the He abundance modulation due to open coronal magnetic field expansion factor. The observation of the disk emission with the He II imager is needed in order to correctly interpret HeII resonant scattering in corona. Therefore the combination of UV coronagraph and imager observations, during the rocket flight, is a powerful tool to obtain those observations that are necessary to study for the first time the acceleration of the He solar wind component. In the future, the solar and heliospheric ESA mission, Solar Orbiter, will explore unknown heliospheric regions near the Sun (perihelion 0.2 AU, equivalent to 45 solar radii), deliver the first images of the solar poles, provide unprecedented high-resolution observations of the Sun (35 km), correlate in situ and remote sensing measurements in the period of corotation of the spacecraft with the Sun. The solar and heliospheric community is prepared to contribute to develop instruments in the fields of UV/visible light coronagraphy and UV spectrometry, for what concerns remote sensing, and instrumentation apt to measure the solar wind plasma, the neutral particle component and dust, for what concerns the in situ observations.