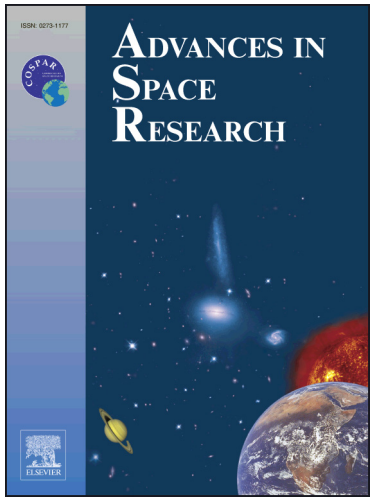

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DREAMS-SIS: the Solar Irradiance Sensor on-board the ExoMars 2016 Lander

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Abstract – The Solar Irradiance Sensor (SIS) was part of the DREAMS (Dust characterization, Risk assessment, and Environment Analyzer on the Martian Surface) payload package on board the ExoMars 2016 Entry and Descent Module (EDM), "Schiaparelli". DREAMS was a meteorological station aimed at the measurement of several atmospheric parameters, as well as the presence of electric fields, during the surface operations of EDM. DREAMS-SIS is a highly miniaturized lightweight sensor designed for small meteorological stations, capable of estimating the aerosol optical depth (AOD) several times per sol, as well as performing a direct measurement of the global (direct plus scattered) irradiance on the Martian surface in the spectral range between 200 and 1100 nm. AOD is estimated from the irradiance measurements at two different spectral bands – Ultraviolet (UV) and near infrared (NIR) – which also enables color index (CI) analysis for the detection of clouds. Despite the failure in the landing of Schiaparelli, DREAMS-SIS is a valuable precursor for new developments being carried-on at present. The concept and design of DREAMS-SIS are here presented and its operating principles, supported by preliminary results from a short validation test, are described. Lessons learnt and future work towards a new generation of Sun irradiance sensors is also outlined.

Key words: Solar Irradiance Sensor, Martian atmosphere, Optical Depth, Color Index, ExoMars, Mars 2020.

1.- INTRODUCTION

DREAMS-SIS is a radiometer that was part of the DREAMS meteorological station on board the ill-fated ExoMars 2016 EDM "Schiaparelli" (Esposito et al., 2014). DREAMS goal was to increase our understanding of the Martian environment through the measurement of different parameters such as pressure, temperature, humidity, wind speed and direction, and solar irradiance on surface, as well as novel measurements of the electric field on Mars atmosphere.

The two main goals of DREAMS-SIS were to provide high time resolution estimations of the aerosol optical depth (AOD) and to enable the detection of clouds. Dust plays a key role in the dynamics of Martian atmosphere, being the main scatterer and absorber of light in the

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