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ESCAPE: The study of the solar corona from Dome C, Antarctica

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The Antarctica solar coronagraph –AntarctiCor– for the “Extreme Solar Coronagraphy Antarctic Program Experiment” –ESCAPE– comprises an internally-occulted coronagraph based on the externally-occulted AS-PIICS space coronagraph for the ESA formation-flying PROBA-3 mission to be launched in 2024.

This presentation describes the AntarctiCor optical design for ground-based observations of the polarized broad-band ($591 \text{ nm} \pm 5 \text{ nm}$) K-corona emission from the Italian-French Concordia station, located on the DomeC Antarctica plateau. The science goal of these observations is to map the topology and dynamics of the corona, addressing coronal heating and space weather questions.

The Antarctica plateau of Dome C offers a unique opportunity for ground-based observations of the solar corona, due to the high altitude of the site (3,233 m above sea level), the large amount of the daily hours of observations, and a low-level of sky-brightness background. AntarctiCor was deployed at the Concordia station in four Expeditions funded by the Italian Piano Nazionale Ricerche Antartiche (PNRA): XXXIV (2018-19), XXXV (2019-2020) XXXVII (2021-22) and XXXVIII(2022-23).

This presentation will report the preliminary results of the first coronagraphic observations from Antarctica together with the measurements of the level of sky brightness at Dome C. These measurements have demonstrated that this plateau has indeed a “coronagraphic sky”, that is, a sky brightness of the order of 1e-6 of the solar disk brightness.

Some of the lessons learned in operating a solar telescope in Antarctica will also be discussed.

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