

# Connecting the Sun and the Heliosphere through the FIP effect

Natalia Zambrana Prado (1,2,3) Therese Kucera (1), Samantha Wallace (1), Irena Gershkovich (4), Nicholeen Viall (1)

(1) NASA Goddard Space Flight Center (2) Catholic University of America (3) Mullard Space Science Laboratory (4) Michigan State University

Linking solar activity in the photosphere and corona to the inner heliosphere is one of the main objectives of ESA and NASA's Solar Orbiter mission. Establishing a link between an event on the Sun and its repercussions in the heliosphere is no trivial matter, especially in the case of small structures that are often below the resolution of current heliospheric imagers. Fortunately, for these small events, it is possible to find a link between the Sun and the heliosphere by diagnosing the elemental composition of the plasma thanks to the FIP effect (for first ionization potential), an increase in the abundance of low-FIP elements usually present in closed magnetic field zones.

Solar Orbiter was designed to narrow the gap between in situ and remote sensing measurements, approaching the Sun as close as 0.28 AU. Its unique combination of in situ and remote sensing instruments can be used to shed light on this difficult task. We present an analysis in which we have established such a connection through observations and modeling. The SPICE EUV spectrometer can observe the source regions of the Sun that will be sampled a few days later by the SWA-HIS in-situ instrument. Thanks to modeling, we have determined the trajectory followed by the solar wind and established where the various plasma parcels measured in situ originated.

We analyzed an event that took place in March 2022 where the in situ composition showed an overall decrease in the Fe/O ratio with periodic structures in the composition and determined whether the general trend we observed in situ was reflected in remote sensing data when measuring relative sulfur/nitrogen abundances.