Model Calculations of the F-Corona and inner Zodiacal Light

Saliha Eren and Ingrid Mann
The Arctic University of Norway, Physics and Technology, Space Physic, Tromsø, Norway (saliha.eren@uit.no)

The white-light Fraunhofer corona (F-corona) and inner Zodiacal light are generated by interplanetary (Zodiacal) dust particles that are located between Sun and observer. At visible wavelength the brightness comes from sunlight scattered at the dust particles. F-corona and inner Zodiacal light were recently observed from STEREO (Stenborg et al. 2018) and Parker Solar Probe (Howard et al. 2019) spacecraft which motivates our model calculations. We investigate the brightness by integration of scattered light along the line of sight of observations. We include a three-dimensional distribution of the Zodiacal dust that describes well the brightness of the Zodiacal light at larger elongations, a dust size distribution derived from observations at 1AU and assume Mie scattering at silicate particles to describe the scattered light over a large size distribution from 1 nm to 100 µm. From our simulations, we calculate the flattening index of the F-corona, which is the ratio of the minor axis to the major axis found for isophotes at different distances from the Sun, respectively elongations of the line of sight. Our results agree well with results from STEREO/SECCHI observational data where the flattening index varies from 0.45° and 0.65° at elongations between 5° and 24°. To compare with Parker Solar Probe observations, we investigate how the brightness changes when the observer moves closer to the Sun. This brightness change is influenced by the dust number density along the line of sight and by the changing scattering geometry.
