

The Coronal Dynamics Imagers for the KUAFU mission

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The Space Weather Explorer - KuaFu mission will provide simultaneous, long-term, and synoptic observations of the complete chain of disturbances from the solar atmosphere to the geospace. KuaFu-A (located at the L1 liberation point) includes Coronal Dynamics Imagers composed of a Lyman-alpha coronagraph (from 1.1 to 2.5 solar radii) and a white light coronagraph (out to 15 solar radii), in order to identify the initial sources of Coronal Mass Ejections (CMEs) and their acceleration profiles. The difficulty of observing the lower corona should not be underestimated since instrumental stray light remains a critical issue in the visible because of the low contrast of the corona with respect to the Sun. Observing the corona in the Lyman-alpha line is a valid alternative to white light observations. The Lyman-alpha approach takes advantage of both the intrinsic higher contrast of the corona wrt the solar disk in this line compared to the visible, and the absence of F-corona at 121.6nm. Furthermore, it has been convincingly shown that the coronal structures seen in Lyman-alpha correspond to those seen in the visible and which result from Thomson scattering of the coronal ionized gas. This is because the plasma is still collisional in the lower corona so that the hydrogen neutral atoms are coupled to the protons. A classical, internally-occulted Lyot coronagraph is required so as to preserve the image quality down to the inner limit of the field of view. Following the general concept of a Lyot coronagraph, the optical design uses only mirrors. A narrow band interferential filter located into a collimated beam allows isolating the Lyman-alpha line. The visible coronagraph will adopt the approach of a single instrument having a large field of view extending from 2.5 to 15 solar radii. Such a design is based on on externally occulted coronagraphs built for recent past missions, essentially the LASCO C2 and C3 instruments and the yet to be flown SECCHI COR 2 of the STEREO mission, which is itself a combination of the C2 and C3 instruments.