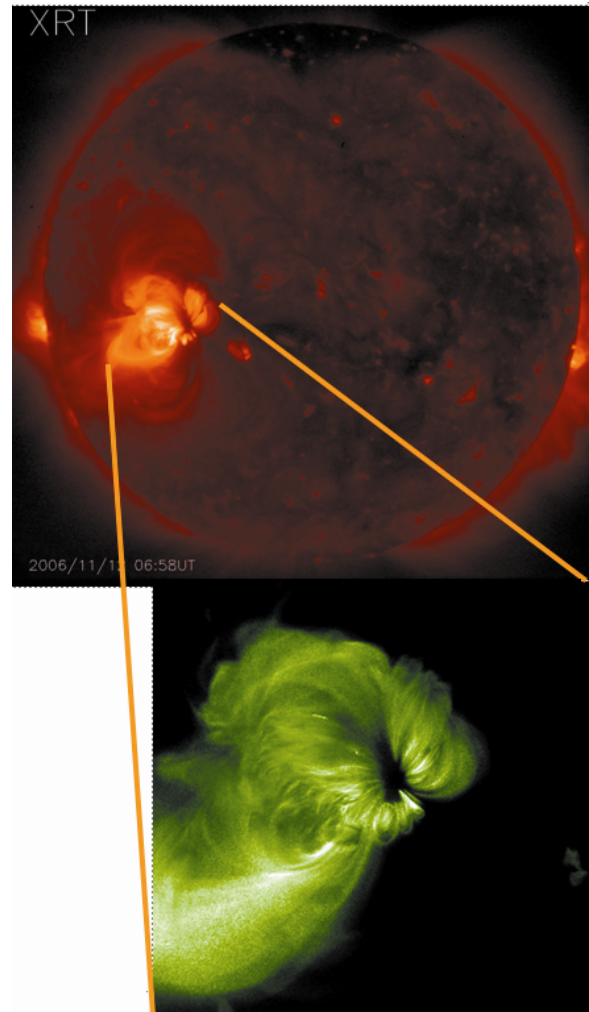


The Sun

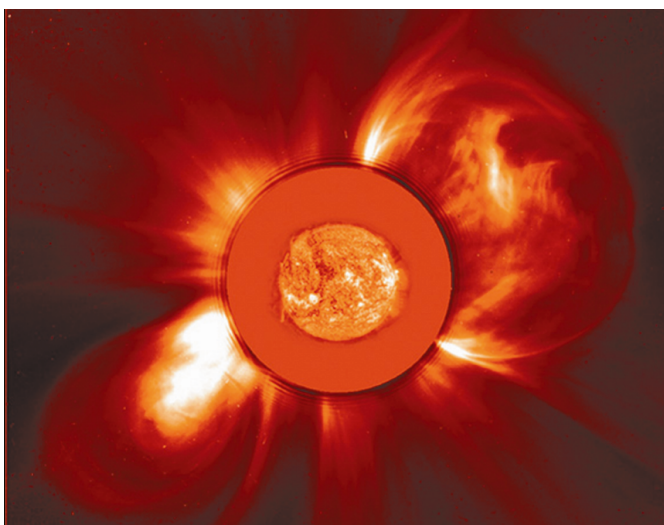
The sun and the solar corona

Owing to its closeness to Earth, the Sun is the most important star for us and the only one we can observe in detail. It can thus act as a precious laboratory revealing the processes taking place in a star, and also as a model allowing us to understand how the other stars work. The Observatory of Palermo is involved in research activities – dating back to Vaiana's pioneering work in the 60-70s – which study the X- and UV-rays coming from the Sun. Satellite observations have shown that the Sun appears more unstable and dynamic in the X-band than in the optical one. This band allows the observation of the solar corona, made up of plasma millions of degrees hot and strongly influenced by magnetic fields. The plasma trapped inside the corona, being heated by the magnetic field, becomes incandescent and glowing in areas known as coronal arches. The detailed mechanisms behind this process are currently under study. It has recently been realized the importance of focussing on the fine structure of the corona. When observed at high resolution, coronal arches appear to be formed by bundles of very thin threads and this might reveal the heating of plasma due to the occurrence of frequent and strictly localized small explosions (flares).

Astronomers at the Observatory carry out research on the Sun based on observations made during solar missions dating back to the 70s, such as Skylab, Solar Maximum Mission, the European-American SoHO and the Japanese-US Yohkoh, Hinode and TRACE. The studies concern the structure, evolution and dynamics of the plasma confined in coronal arches, and are based not only on data analysis but also on the comparison with detailed physical models requiring complex number codes and high performances calculation systems.



Current temperature maps of the solar corona have reached an unprecedented resolution degree. In green the magnified view of an active region, obtained from data from the Hinode mission (Science, 2007).



Emissions of hot plasma from the sun into the interplanetary space, as observed with SoHO.

The outer corona

Part of the OAPa research activity is devoted to studying the plasma located in the most external coronal areas, inside magnetic structures open to the interplanetary space. In particular, the research is focused on the plasma clouds frequently emitted from the corona toward the interplanetary space, which could affect terrestrial activities such as telecommunications and the electricity network. These phenomena have been observed in detail with the SoHO satellite, in particular by means of the UltraViolet Coronagraphic Spectrometer – developed with a strong Italian component to it – and a detailed study has already been carried out. Another research field at the Observatory concerns the propagation of plasma clouds, and studies rely also on complex magnetohydrodynamic numeric models.