

How Star-Like is the Sun; How Solar-Like are the Stars?

Thomas R. Ayres [thomas.ayres@colorado.edu], Center for Astrophysics and Space Astronomy (CASA), University of Colorado, Boulder.

The guiding principle of the so-called Solar-Stellar connection (SSC) is that the Sun is a perfectly normal example of a G-type dwarf of the Milky Way's metal-rich Pop I. If this is true, we can use broad surveys of the distant but numerous field and cluster stars to help inform our understanding of general solar phenomena, such as the still enigmatic magnetic cycle; and similarly apply detailed measurements of solar processes to help us wrap theory around the sometimes rather curious behavior encountered among the myriad stars. If, on the other hand, the Sun actually deviates significantly from the normal behavior of stars, we not only lose our proximity leverage to answer broader cosmic questions, but also run the risk of over-applying hard-won stellar wisdom to an inapplicable case. This is particularly a concern in long term irradiance studies, where we might appeal, for example, to the photometric properties of G-type stars currently thought to be in Maunder Minimum-like states to project possible historical solar influences on terrestrial climate. Trying to establish how star-like is the Sun is complicated, and often frustrated, by the very different observational techniques applied in daytime astronomy compared with the sensitivity-disadvantaged "dark side." Here, I will provide a general review of areas where the Sun and stars appear to be congruent in their behavior, and areas where they appear not to be so similar. A key example is the nearby Alpha Centauri system, whose main component ("A") is considered a near twin of the Sun. Alpha Cen A, however, completely disappeared from X-ray sight in 2005, according to a careful study by the highly sensitive XMM-Newton observatory. This was reported at the time as completely unprecedented behavior for the corona of the Sun, or any Sun-like star previously observed by the broad X-ray survey of the earlier ROSAT satellite. Is this what a Maunder Minimum is like in X-rays? Or, was the "darkening of the solar twin" caused by some unrecognized instrumental effect? The surprising answer bears directly on the subject of this talk, and suggests that the stellar feedback part of the SSC is alive and well.