**Vendredi 8 février 2019 à 11h30 (IAS, bâtiment 121, salle 1-2-3)**

**What Drives the largest Solar Flares**

**Alan Title (LM Advanced Technology Center, Palo Alto, CA)**

For more than 40 years the GOES satellites, a period that spans cycles 21 through 24, have monitored the soft x-ray flux of solar flares. This data allow an examination of the solar cycle variations in the rates of X-class flares. A plot of the contribution of the number of X-class flares are well fitted by straight lines (see figure below). The slopes in these linear regions, the cycle cores, are the mean X flare rates in these cycles. The cores contain 90.5% of all the X flares in the data set. If the X flares in the cores had occurred at random, then the mean separation time between the X flares in the individual cycles would have been 18.2 days with a standard deviation 9.67 days a range of about a factor of three. However, 84.2% of the X flares occur in clusters, groups of flares all separated by less than a maximum time. The total duration of all the clusters is less than 10% of the total durations of the cores. Consequently, the flare rate in the clusters is an order of magnitude or more greater than the mean rate in the cores and two orders of magnitude greater than the X flare rate outside the cores. It is interesting that the mean X flare rate in the cores is linear in spite of the fact that most of the X flares occur in brief isolated bursts. There must be a mechanism that causes the clusters to be spaced in time way to maintain a constant average X flare rate. The median time separations of X flares in clusters in the individual cycles is 1.05 days with a standard deviation of 0.092 days. For the last 40 plus years, if an X flare occurred it was likely another would occur in during the next day independent of the strength of the cycle.
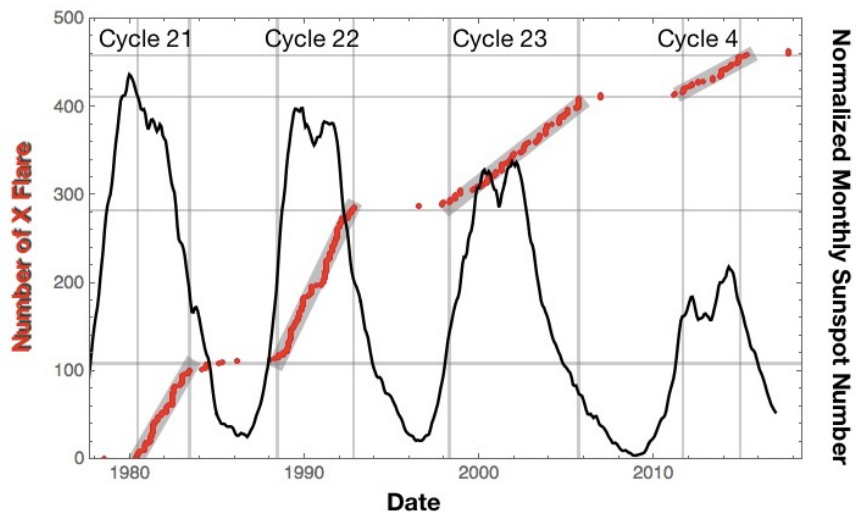
Figure 1.The pairs - date of X flare, number of the flare - for all 463 X flares in the data set (red dots). The straight line fits are (highlighted in gray) occur in cycles 21, 22, 23, and 24, respectively. These linear regions define the cores of the X flare regions in the cycles. Each of these periods has an unique slope. These are 0.0942, 0.108, 0.0425, and 0.0282 X flares/day. They represent the mean X flare rate in the cycles. Over plotted is the Monthly Sunspot Number scaled to fill the X flare data. The the vertical lines are at starts and ends of the cores and are [1980.47, 1983.50], [1988.45, 1992.80], [1998.28, 2005.80], and {2015.34, 2011.60]. The horizontal lines indicate the number of X flares that have occurred at the end of each core.