

# Long-term variations of solar, interplanetary and geomagnetic indices – An update

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The long-term variations of the 12-month running means of several solar, interplanetary and geomagnetic parameters during the last several sunspot cycles revealed that during cycles 11-23 (1868-2004), whereas the sunspot numbers Rz showed smooth but broad maxima for 2-3 years in each cycle, the geomagnetic aa index showed several peaks within 3-5 years around the sunspot maxima, with some peaks during the declining phases of the sunspot cycles. The Calcium Plage area also showed multiple peaks but none in the declining phases. The 11-year running means showed very good parallelism between Rz, aa index and global sea-surface temperature (SST). During about 1940-2004, Rz and F10 (2800 MHz radio emission) showed similar 11-year fluctuations of varying amplitudes, but coronal index CI showed monotonically increasing amplitudes by almost a factor of two. The open magnetic flux emanating from the Sun during 1968-2004 showed long-term fluctuations very different at low and high solar latitudes. The variations of the fluxes at low latitude (0-45o) were almost parallel to the sunspot cycle (there was a slight N-S asymmetry), while fluxes at high latitudes (45o-90o) were almost anti-parallel to the sunspot cycle. Cosmic ray neutron monitor intensities at Climax were well anti-correlated with sunspot cycle and interplanetary magnetic field B but poorly correlated with interplanetary number density N, solar wind speed V, and geomagnetic index aa. The geomagnetic index aa was best correlated with the product VB.

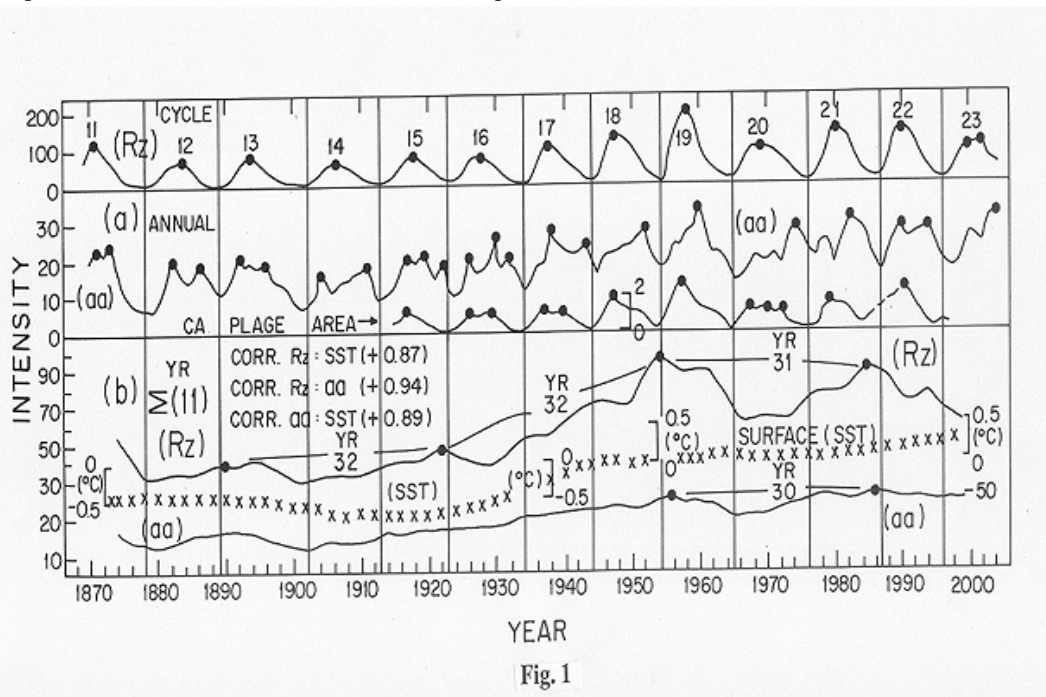


Fig. 1

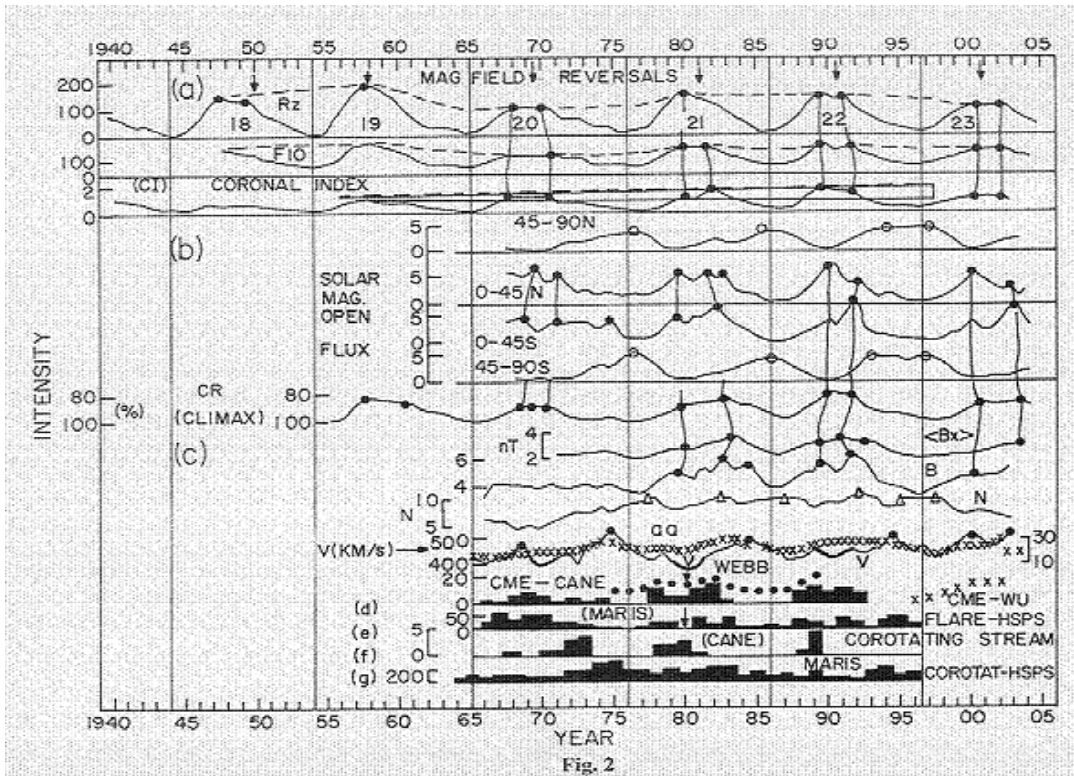


Fig. 2

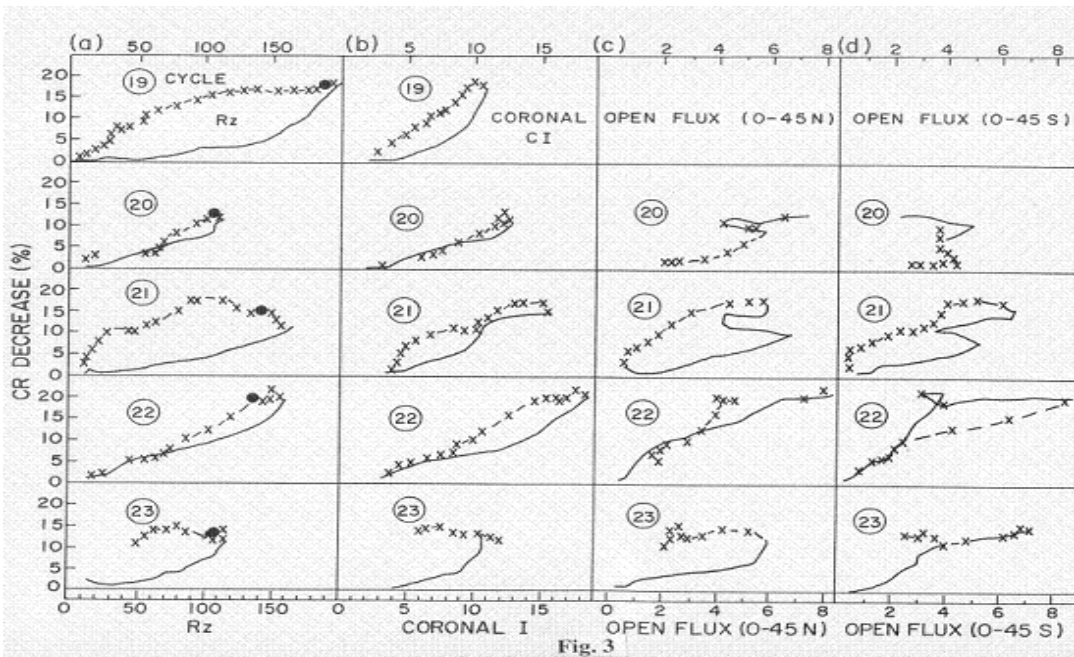


Fig. 3