



**Cosmic Ray**  
and **Solar Variability** throughout the  
past **9,400 years** and speculations  
regarding their **origin**

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**ABSTRACT:**

Using the cosmogenic radionuclides  $^{10}\text{Be}$  (stored in Antarctic ice) and  $^{14}\text{C}$  (in trees) the speaker and his Swiss colleagues have studied the variability of the cosmic radiation and solar activity throughout the past 9,400 years. Using a new, high accuracy synthesis of the cosmogenic data, they have shown that the Sun was in an abnormally active state in the interval 1946 - 2005, resulting in high sunspot numbers, large coronal mass ejection (CME), and intense geomagnetic storms. However, the data shows that during the past 9,400 years the Sun has experienced twenty six "Grand Minima" similar to the "Maunder Minimum" (1645 -1715) when there was an almost complete absence of sunspots, and other magnetic activity.

The magnetic properties of the Sun are attributed to the solar dynamo, and the cosmogenic data implies that the dynamo has the remarkable ability to turn off and on for 50 -100 years at a time. The cosmogenic data exhibit fourteen periodicities in addition to the well-known 11- and 22 - year cycles, and the new data shows that many of them are related to synodic and other periodicities of the Jovian (Jupiter, Saturn, Uranus and Neptune) planets. The possibility that solar activity is controlled by planetary motions has long been discredited, and regarded as pseudo-science and numerology of the worst kind. The new high quality cosmogenic record shows that this possibility should be re-considered. The speaker will conclude with speculations regarding a possible mechanism based on the properties of an asymmetrical tachocline (a feature of the interior of the Sun).

**SPEAKER PROFILE:**

Ken McCracken has had a long and varied life as a scientist, technologist, and contrarian. Having obtained his science degree in Tasmania, he commenced his research career in Tasmania and New Guinea in the 1950s. Joining the space research group at the Massachusetts Institute of Technology in 1959, he was deeply involved in the early days of the US space program for seven years while first at MIT, and then the University of Texas. He designed and built scientific instruments that were flown on seven spacecrafts that went to the orbits of Mars and Venus in the 1960s. Appointed to a professorship at the University of Adelaide, he and his colleagues from the University of Tasmania flew rockets from the Woomera rocket range and were responsible for some of the most exciting discoveries when mankind first began to study the x-rays emitted by stars.

In 1970 CSIRO appointed Dr Ken McCracken to inaugurate a new research laboratory to improve geophysical exploration for minerals in the harsh Australian environment. He and his colleagues developed a number of new ways to find deeply buried ore-bodies, using the electrical, magnetic, and gravity signals that ore bodies emit. Retiring in 1989, Ken McCracken operated a consultancy providing scientific advice to the mining industry. In addition, over the past decade, he and his Swiss, US, and Australian colleagues have used results from ice cores from Greenland and Antarctica to understand how the Sun has waxed and waned in activity over the past 9400 years. With his wife Gillian, Ken owns and operates a 850 acre beef breeding property near Bowral, NSW, and names some of their herd after politicians, bureaucrats, and colleagues they have know.