Space Scientists Reveal Super Solar Particle Event in History

Researchers from the National Space Science Center (NSSC), Chinese Academy of Sciences have recently unraveled a super solar particle event around AD775, probably the strongest of its kind in the past 11,400 years.

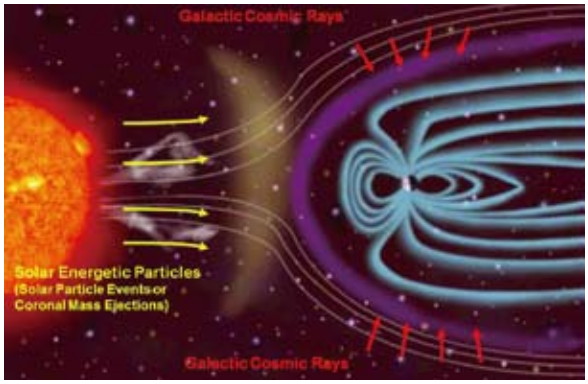
The intensity of this event was about $4.5x10^{10}$ protons/cm^2 (more than 30 MeV), which is about two times higher than that of the 1859 "Carrington Event" – the largest solar event in the past 154 years leading to the failure of telegraph systems all over Europe and North America.

In recent years, scientists from Japan, Europe and China reported a rapid radiocarbon ^{14}C increase by 12‰ in cedar/oak tree rings and coral rings around AD775. However, the origin of this rapid increase remains uncertain. Either supernova or solar particle event might have caused the major ^{14}C upsurge.

Dr. ZHOU Dazhuang from the Space Environment Exploration Laboratory, NSSC believed that the considerable ^{14}C increase was due to strong solar particle events and Coronal Mass Ejections (CMEs) with intense particles emissions. Theoretical studies have also indicated that strong solar flares and CMEs may produce energetic plasma, which explode towards the Earth and may carry enough energy and intensity to induce a ^{14}C spike and strong auroras on Earth. His group introduced diverse approaches to identify strong historical solar particle events, via the ^{14}C increase, strong and long-duration auroras, and geomagnetic storms.

Dr. ZHOU and his coworkers found abundant evidence of super auroras occurring in AD775: the white light bands in night sky, like spread silk, as recorded by the Old Tang Book; the celestial lights in Italy, by an encyclopedia; and a red crucifix in the heavens in Britain, by the Anglo-Saxon Chronicle. Such world-wide strong and long-duration auroras provided key support to a strong solar particle event in AD775.

The radiation of such solar particle events is extremely strong, according to Dr. ZHOU. The probability of getting cancer and leukemia may be as high as 100% and all space missions must be avoided. Intense solar particles can also cause serious damages to the microelectronic and photonic devices in space, and cut off communications and power grids.



Solar energetic particles and galactic cosmic rays bombarding the Earth. (Credit: NASA/JPL-Caltech/SwRI)

Strong band-like auroras generated by intense solar particle event.

The discovery is significant for the research on the history of solar activities, space weather and forecast, radiation of solar energetic particles and protection. Further research on ancient solar activities and space weather is now under way, combining efforts from space science, archeology and ancient literature.