



HAO Colloquium Series

(Refreshments served)

Speaker: Hiroko Miyahara—U. of Tokyo (Cosmic Rays Institute)

Time: 1:30 pm

Date: Wednesday, February 23, 2011

Location: CG-1, South Auditorium

Title: Variations of solar activity and cosmic rays at the Maunder Minimum

Abstract: I discuss the variations of solar activity and cosmic rays at the Maunder Minimum based on the records of annually measured cosmogenic nuclides in tree rings and ice cores. The variations of incident galactic cosmic rays (GCRs) modulated by solar magnetic field are recorded in tree rings and ice cores as the changes in the abundance of carbon-14 and beryllium 10, respectively. These two proxies are complementary, for the carbon-14 content in absolutely dated tree rings is strongly attenuated in the atmospheric circulation, while beryllium-10 in ice cores preserves detailed structure of cosmic-ray variation with a few years of dating errors. Records of carbon-14 content in tree rings have suggested that the length of the eleven-year solar cycle was ~14 years at the Maunder Minimum. The tendency of lengthening, however, had started two cycles ahead of the Maunder Minimum. Beryllium-10 record for this period has revealed the amplification of the “22-year” Hale cycle in GCRs. The Hale cycle in GCRs is related to the drift effect of the GCRs in the heliosphere. The amplification of the Hale cycle suggests that the structure of the heliospheric current sheet had been different from today. These results might help in understanding the state of solar magnetic field at the Maunder Minimum. I also discuss the importance of solar magnetic field on climate change.