

Plenary Talk

TERRA-ASTRONOMY – HISTORIC OBSERVATIONS TO STUDY SOLAR ACTIVITY AND GALACTIC SUPERNOVAE

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We use terrestrial archives (written reports and radioisotopes) to study variable solar activity and nearby stellar explosions with possible effects on Earth atmosphere, climate, and biosphere: nearby explosive events (solar and stellar flares, novae and supernovae, γ -ray bursts) deposit high-energy emission into the Earth atmosphere. Both, the steady flux of Galactic cosmic rays into the Solar system – modulated by the variable solar wind – and the transient flux from high-energy events generate radioisotopes (like ^{10}Be , ^{14}C) on Earth, so that they can be used to study such effects.

We investigated possible causes for the strong ^{14}C variation around AD 775 (supernova, gamma-ray-burst, stellar or solar flare, solar activity variation). Partly due to missing aurora observations, a giant solar flare is unlikely. Instead, we suggest that solar activity has dropped strongly within a few years, so that more cosmic rays entered the solar system and produced more ^{14}C on Earth. A similar, but weaker, such variation was observed around 1795 at the sudden start of the Dalton minimum.

Furthermore, we have studied in detail early telescopic sunspot observations in the 1610s, and found several previously overlooked observations and several previously unknown observers. This particular time is important, because it is just before the start of the Maunder Minimum – and the Sun may well have started a new similar minimum a few years ago.

We also present new Arabic observations of the historic Galactic supernovae of AD 1006, 1572, and 1604.

Terra-Astronomy is universal and trans-disciplinary. Reports from Europe as well as Near and Far East Asia date back more than 3000 years. We highlight the importance of (and challenges with) historic observations written centuries or millenia ago for tackling current astrophysical problems.