



The Decadal Variability of Cosmic Ray Flux Outside of a Grand Solar Maximum

Simon Thomas (1), Mathew Owens (2), and Mike Lockwood (2)

(1) University College London, Mullard Space Science Laboratory, Space and Climate Physics, Dorking, United Kingdom (s.r.thomas@ucl.ac.uk), (2) Department of Meteorology, University of Reading, Earley Gate, Reading, United Kingdom, RG6 6BB.

Galactic cosmic ray (GCR) flux is modulated by changes in the Sun's magnetic field. In the long-term, GCRs flux at Earth varies in a 22-year cycle. Observing time-series of GCR flux we see a pattern of 'flat topped' and 'spiked topped' peaks. It is thought that differing drift patterns for when the northern solar pole is predominantly positive ($qA > 0$) to when the northern pole is negative ($qA < 0$) cause this difference in modulation. We demonstrate a link between GCR modulation and long-term changes in the intensity and structure of the large-scale heliospheric magnetic field, particularly during the declining phase of consecutive solar cycles. Using reconstructions of the heliospheric field from geomagnetic data, we demonstrate that this cause of GCR modulation is only present in cycles during the recent Grand Solar Maximum and not during the weaker period of activity prior to it. We therefore suggest that the current decline in solar activity will result in different long-term patterns in GCR data to those observed during the space-age which would be important for the planning of space-based missions. Finally, we compare our results to ice-core data (found to display the 22-year variation) to further explore how the 22-year cycle varies between different solar activity periods.