SOLAR ACTIVITY, COSMIC RAYS, CLOUDS AND CLIMATE - AN UPDATE

J. E. Kristjansson (1), J. Kristiansen (1), E. Kaas (2)
(1) Department of Geophysics, University of Oslo, Norway, (2) Danish Meteorological Institute, Copenhagen, Denmark (ek@DMI.dk)

Eighteen years of monthly averaged low cloud cover data from the International Satellite Cloud Climatology Project are correlated with both total solar irradiance and galactic cosmic ray flux from neutron monitors. For globally averaged low cloud cover, consistently higher correlations (but with opposite sign) are found between low cloud variations and solar irradiance variations than between variations in cosmic ray flux and low cloud cover. The correlations are not significant at the 0.1 level, but it is noted that human induced trends and natural impacts from e.g. El Niño and volcanic eruptions have not been removed so far. Spatial regression patterns between low cloud cover and total solar irradiance are reminiscent of patterns associated with the Pacific Decadal Oscillation. A possible interpretation is that the solar signal interacts with variability modes in the ocean to give this kind of pattern. Correlating low cloud cover with its own global average shows that most of the variability is coming from the subtropical oceans, where the bulk of the earth’s low clouds are found.

In conclusion, the updated analysis is not inconsistent with a modulation of marine low cloud cover due to variations in solar irradiance causing changes in lower tropospheric static stability. A cosmic ray modulation seems less likely, but can not be ruled out on the basis of the present analysis. In either case we note that since proxies for solar variability show no general trend over the last 50 years there is no indication for a trend in (indirect) solar forcing in this period.