

NEW EVIDENCE OF SPACE WEATHER IMPACT ON WEATHER AND CLIMATE IN SOUTHERN HEMISPHERE

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Data on precipitation in Brazil for three meteorological stations (Pelotas: 31°45'S, 52°21'W; Campinas: 22°53'S, 47°04'W; Fortaleza: 3°45'S, 38°31'W) covering latitudinal range of Brazil from 1849 up to 2000 were considered. Periodic analysis of the annual rainfall level shows a pronounced 22-year periodicity for several littoral regions. The amplitude of the variation reaches ~90%. In the equatorial station Fortaleza the correlation coefficients between the solar magnetic cycle and the rainfall pattern are $-77\% \pm 4\%$ during 1849–1940 and $+80.0 \pm 4\%$ during 1952–2000, showing the phase change, and in the south-middle latitude station Pelotas $+60\% \pm 13\%$ in 1893–1920 and $-84\% \pm 4\%$ from 1929 up to 2000 reaching even more than 90% during the time intervals 1928–1939; 1948–1959 and 1970–1981. The phase change is found to have occurred mostly during the even 16th and 18th solar cycles, first recorded at higher latitudes, and later discerned in the equatorial region. The phase of the space weather versus terrestrial weather correlation is different for the various latitudinal regions. The rainfall time series also demonstrate a 52% correlation with an apparent 24-year periodicity that is possibly connected with the atmosphere-ocean coupling; and this feature is without any phase change in the time series.

Specific analysis of short-term rainfall variations shows a significant increase in rainfall level several days after solar magnetic sector boundary (MSB) crossing detected by Earth orbiting spacecraft. This additional finding is an argument in favor of existence of physical link between rainfall variations and the solar magnetic field cycle.

The results appear to have bearing both as a scientific instrument for the solution of the sun-weather connection problem, and may possibly have significance for long term practical weather forecasting in the South American region and elsewhere.