

A NEW APPROACH FOR MONITORING THE 27-DAY SOLAR ROTATION USING VLF RADIO NOISE ON THE EARTH'S SURFACE

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The Sun is a very dynamic star, with variability on all time scales, from minutes to decades and centuries. One of the dominant periods of the Sun's variation is related to the solar rotation of ~27 days. Although this period is quite fundamental to our Sun, it is only partially observable via the typical solar parameters such as sun spot number, Lyman alpha radiation and 10.7cm radio flux. We have discovered a very robust indicator of this 27 day rotation from measurements of VLF radio noise at the Earth's surface. While VLF radio noise spans the frequency range of 3-30 kHz, the solar rotation is only observed at frequencies close the Earth-ionosphere waveguide cutoff frequency (~2 kHz). Furthermore, the 27-day solar rotation is detected only during daylight hours, implying a 27-day periodicity in the day-time collision frequency between free electrons and neutral air molecules in the lower part of the ionosphere. We propose that continuous monitoring of VLF radio noise at frequencies close to the waveguide cutoff will provide a new method of monitoring changes in the solar rotation rate.

VLF noise, ionosphere, solar rotation

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