



## **Short-term Solar Modulation of the Madden-Julian Climate Oscillation**

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Normalized occurrence rates of daily Madden-Julian Oscillation (MJO) events are calculated as a function of phase lag relative to peaks and minima in solar ultraviolet flux occurring on the solar rotational time scale ( $\sim 27$  days). All MJO phases and four solar maximum periods are considered (1979-83; 1989-93; 1999-03; 2011-15). Corresponding daily static stabilities in the tropical lower stratosphere (70 to 100 hPa) are calculated from ERA Interim reanalysis data and are averaged over the warm pool region. The statistical significance of occurrence rate changes following UV peaks and minima is assessed using a Monte Carlo method. When MJO events with amplitudes greater than about 2 are considered during the December to May period (about 15% of those days), significant reductions of MJO occurrence rates and associated increases in static stability in the tropical lower stratosphere are obtained one to seven days following solar UV peaks. Consistently, cross-correlation analyses of high-pass filtered daily MJO amplitudes and solar UV flux during the same seasonal period produce significant negative correlations near and following solar UV peaks. Conversely, mean occurrence rates are increased and lower stratospheric static stabilities are decreased following solar UV minima. The reductions (increases) in occurrence rate following solar UV peaks (minima) are largest when the stratospheric quasi-biennial oscillation is in its easterly phase. Little or no dependence of the solar modulation on the phase of the El Niño-Southern Oscillation is obtained.