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Modulation of Global Fire Probability by the Madden-Julian Oscillation

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The Madden-Julian Oscillation (MJO) is an atmospheric phenomenon that dominates the subseasonal (20 – 90 day) variability in the tropics. Its main feature includes an eastward moving large-scale center of deep convection from the Indian Ocean to the western and central Pacific Ocean. As its convection center moves eastward, the MJO exerts influences on many weather, climate and other phenomena in the Earth system, both in the tropics and extratropics. Satellite-based global fire data sets (MODIS, ATSR) have revealed that probability of fire in many regions of the world undergoes systematic changes through the life cycle of the MJO. For example, when MJO convection center is located over the Indian Ocean, fire probability is anomalous high in West Africa and northern Australia, but anomalously low in central Africa, the Amazonia, and Alaska. In the tropics, such changes are directly related to rainfall fluctuations of the MJO itself in the eastern hemisphere, and are consequences of atmospheric equatorial waves excited by MJO convection that propagate into the western hemisphere. In the extratropics, the changes are mainly due to teleconnection patterns in the atmosphere established by anomalous convection of the MJO. Simultaneous perturbations in rainfall, surface temperature and humidity suggest that no single meteorological variable can fully explain the modulation of fire probability by the MJO. Current efforts are being made to related wild fire to lightening frequencies, which are also modulated by the MJO.