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Origin of Pink Noise in MAXI X-ray Sources

A fair number of MAXI X-ray sources show pink noise (power index -0.8 to -1.2) in their power spectral density toward the lowest frequency, the inverse of 15 years. This pink noise is quite robust and reappears after thresholding, inverse-thresholding, and even after removing the energy information, leaving only the timing data. We explore the origin of this robust pink noise in MAXI sources. The system of a black hole and the surrounding rotating plasma/disk generates multiple vortices tend to align with the rotation axis. The winding electric currents on these vortices form multiple local dynamos, whose dynamics can be described by the Macro Spin Model. This model has successfully explained the dynamics of geomagnetism and solar magnetism. Through stochastic resonance, the bipolar magnetic field undergoes intermittent sudden reversals. This model generally yields 1/f fluctuations by the synchronization of the spins through the systematic accumulation of frequencies and their wave beat. We further explore possible verifications of this model and compare the similar pink noise in solar flares and earthquakes.

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