Flares from the supermassive black hole in our Galaxy

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Multi-wavelength flares have routinely been observed from the supermassive black hole, Sagittarius A* (Sgr A*), at our Galactic center. The nature of these flares remains largely unclear, despite many theoretical models. We first study the statistical properties of the Sgr A* X-ray flares and find that they are consistent with the theoretical prediction of the self-organized criticality system with the spatial dimension S = 3. We suggest that the X-ray flares represent plasmoid ejections driven by magnetic reconnection (similar to solar flares) in the accretion flow onto the black hole. Motivated by the statistical results, we further develop a time-dependent magnetohydrodynamic (MHD) model for the multi-band flares from Sgr A* by analogy with models of solar flares/coronal mass ejections (CMEs). We calculate the X-ray, infrared flare light curves, and the spectra, and find that our model can explain the main features of the flares. Other properties, e.g., polarizations, time delay, are also discussed within the context of our model.