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Orientation of the crescent image of M87*

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The first image of the black hole (BH) M87*obtained by the Event Horizon Telescope (EHT) has the shape of a crescent extending from the E to WSW position angles, with a possibly distinct bright hotspot in the ESE sector. We have explored highly simplified toy models for geometric distribution and kinematics of emitting regions in the Kerr metric, assuming that the BH spin vector is fixed to the jet axis and that the emitting regions are stationary and symmetric with respect to the BH spin. Since the observed direction of the large-scale jet is WNW, emission from the crescent sector between SSE and WSW can be readily explained in terms of an equatorial ring with either circular or plunging geodesic flows, regardless of the value of BH spin. We have also considered plane-symmetric polar caps with plunging geodesic flows, in which case the dominant image is that of the cap located behind the BH. Within the constraints of our model, we have not found a viable explanation for the ESE hotspot. Most likely, it has been produced by a non-stationary localised perturbation in the inner accretion flow. The recent polarimetric EHT image of M87* shows that the ESE hotspot is essentially unpolarized, which seems to support its distinct origin. Possible causes for this apparent depolarization will be discussed.

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