ON THE FATE OF THE LIGHT RING INSTABILITY

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Ultracompact objects with light-rings (LRs) but without an event horizon could mimic black holes (BHs) in their strong gravity phenomenology. But are such objects dynamically viable? After reviewing some results about LRs and fundamental photon orbits of black holes, I will review a theorem establishing that stationary and axisymmetric ultracompact objects that can form from smooth, quasi-Minkowski, physical initial data must have at least one stable LR. Such LR has been argued to trigger a spacetime instability, but the development and fate of this instability has been unknown. Using ultracompact bosonic stars free of any other known instabilities as a testing ground for the instability, we will confirm the LRs triggered instability, identifying two possible fates: migration to non-ultracompact configurations or collapse to BHs. In concrete examples we show that typical migration/collapse time scales are not larger than a few thousands of light-crossing times, unless the stable LR potential well is very shallow. These results support that the LR instability is effective in destroying horizonless ultracompact objects that could be plausible BH imitators.