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New evidence for an intermediate-mass black hole in ω Centauri

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The intermediate mass black hole (IMBH) regime is still poorly constrained with few detections between 150 and 10^5 $M_\odot$.
An IMBH in ω Centauri, the Milky Way's most massive globular cluster, has been suspected for almost two decades, but all previous detections have been questioned due to their assumptions and the possible mass contribution of a central cluster of stellar mass black holes.
I will present a new astrometric catalog for the inner region of ω Centauri, containing 1.4 million proper motion measurements based on 20 years of Hubble Space Telescope observations.
Our catalog is supplemented with precise HST photometry in 7 filters, allowing the separation of its complex subpopulations. The catalog will be made publicly available, providing the largest kinematic dataset for any star cluster.
Our new catalog revealed 7 fast-moving stars in the innermost 3 arcseconds (0.08 pc) of ω Centauri. The inferred velocities of these stars are significantly higher than the expected central escape velocity of the star cluster, so their presence can only be explained by being bound to an IMBH. From the velocities we can infer a firm lower limit of the black hole mass of ~8,200 M . In addition, we compare the full distribution of stellar velocities to N-Body models that suggest the presence of an IMBH with M⊠50,000 M . These results confirm ω Centauri hosts an IMBH which makes this the nearest known massive black hole and, after the Milky Way center, only the second where we can track the orbits of multiple individual bound companions.

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