Astrophysics of gravitational wave sources

Lecture 9: Merger & subsequent evolution of the remnant

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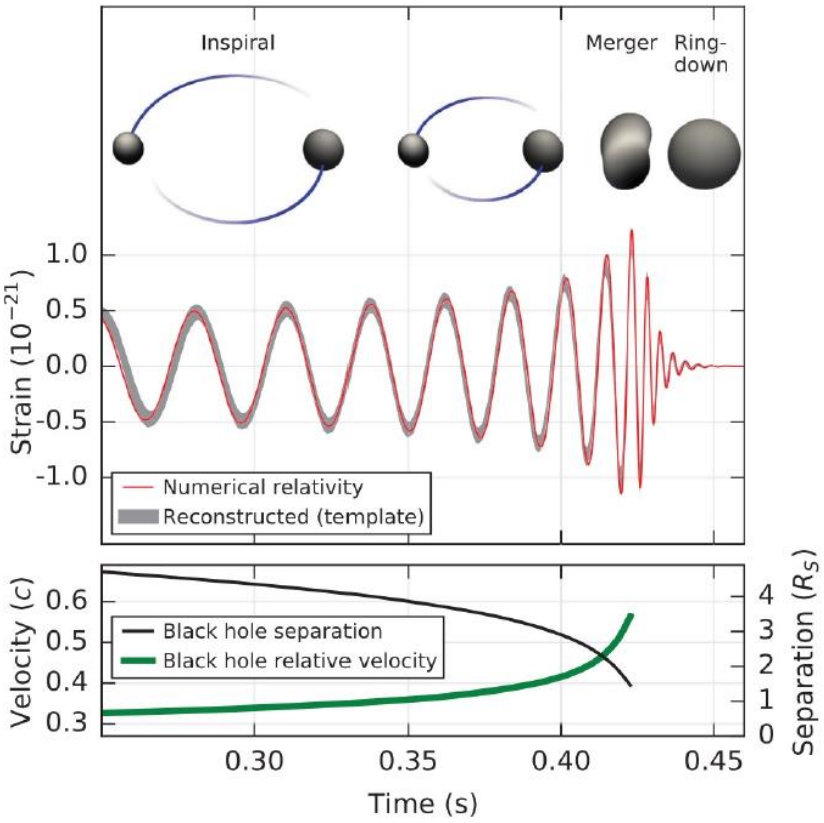
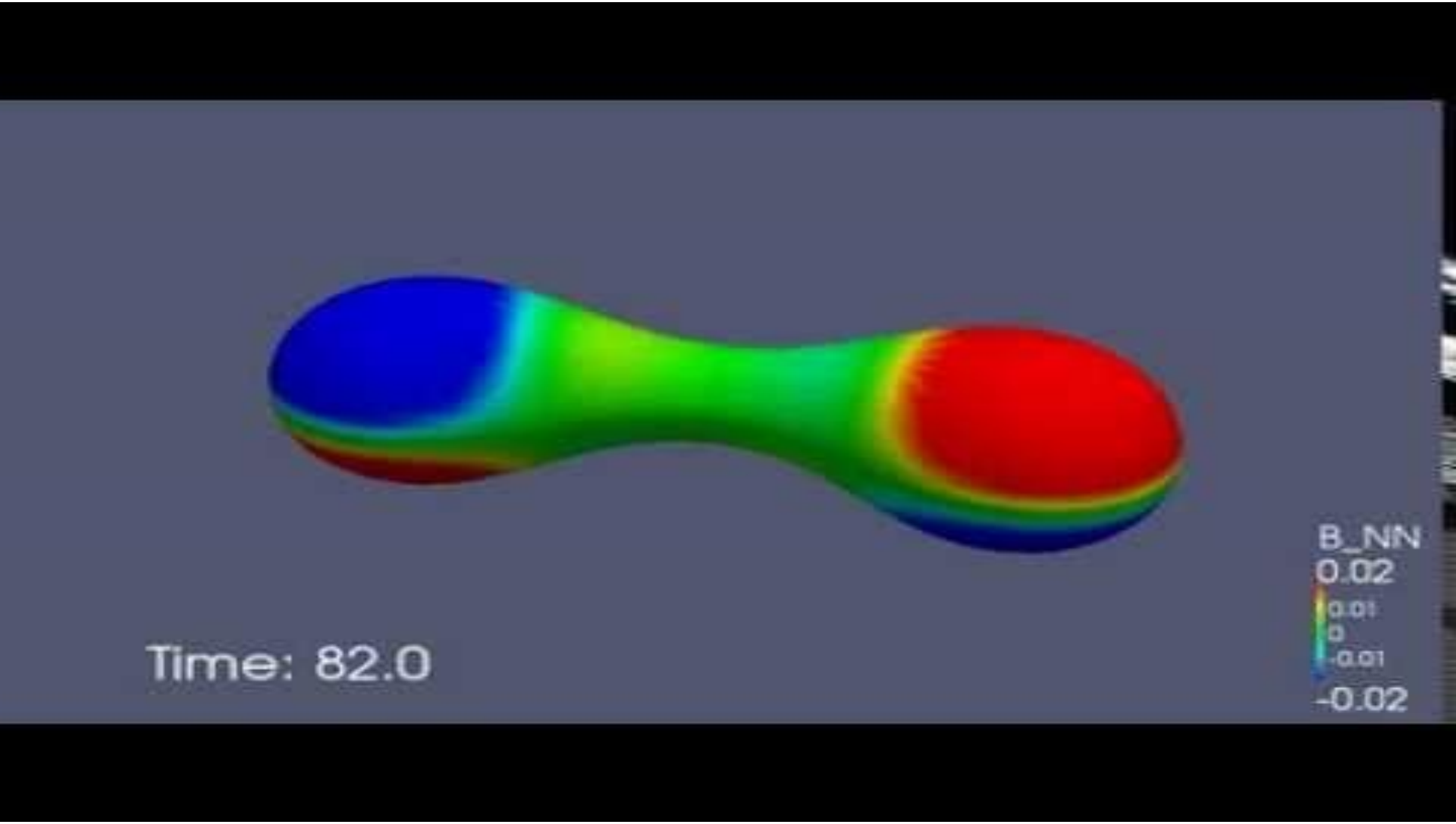
Binary black hole mergers

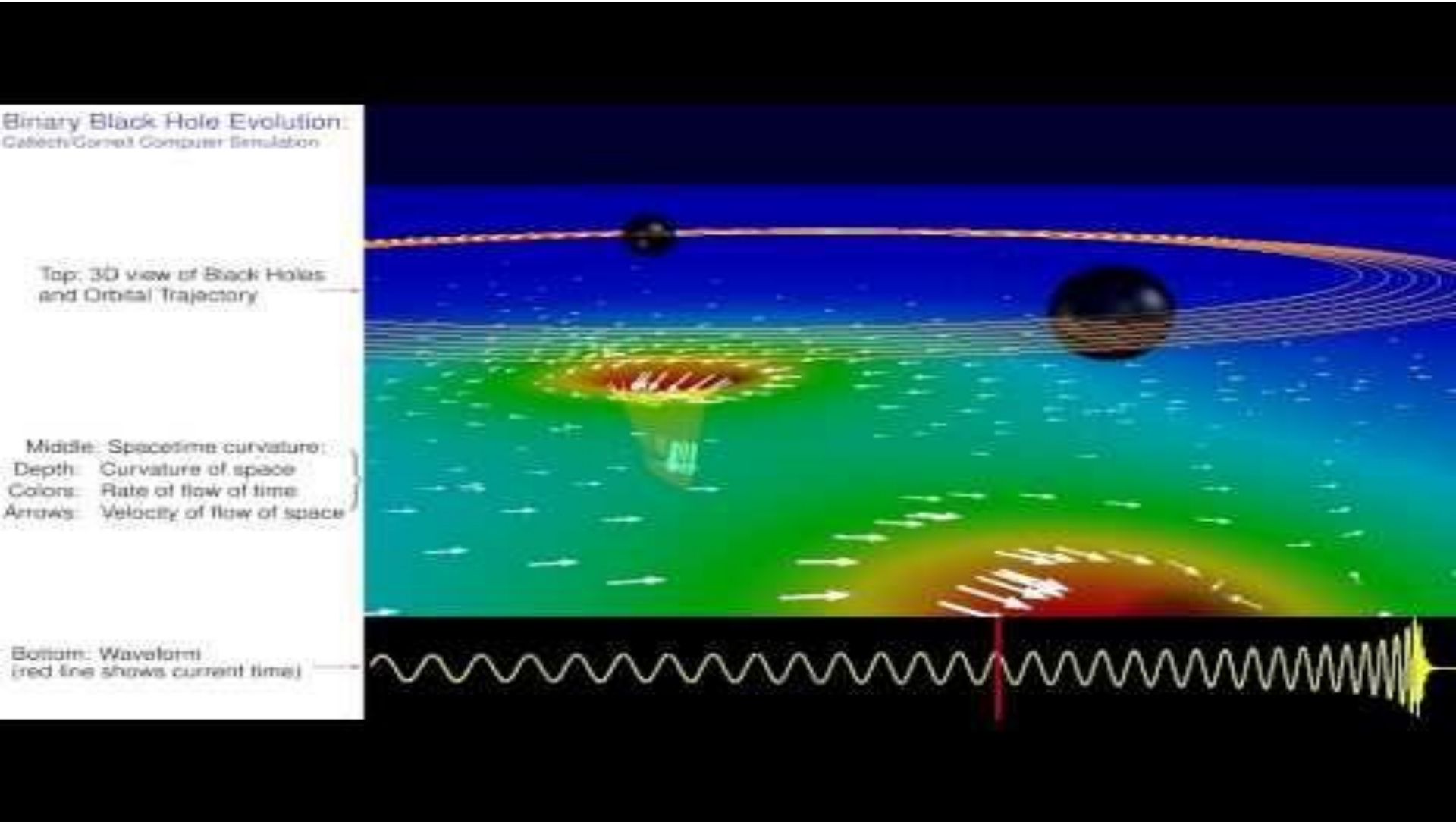


Abbott et al. (2016)

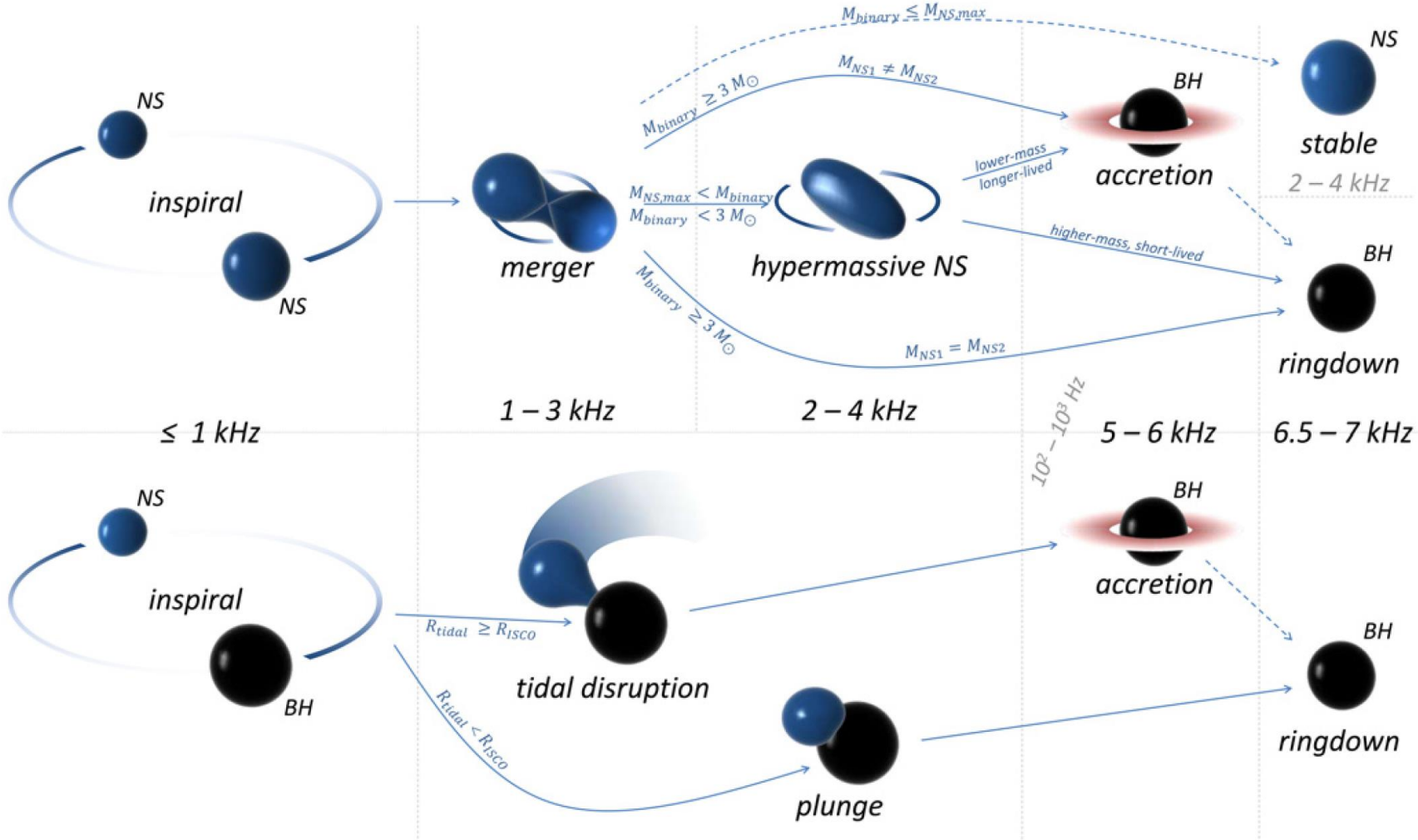
Black hole collision



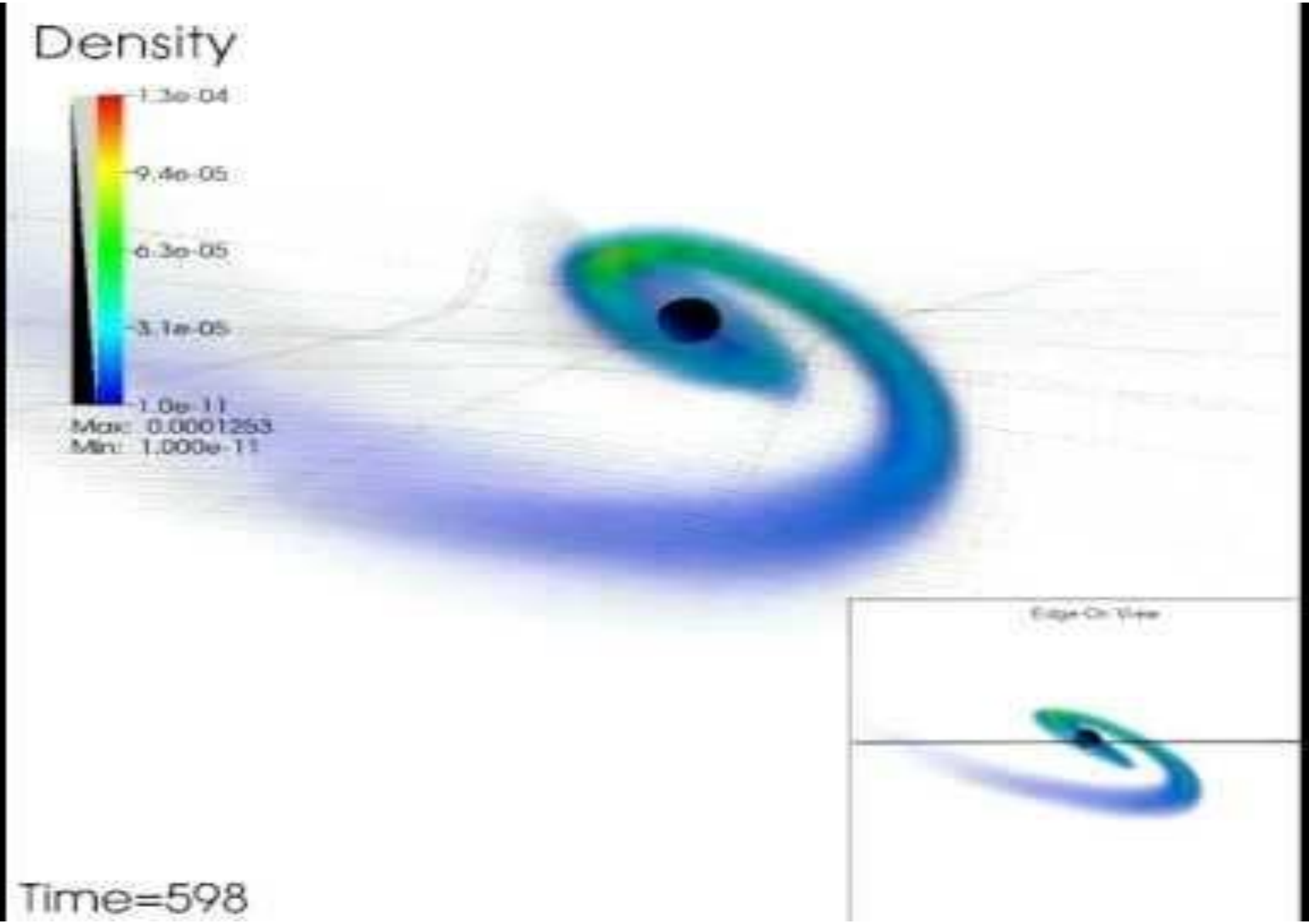
https://www.black-holes.org/



https://www.black-holes.org/

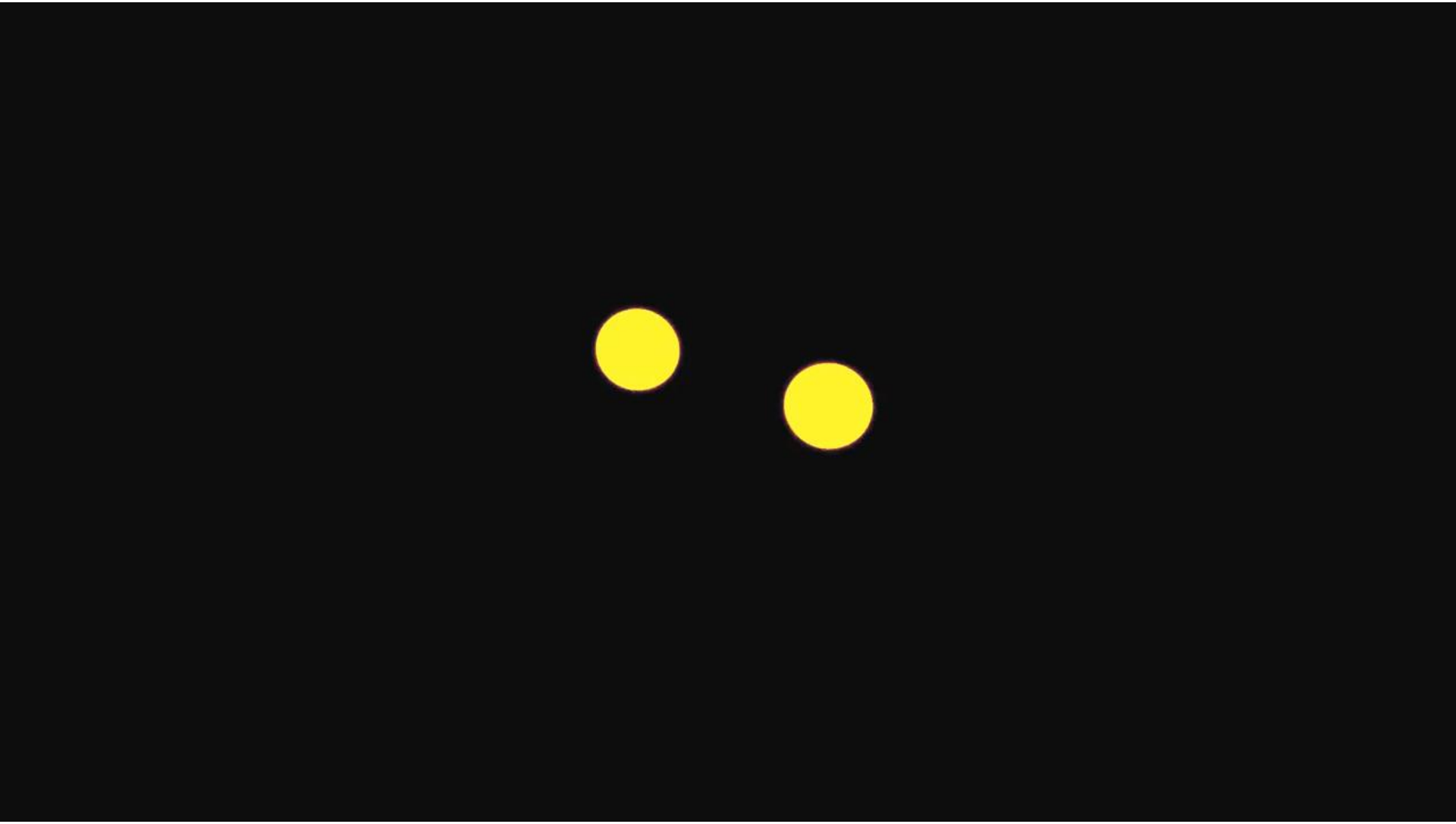


Bartos et al. (2013)

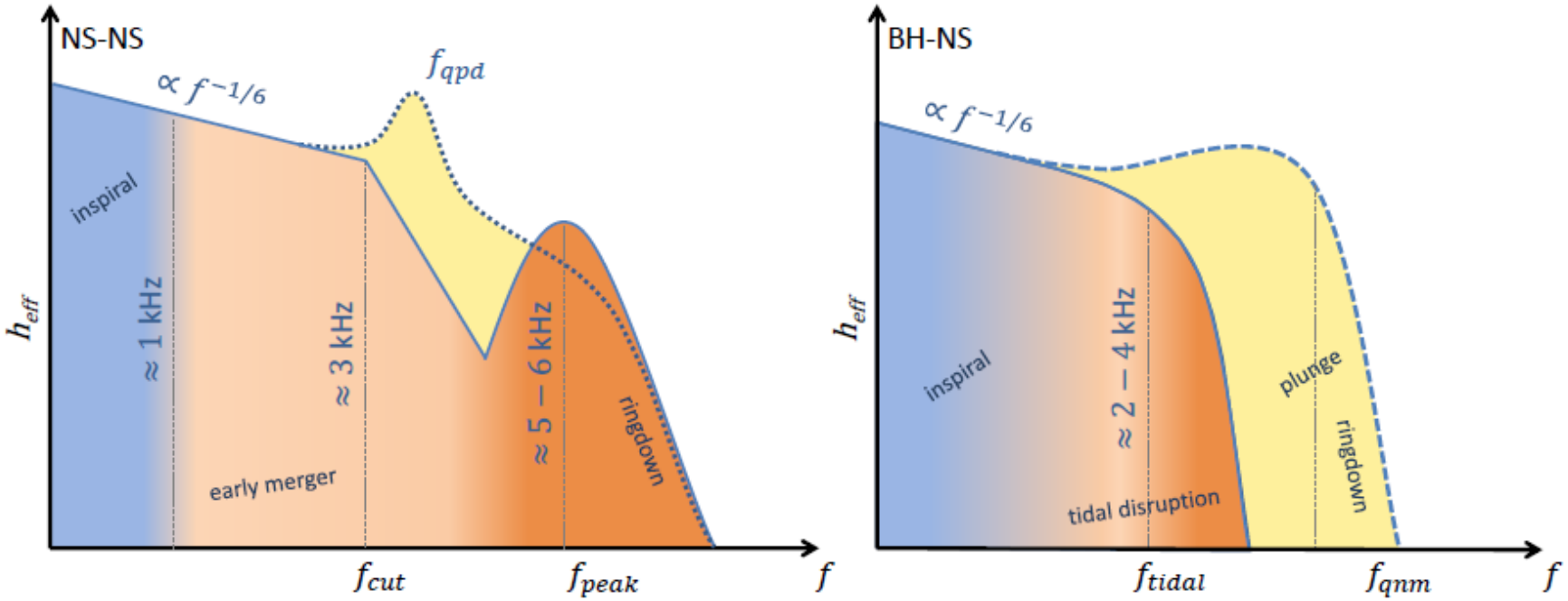


https://www.black-holes.org/

Binary neutron star merger



Radice et al.



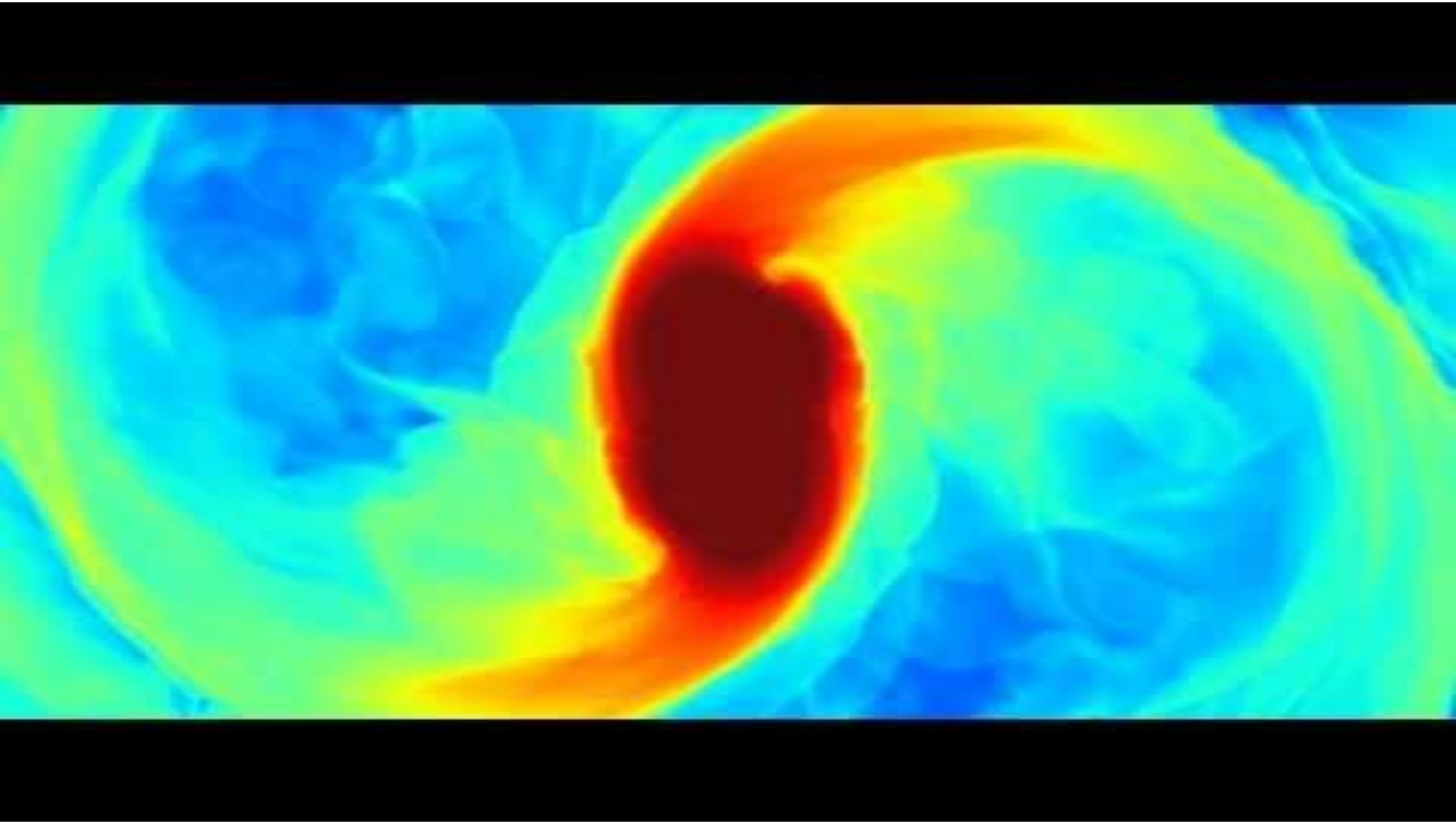
Bartos et al. (2013)

Subsequent evolution of the (rotating) remnant

$$\beta \equiv T_{\rm rot}/|W|$$

- Dynamical instability (non-axisymmetric shape with same angular momentum is energetically favorable
  - Uniformly rotating body $\beta \gtrsim 0.27$
  - Differentially rotating body $\beta \lesssim 0.09$

- Secular instability (redistribution of angular momentum)
  - Dissipation due to GW or viscosity $\beta \gtrsim 0.14$



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