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# (A Universe of) Massive Black Holes: Birth, Growth and Impact

Organizers:

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I like black's <sup>hole</sup> authority: its **gravity**, its self-evidence, its radicalism. Its **powerful strength** of contrast gives an intense presence to all other colour, and when it **illuminates** the darkest of them, it confers to them a sombre grandeur. Black <sup>hole</sup> has unsuspected possibilities, and **remaining alert to what I do not know**, I go to meet them.



Soulages  
**P. Soulages 2005**

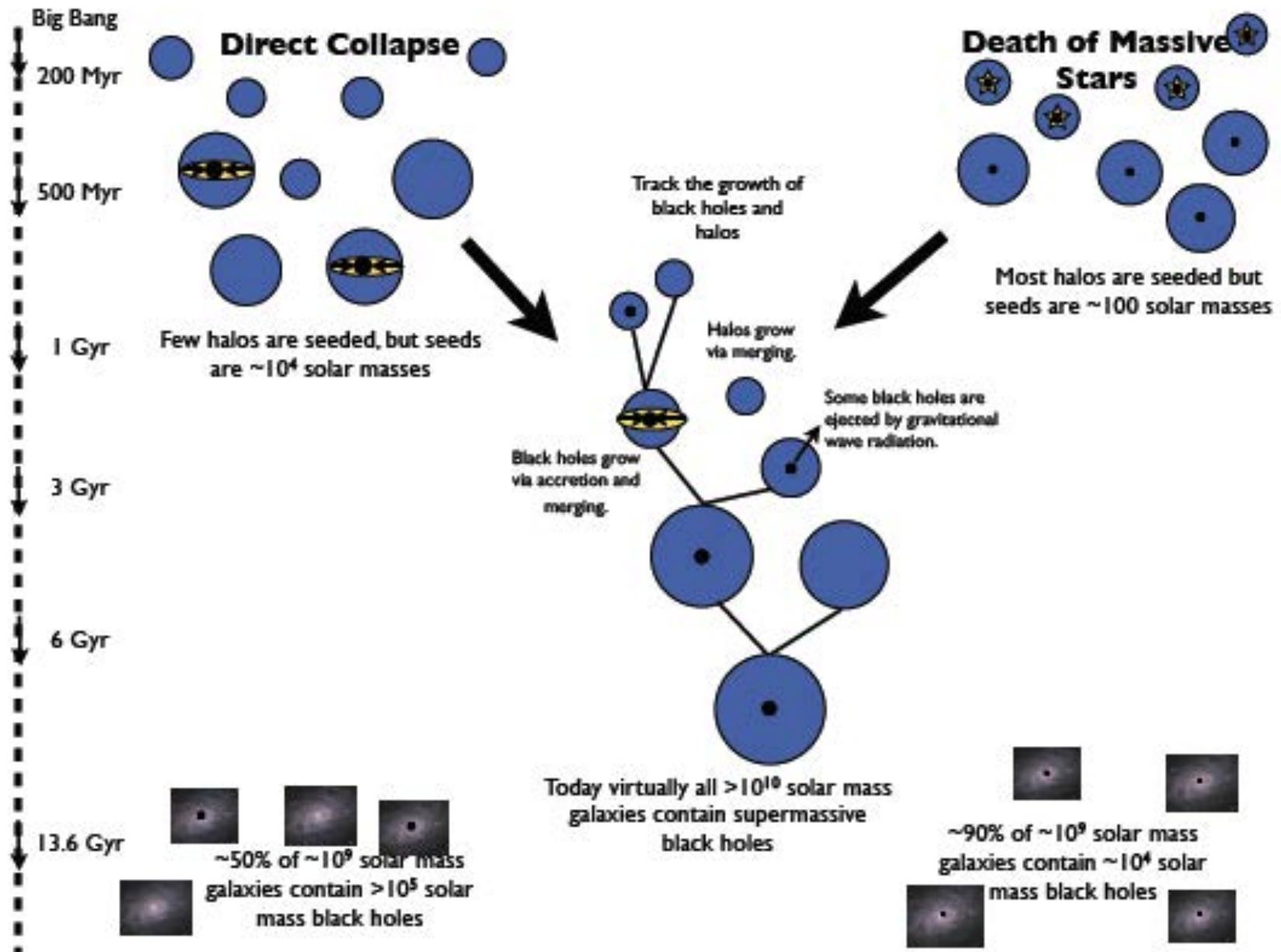
Pierre Soulages (born 1919)  
French abstract painter, engraver,  
lithographer and designer

# Rationale

- *Physics* of massive black holes and their link to the evolution of *cosmic structures*
- Explore the relevant processes operating on *different scales* and in *different physical regimes* relevant to black holes

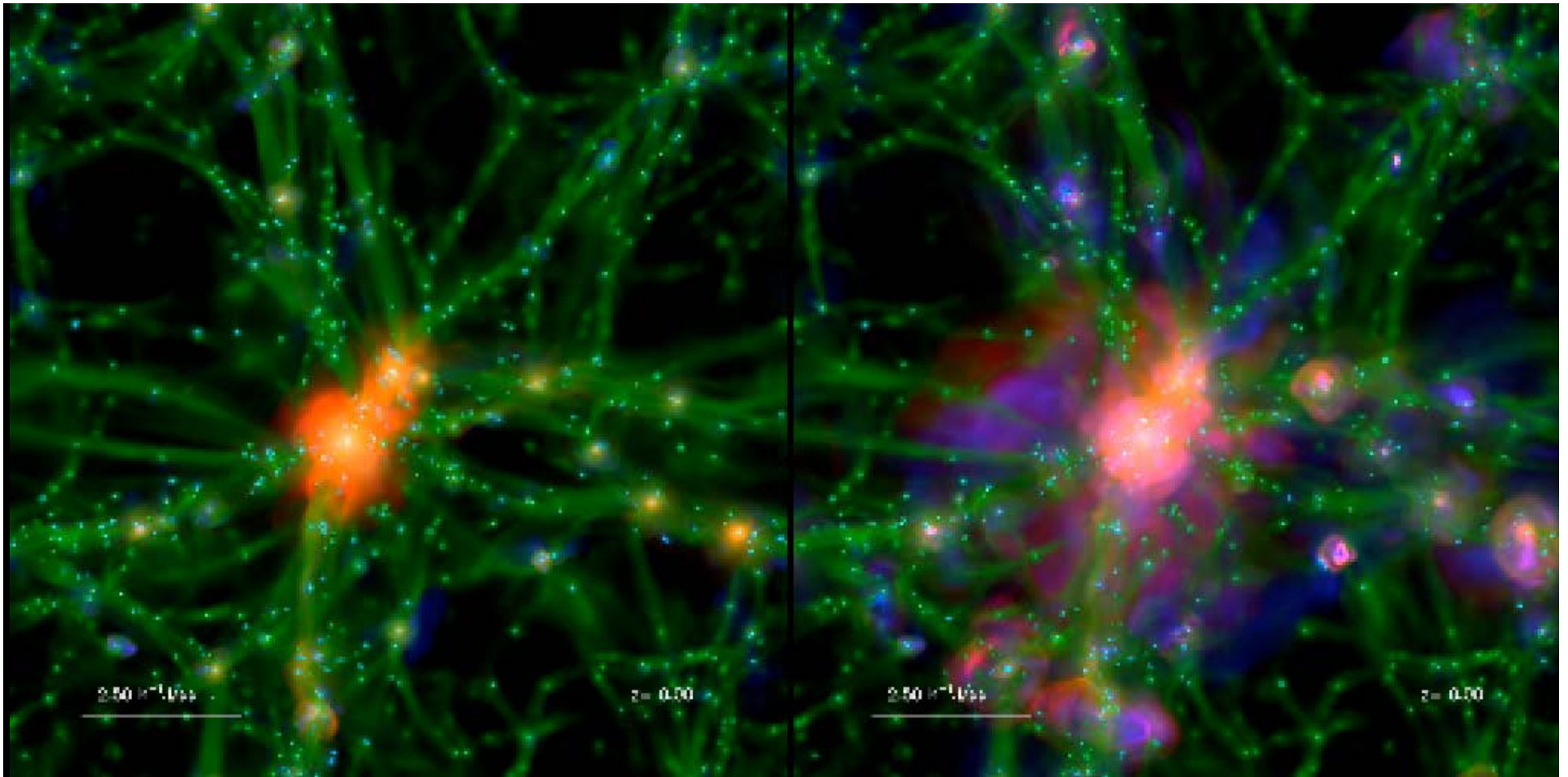
# I. BH formation

- Identify the main physical ingredients of each formation model
- Bridge the gap between Newtonian and general relativity models
- Investigate observational consequences that can distinguish different models



## 2. Accretion and feedback

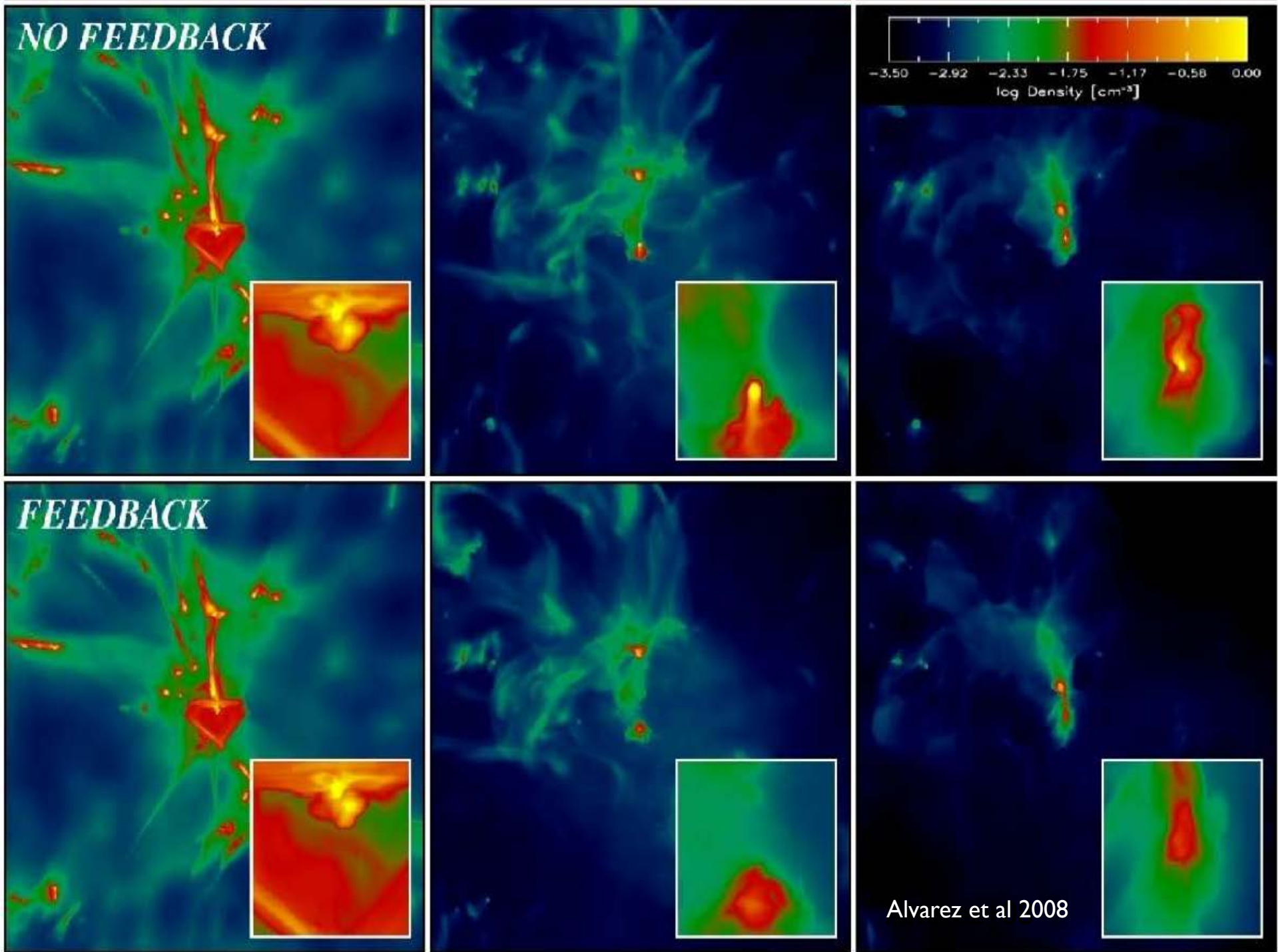
- How models of accretion and feedback on different scales relate to observations
- How observations and physical models on small scales can inform large scale simulations in order to improve 'sub-grid' physics
- Assess the role of AGN in energizing the intracluster/interstellar medium and estimate the implications for accretion/feedback themselves



Courtesy of Y. Dubois

NO AGN

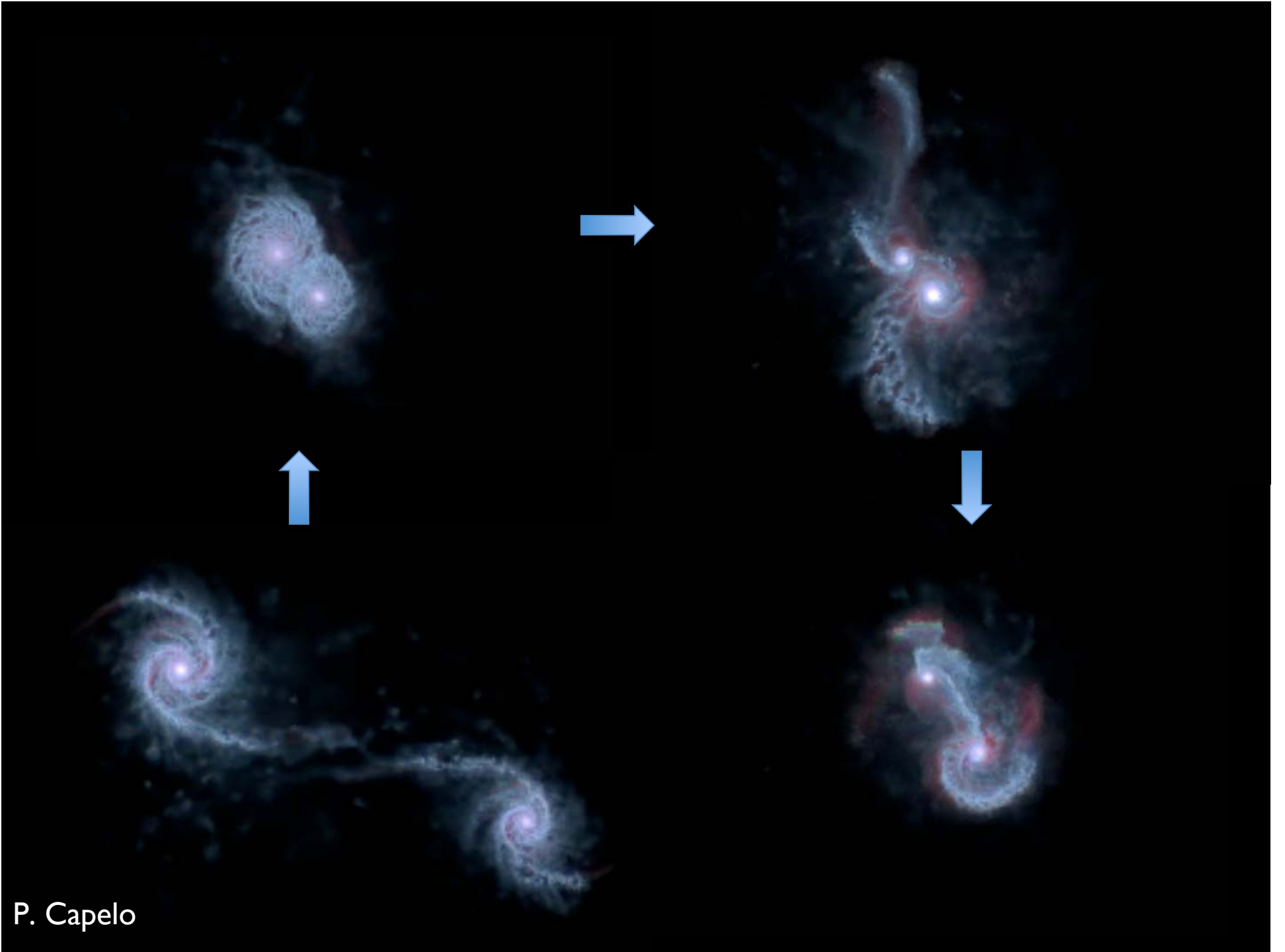
WITH AGN



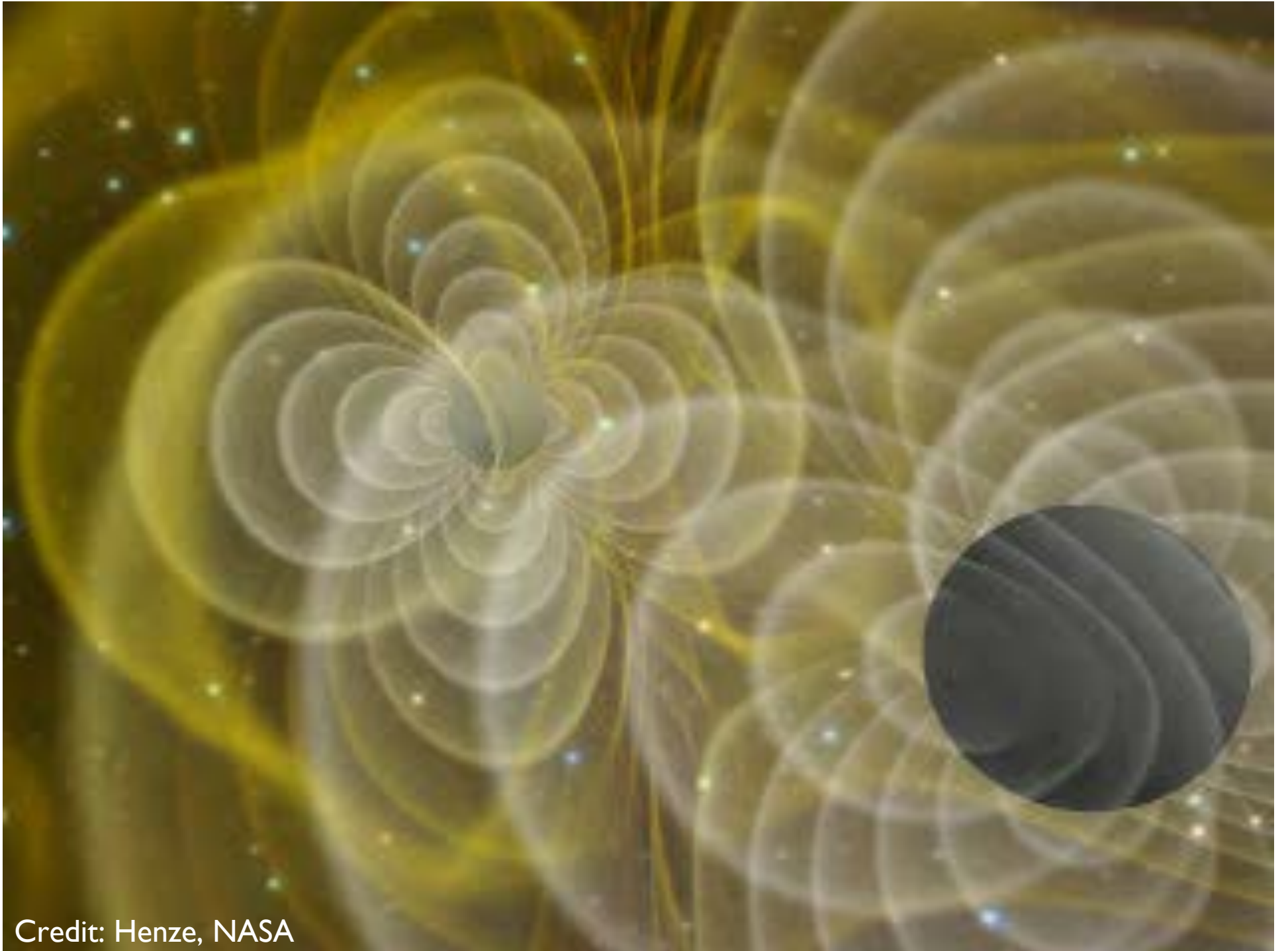


# 3. BH mergers

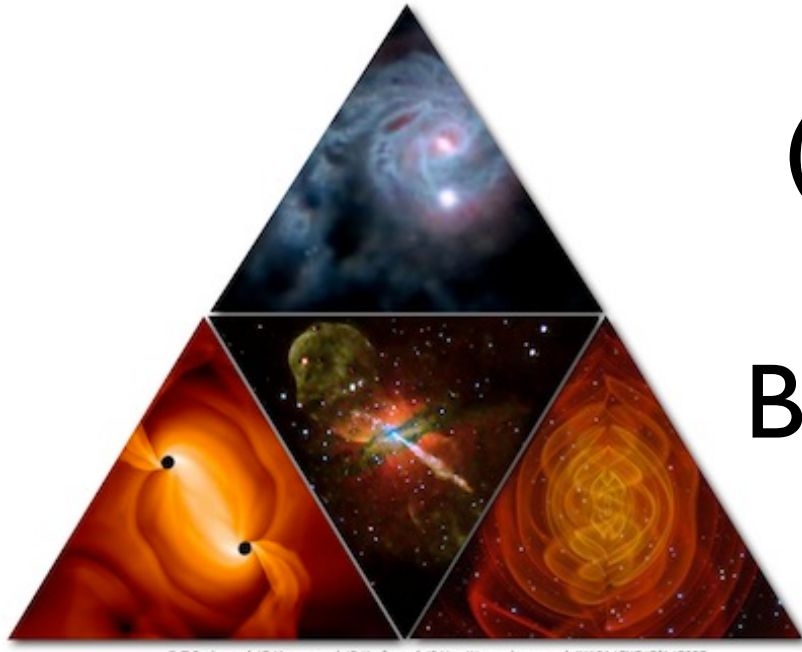
- The role of gas vs stars in shrinking massive BH binaries
- Gravitational waves and electromagnetic counterparts
- Timescales associated to sinking from the galactic scales of many kiloparsecs to the milliparsecs relevant gravitational radiation



P. Capelo



Credit: Henze, NASA



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