

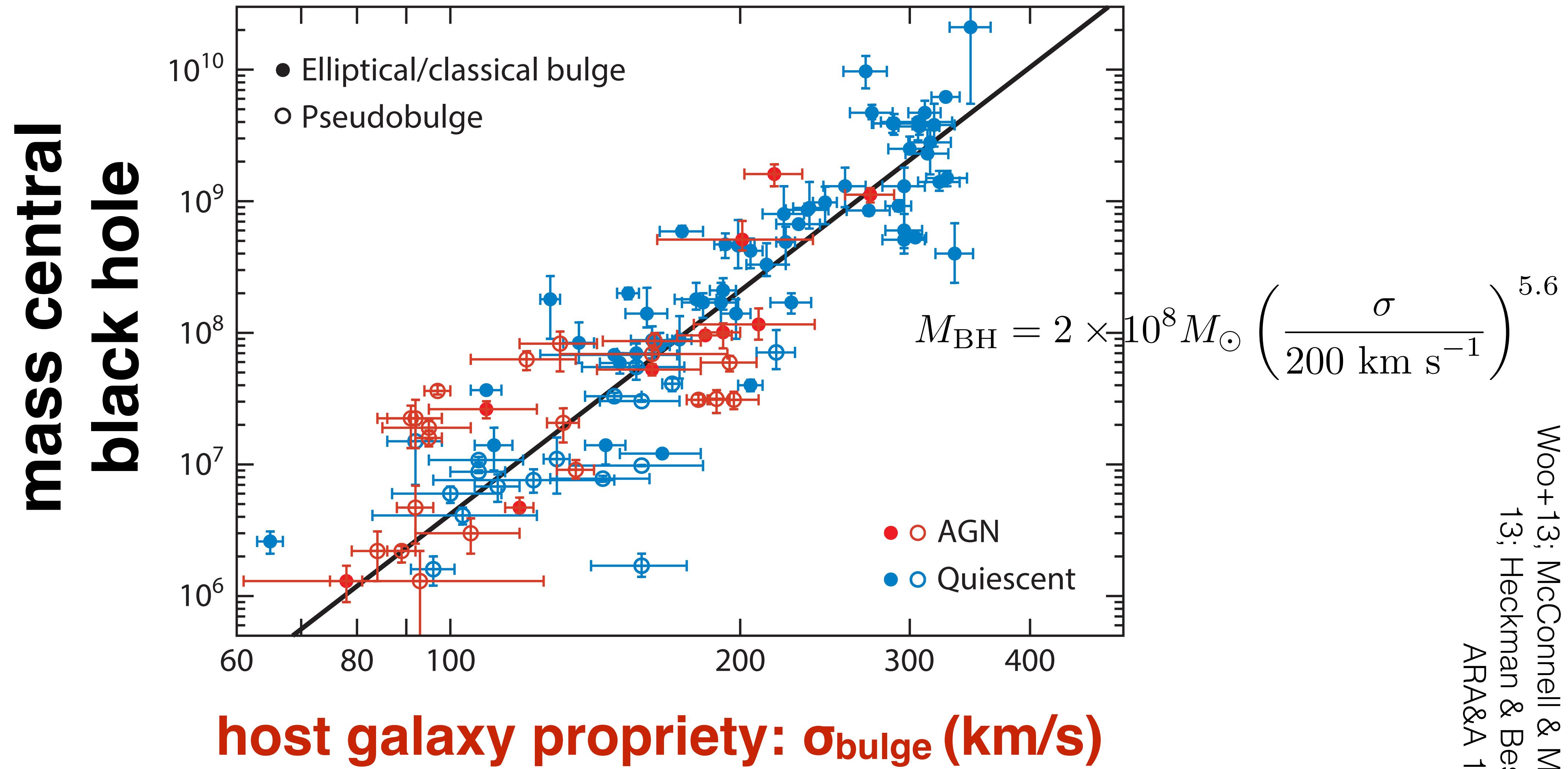
Cosmic impact of black holes



Rodrigo Nemmen
Universidade de São Paulo

Remarkable connection between central black holes and host galaxies: the M - σ relation

Fundamental link between BH growth and galaxy evolution



Connection between black holes and host galaxies was completely unexpected

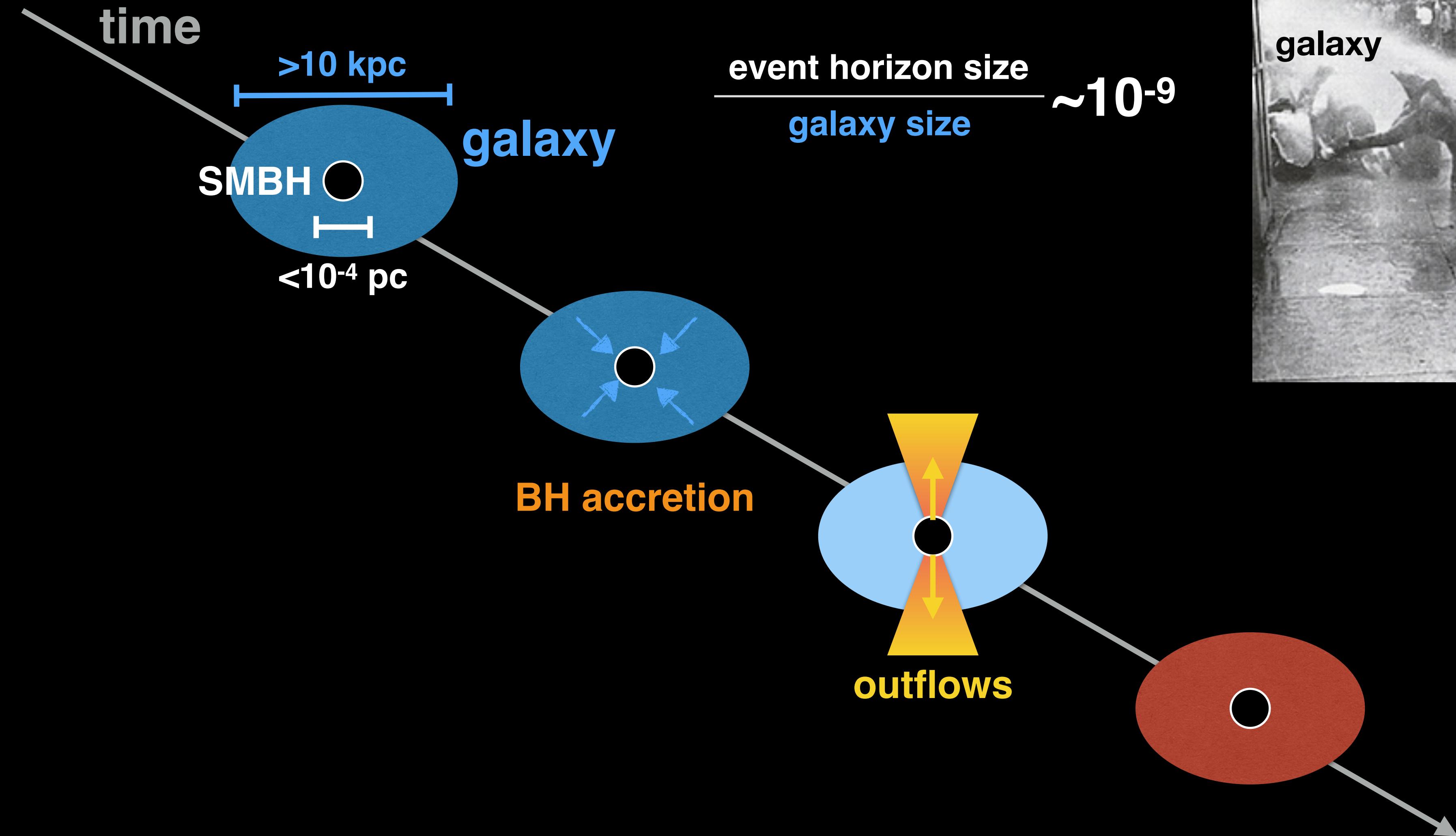
SMBH



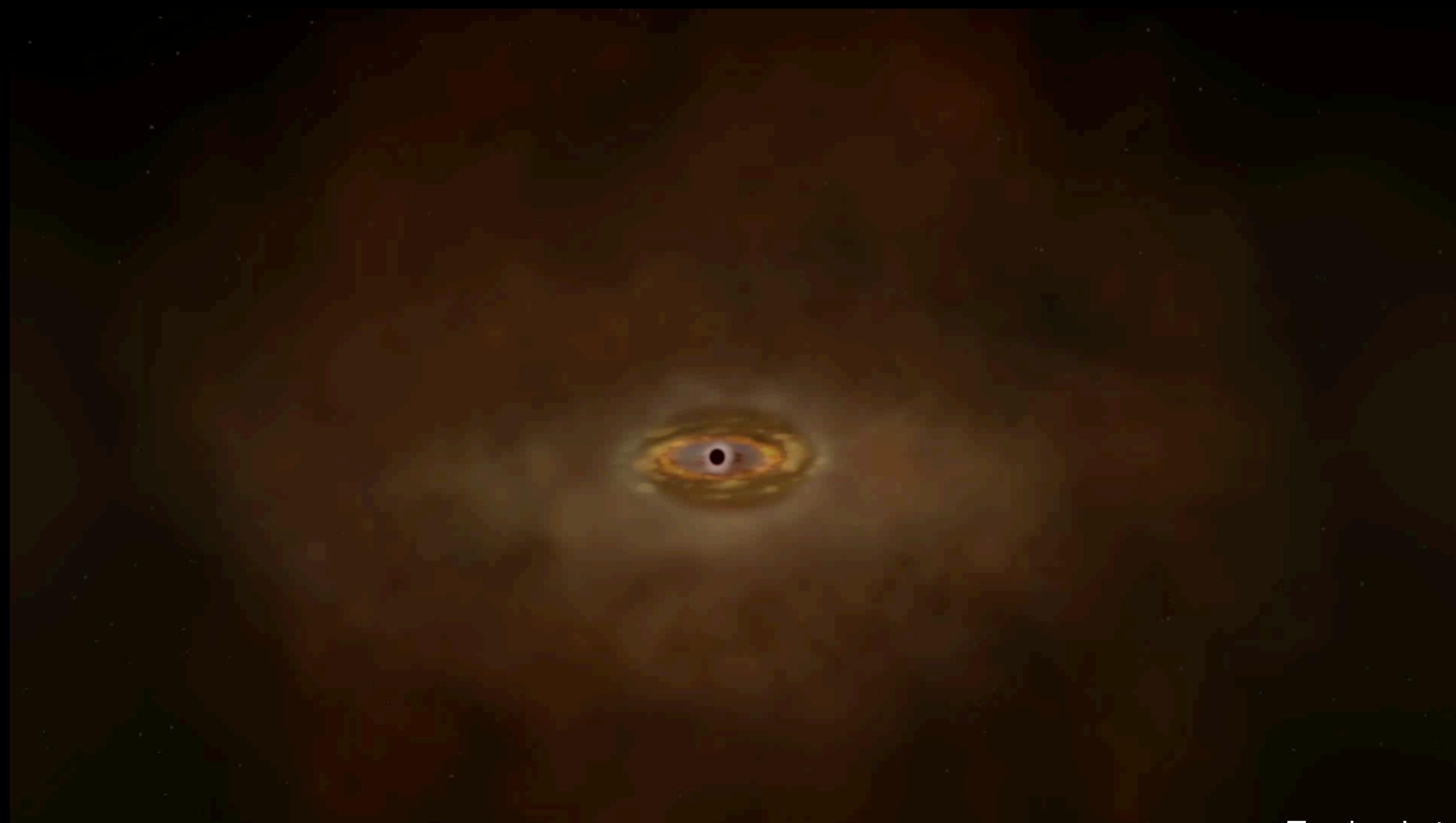
Grapefruit



Energy release from supermassive BHs impact large scale structure formation (“AGN feedback”)

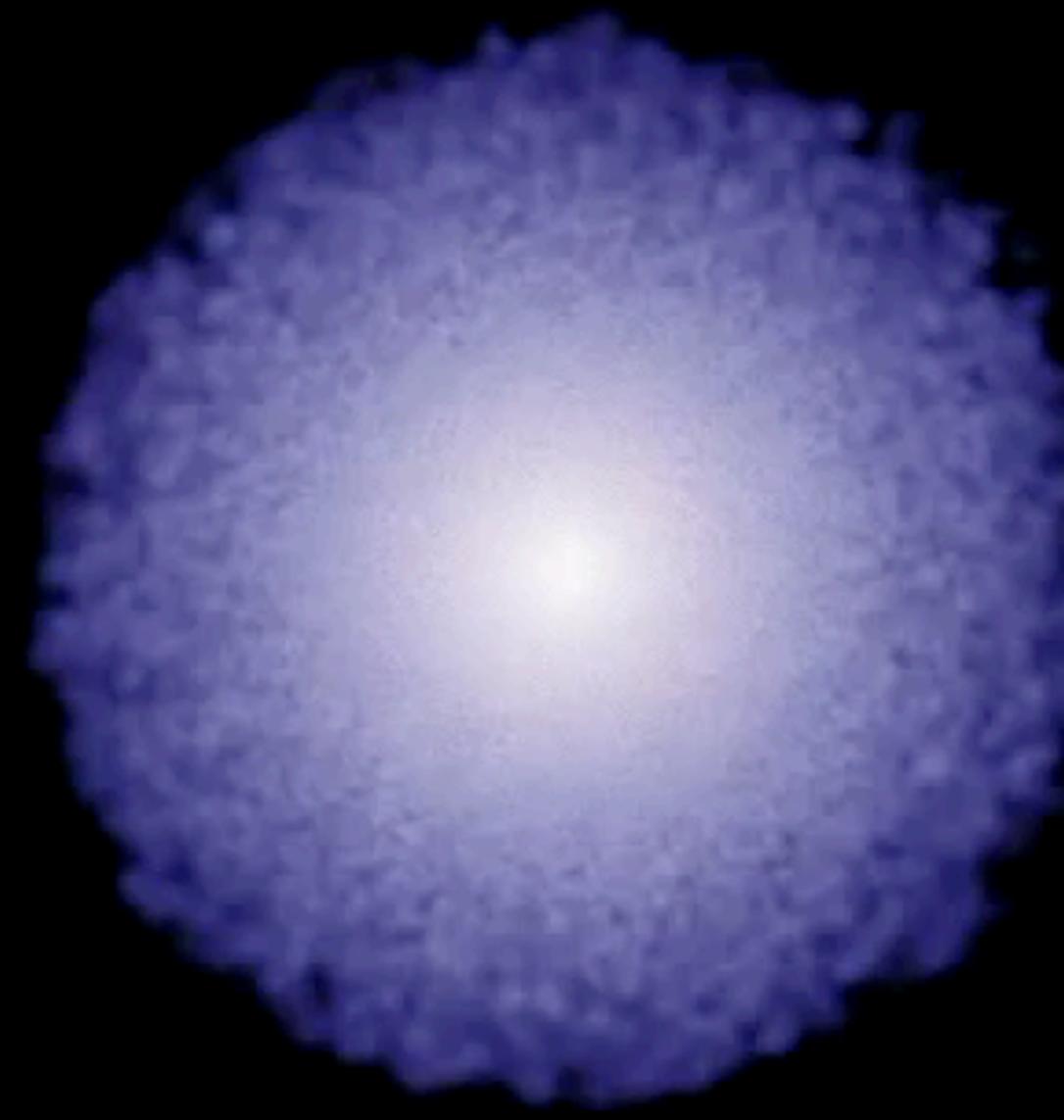
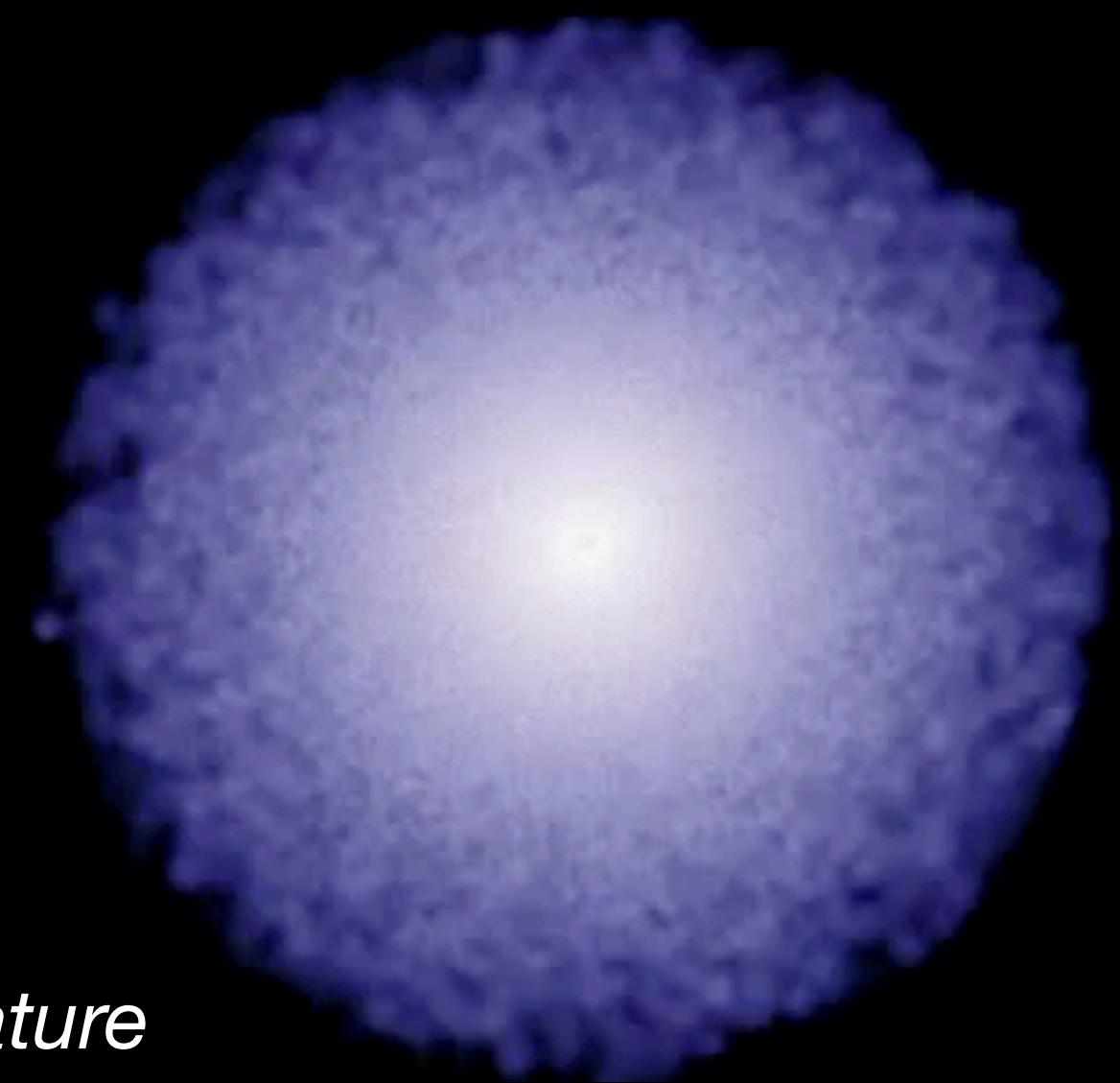


AGN feedback: Black hole outflows transfer energy from near the BH to galactic scales



Credit: NASA
Tombesi et al. 2015, *Nature*

$T = 0 \text{ Myr}$





- How do supermassive black holes affect their host galaxies?**
- What is their cosmological evolution?**