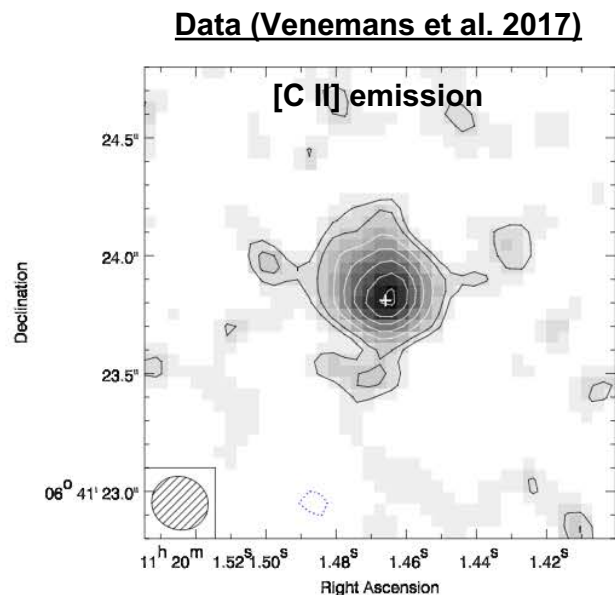
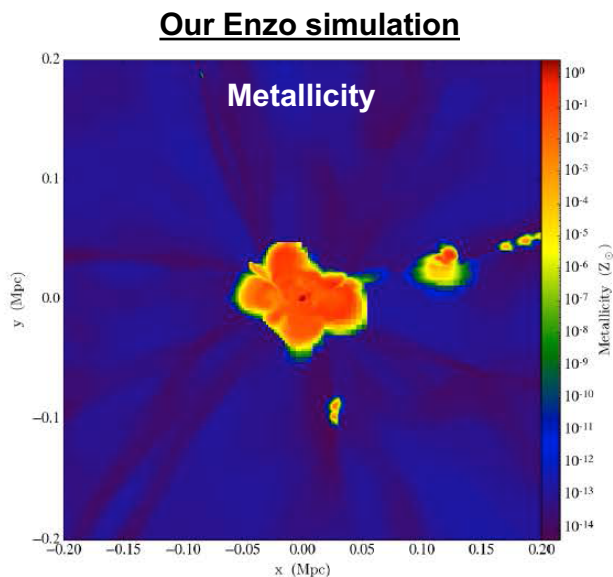


The Birth and Growth of the Most Massive Black Holes in the Early Universe

Smidt, Whalen, Johnson & Li (2017), arXiv:1703.00449

- For the first time, we find broad agreement with the available data on the earliest known quasar at $z = 7.1$ (Mortlock et al. 2011).
- The key advance in our simulations is the inclusion of on-the-fly ray-tracing X-ray feedback from the central black hole (BH).
- The growth is generally sub-Eddington, implying that the black may have originated as a direct collapse (DCBH) seed.



Quantity	Data	Simulation
BH mass [10^9 Msun]	$2^{+1.5}_{-0.7}$	2.2
BH accretion rate [Msun yr ⁻¹]	~ 40	11^{+20}_{-10}
Star formation rate [Msun yr ⁻¹]	105 -- 340	245
Radius of H II region [Mpc]	$2.1^{+0.1}_{-0.1}$	2
Metallicity [Z_{sun}]	~ 1	1 -- 2
Dynamical mass [10^9 Msun]	43^{+9}_{-9}	40