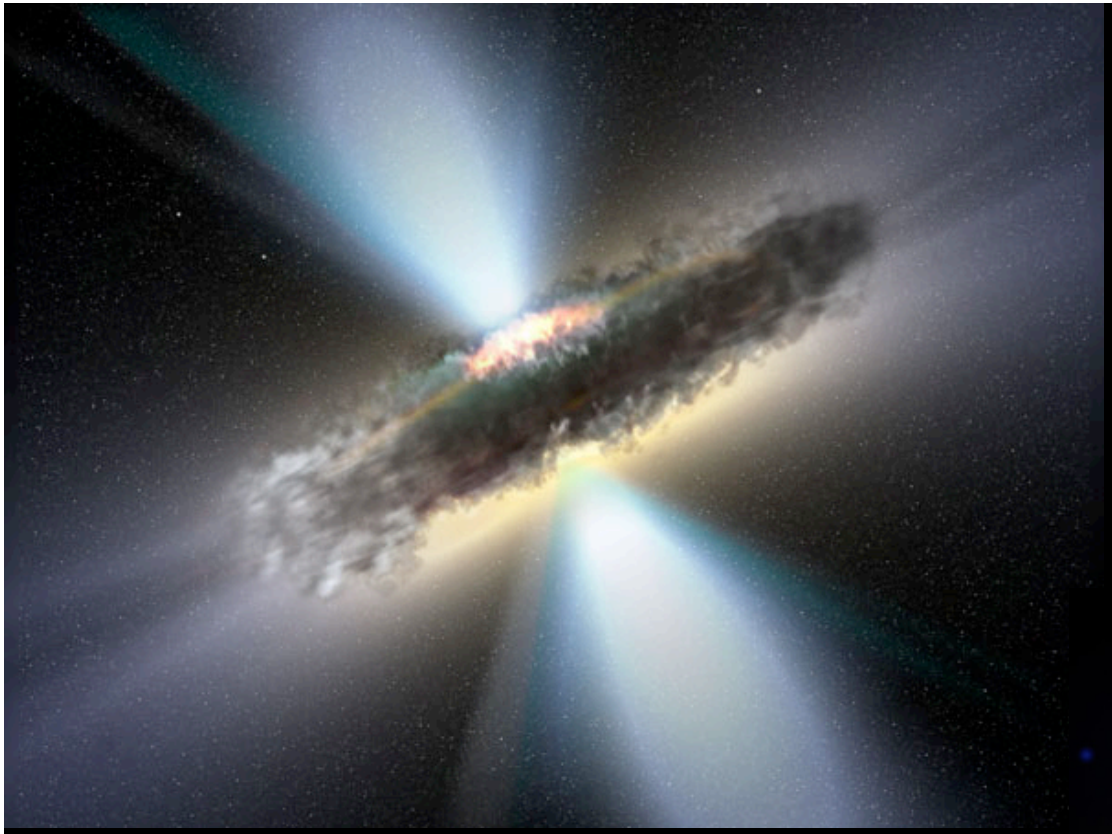
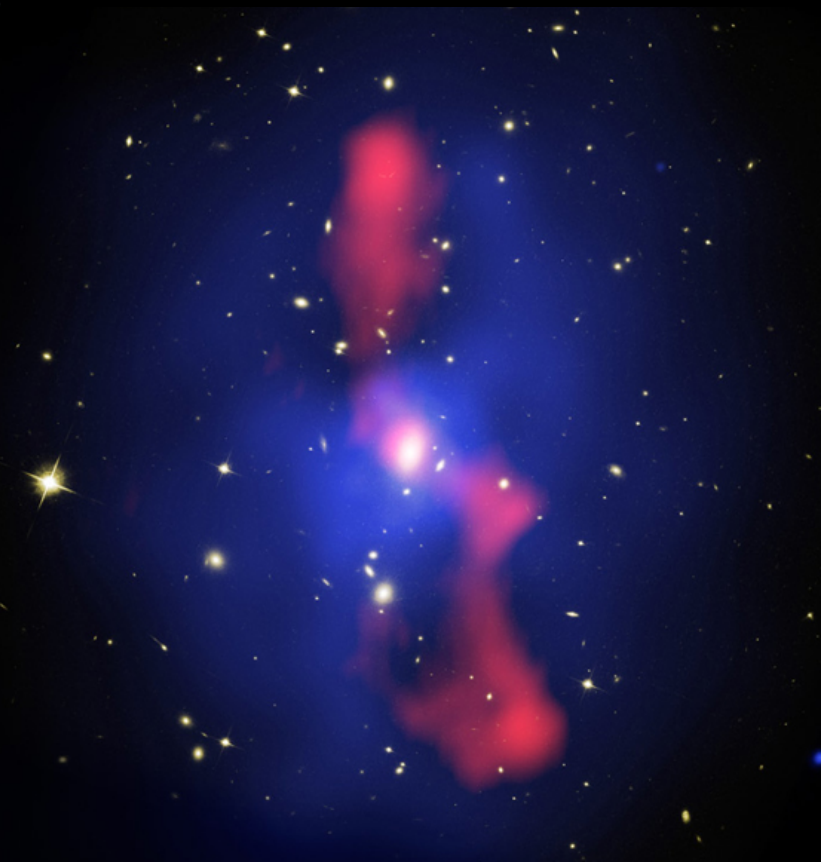


AC Fabian, B. McNamara

Cosmic Feedback from AGN



Possible effect of central black hole on host galaxy

$$E_{BlackHole} > 30 \times E_{Galaxy}$$

Energy released by growth of Black Hole

Gravitational Binding Energy of Host Galaxy

2 major modes for the interaction:

Kinetic (radio/jet) and Radiative (quasar)

AGN with reported fast outflows

			v/c	
APM 08279+5255	BALQSO	3.91	0.2 and 0.4	(Chartas et al. ApJ, 2002, ApJ, 579, 169)
H 1413+117	BALQSO	2.56	0.23 and 0.67	(Chartas et al. ApJ, 2007, 661, 678)
•PG 1115+080	BALQSO	1.72	0.1 and 0.4	(Chartas et al. ApJ, 2003, 595, 85)
PDS 456	RQ QSO	0.184	0.15	(Reeves et al. ApJ, 2003, 593, 65)
PG 1211+143	NLS1	0.081	0.13	(Pounds et al. MNRAS, 2003, 345, 705) (1) (2)
PG 0844+349	Sey 1	0.064	0.2	(Pounds et al. MNRAS, 2003, 346, 1025) (3)
Mrk 509	Sey 1	0.034	0.1-0.2	(Dadina et al. A&A, 2005, 442, 461)
IRAS13197-1627	Sey 1.8	0.0165	0.11	(Dadina and Cappi, A&A, 2004, 413, 921)
IC 4329a	Sey 1	0.016	0.1	(Markowitz et al. 2006, ApJ, 646, 783)
MCG-5-23-16	Sey 1.9	0.0085	0.1	(Braito et al. 2006, AN, 327, 1067)
MCG-6-30-15	Sey 1.2	0.0077	0.007	(Young et al. 2005, ApJ, 631, 73)
NGC 1365	Sey 1.8	0.0055	0.017	(Risaliti et al. 2005, ApJ, 630, 129)

(1) Disputed by Kaspi et al., who claim the outflow may arise from a lower velocity, depending on the specific identification of lines in the spectrum.

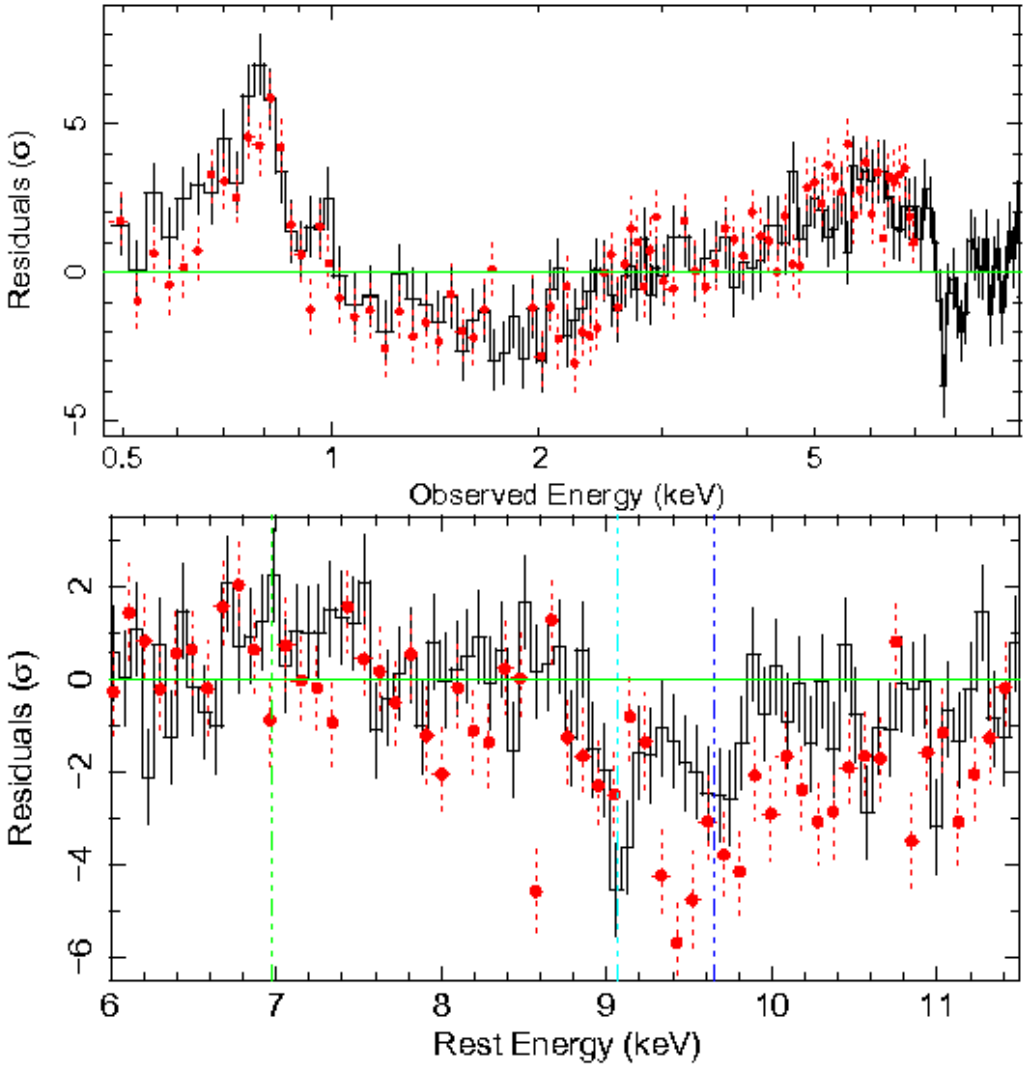
(2) Pounds & Page 2006 (astro-ph0607099) confirm the high velocity outflow in PG 1211+143.
Reeves et al 2008 (astro-ph08011578) use a variability argument to show that the iron K shell absorption in PG 1211+143 is not due absorption from local IGM gas but is most likely associated with a fast outflow.

(3) Disputed on the basis of background subtraction in the EPIC/PN spectrum (Brinkman et al. 2005)

Likely that ALL AGN have outflows but influence at present unclear

PDS456 z=0.184 Reeves+09 Suzaku

Kinetic power ~ 10^{47} erg/s

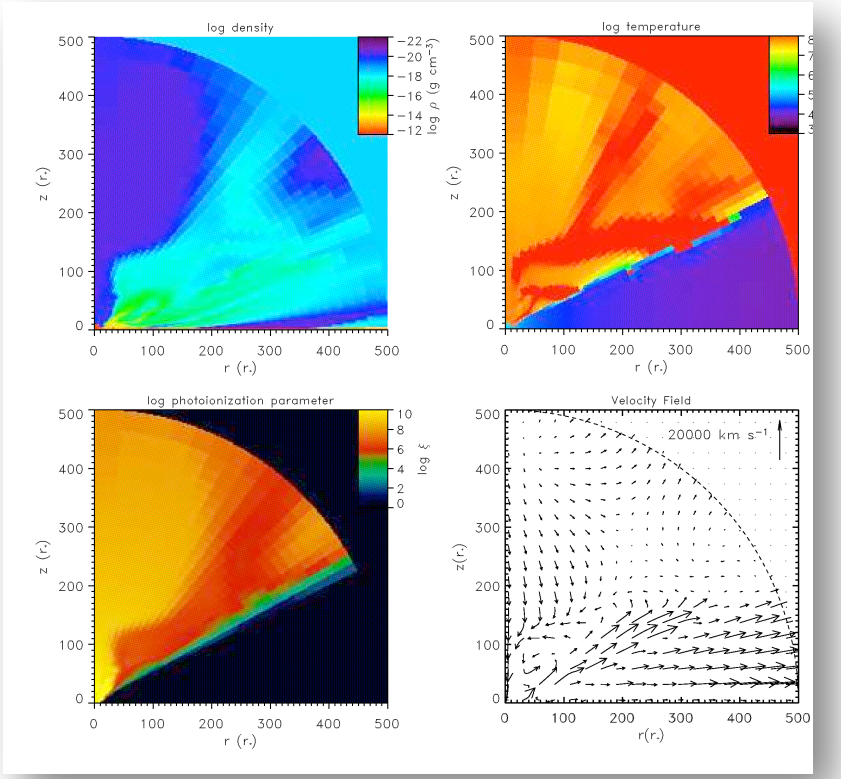


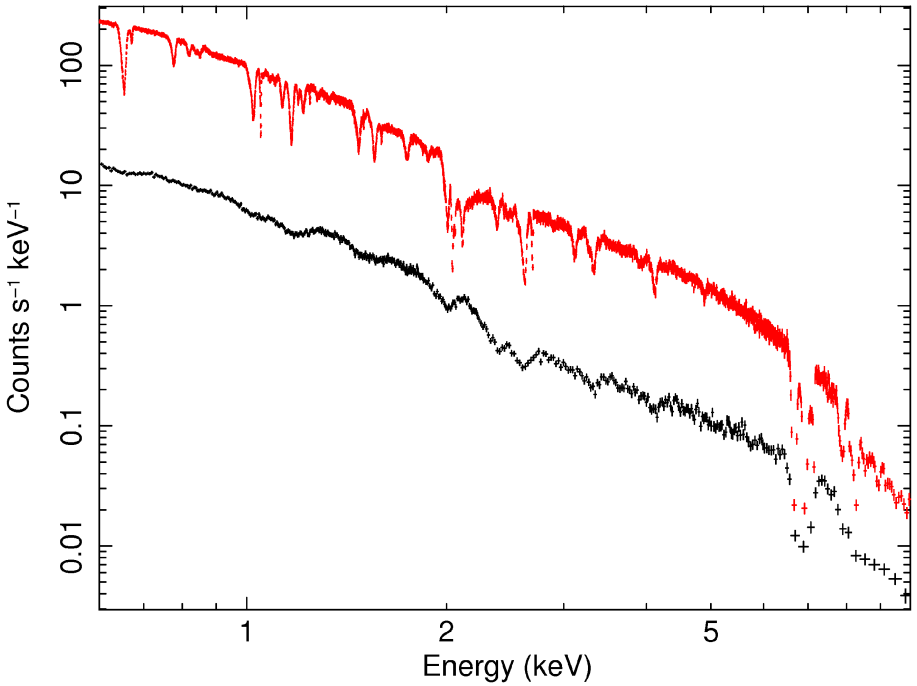
XMM 2001
in red

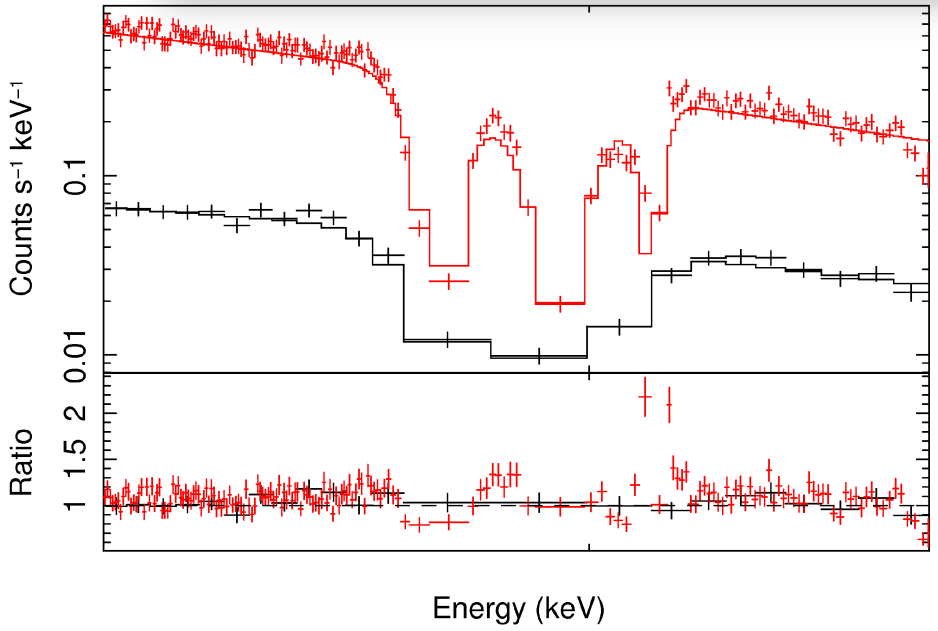
Wind Outflow

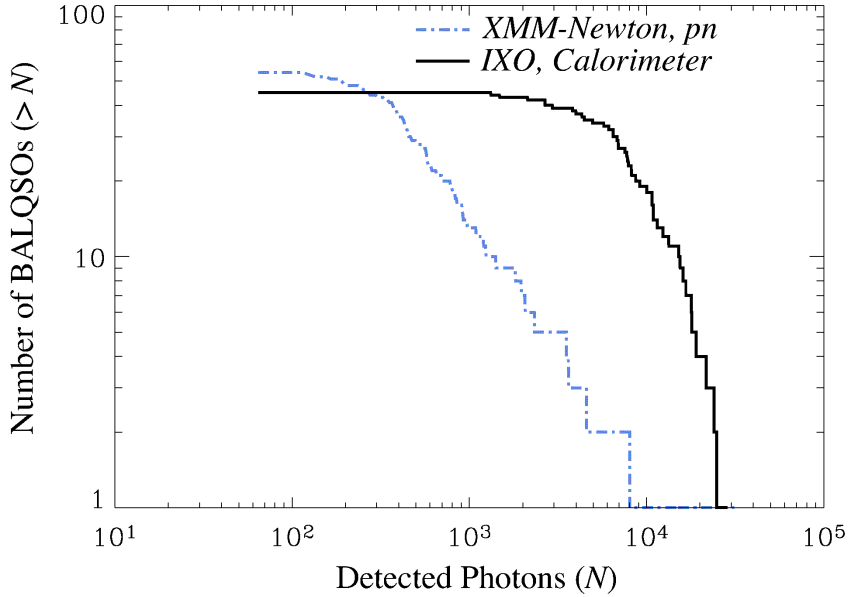
(Model by Proga & Kallman04, Spectrum by N Schurch, at 62 deg)

IXO in red, XMM in black

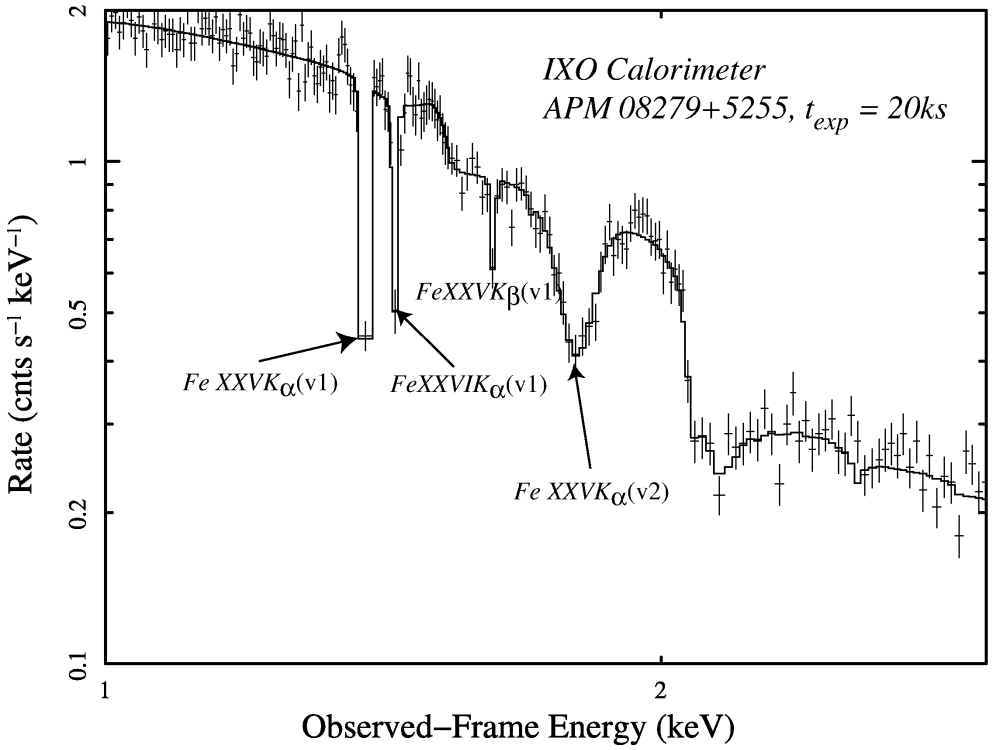




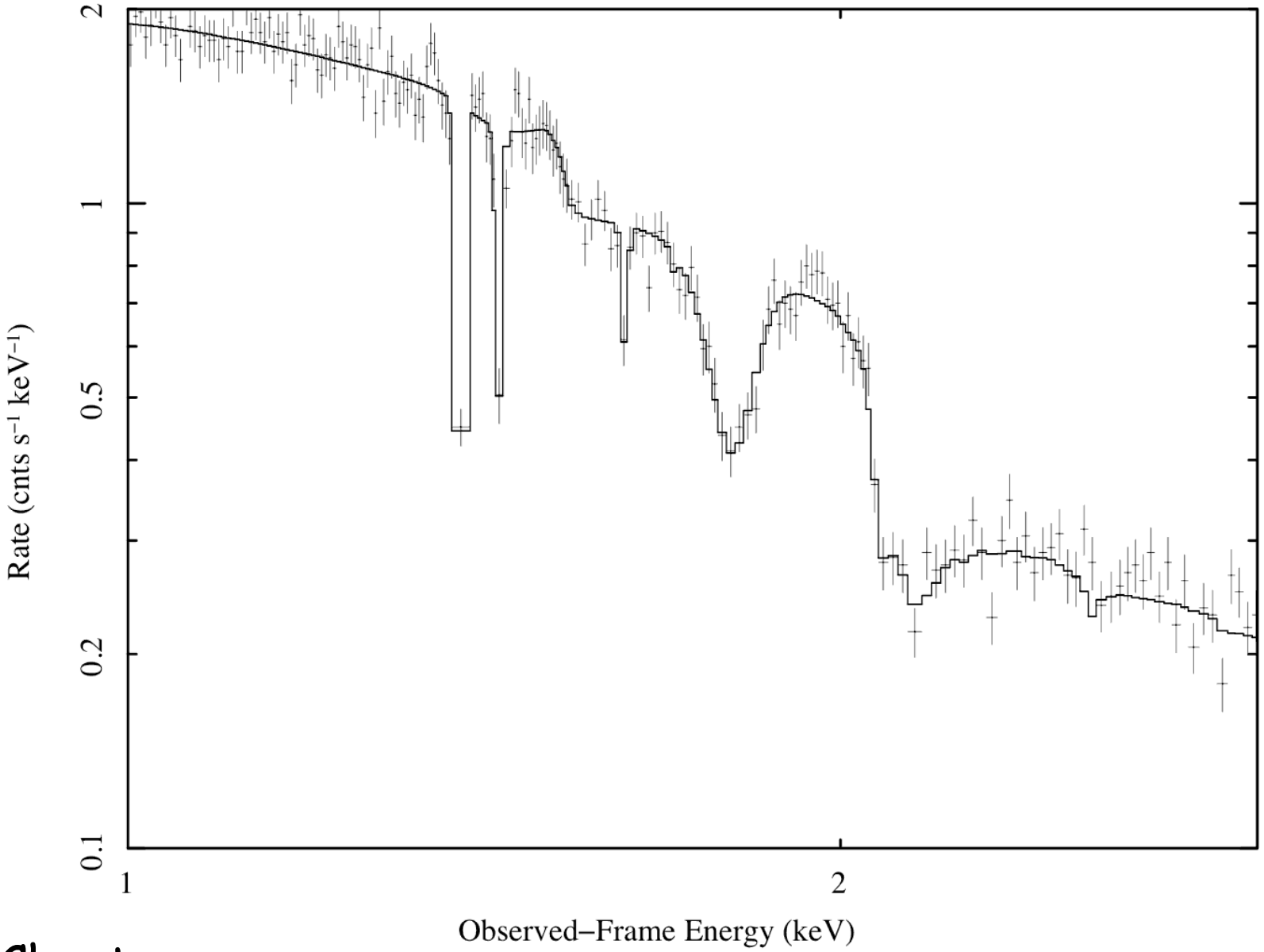




BAL QSOs
George Chartas



20x20s IXO simulations of z=3.91 BALQSO APM08279

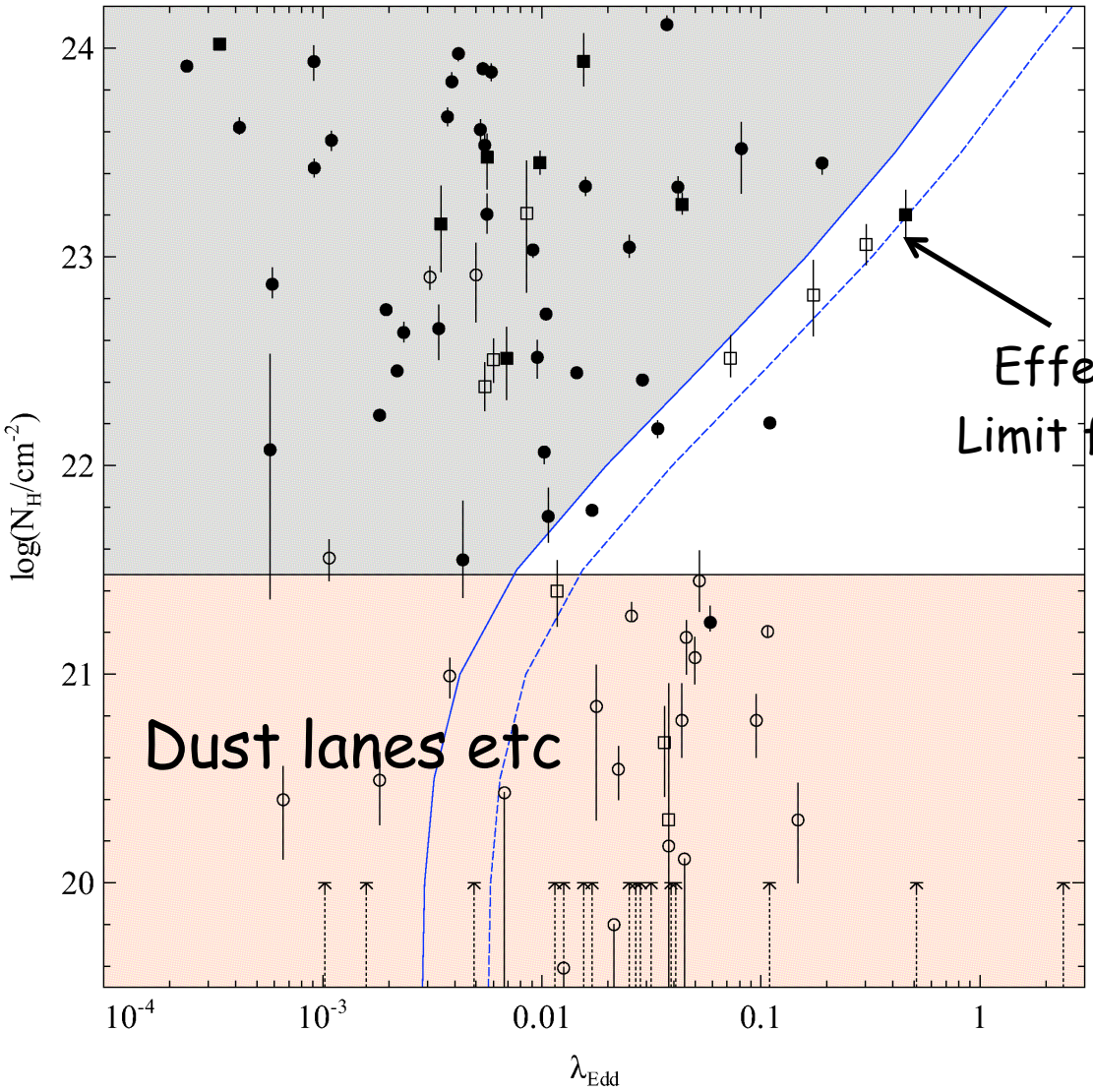


G Chartas

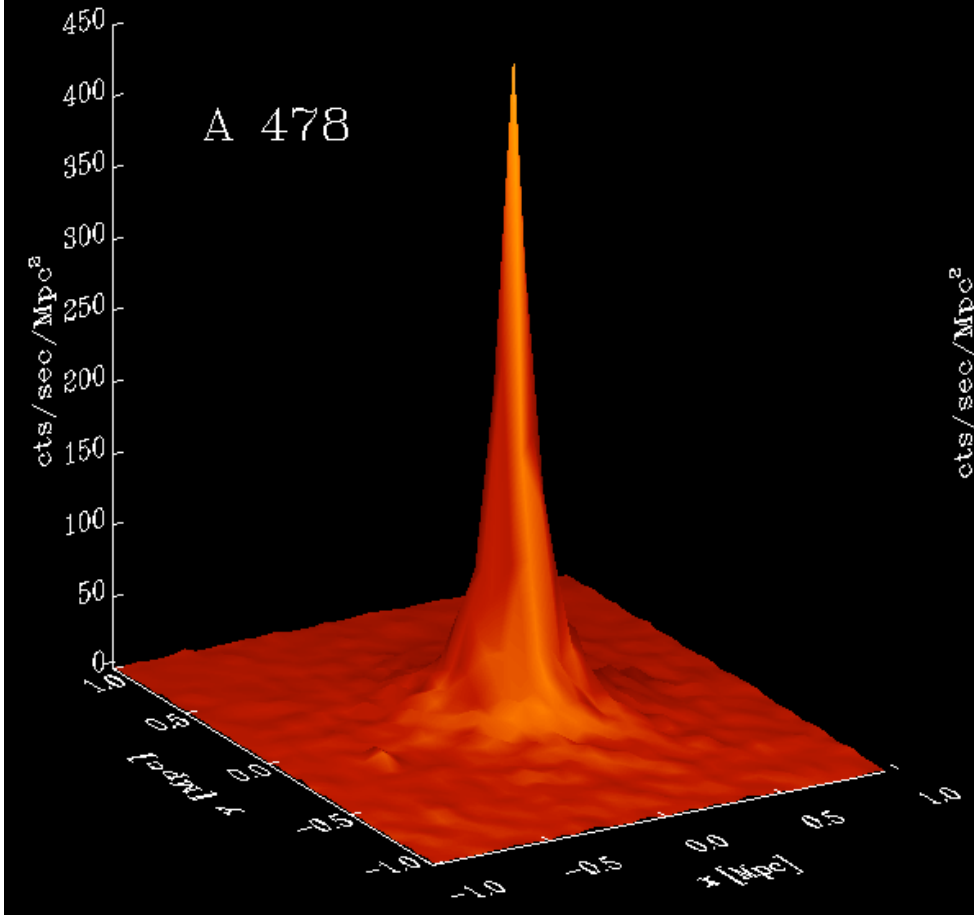
Radiative mode example

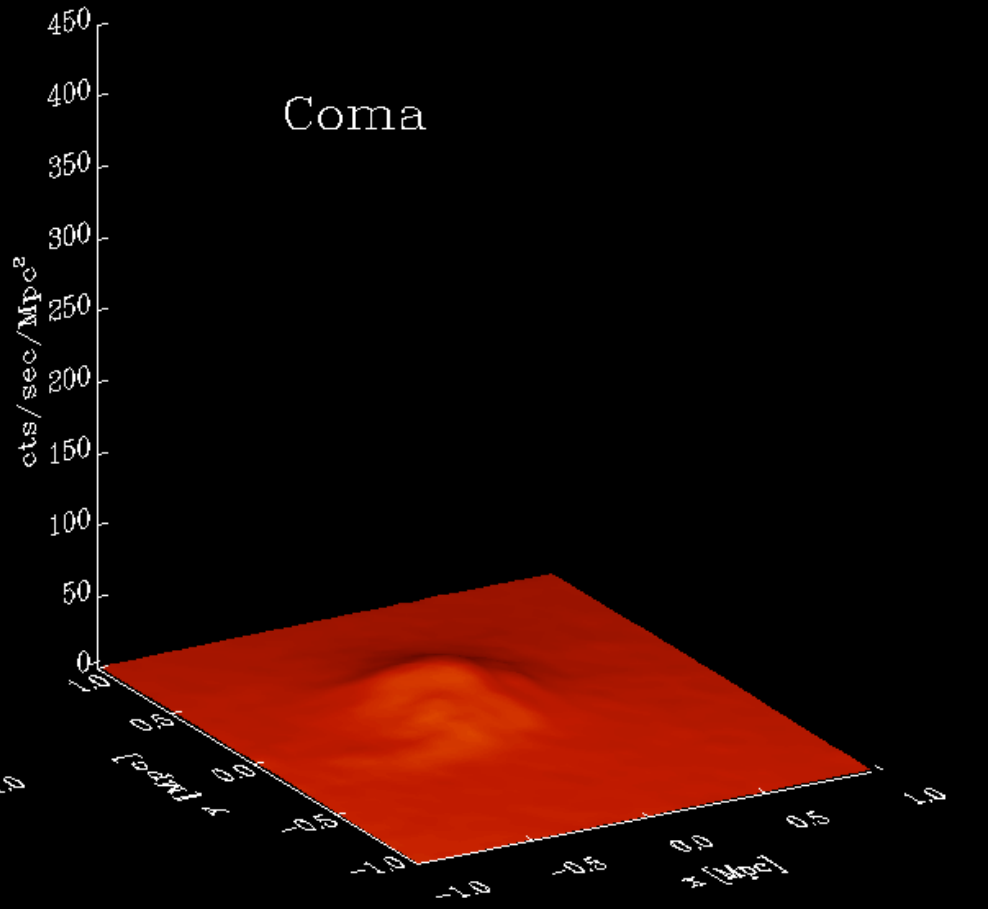
Fabian+09

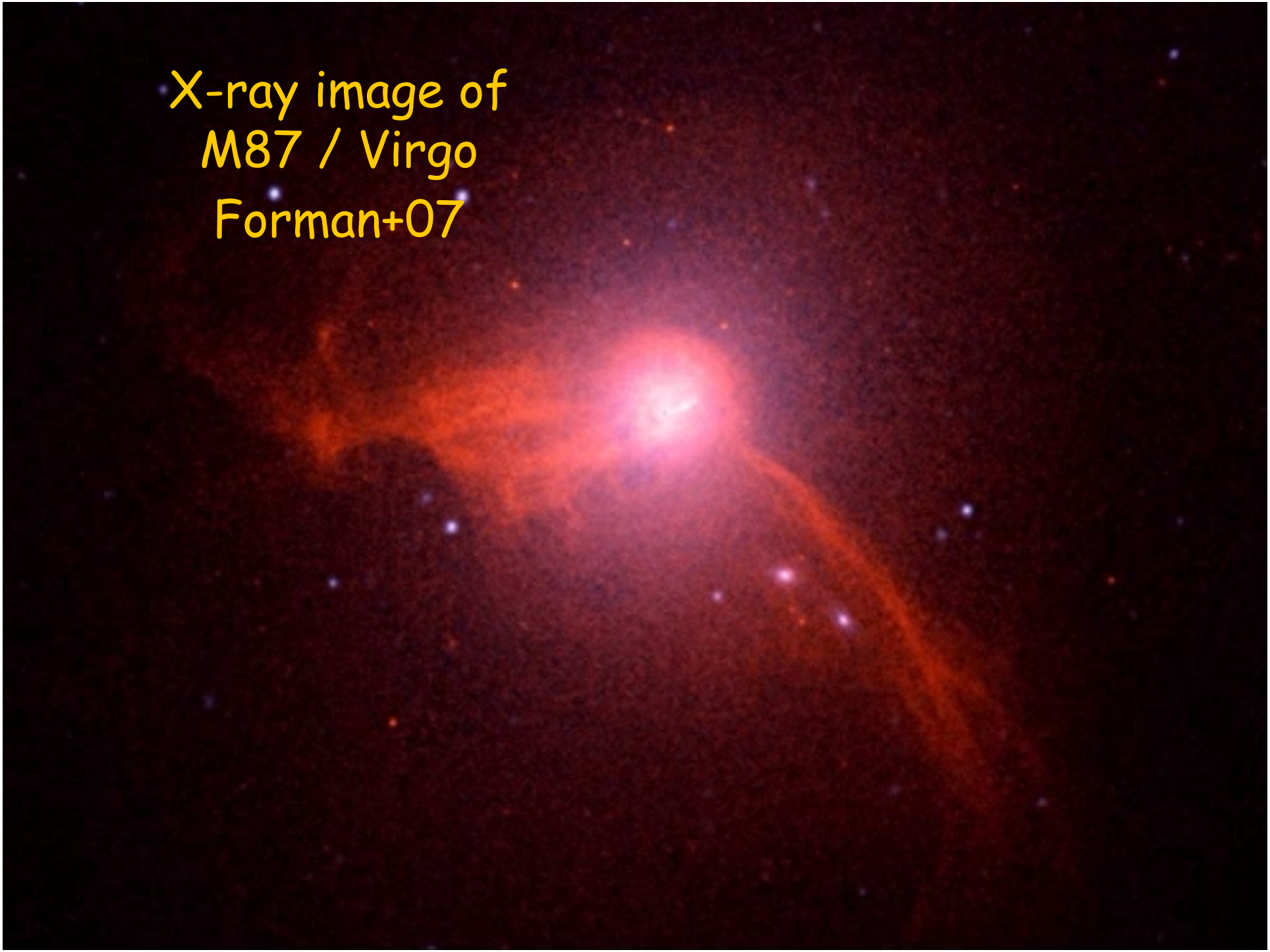
Swift-BAT catalogue

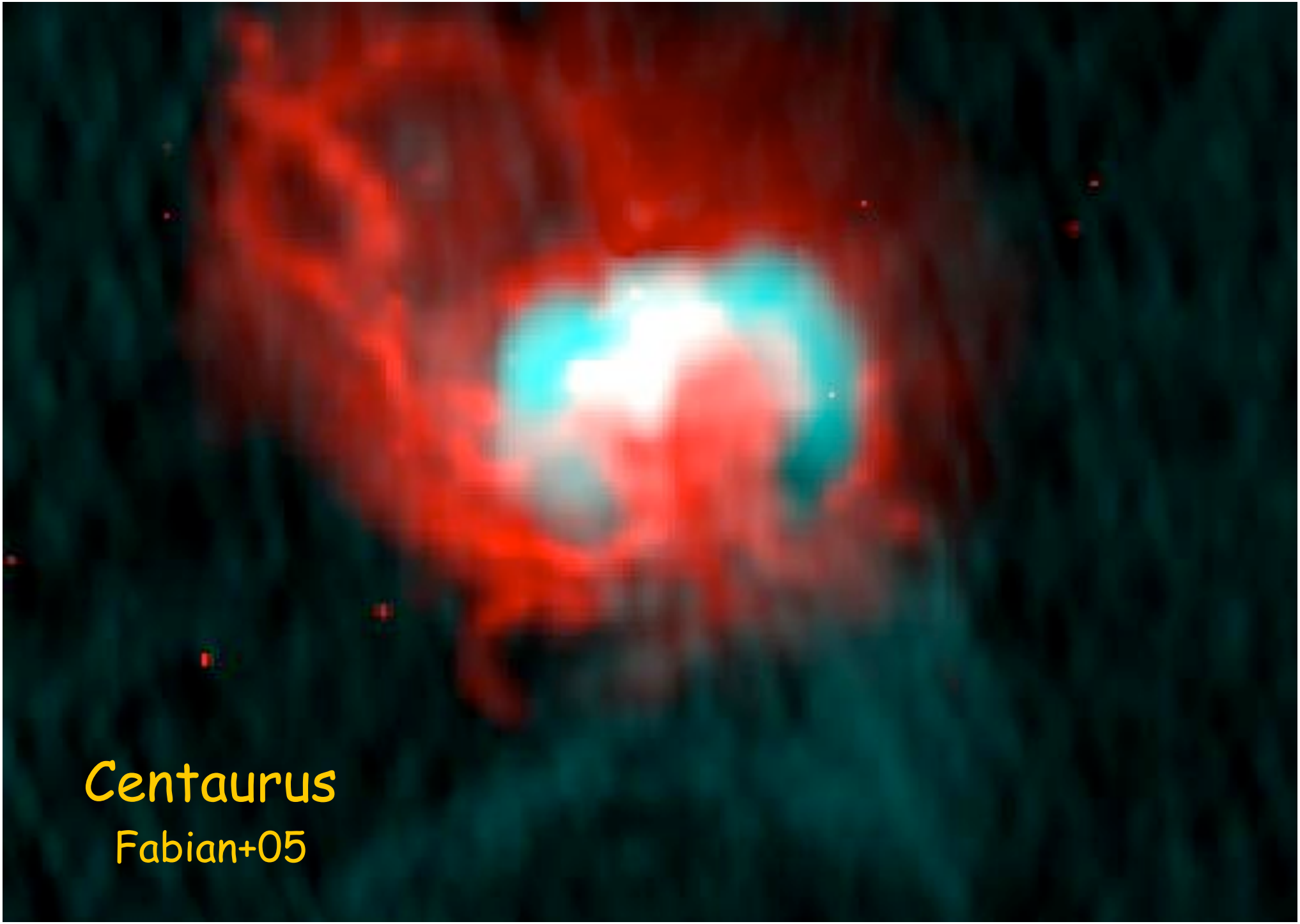


X-ray surface brightness of typical clusters of galaxies

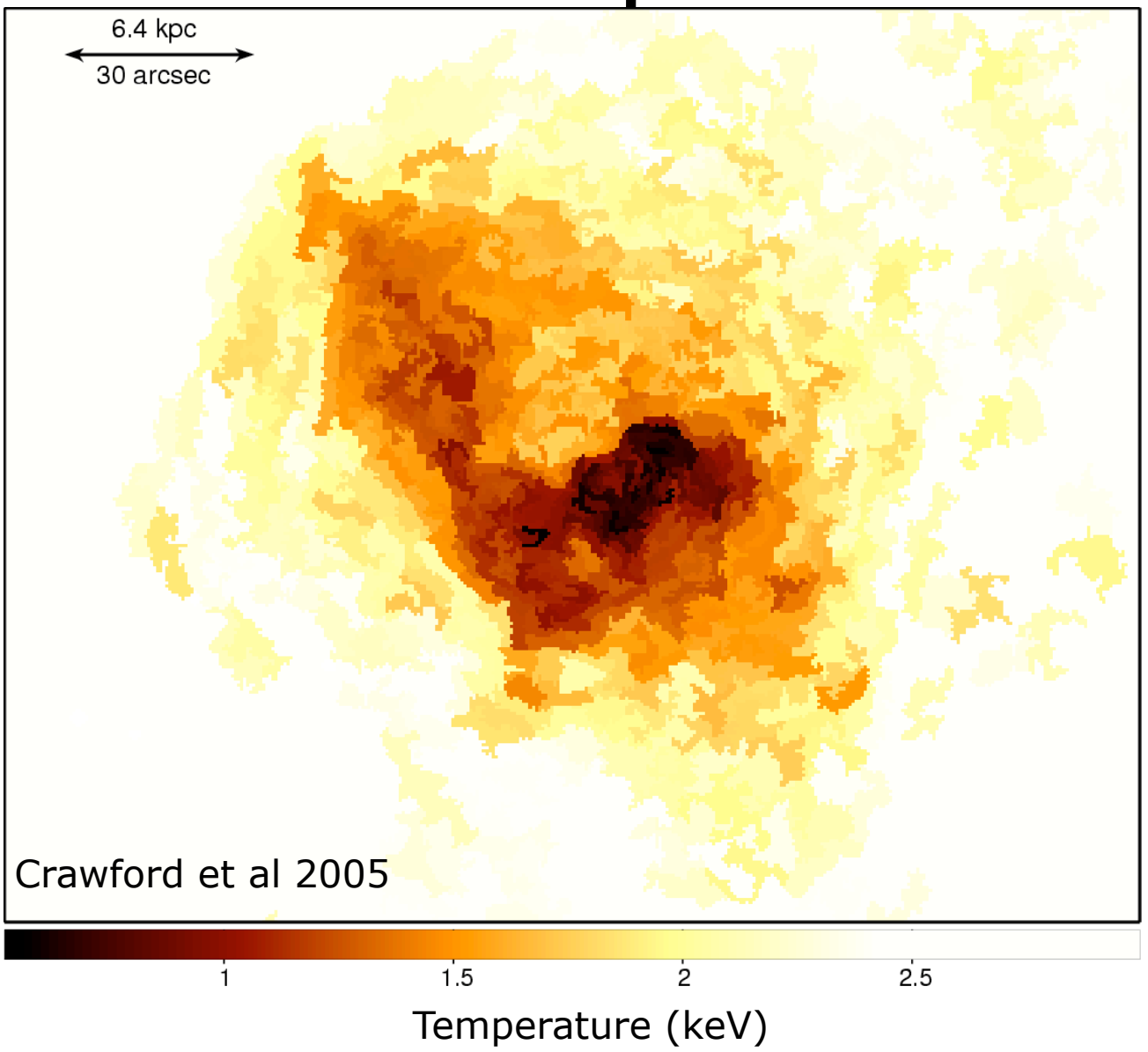





X-ray image of
M87 / Virgo
Forman+07


Centaurus
Fabian+05

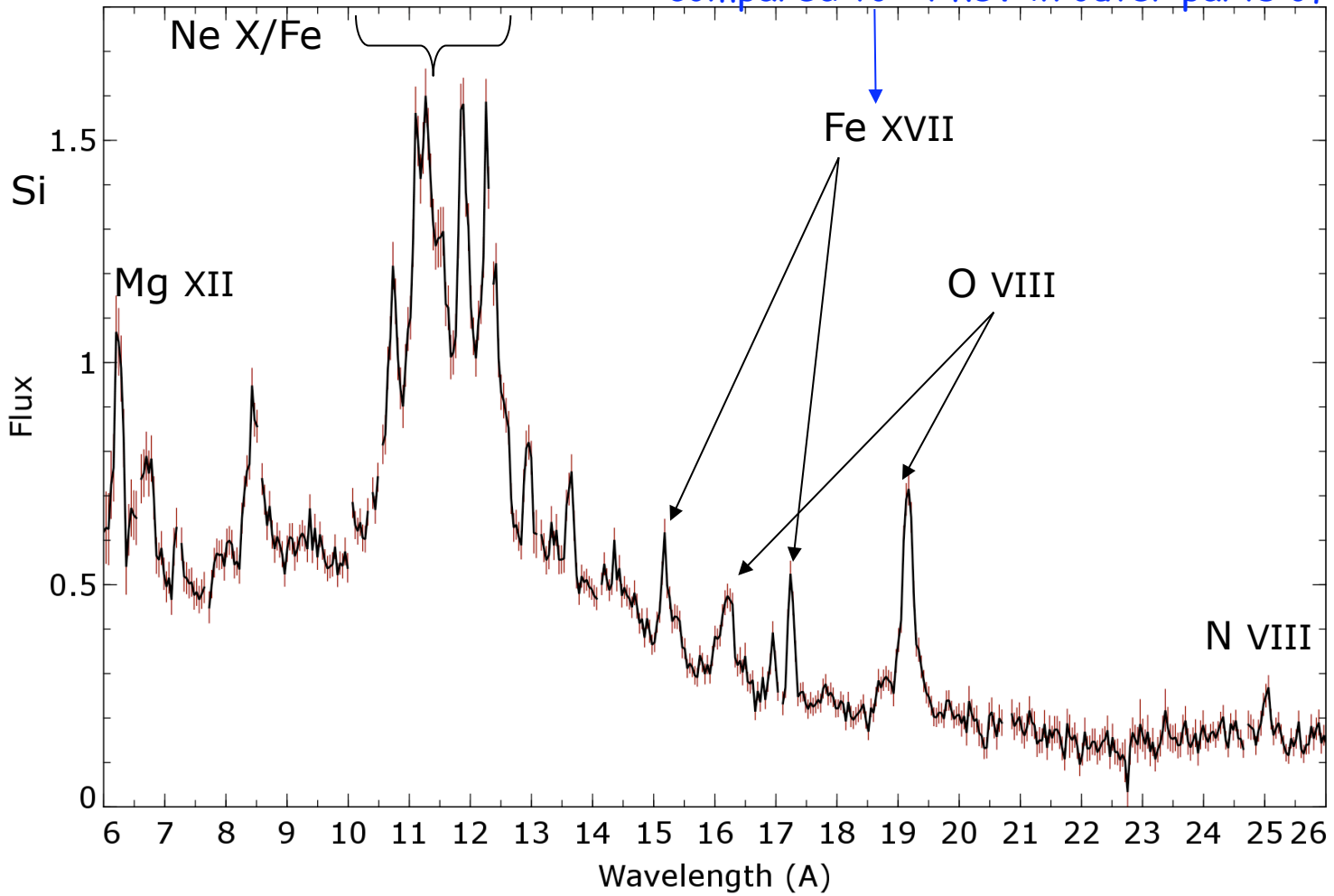
Centaurus temperature map



Cool gas in the Centaurus cluster

Factor 10 temp range

T-sensitive lines indicate gas around ~0.4 keV compared to >4 keV in outer parts of cluster

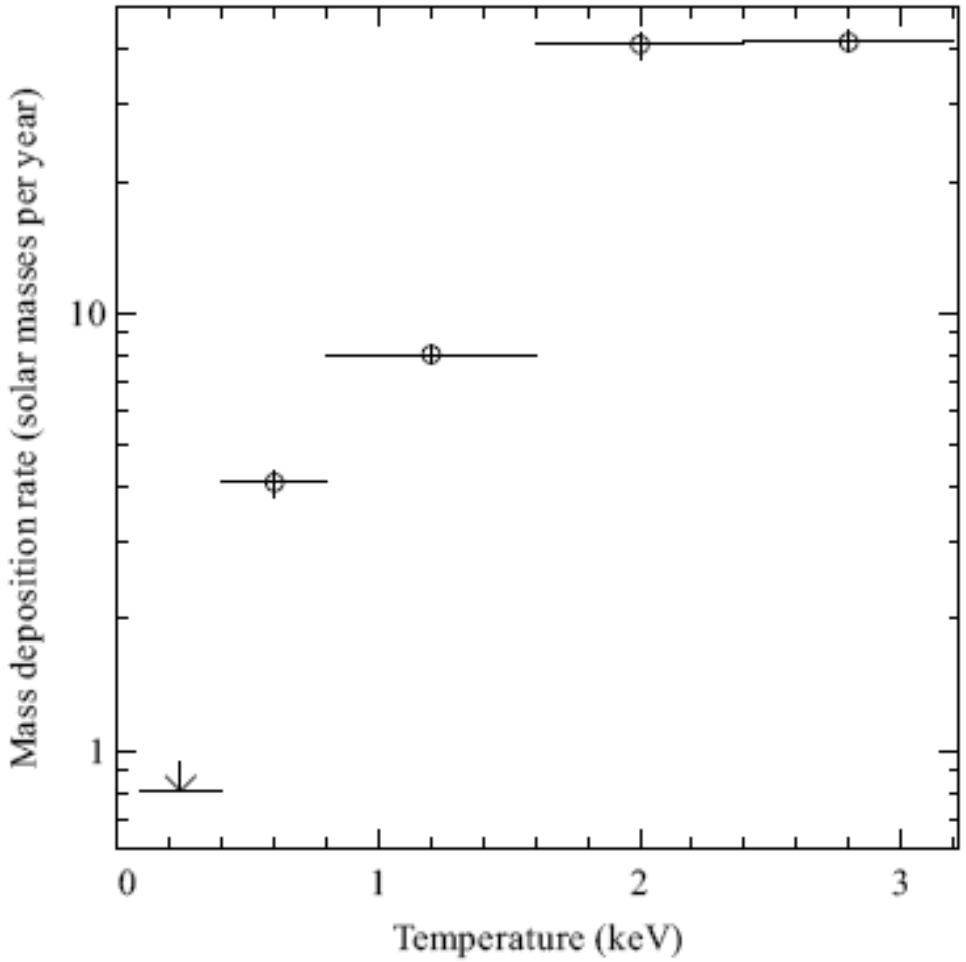


170 ks XMM-Newton RGS exposure

Sanders +07

Cooling in Centaurus?

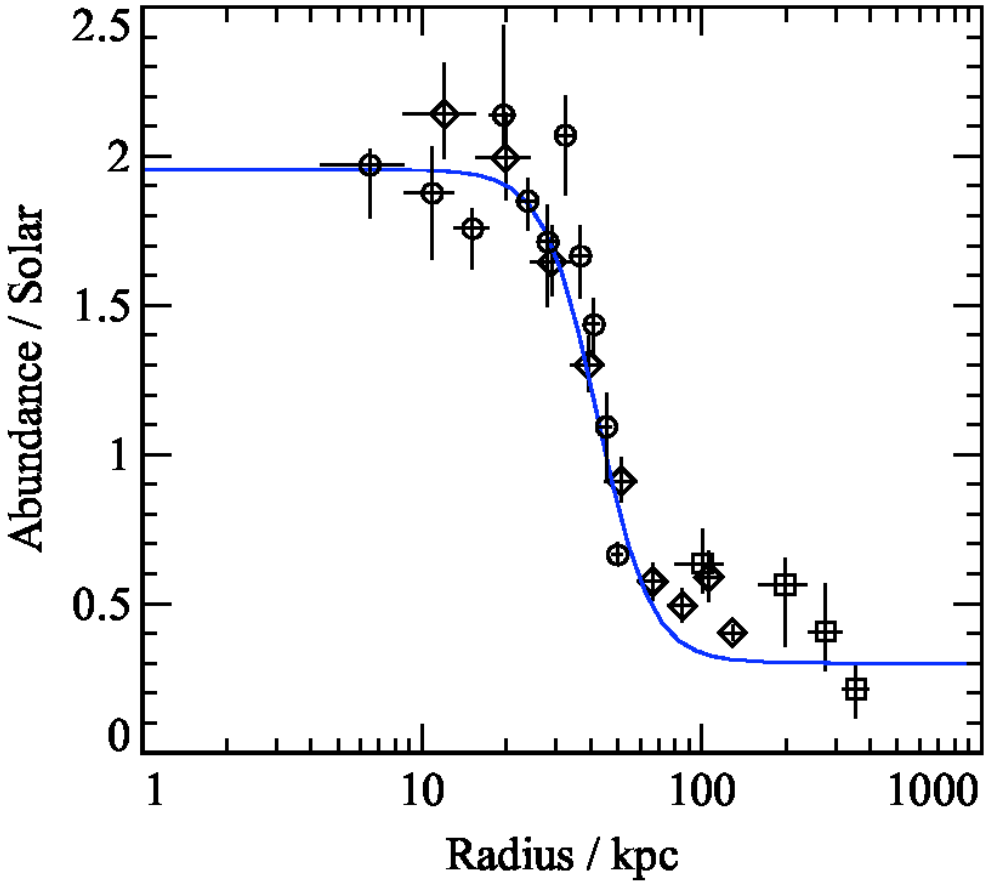
Mass cooling rate



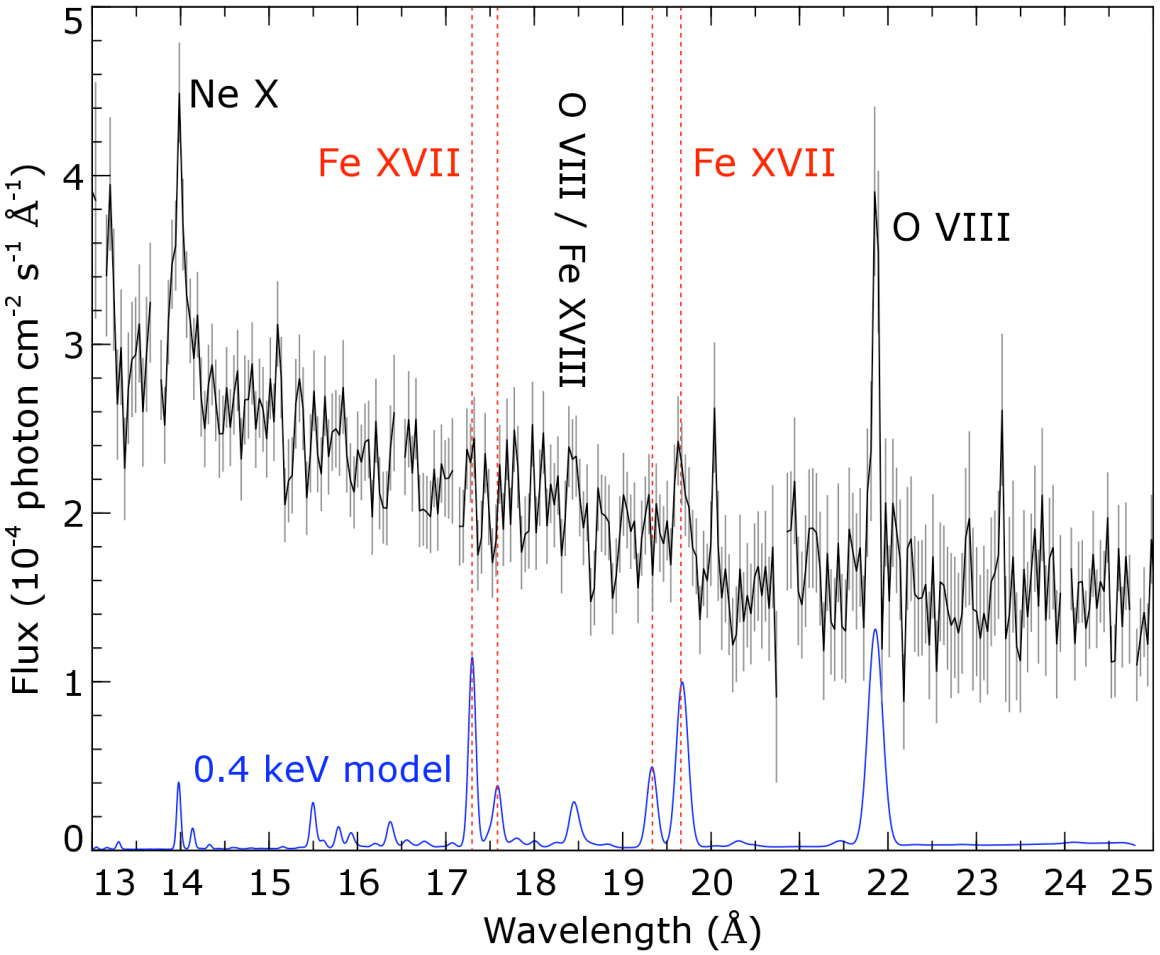
Temperature

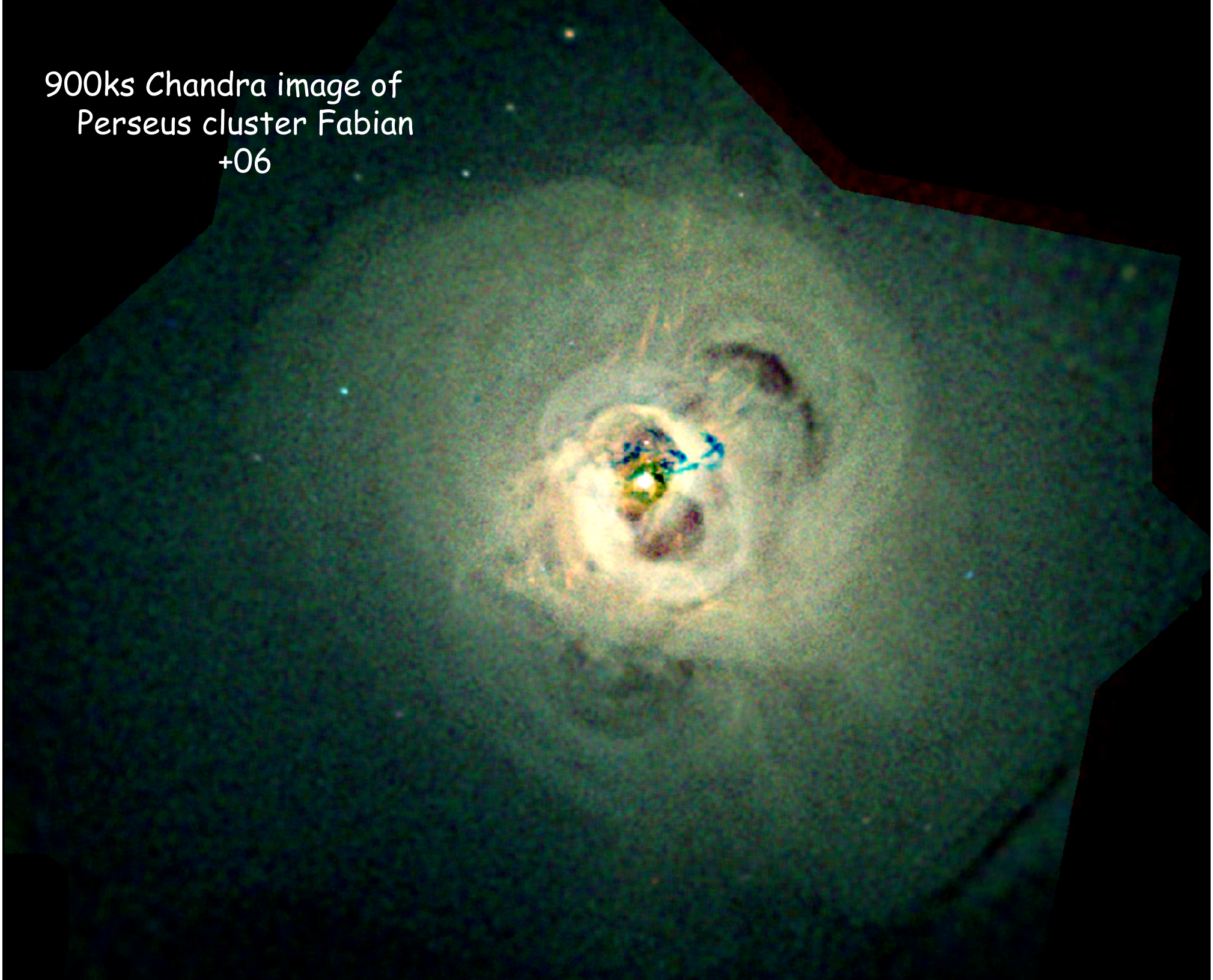
Cen cluster: Abundance profile implies little diffusion/mixing

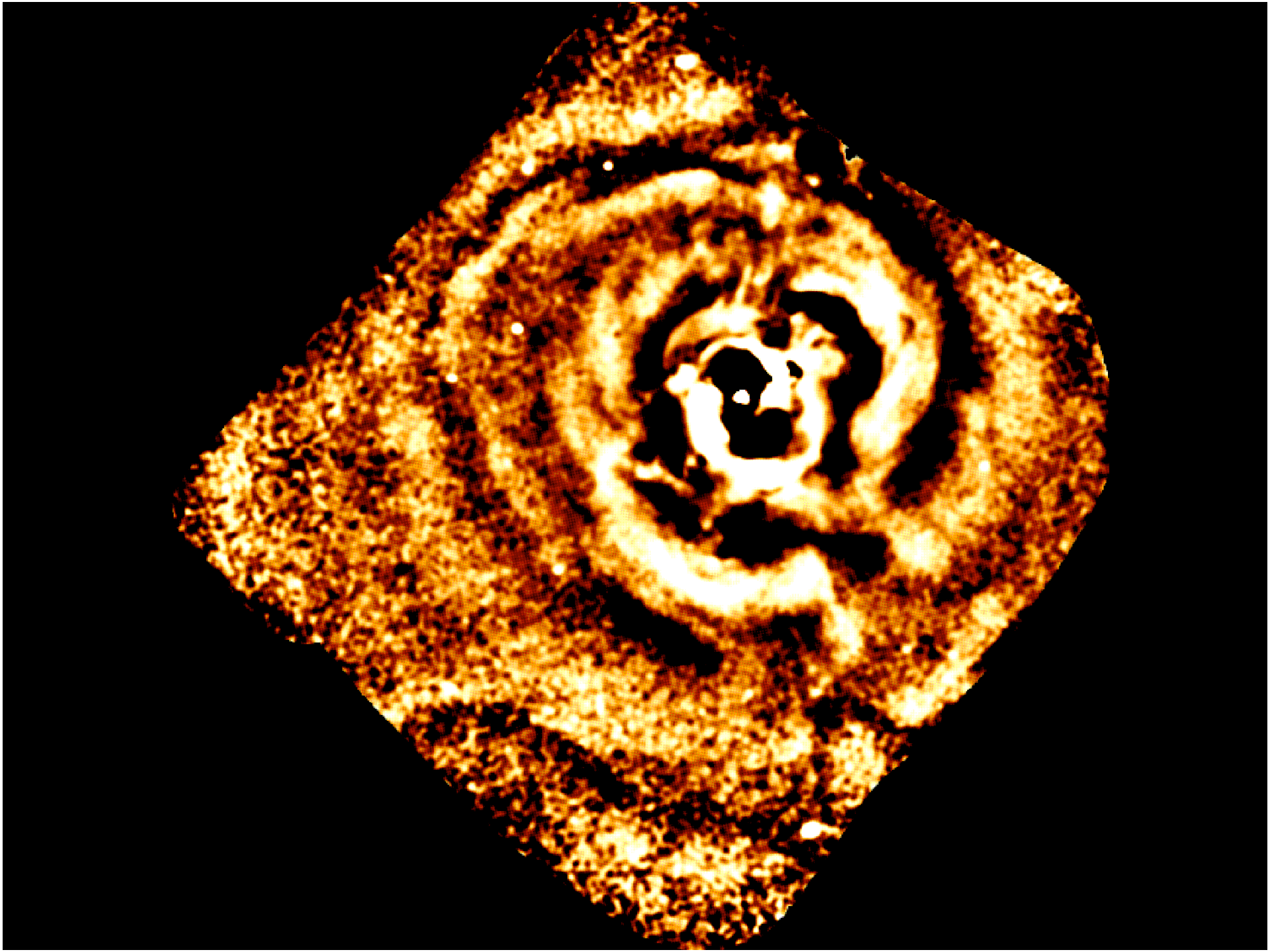
Graham+06 (following method of Rebusco+05)



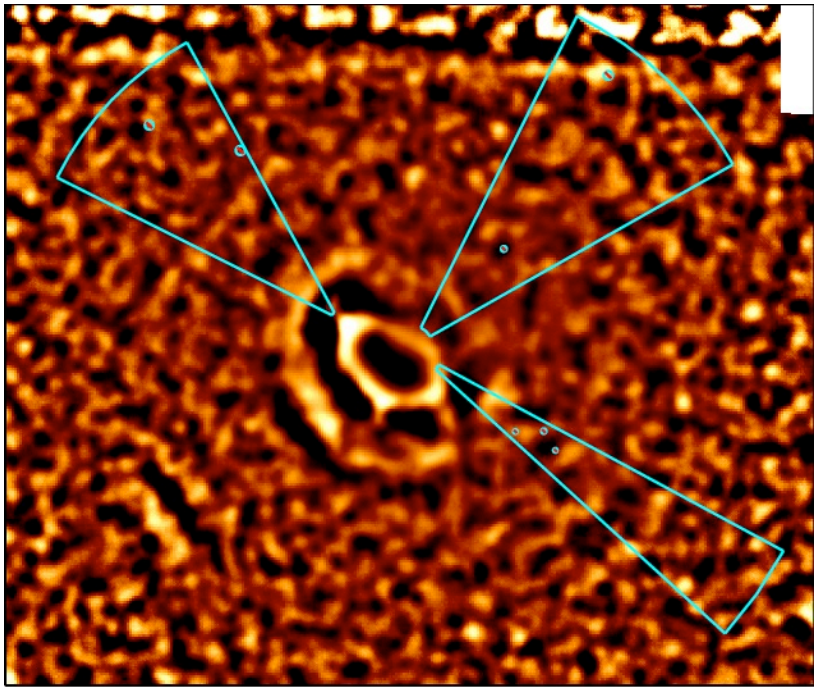
A2204 Sanders+08

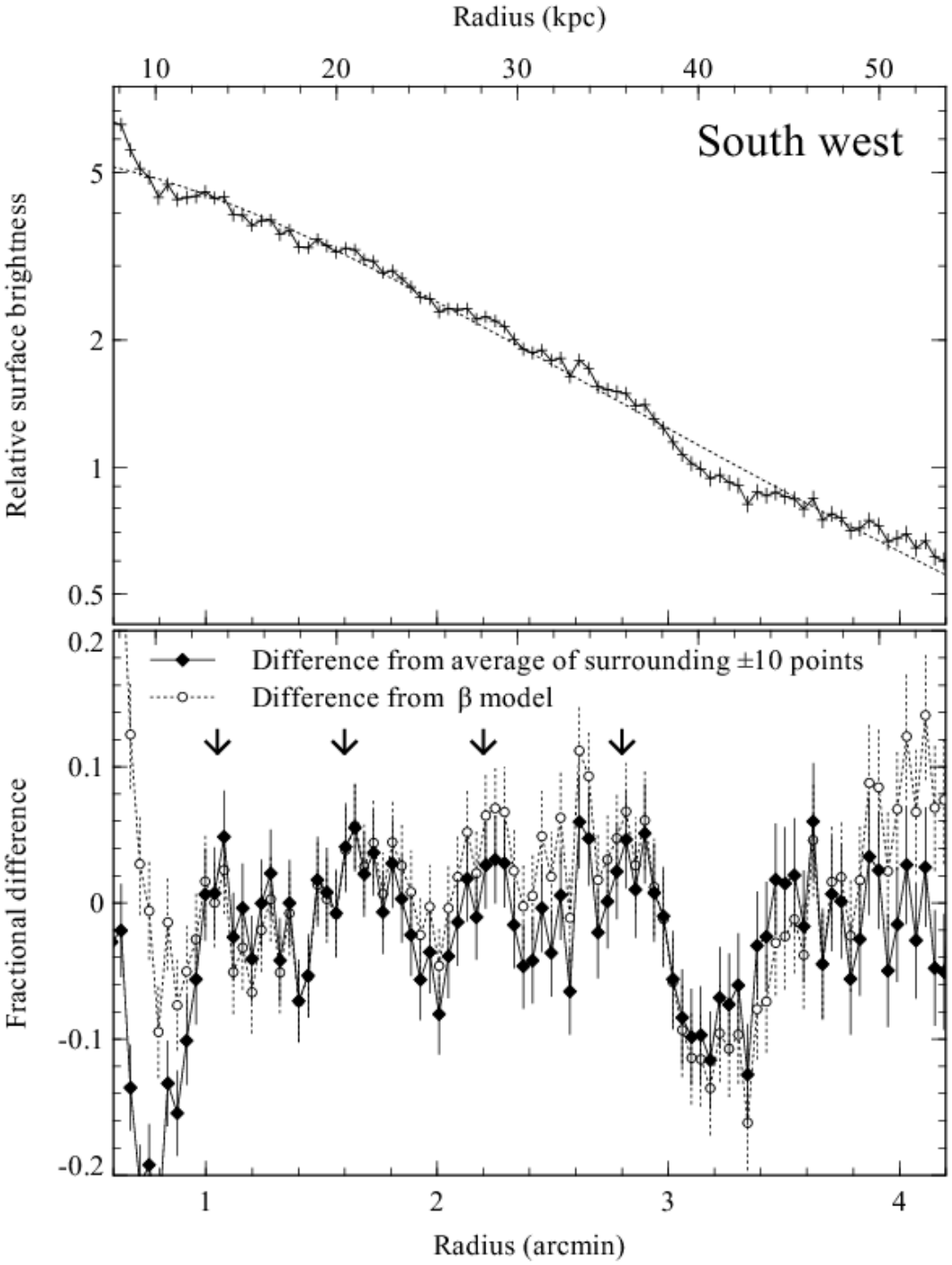



900ks Chandra image of
Perseus cluster Fabian
+06

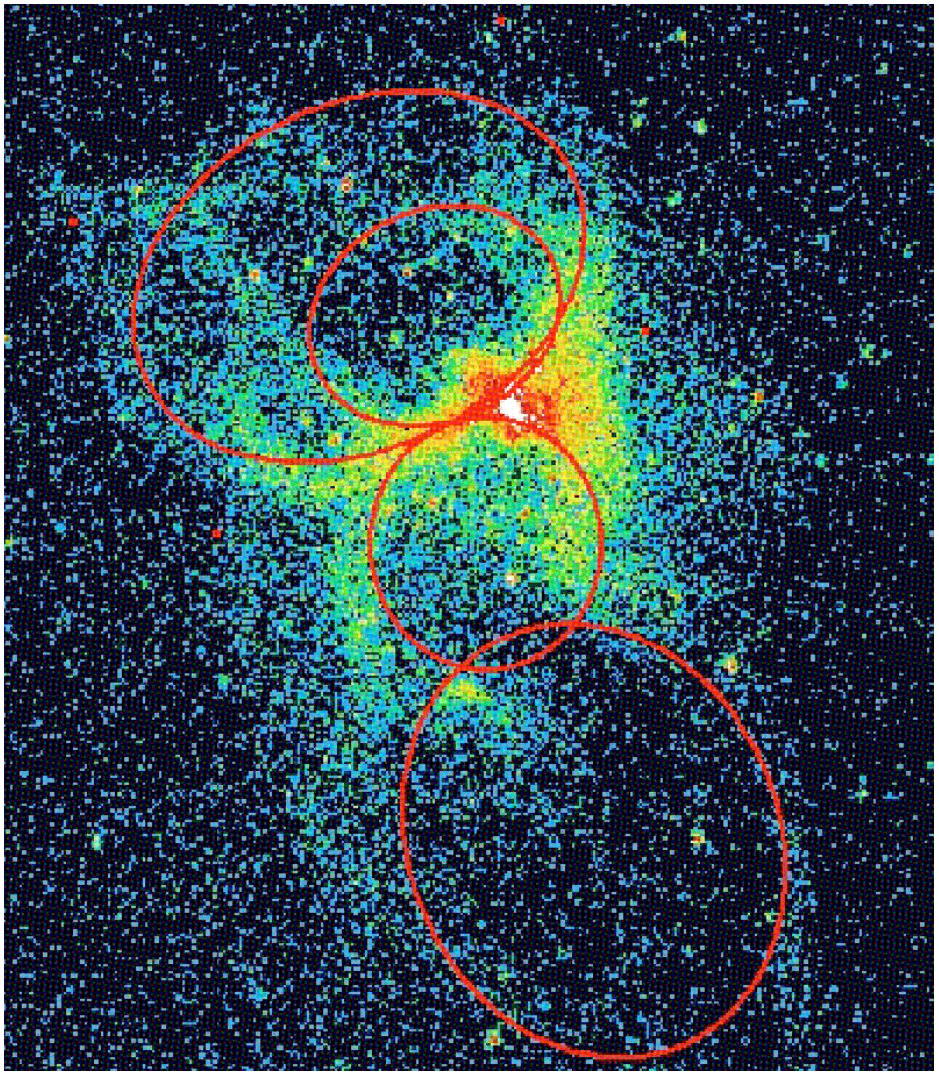


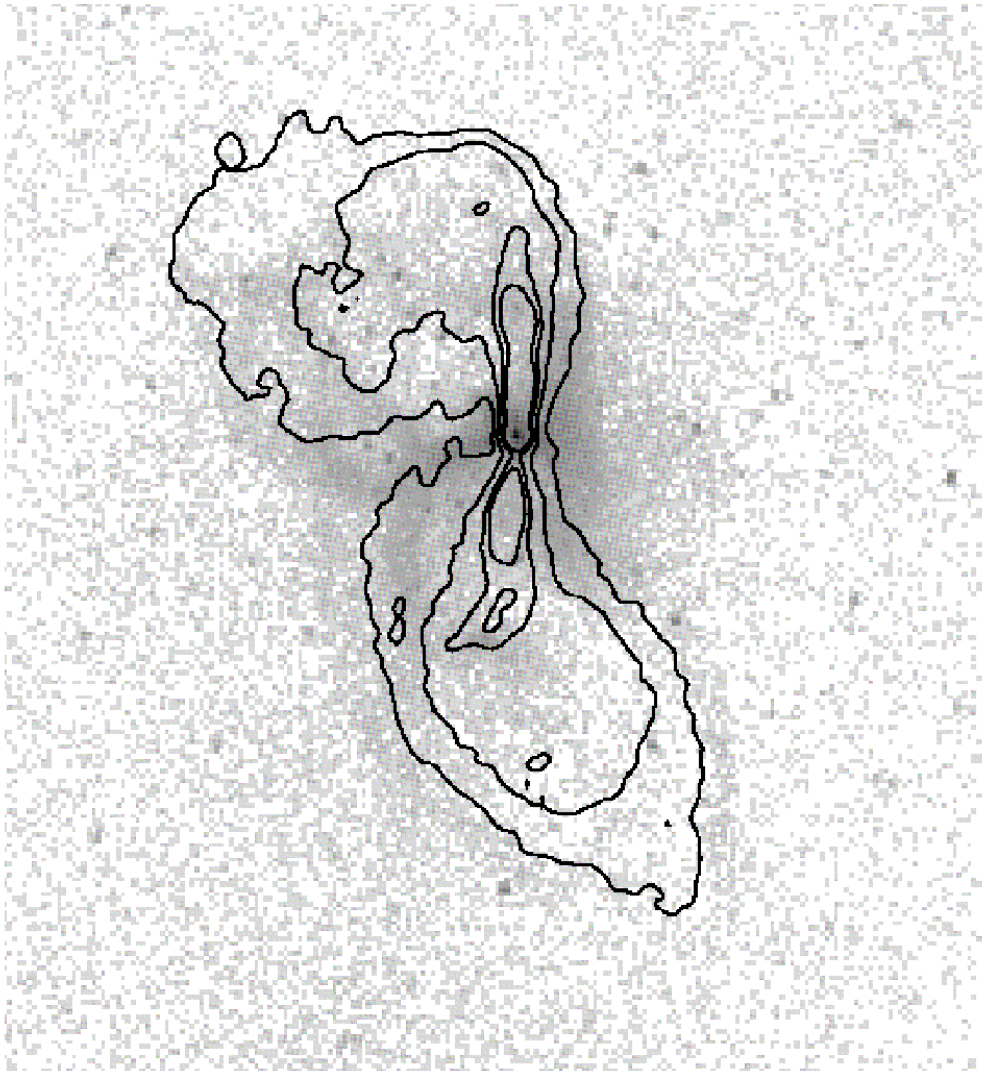
Discovery of Ripples in Centaurus Cluster Sanders & Fabian 08

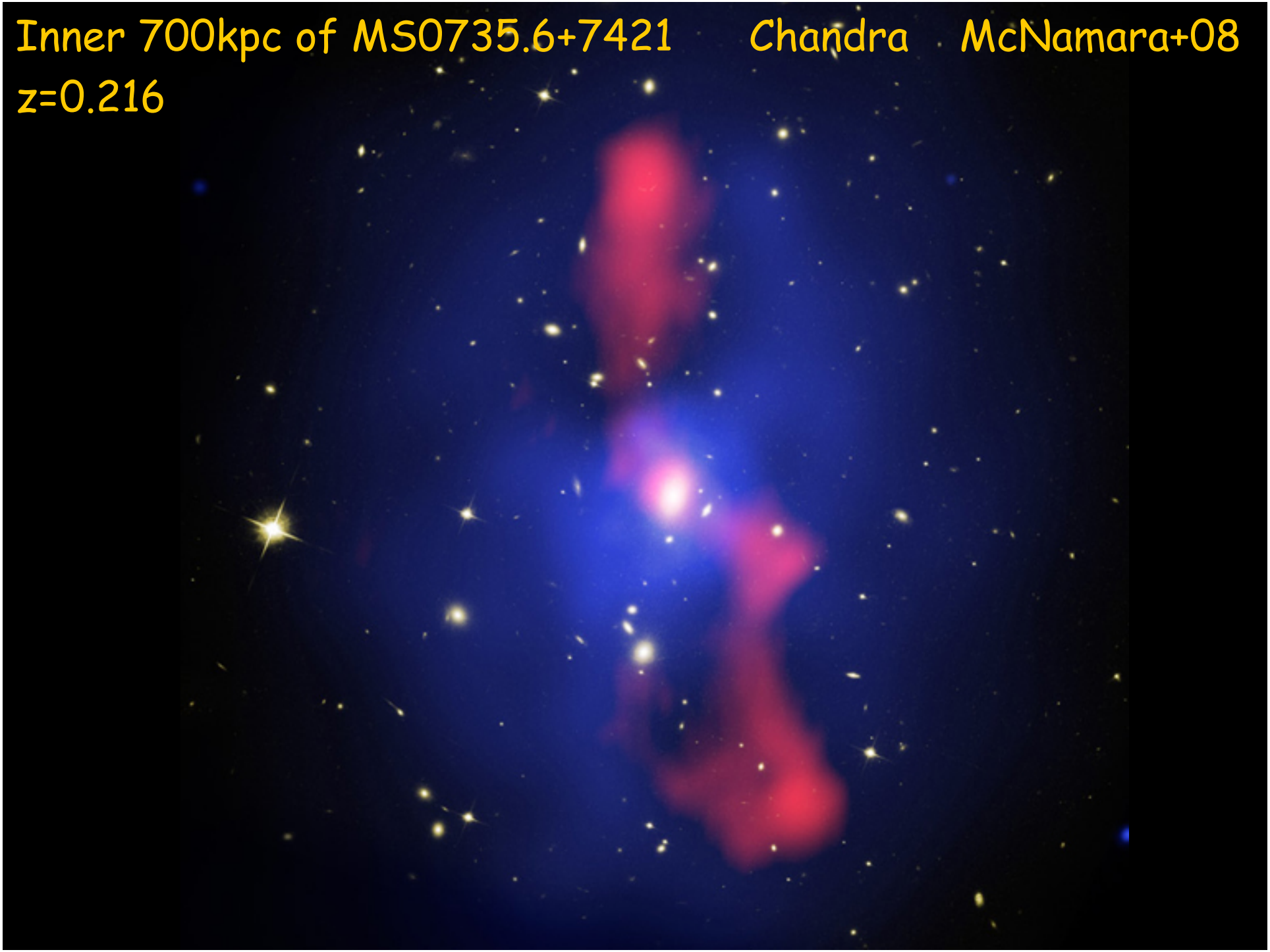




M84 in Virgo cluster Finoguenov+08

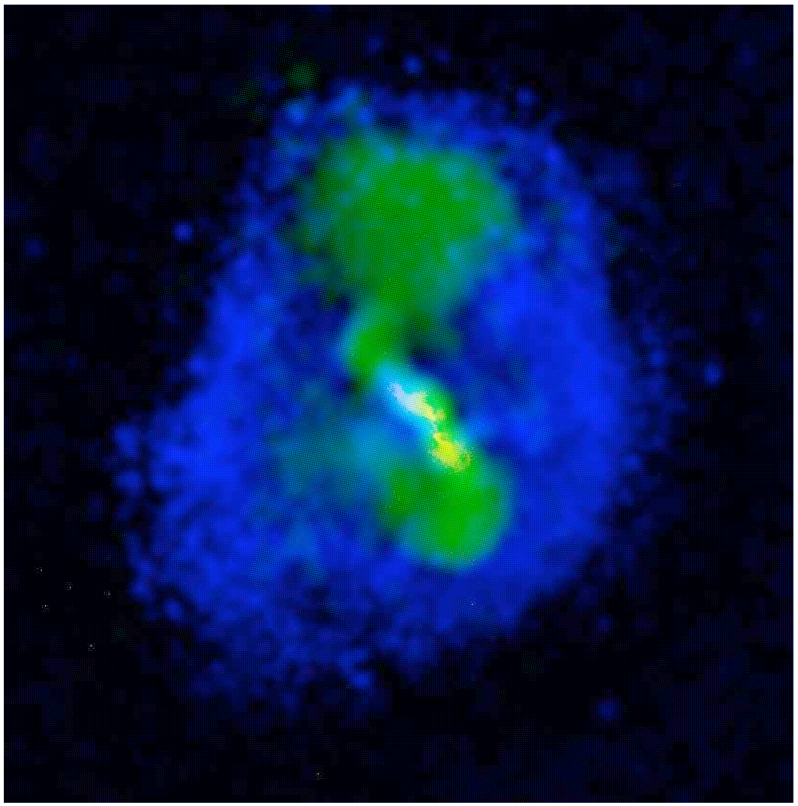


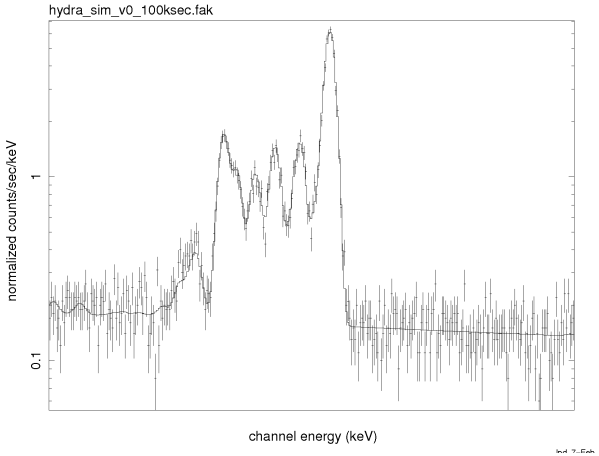


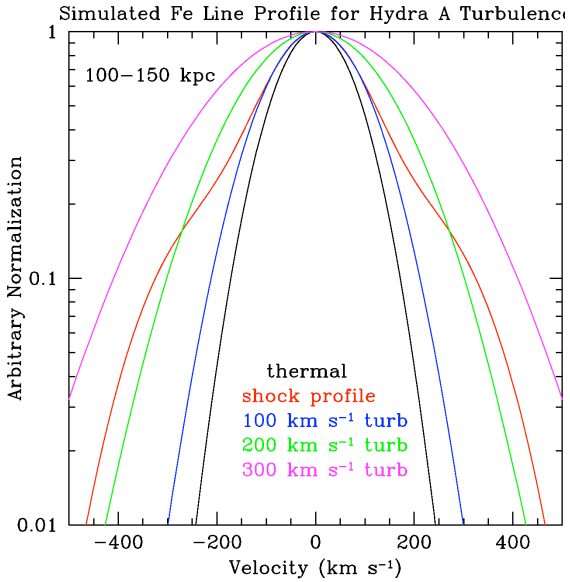

Inner 700kpc of MS0735.6+7421 Chandra McNamara+08
z=0.216

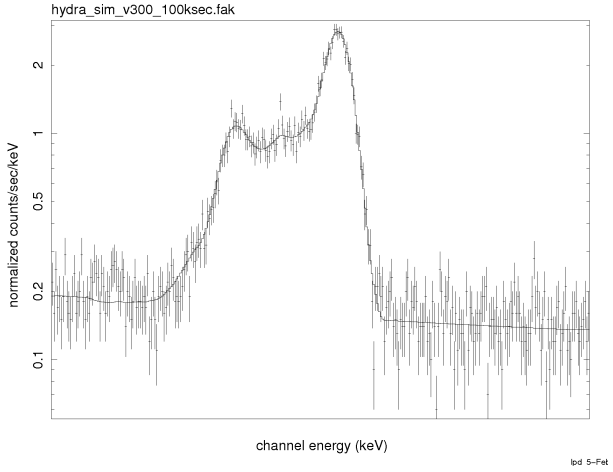
Hydra A

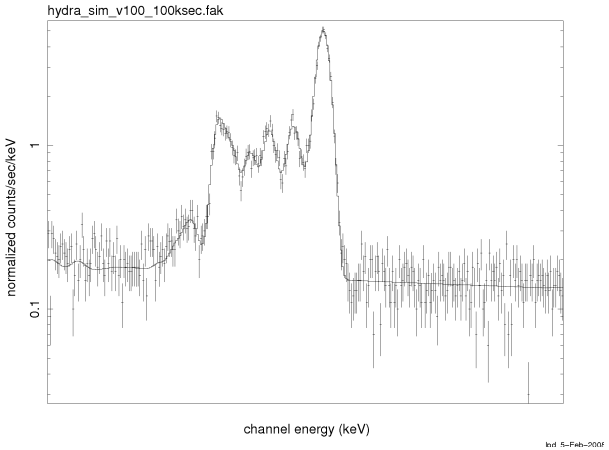
Larry David

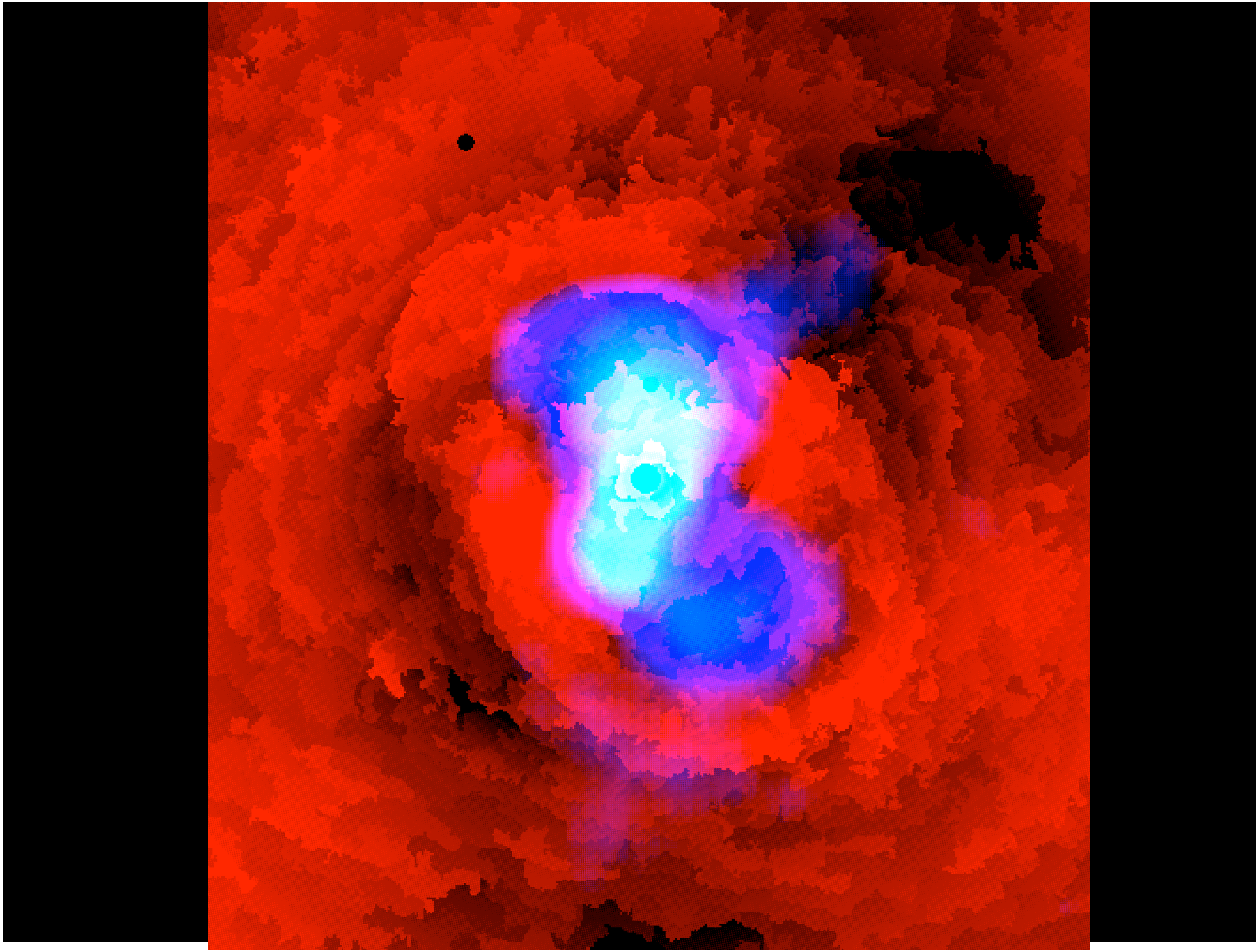


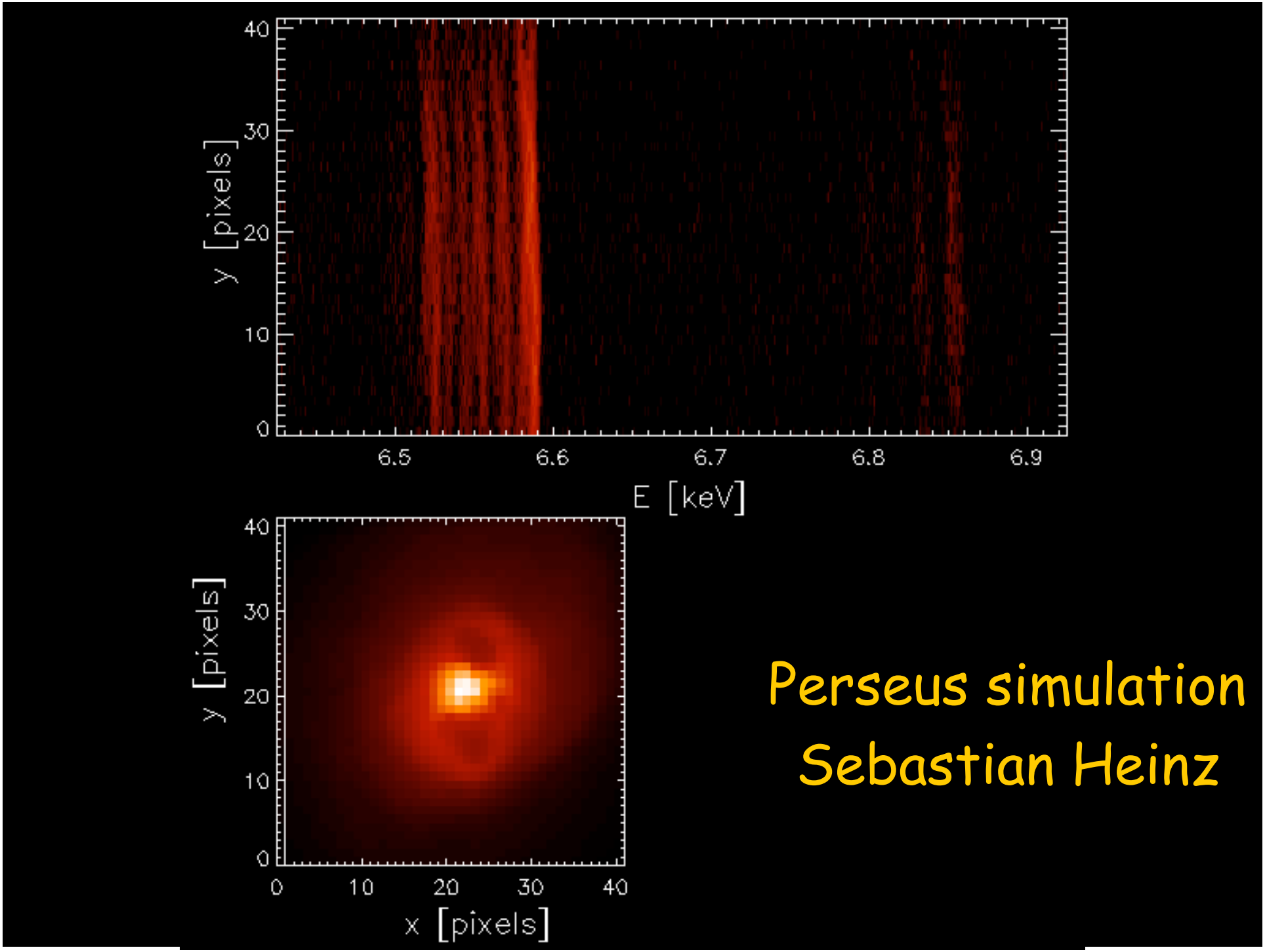








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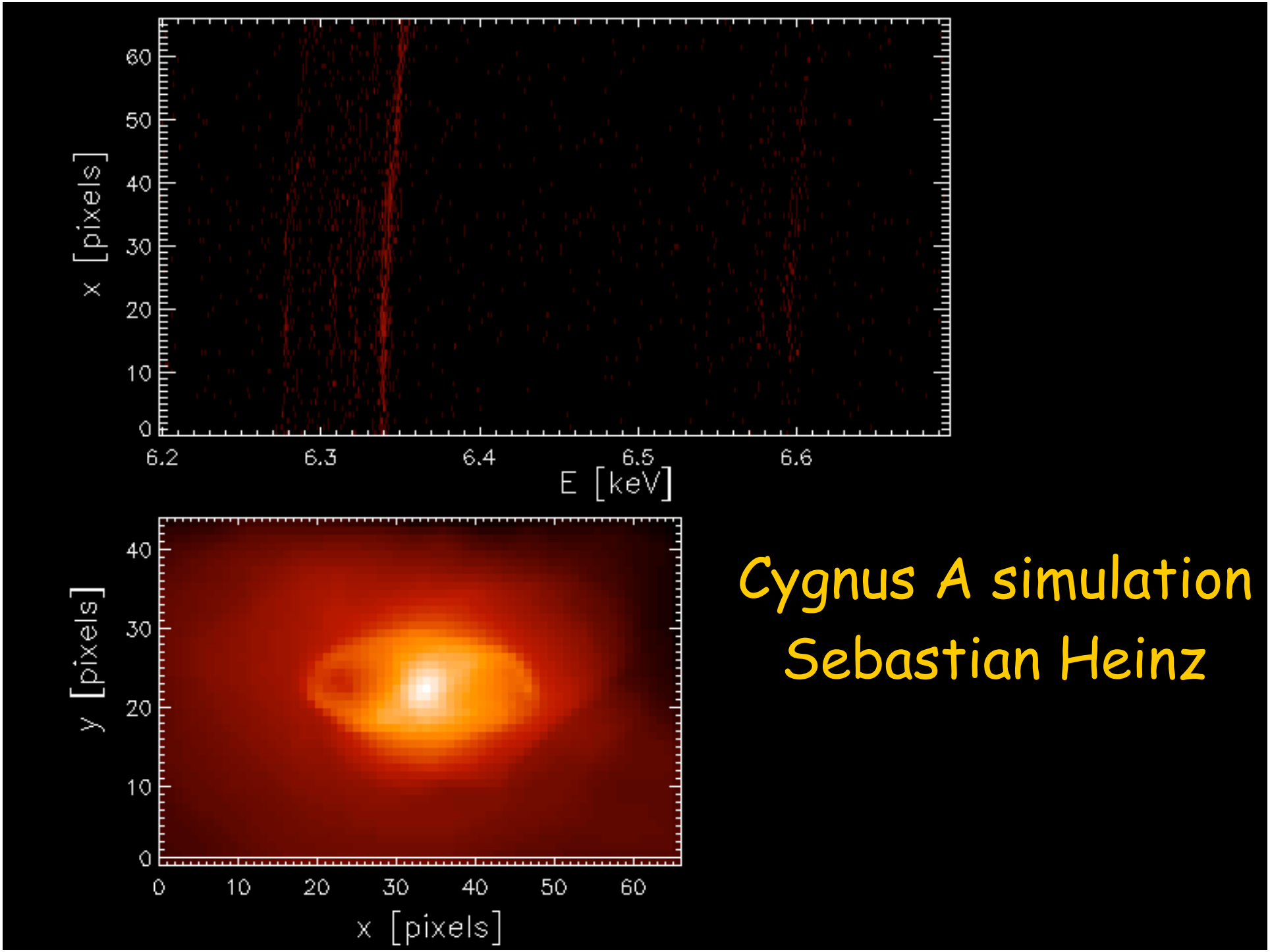
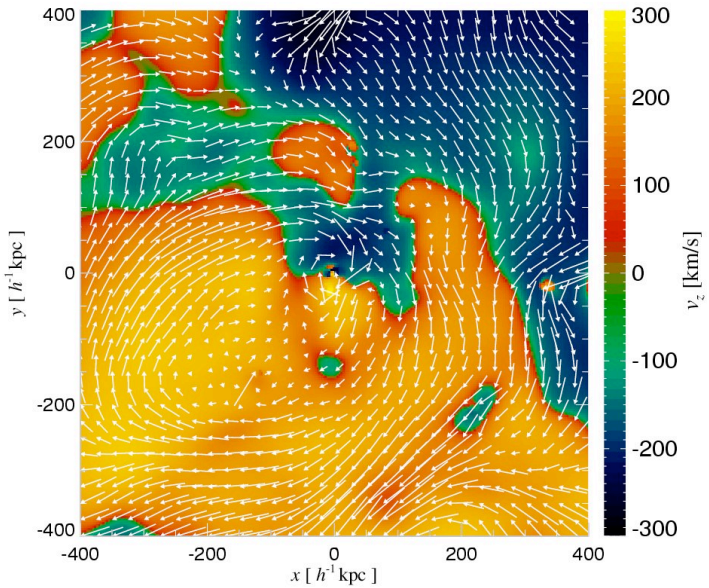
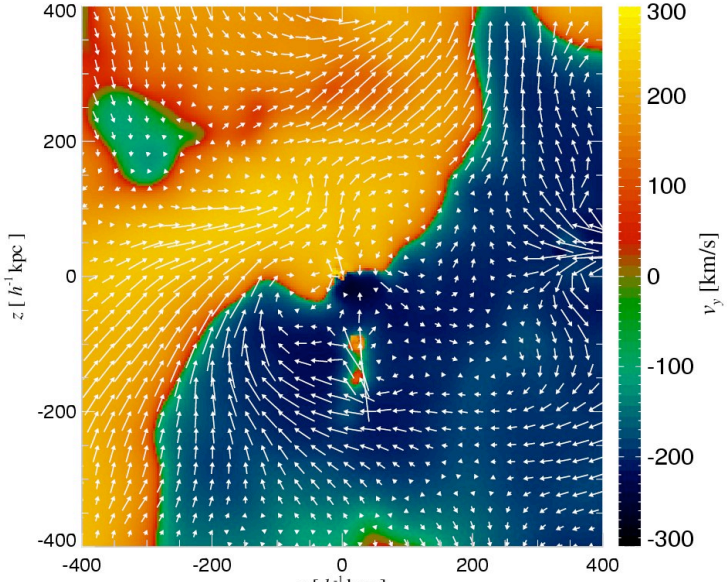
x [pixels]
Perseus simulation
Sebastian Heinz

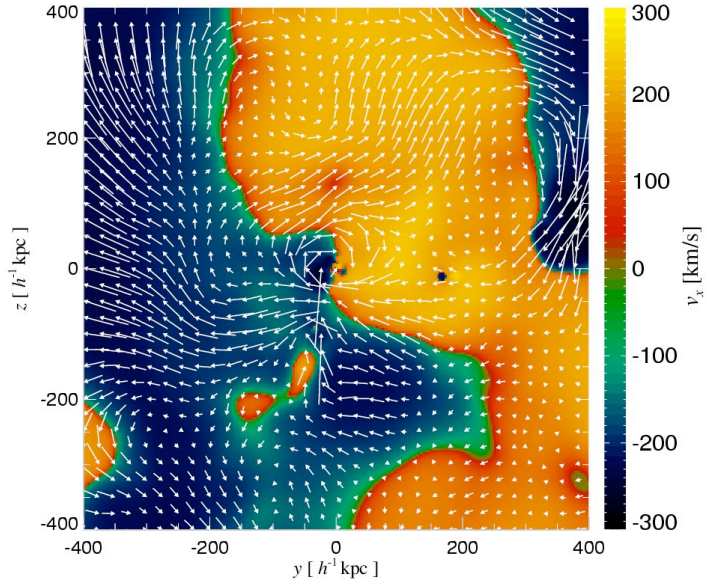


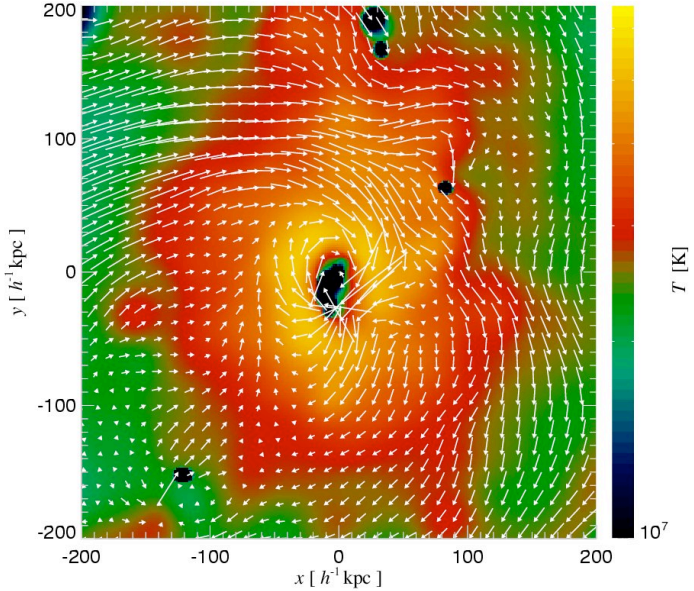
Cygnus A simulation
Sebastian Heinz

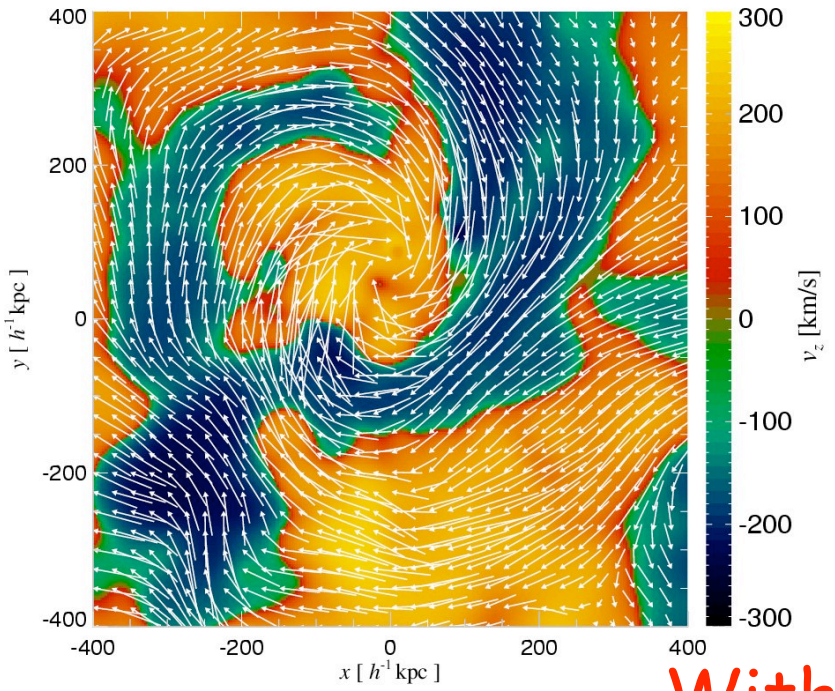
Cluster Velocity Field with No Feedback (D Sijacki)

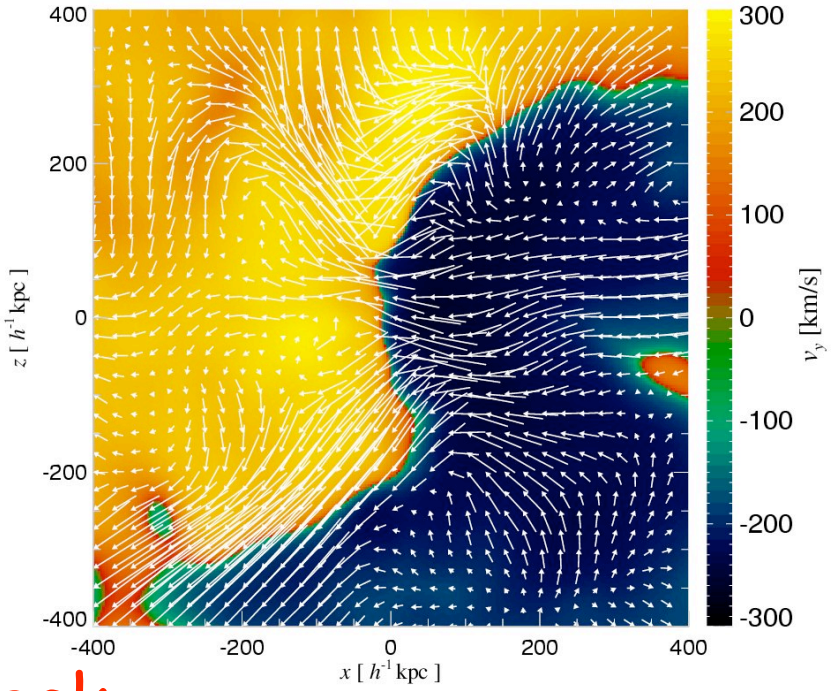




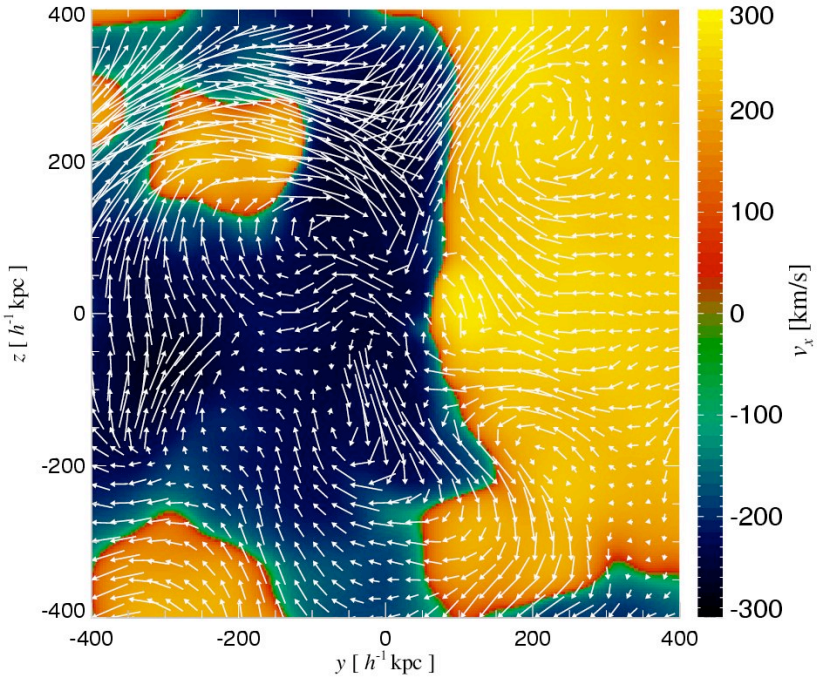


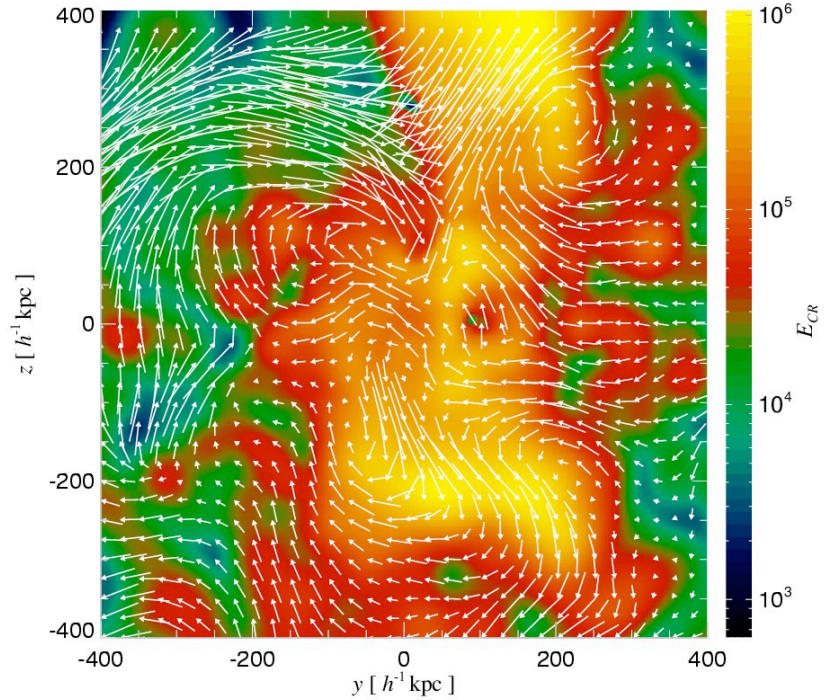






With Feedback






M87
Centaurus
Resolution is very important!
Perseus
A2052
10″
bars