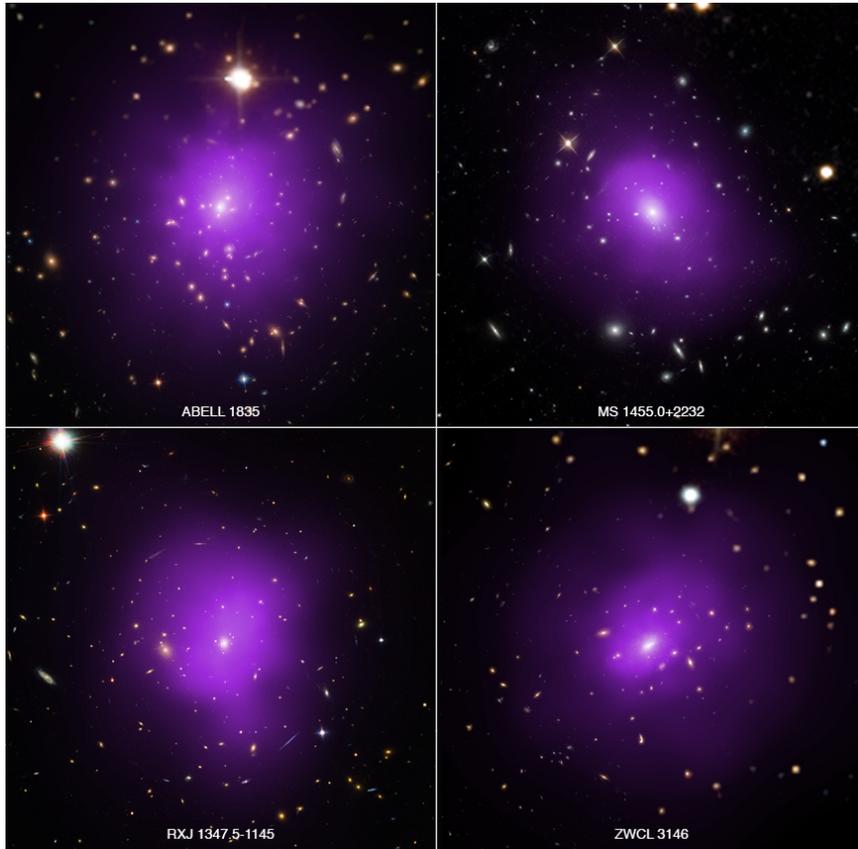




Chandra Science Highlight

Probing Dark Energy with Galaxy Clusters



Composite images of galaxy clusters using X-ray data from Chandra (purple) and optical data from the Hubble Space Telescope and Sloan Digital Sky Survey (red, green, blue).

- ❑ These four galaxy clusters were part of a large survey of over 300 clusters used to investigate the properties of the dark energy that is presumed to drive the accelerated expansion of the universe.
- ❑ A new technique uses observations and theoretical modeling of the X-ray emission profiles of the outer reaches of galaxy clusters.
- ❑ These results support the idea that dark energy is best explained by the "cosmological constant," which Einstein first proposed and is equivalent to the energy of empty space.

Reference: Morandi, A. et al, 2016, MNRAS, 457, 3266; arXiv:1601.03741

Credit: NASA/CXC/Univ. of Alabama/A. Morandi et al; Optical: SDSS, NASA/STScI

Instrument: ACIS

Distance estimates in billions of light years (Gly): **Scale in arcmin & millions of light years (Mly):**

Abell 1835: 3.0 Gly ;

MS 1455.0+2232: 3.1 Gly;

RXJ 1347.5-1145: 4.7 Gly;

ZWCL 3146: 3.3 Gly.

Abell 1835, 3.0 arcmin (2.3 Mly);

MS 1455.0+2232: 3.3 arcmin (2.6 Mly);

RXJ 1347.5-1145: 2.2 arcmin (2.5 Mly);

ZWCL 3146: 2.5 arc min (2.1 Mly).

**CXC Operated for NASA by the Smithsonian
Astrophysical Observatory**



May 2016