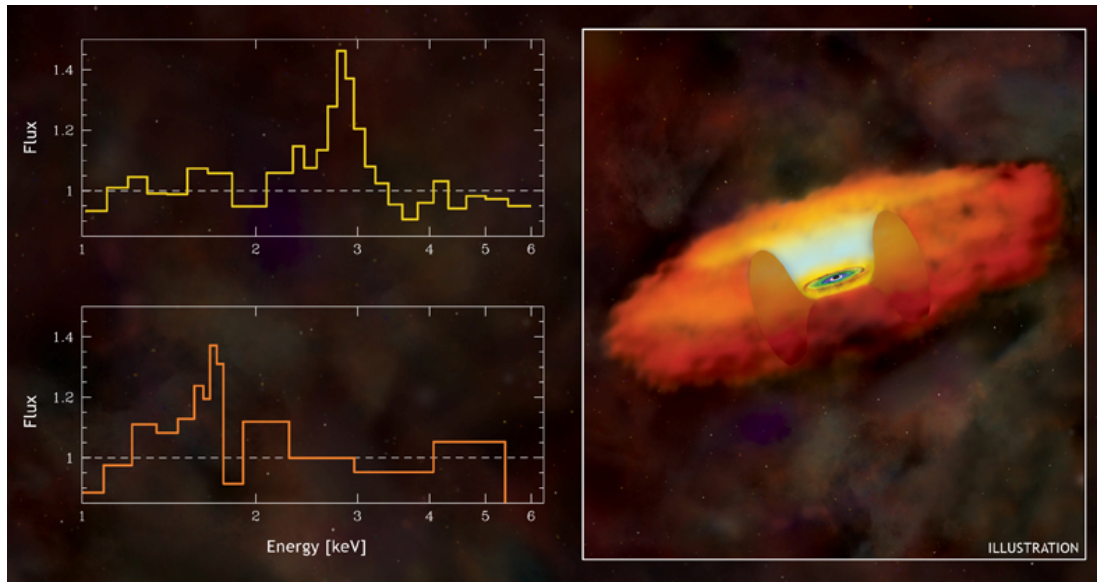




# Chandra Science Highlight

## Iron Spectra from Supermassive Black Holes



Chandra X-ray Observatory ACIS spectra

The left side of the above graphic shows portions of X-ray spectra from a subset of 50 black holes about 9 billion light years from Earth (upper panel), and another group of 22 black holes that are about 11 billion light years from Earth (lower panel). The peaks in the spectra are produced by fluorescent X-ray emission from iron atoms (light blue in illustration on the right) near supermassive black holes in the centers of galaxies. The spectra were compiled by adding the spectra of X-ray sources in the Chandra Deep Field South.

(Credit: X-ray spectra/NASA/CXC/MPI/M.Brusa et al.; Illustration: CXC/M.Weiss.)

- The strength of the iron line is similar in both sets of spectra, indicating that approximately the same amount of iron was present around black holes 9 billion years and 11 billion years in the past.
- Similar results corresponding to times ranging from 5 billion years to 9 billion years in the past show that the amount of iron around black holes has not changed significantly over the past 11 billion years.
- This implies that most of the iron in the galaxies that contain these supermassive black holes was created before the Universe was about 2 billion years old, when galaxies were very young.

Reference: M.Brusa, R. Gilli, and A. Comastri, 2005. The Astrophysical Journal Letters, Volume 621, p.L5-L8, see also astro-ph/0501542