Chandra HETG Observations of Cooling Flow Clusters

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[Contributed talk, 15min.]

Abstract

We present high resolution X–ray spectra for three cooling flow clusters observed with the Chandra High Energy Transmission Grating (HETG) spectrograph. PKS0745-191 ($z = 0.1028$), A1835 ($z = 0.2523$) and Zw3146 ($z = 0.2910$) are luminous, medium redshift clusters with large ($\dot{M}_X \sim 1000$ $M_\odot$ yr^{-1}) previously reported cooling flows. Although optimized for point sources, the HETG resolution spectral for clusters at these redshifts can still greatly exceed the intrinsic ACIS CCD resolution, achieving values in the range $E/\Delta E$ ~100-300. Dispersed 1st order spectra are presented along with a simultaneous, high spatial resolution imaging analysis of the undispersed 0th order images. We confirm the lack of low T emission lines below 2.7 keV seen in A1835 by the RGS onboard XMM. Similar results are found for PKS0745-191 and Zw3146. The O VIII Lyα line at 18.97 Å is detected in all three objects and upper limits placed on the presence of several Fe L complex lines associated with cooler material. In all cases, implied limits on the cooling rates are factors of ~3–5 below previously measured values. Implications for the standard cooling flow picture are discussed.

CATEGORY: CLUSTERS OF GALAXIES