High Resolution Spectroscopy of 14 Cooling-Flow Clusters of Galaxies using the Reflection Grating Spectrometers

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[Contributed talk, 15min.]

Abstract

We present high resolution X-ray spectra of 14 cooling-flow X-ray clusters and groups obtained with the Reflection Grating Spectrometers (RGS) on XMM-Newton. The spectra exhibit line emission from a number of Fe L charge states as well as O VIII, Mg XII, Ne X, Si XIV & XIII, N VII, and C VI. All spectra show a deficit of soft X-ray lines predicted from the isobaric multiphase spectra model as compared with morphological mass deposition rates from spatially-resolved spectroscopy with the European Photon Imaging Cameras (EPIC). These results are quite generally consistent with the early results obtained with XMM-Newton and Chandra observations of the spectra of cooling-flows and this analysis places further constraints on the temperature distribution. The size of this sample and the three orders of magnitude difference of cooling-flow scales suggest that the inconsistency is not an isolated phenomena. The results further suggest that either morphological mass deposition rates systematically overestimate the actual cooling rate or the emission measure of cooling-flows has a much steeper distribution than that predicted by the multiphase cooling-flow model. We briefly discuss some modifications to the cooling-flow process that could reproduce the observed spectra.

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