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Current Challenges of Astrophysical Photoionized Plasmas

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Photoioniation and photoexcitation has been known to be important in astrophysical plasmas since the early study of emission line nebulae, and the study of optical and UV emission lines is a classical subject. Recently, this has broadened to include emission in other wavelength bands. In the X-ray band, Chandra and XMM-Newton have revealed rich spectra from active galaxies and compact binaries, and this has motivated new efforts at modeling these plasmas. This has led to insights about a component of the gas in these systems which had been previously unknown, observationally, and which has implications for our understanding of the global mass budget. In this talk I will review the observational data on these plasmas, and discuss some recent results on modeling.