

Physical Properties of Active Galactic Nuclei Winds

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Abstract

Active Galactic Nuclei (AGN) winds may hold the solution to several unsolved astrophysical problems: The Inter Galactic Medium metal enrichment, the physics of Black holes, photo-ionized plasma and thermal instabilities. In order to investigate these phenomena, reliable measurements of the physical properties of the outflows are needed.

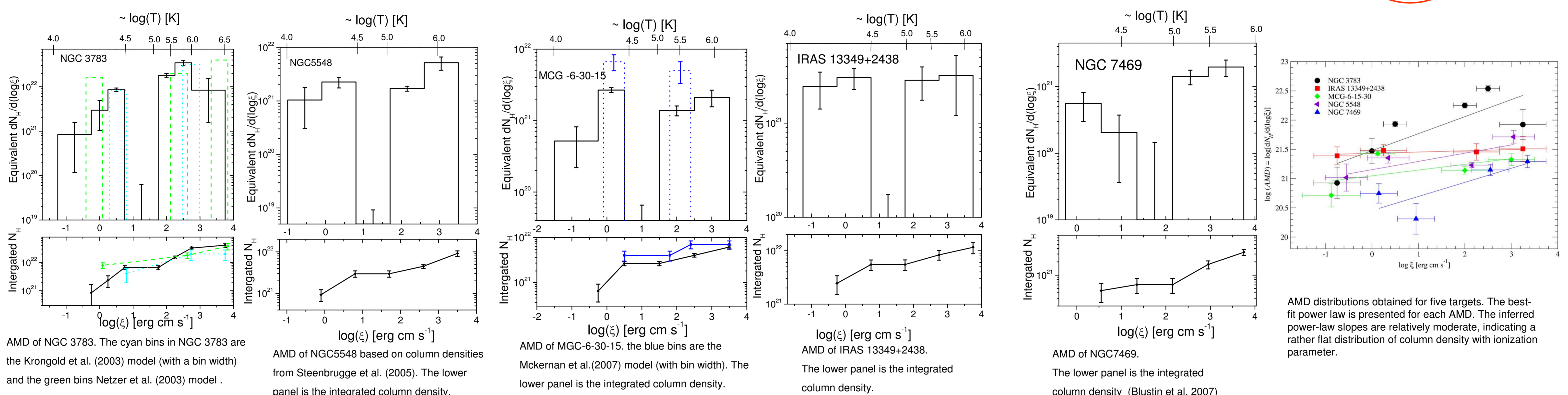
This poster shows two different approaches for studying AGN outflows using high resolution X-ray spectra. One approach is to find the gas column density distribution with ionization parameter. We call this function the Absorption Measure Distribution (AMD). In the other approach, we search for correlations between different physical properties of the outflow.

Absorption Measure Distribution

The AMD analysis is based on accurate measurements of each ionic column density, which is measured by fitting individual ion by ion spectra. These measurements are then used to solve the AMD equation :

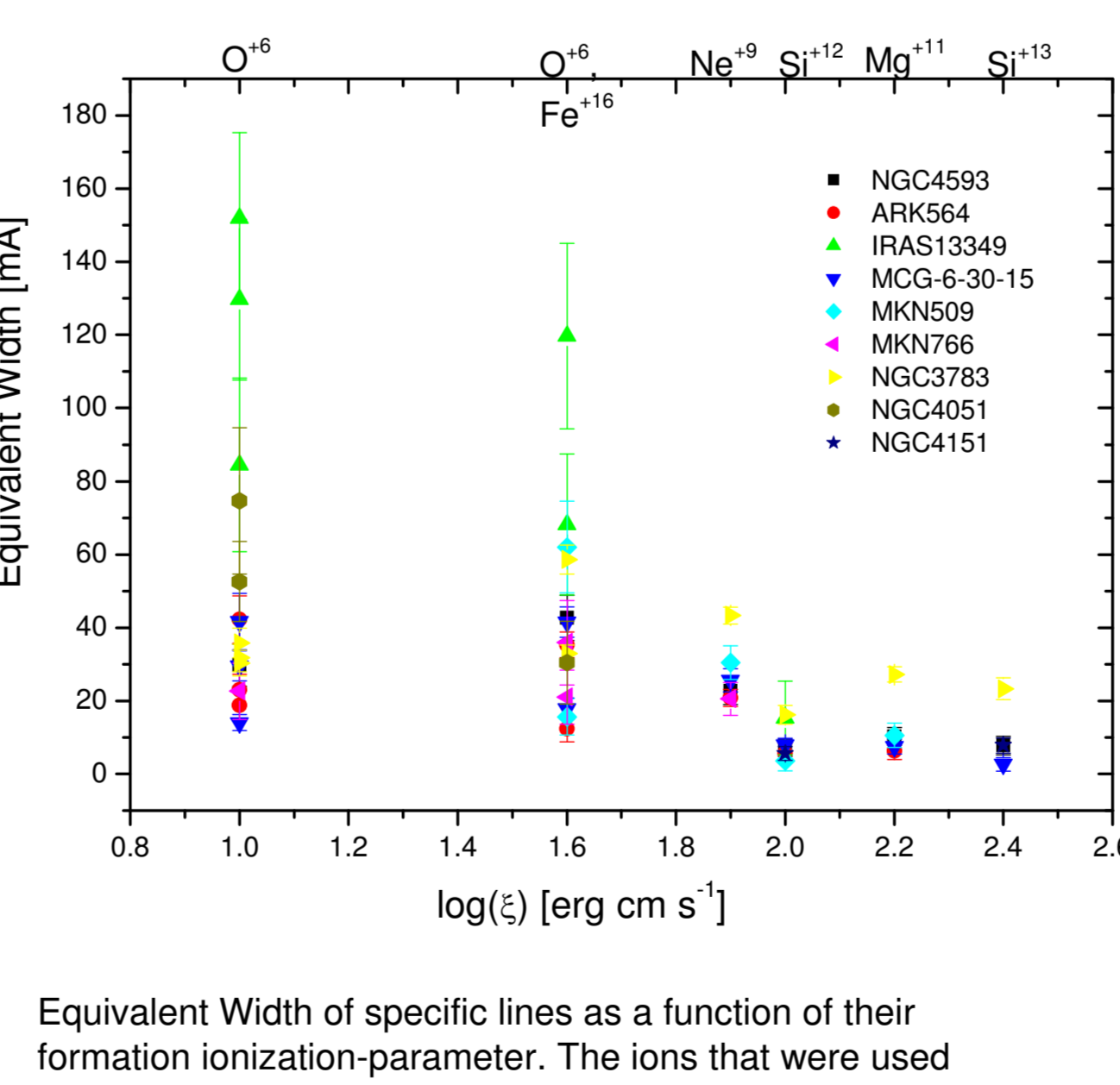
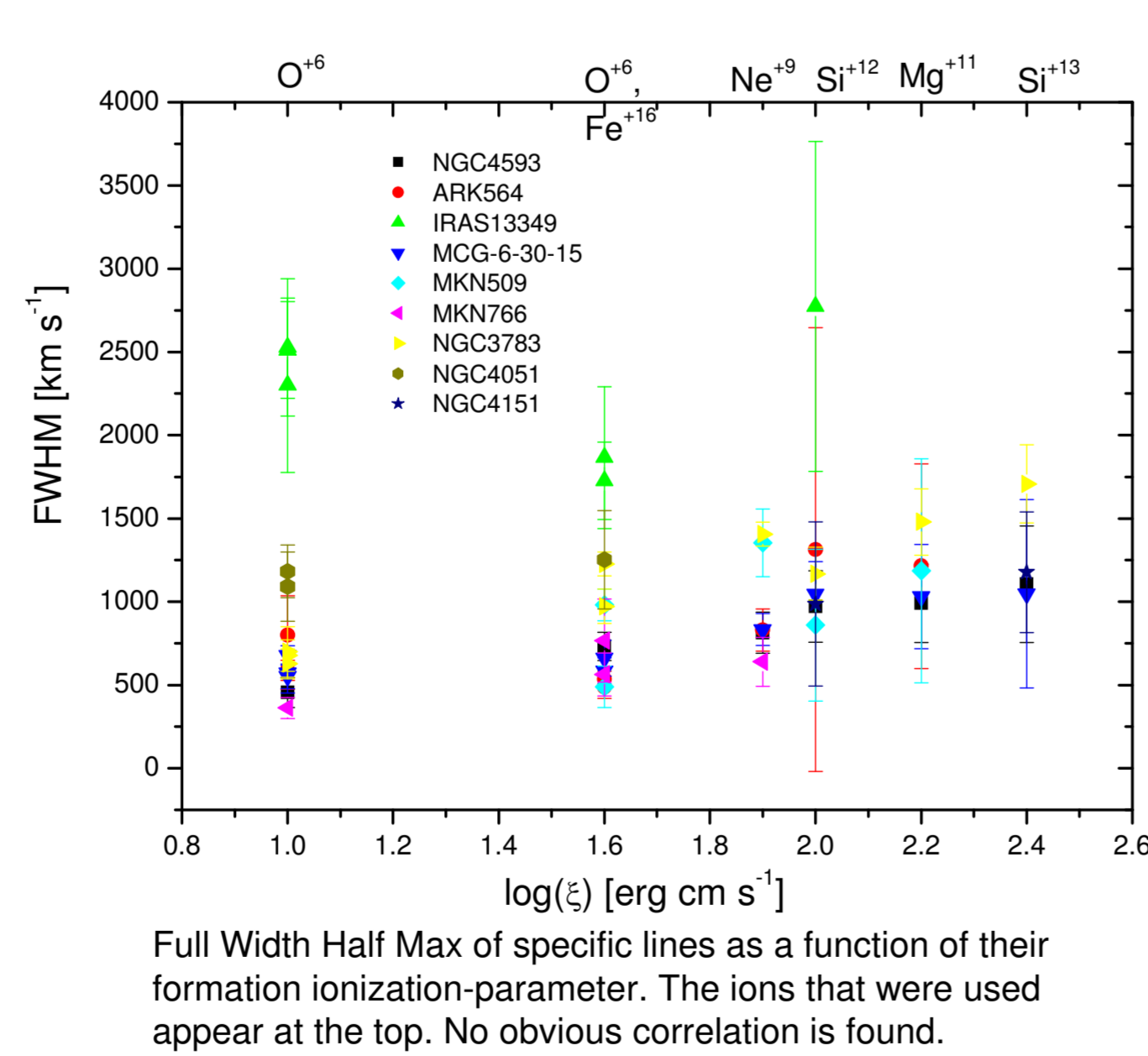
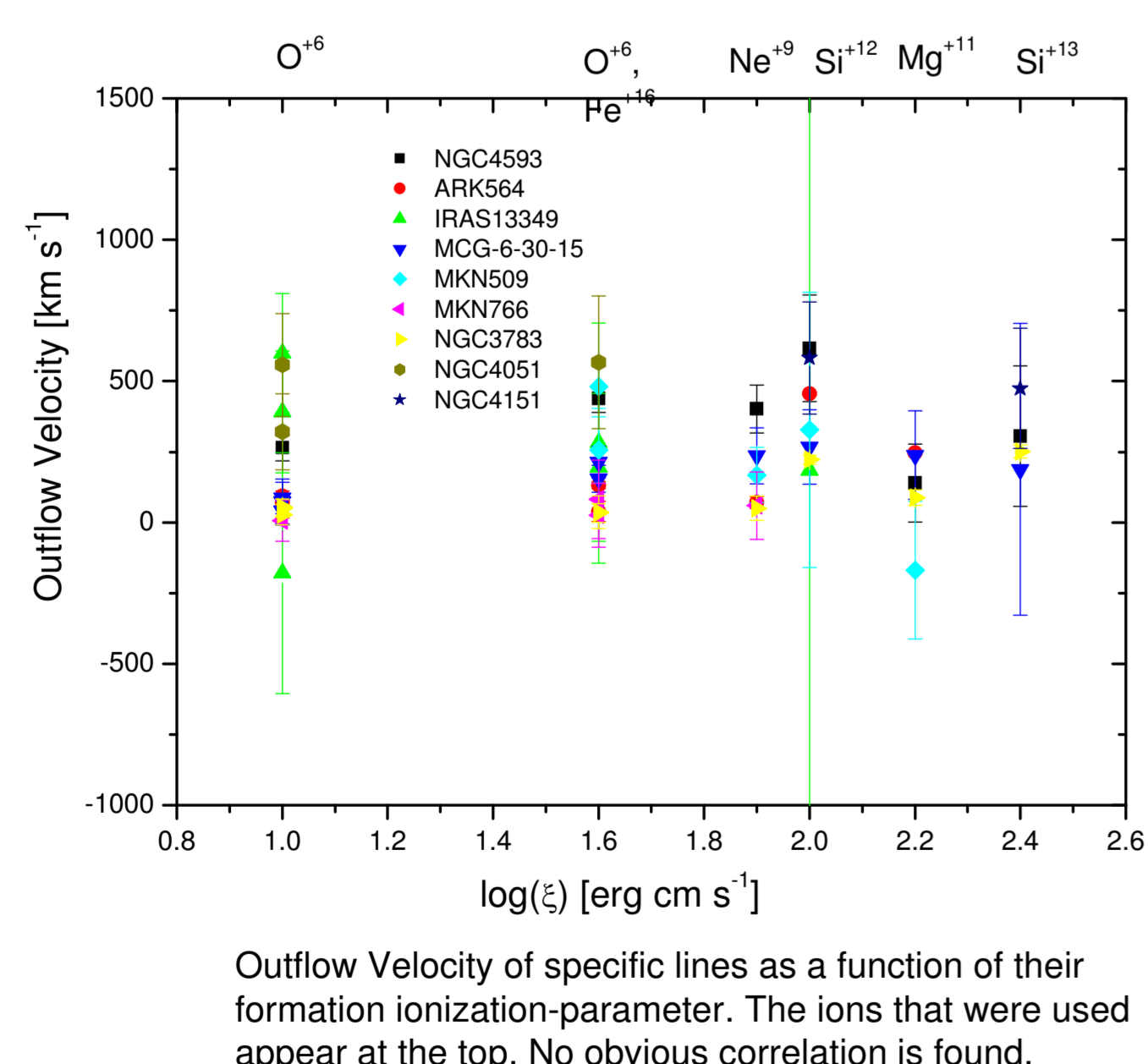
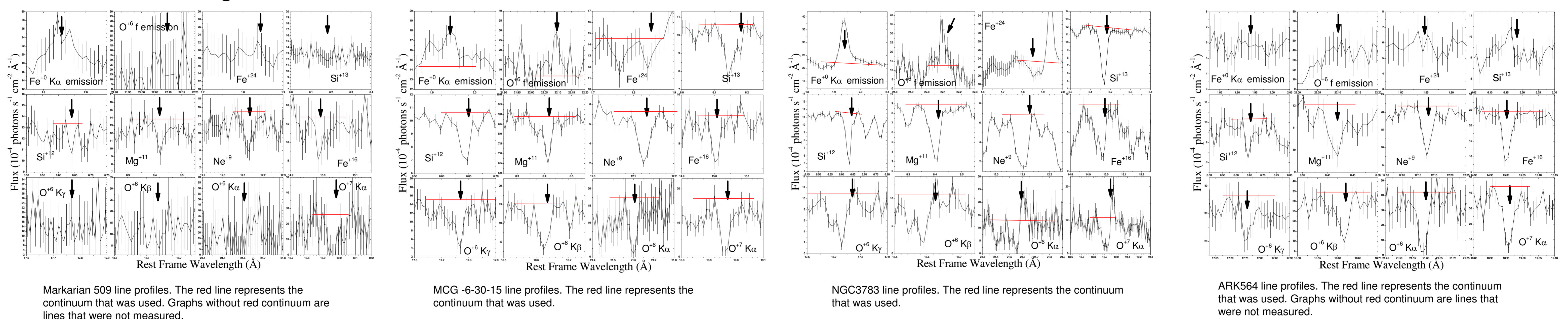
A_Z is the element abundance, f_{ion} is the ion relative abundance and the AMD is the expression in the red circle.

$$N_{ion} = A_Z \int f_{ion}(\xi) \left(\frac{\partial N_H(\xi)}{\partial \xi} \right) d\xi$$



Statistical Approach

We investigate a group of Seyfert 1 outflows and extract from relatively unblended lines the outflow velocity, full width half max, and equivalent width of each line. We do not use a model to fit the line but rather measure these properties directly from the troughs.



Conclusions

- We find that the temperature zone $4.5 < \log T < 5$ (K) lacks absorbing gas. We infer thermal instability in this region.
- We find no correlation between ionization parameter and the line width, outflow velocity, or equivalent width.
- We find a strong correlation between outflow velocity (line shift) and kinematic dispersion (line width).

Future Work

- AMD analysis for a complete sample of AGN outflows with high enough S/N ratio.
- Search for additional correlations that can shed light on the properties of these outflows.

