HST Observations Reveal the Curious Geometry of Circumgalactic Gas

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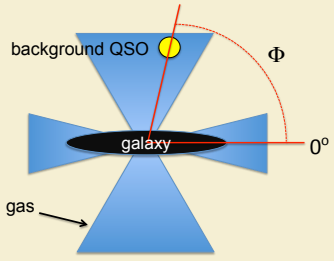
We have discovered that warm gas flows along galaxy major and minor axes detected out to 200 kpc. Our results are derived from a sample of HST-imaged isolated galaxies with nearby background quasars used to probe their 10^5K CGM detected in HST/COS UV spectra (traced by OVI absorption). We constrain the geometry of the gas to reside between 20-40 degrees of the projected major axis and within 60 degrees of the projected minor axis, with little-to-no gas found in between. Furthermore, strong absorption systems tend to be found along the minor axes of star-forming galaxies. All of our results are consistent with the current view of the CGM originating from major axis-fed inflows/recycled gas and from minor axis-driven outflows.

The Sample

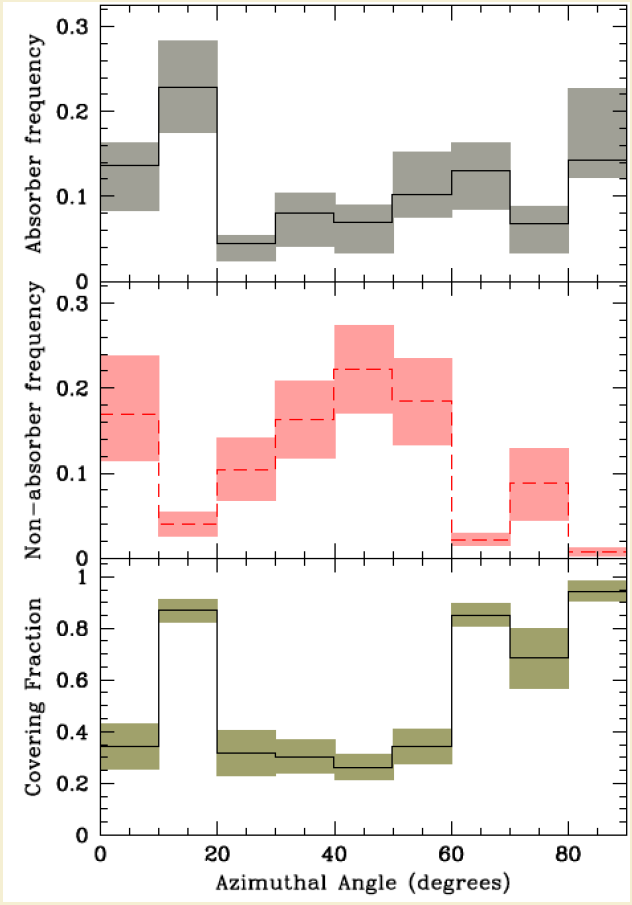
Our sample consists of 29 OVI absorbing (EW>0.1A) and 24 non-absorbing isolated galaxies within 200 kpc of background quasars.

The ***azimuthal angle*** is measured relative to the galaxy projected major (0^o) and projected minor (90^o) axes and the quasar sightline.



Results

- OVI is Φ dependent and occurs along the projected major axis (half opening angle of 20^o) and along the projected minor axis (half opening angle of $>40^o$).
- Non-detections are situated at intermediate Φ.
- Covering fraction is dependent on Φ and is the highest along the projected major and minor axes.
- For additional results see Kacprzak et al. 2015.



(Top) The Φ distribution for absorbing galaxies (0^o = major axis, 90^o = minor axis). Shaded regions are bootstrap 1 sigma errors. Absorption is detected with increased frequency towards the major and minor axes. (Middle) Φ distribution for non-absorbing galaxies. Note the opposite effect, where peak is maximized at intermediate Φ. (Bottom) The OVI covering fraction.

Conclusions

The distribution of OVI is consistent with the expected geometry of major axis-fed inflows and minor axis driven outflows and is consistent with bi-modal results found for MgII absorption (Kacprzak et al. 2012).

Full Paper QR code: Kacprzak et al. 2015, ApJ, 815, 22

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