Outflowing Winds in DEEP2 Galaxies at $z = 1$

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What are the properties of galaxies experiencing outflows at $z = 1$?

Is a critical star formation rate surface density required to drive superwinds at high redshift, and how does this value compare to local measurements?

A Physical Picture:

Superwinds from the combined effect of supernovae explosions and stellar winds are thought to strongly affect both their host galaxy and the surrounding intergalactic medium:

1) Quench star formation by expelling cold gas
2) Enrich the intergalactic medium (IGM) in metals
3) Limit black hole growth

read high-resolution spectra included in both outflow features (e.g.) and systemic lines (e.g.)

Star Formation Rates:

A galaxy's star formation rate is an important parameter which has been linked to outflows:

Higher velocity outflows are associated with more rapidly star-forming galaxies.

With the multwavelength data from AEGIS, we estimate star formation rates using both 24 μm observations (to infer L2 using Chary & Elbaz (2001) SED templates) and UV GALEX measurements.

Galaxy Areas and SFR Surface Densities:

Determining the physical extent of star formation in galaxies allows a calculation of the star formation rate surface density ($\Sigma$).

Locally, it has been suggested that a threshold $\Sigma = 0.1$ $M_{\odot}$ yr$^{-1}$ kpc$^{-2}$ is required to drive an outflow (Heckman 2002). Is this threshold constant at high redshift?

Estimating the area of distant galaxies is complicated by clumpy morphologies:

Select pixels on the basis of surface brightness:

Given F606W HST images, the conversion between $L_{UV}$ and SFR (Kennicutt 1998) is valid only for galaxies at $z \approx 1.3$. In this high redshift subsample, we found that the area selected by imposing $\Sigma = 0.1$ $M_{\odot}$ yr$^{-1}$ kpc$^{-2}$ was inclusive of approximately 74% of the flux within the Petrosian radius.

Therefore, for each object, we isolated the area corresponding to 74% of the flux.

Work in Progress:

Absorption line modeling to infer outflows:

We fit a one-component model to the resonance absorption lines, with four free parameters: $C = $ covering fraction, $v_0 = $ line center, $\tau = $ optical depth at $v_0$, $b =$ Doppler parameter (2$^\circ$)

Trends with SFR:

Several authors have found trends between outflow strength and SFR or 1. We are investigating these correlations in our data.

Emission features:

A variety of fine-structure FeII emission features are present in the spectra, including lines at 2365, 2396, 2612, and 2626 Å. These features are rarely seen in local starbursts; what is their origin?

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