

# The M31 Abundance Gradient

M. Croley<sup>1</sup>, P. Barmby<sup>1</sup>, M. Azimlu<sup>1,2</sup>, E. Rosolowsky<sup>3</sup>

<sup>1</sup>Western University, <sup>2</sup>Harvard-Smithsonian Center for Astrophysics, <sup>3</sup>University of British Columbia

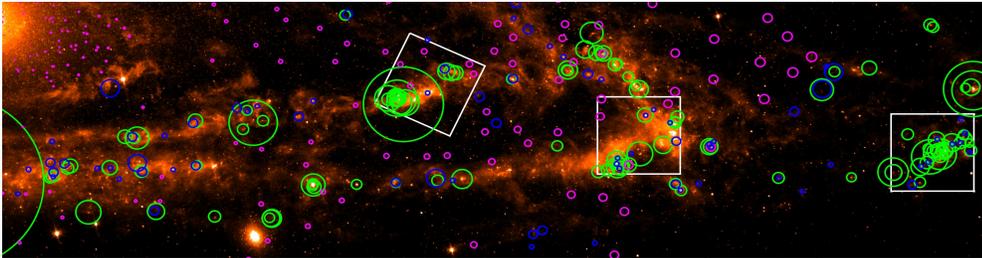
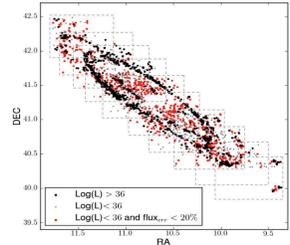
Radial gradients in metallicity have been observed in nearly every large galaxy. The study of current abundance gradients in galaxies from HII region spectroscopy provides important constraints on the parameters that govern chemical evolution and star formation. Optical and near-IR observations of HII regions in 6 fields in the disk of M31 have been obtained with the GMOS-N spectrograph. The spectra are sensitive enough to detect the auroral lines of oxygen, nitrogen and sulphur, allowing for a direct estimate of the electron temperature. This yields precise measurements of their abundance as well as unveiling M31s radial metallicity gradient.



NOAO/AURA/NSF

## Sample

Using a recent catalog of HII regions in M31 (Azimlu et al. 2011) as well as the multi-object capabilities of GMOS allows for the observation of a large enough sample of HII regions to robustly measure a metallicity gradient even in the presence of intrinsic scatter. Our GMOS-N observations contain emission-line spectra for HII regions in 5 fields at 4, 7, 11, 15 and 19 kpc from the centre of M31, encompassing over 80 regions in total



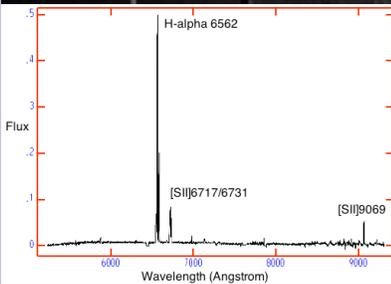
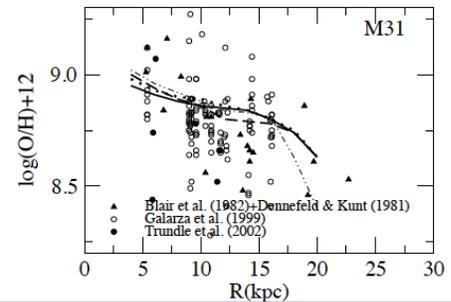
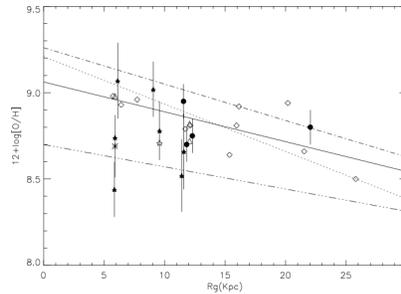
## GMOS Fields

M31 SW disk (67 x 18 arcmin, or 15 x 4 kpc), showing the location of our GMOS fields at 7, 11 and 15 kpc (solid white boxes) with their included HII regions (green circles, size scaled to H-alpha flux), planetary nebulae (purple circles) and supernova remnants (blue circles). Background image: Spitzer/8um image of M31 (Barmby et al. 2006).

## Oxygen Abundance Gradient in M31

Left: Stars/solids are stellar abundances and open symbols are from HII regions. The 4 lines are HII region abundance gradient fits using 4 different calibrations of the strong-line method (Trundle et al. 2002).

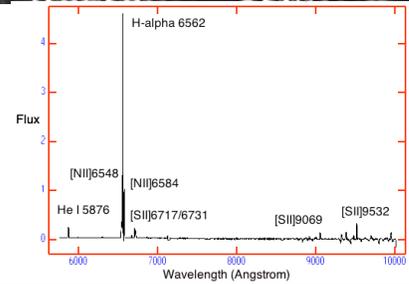
Right: Radial abundance measurements from a variety of sources. The solid and dashed lines show the results of different chemical evolution models (Marcon-Uchida et al. 2010).



## HII Region Spectra

Example emission-line spectra for HII regions in the 4 kpc (left) and 11 kpc field (right).

Top: Reduced 2D spectrum before sky subtraction and extraction



## References:

- Azimlu, M. et al. 2011, AJ, 142, 139
- Barmby, P. et al. 2006, ApJ, 650, L45
- Marcon-Uchida, M. M. et al. 2010, A&A, 520, 35
- Trundle, C. et al. 2002, A&A, 395, 519