

UKIRT Widefield Infrared Survey for Fe⁺

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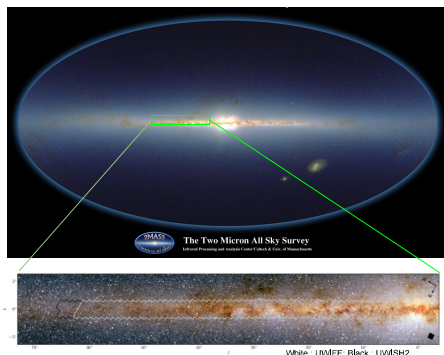
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Abstract

The United Kingdom Infrared Telescope (UKIRT) Widefield Infrared Survey for Fe⁺ (UWIFE) is a 180² imaging survey of the first Galactic quadrant ($7^\circ < l < 62^\circ$; $|b| < 1.5^\circ$) using a narrow-band filter centered on the [Fe II] 1.644 μm emission line. The [Fe II] 1.644 μm emission is a good tracer of dense, shock-excited gas, and the survey will probe violent environments around stars: star-forming regions, evolved stars, and supernova remnants, among others. The UWIFE survey is designed to complement the existing UKIRT Widefield Infrared Survey for H₂ (UWISH2; Froebrich et al. 2011). The survey will also complement existing broad-band surveys. We present the overview and preliminary results of this survey and our follow-up effort with Gemini telescopes.

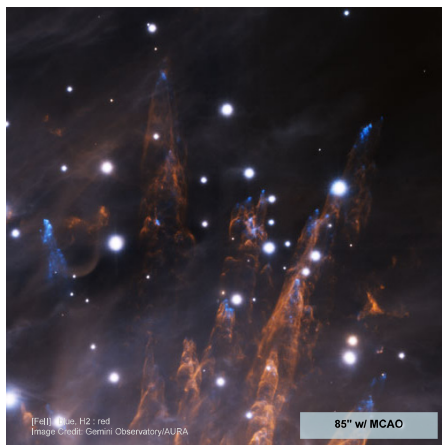
UWIFE in brief

- Unbiased
- near-infrared, narrow-band (1.64 μm [Fe II])
- imaging survey
- of the First Galactic Quadrant ($7^\circ < l < 65^\circ$; $-1.5^\circ < b < +1.5^\circ$)



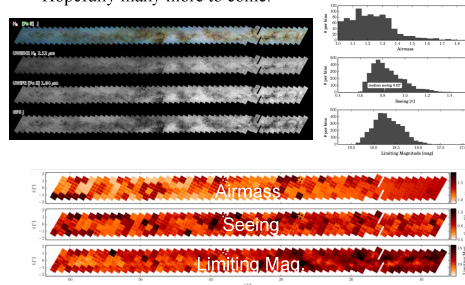
[Fe II] & H₂

- [Fe II] lines trace the dense atomic gas
- H₂ lines trace the dense molecular gas
- [Fe II] produces a wealth of lines across the NIR band, allowing us to measure the various gas properties (e.g., extinction, excitation T, electron density).

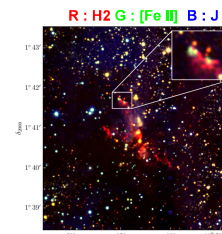


Survey status

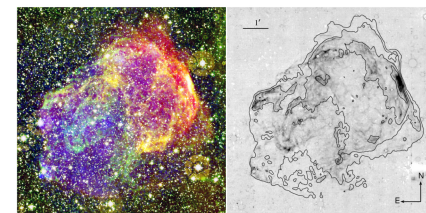
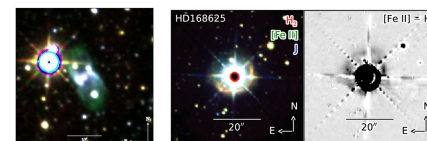
- Observations were conducted w/ UKIRT during 2012 and 2013
- 1 tile ~ 50' x 50'
- 1 hour / tile
- 220 tiles finished.
- The survey is completed and all data is publicly available.
- The survey paper is published (Lee et al., 2014; MNRAS 443, 2650)
- The first science paper is published (Shinn et al., 2014)
- Hopefully many more to come.



Gallery

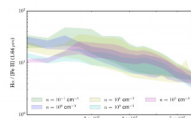


- [Fe II] emission are detected from jets/outflows around YSO, planetary nebulae and supernova remnants.
- [Fe II] emission, especially in YSO jets, are knotty and often barely resolved.
- Also detected are numerous unidentified sources.

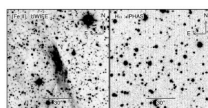


[Fe II] vs. H α

- In typical shock conditions, H α is intrinsically brighter than [Fe II] by factor of 3 ~ 30.
- Extinction makes [Fe II] look brighter! ($A_V > 6$; $N_H = 10^{22} \text{ cm}^{-2}$)



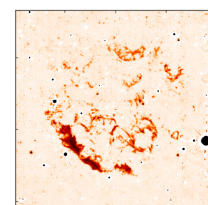
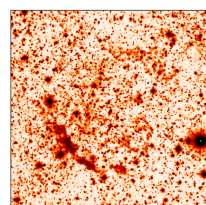
Intrinsic line ratios of [Fe II] 1.644 μm to H α for various shock models.



Northwestern part of SNR 3C391

Cont. subtraction

- Proper continuum subtraction is essential to reveal faint diffuse emission.

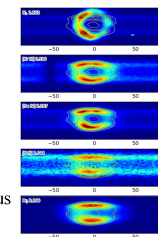


Before

After

Follow-ups

- Narrow band AO imaging w/ Gemini
 - NIRI (GN) observations in next semester
 - Ideally targets for GEMS GSAOI (GS)
- High-spectral resolution NIR spectroscopy
 - IGRINS; R=40,000 w/ simultaneous coverage of H & K
 - McDonald 2.7m telescope



IGRINS Observation of PN 7027

<http://gems0.kasi.re.kr/uwife/>