

[IM-23] Line Profiles of the Saturn Ring Planetary Nebula

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We analyzed the line profiles of the planetary nebula (PN) NGC 7009 secured with the Keck I HIRES and BOES's spectral data. The 5 positions were taken over the nebular image, 4 points on the bright rim plus 1 point at the central position. The covered spectral wavelength range was 3250 Å–8725 Å in these observations. We decomposed the lines of H I, He I, He II, C II, N III, [C III], [N II], [O II], [O III], [S II], [S III], [Cl III], and [Ar III] using the IRAF and StarLink/Dipso. After correcting the Earth's movement and the PN's radial velocities, -48.6 & -48.9 km/s, respectively, for the Keck & BOES, we produced the line profiles in a velocity scale. The zero velocity at each line profile clearly indicates which part of the components is approaching or receding, giving a general information of the kinematical structure. Almost all of the low-to-medium excitation lines, such as [N II], [S II], [O III], and [Ar III], secured at the central position and four positions along the major & minor axes, showed 3 components, double peak + a wide wing component, suggesting the fast outflow structures are present. The overall geometry is a prolate shell which also has a fainter outer shell in the halo zone, but there appears to be some peculiar sub-structures inside the main shell. The high excitation He I, He II, N III lines which might be formed close to the inner boundary of the shell show unusual features, completely different from the other lines. The He II and these high excitation lines may be indicative of a relative recent fast outflow from the central star and the permitted lines such as N III might be affected by the innermost structure. We discuss a possible presence of a jet-like fast outflow structure in an out-flow axis different from the main axis of the spheroid shell.

[IM-24] Supernova Remnants in the UWISH2 survey: A preliminary report

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UWISH2 (UKIRT Widefield Infrared Survey for H₂) is an unbiased, narrow-band imaging survey of the Galactic plane in the H₂ 1-0 S(1) emission line at 2.122 μm using the Wide-Field Camera (WFCAM) at the United Kingdom Infrared Telescope (UKIRT). The survey covers about 150 square degrees of the first Galactic quadrant (10° < l < 65°; -1.3° < b < +1.3°). The images have a 5 σ detection limit of point sources of K~18 mag and the surface brightness limit is 10⁻¹⁹ W m⁻² arcsec⁻². The survey operation began on 28 July 2009 and has completed on 17 August 2011.

We have been studying the supernova remnants (SNRs) in the UWISH2 survey area. Among the known 274 Galactic SNRs, the survey area includes 65 SNRs or 24 percent of the known SNRs. The wide-field and high-quality UWISH2 images allow us to identify both the diffuse extended and compact H₂ emission associated with SNRs, which is useful for understanding their physical environment and evolution. The continuum is subtracted from the narrow-band H₂ images using the K-band continuum images obtained as part of the UKIDSS GPS (UKIRT Infrared Deep Sky Survey of the Galactic Plane). So far, we have inspected 42 SNRs, and found distinct H₂ emission in 14 SNRs. The detection rate is 33%. Some of the SNRs show bright, complex, and interesting structures that have never been reported in previous studies. In this report, we present our identification scheme and preliminary results.