

New and old roles for narrowband H α

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Abstract. Until recently, H α has been seen as *the* tracer of ionized gas, picking out both star formation and the late stages of stellar evolution. This has been reaffirmed, spectacularly, by the recent WHAM and SHS surveys. But the advent of large-area digital detectors creates a new role for narrowband H α as a direct, simultaneous, measure of intrinsic stellar colour and reddening when e.g. $r' - H\alpha$ is combined with a nearby broad band colour e.g. $r' - i'$. This new capability has been clearly demonstrated by the nearly-complete IPHAS survey.

The H α line, observed in emission, has been recognised as a critical tracer of ionized gas for many decades now. Until recently, H α survey data has been obtained using photographic media, deployed both in imaging surveys and in objective prism work delivering slitless low resolution spectra (the latter only being complete to $R \sim 12$). The transition to large-area digital detectors, combined with increasingly capable database techniques, has wrought a major change. At the forefront of this have been three comprehensive surveys: the Wisconsin H α Mapper (WHAM, Haffner *et al.* 2003), the Schmidt H α Survey (SHS, Parker *et al.* 2005), and the INT/WFC Photometric H α Survey (IPHAS, Drew *et al.* 2005, <http://www.iphas.org>). WHAM has migrated to the southern hemisphere, having already given us an extraordinarily dynamic image of the Warm Ionized Medium (WIM) across the northern sky. The SHS, on the other hand, is both an end and a beginning, as the last major photographic survey, and the first to take on the entire southern Galactic Plane at seeing-limited spatial resolution. Its major contribution to date has been a uniform planetary nebulae census (Parker *et al.* 2006).

A quite different role for narrowband H α , now permitted by digital detectors, comes from sampling the stellar photospheric spectrum where either H α presents as an absorption feature, or pseudo-emission between TiO bands is seen at K/M types. The net result is a monotonic sensitivity to stellar spectral type (or intrinsic colour), that is now being realised by the nearly-complete IPHAS survey of the northern Galactic Plane. As well as taking the sensitivity limit for the detection of emission line stars down to $m_r = 19.5$ (see Witham *et al.* 2008), this ~ 1 arcsec resolution survey provides a colour-colour diagram ($r' - H\alpha$ versus $r' - i'$) that allows spectral types *and* reddenings to be assigned with high confidence to many millions of normal A–K stars. This has many applications, including to 3-D extinction mapping (see e.g. Drew *et al.* 2008, Sale *et al.* 2009).

References

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