Abstract
We present early stages of an Hα survey of the Magellanic System using the Wisconsin Hα Mapper (WHAM). Our maps of the Small Magellanic Cloud, Large Magellanic Cloud, Magellanic Bridge, and Magellanic Stream are the most sensitive kinematic maps of ionized gas throughout the System. With a velocity resolution of 12 km/s, WHAM observations can cleanly separate diffuse emission at Magellanic velocities from that of the Milky Way and terrestrial sources. These new maps of the MS and SMC compliment observations of the Magellanic Bridge by Barger et al. (2013), who found Hα emission extending throughout and beyond the observed H I emission. Using WHAM’s unprecedented sensitivity to the limit of atmospheric line confusion (~10s of mR), we find Hα emission where H I is traced in recent all-sky surveys (e.g., LAB; Kalberla et al. 2005) throughout the currently observed portion of the MS. The diffuse ionized emission at similar to the neutral gas extent as traced by 21 cm. We present spectra comparing H I and Hα kinematic signatures throughout the emission region.

Introduction
WHAM is in the process of delivering the first comprehensive surveys of the ionized component in and around the complex, extended gaseous structures related to the Magellanic Clouds and their interaction with each other and the Milky Way. As with studies of the WIM in other galaxies, the Magellanic System presents a much different environment, metallicity, and star formation than the Milky Way. Using the same instrument and the same techniques developed for the Galaxy, we can now compare the emission spectrum from these vastly different environments for the first time and begin to disentangle the processes responsible for establishing the ionization state and temperature within diffuse ionized gas.

The Magellanic Stream
The Magellanic Stream is a difficult complex to observe, with gas at kinematic velocities extending from ~400 km/s to ~600 km/s. To observe the full extent of the stream we adjust WHAM’s velocity window to attempt Hα observations that are kinematically similar to the observed H I emission. The blocks in figure 2 show the location of observed portions of the stream. Already several sight lines have shown H I regions with ionized components that match kinematically. Additionally, Hα emission has been detected with offset velocities compared to H I observed along the same sight lines. In several sightlines increased emission was observed towards the edge of the velocity windows, far offset from the H I emission. These directions will be re-observed to detect if any Hα exists at drastically different velocities then anticipated.

References

Acknowledgments
The move from KPNO to CTIO as well as ongoing WHAM operations are supported by NSF award AST-1108911. WHAM was built with the help of the University of Wisconsin Graduate School, Physical Sciences Lab, and Space Astronomy Lab. Sam Gabelt and Don Michalski provided much needed expertise during the 2008 upgrade in Wisconsin. The relocation south was smooth substantially due to the excellent staff at KPNO and CTIO. Acknowledgments go to Greg Madsen, Kat Barger, Mike Hernandez, and Alex Hill for the previous observations of the Magellanic Clouds.

Figure 1: The Extended Magellanic System. Neutral hydrogen column density as traced by the 21 cm survey (Kalberla et al. 2005) throughout the Magellanic System (figure adapted from Nidever et al. 2008). This representation uses Nidever’s “Magellanic System” frame where the LMC is located at (l, b) = (0, 0). The red boxes mark the planned region of the MS survey.

Figure 2: Magellanic Stream Survey. Figure 2 marks the regions observed by the Magellanic Stream Survey in black. The blue and black snapshots show regions where Hα and HI are observed, often with a velocity offset of ~50-100 km/s in kinematic space.

Figure 3: Magellanic Stream Pilot Study. The region of the pilot study at Kat Barger and Mike Hernandez is marked in red above in Figure 2. Figure 3 shows the pilot study region in windows of 20 km/s. While there are regions where the Hα traces the HI, there are also isolated regions of Hα that are not traced by HI.