

Probe opens a new window to interstellar space

January 16 2005

Taking stock of the stuff between the stars - the all-important dust and gases that are the building blocks of new stars - has never been easy. The interstellar medium, as scientists know it, is a murky, nebulous place that defies easy measurement. Yet probing the space between the stars and the star-building materials that reside there is increasingly important as astrophysicists seek to add precious detail to their pictures of how stars are born, live and die.

Now, with help from a novel new device, a team of University of Wisconsin-Madison astrophysicists has successfully developed a method for sampling the interstellar medium, specifically to take the temperature of and explore the pockets of ionized oxygen interspersed between the stars of the Milky Way.

"This is a first for studies of our galaxy," says Ron Reynolds, a UW-Madison professor of astronomy and an authority on the chemical soup of elements that permeates the space between the stars.

With colleagues John Harlander of St. Cloud State University and Edwin Mierkiewicz, UW-Madison physics Professor Fred Roesler constructed and deployed a new type of instrument capable of sampling wide swaths of the sky and exploring the vast clouds of ionized oxygen that well up from the plane of the galaxy. The new device was built with support from the National Science Foundation (NSF).

Data from the first observations using the new spectrometer, which is

attached to a small telescope at UW-Madison's Pine Bluff Observatory, were presented by Merikiewicz here today (Jan. 13, 2005) at a meeting of the American Astronomical Society (AAS).

The new observations, taken by Mierkiewicz during the past year, reveal enormous chimneys of ionized gas that rise from the galactic plane into the far corners of the Milky Way.

"The galaxy seems to be full of channels or chimneys of ionized hydrogen, oxygen and nitrogen gas," says Reynolds. "The source is down in the muck where stars are born, but these channels seem to extend into the nooks and crannies of the galaxy."

That discovery, according to Mierkiewicz and Roesler, is intriguing because it provides insight not only to the patchwork of elements that make up the interstellar medium, but also to a class of rare stars that seems to be primarily responsible for the heating and churning that creates the chimneys of gas.

The stellar culprits, known as "O stars," are the most massive and luminous of stars, shining as much as a million times brighter than the sun.

"O stars are the only known stars that can create that much ionization," says Reynolds. "These are very rare stars - one in 10 million stars is an O star - but we see that they have a large influence on the interstellar medium. At this point, if there were other objects creating that much ionization, we'd know about them."

The picture that is emerging, according to Roesler, is that the O stars, which tend to occur in clusters near stellar nurseries, act as galactic blenders of sorts: "They are responsible for the ionization - the stripping of electrons from atoms - and the stirring up of the oxygen."

The Spatial Heterodyne Spectrometer, the new spectrometer developed by the Wisconsin team, looks at ultraviolet light, which is invisible to the unaided eye, but is laden with information for astrophysicists. The new technique, says Mierkiewicz, is especially useful as a temperature probe, and gives scientists a new way to take the temperature of the invisible clouds of gas that permeate space.

Teasing out the details of the interstellar medium is important, the scientists say, because each new finding helps fill in the picture of the life cycle of stars and, ultimately, of galaxies like the Milky Way.

In addition to Mierkiewicz, Roesler, Harlander and Reynolds, K.P. Jaehnig of UW-Madison contributed to the work presented at the AAS meeting. The new Wisconsin spectrometer was developed with support from NSF's Advanced Technology Instrumentation Program.

Source: University of Wisconsin-Madison

Citation: Probe opens a new window to interstellar space (2005, January 16) retrieved 18 April 2024 from <https://phys.org/news/2005-01-probe-window-interstellar-space.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.