# 3D map shows dusty structure of the Milky Way

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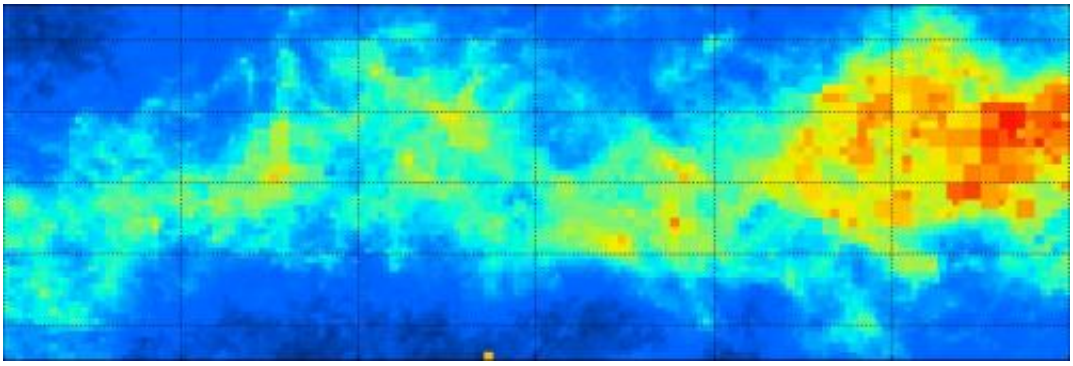

Detail from map at 9000 light years (3 kiloparsec). The map is coloured according to how much dust lies in each direction in the northern Milky Way. The red/brown areas are dustiest directions. Credit: Sale et al/IPHAS

(Phys.org) —A team of international astronomers has created a detailed three-dimensional map of the dusty structure of the Milky Way – the star-studded bright disc of our own galaxy – as seen from Earth's northern hemisphere. The map will be presented by Prof Janet Drew of the University of Hertfordshire at the National Astronomy Meeting (NAM) 2014 in Portsmouth on Monday 23 June.

Dust and gas, making up the Interstellar Medium (ISM), fill space between stars in galaxies. The dust in the ISM is shaped by turbulent flows that form intricate fractal structures on scales ranging from thousands of light years down to hundreds of kilometres. Rather than

measuring the dust itself to create the map, the team has used observations of more than 38 million stars to estimate how much starlight has been obscured by the ISM and thus how much dust lies in our line of sight to each star. This 'extinction' map derives from the newly released catalogue of the Isaac Newton Telescope Photometric H-alpha Survey of the Northern Galactic Plane (IPHAS), the first digital survey to cover the entire northern Milky Way.

"Because the Solar System is embedded in the disc of the Milky Way, our view of it is choked with dust, with the result we know less about its internal structure than we do about some external galaxies, such as M31 in Andromeda. " said Drew, the Principal Investigator for the IPHAS survey. "In this Northern survey, we are mainly looking at the parts of the Galactic disc that lie outside the Sun's orbit around the Galactic Centre. This 3-D map demonstrates with greater force than existing 2-D maps that dust in the outer disc does not trace the Perseus spiral arm and other expected structures in a simple way."

The map shows how extinction builds with distance away from the Sun (typically out to 12000 light years or more) in any part of the surveyed northern Milky Way. Detail on an angular scale 7 times finer than the angular size of the moon is caught. The fractal nature of the ISM is visible in the map, as are large-scale features, such as star-forming molecular clouds and bubbles of ionized gas around clusters of hot stars.

"We can see a number of specific features, including the Rosette Nebula and the star-forming belt in the Perseus Arm of the Milky Way," said Dr Stuart Sale, who led the team that created the map. "Our location within the Milky Way means that we can study the ISM in far greater detail than for any other galaxy. The knowledge that we gain from studying our own galaxy can subsequently be applied to others."

"IPHAS has been a major part of the Isaac Newton Telescope's

programme of observation over the last decade. It is one of several ground-based surveys beginning to provide important new and very large collections of data, complementing ESA's Gaia mission as it starts its work, that are being discussed at NAM 2014. The common goal is to properly unravel the full 3-D spatial organisation of our own Galaxy," said Drew.

**More information:** A 3D extinction map of the Northern Galactic Plane based on IPHAS photometry. Sale et al, MNRAS, 2014, arxiv.org/abs/1406.0009
Barentsen et al, MNRAS, 2014, see www.iphas.org/data.shtml

The map can be explored interactively on the IPHAS website: www.iphas.org/extinction/

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