STUDY OF DUST PROPERTIES AROUND THE WHITE DWARF GD 61 IN IRIS AND AKARI MAPS

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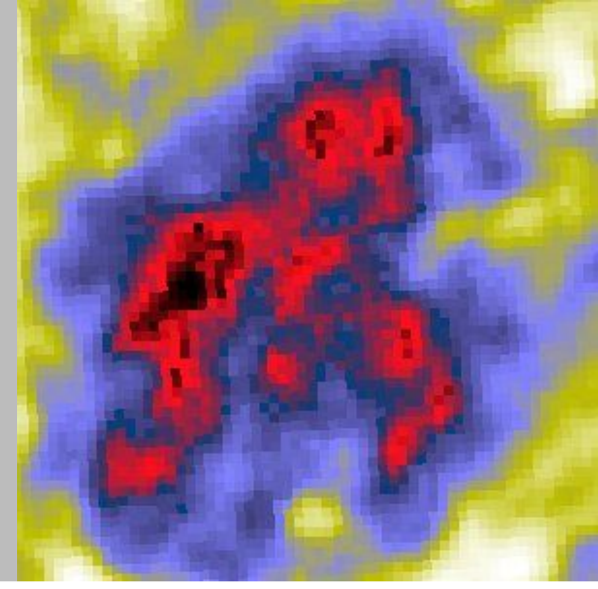
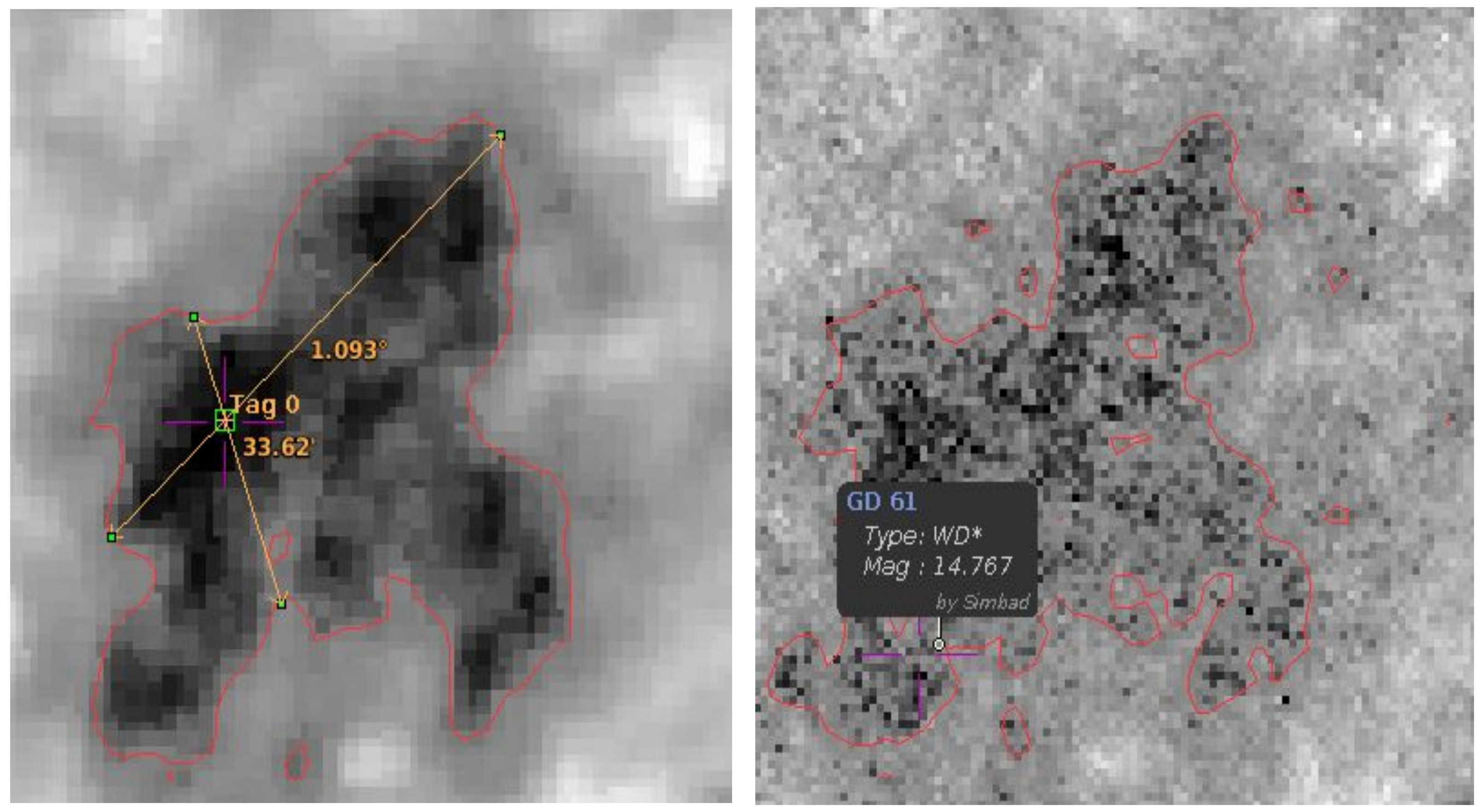


INTRODUCTION

Our research is focused on the study of FIR images (1.5°, 100px) of the region around WD GD 61 located at R.A. (J2000) $04^h\ 38^m\ 39.37^s$ and Dec. (J2000) 41° 09' 32.34" using Improved Reprocessing of the IRAS (IRIS) and AKARI surveys from SkyView Virtual Observatory along with SIMBAD Astronomical Database and Gaia Archive of ESA.



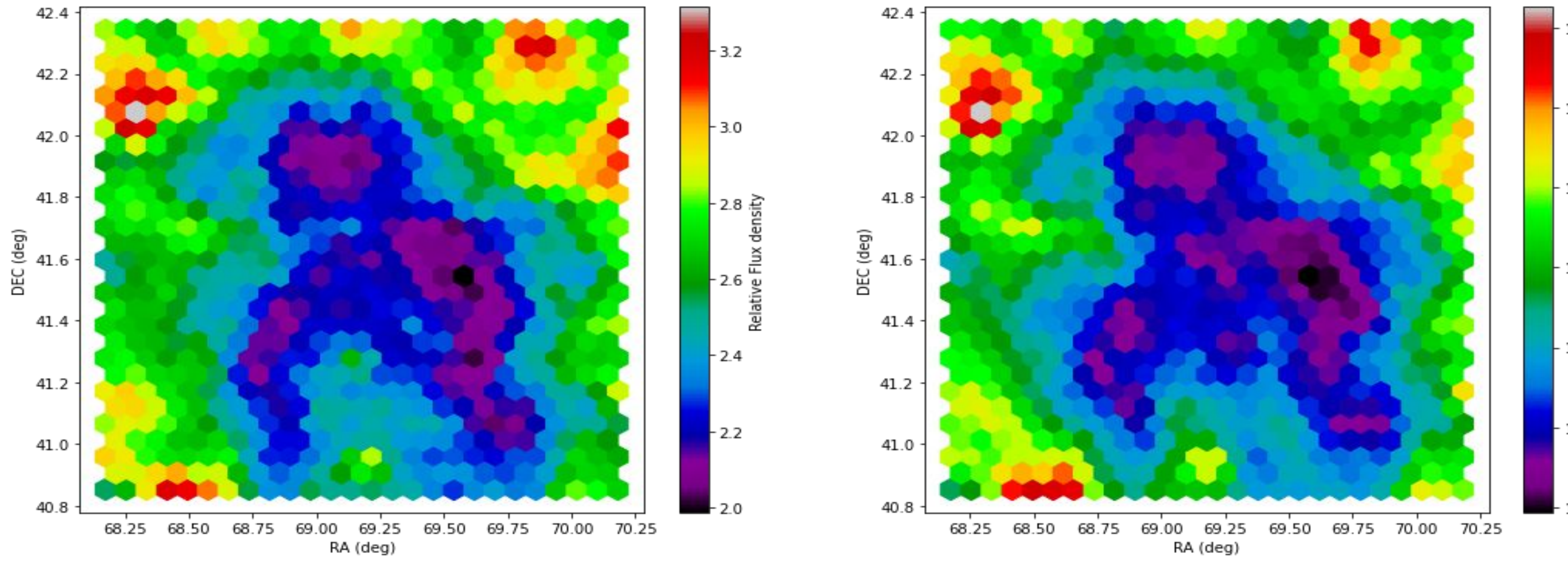
a) b)

Figure 1: Isolated Dust Structure Contour Around WD GD 61 a) in IRIS 100 µm (major axis = 1.093°, minor axis = 33.62') and b) in AKARI 90 µm Pre-processed Using Aladin v10.0 (Tag 0 Represents the Pixel with Minimum Relative Flux Density).

METHOD AND TECHNICAL DETAILS

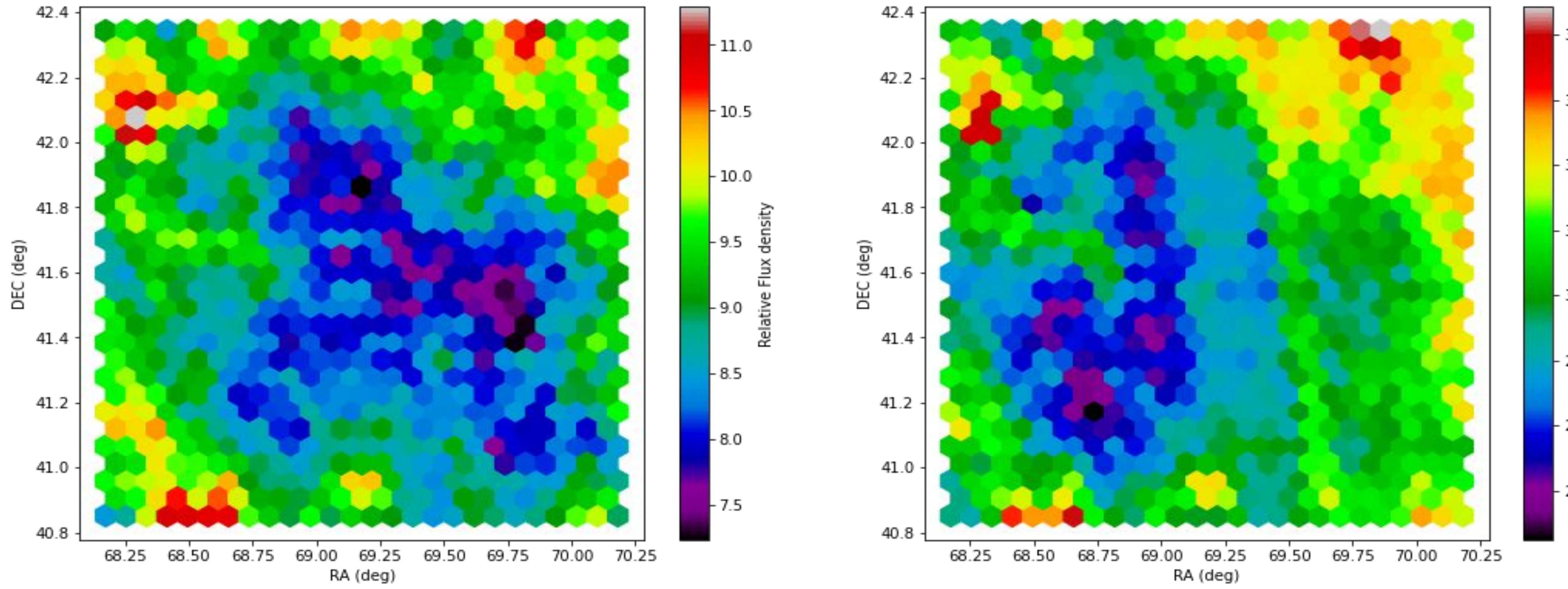
From various white dwarf candidate catalogues, clearly isolated dust structures around the white dwarfs are selected in IRIS and AKARI surveys using SkyView Virtual Observatory followed by cross-validation using Simbad Astronomical Database. Then .fits extension files of the selected region are downloaded to pre-process in Aladin v10.0. After contouring of isolated structure, major and minor axes are determined to calculated inclination angle (Holmber, 1946). The pixel extraction is done for accessing relative flux density values of each pixels.

The data is then processed to calculate the dust properties such as flux distribution, dust color map and temperature distribution (Schnee et al., 2005) subsequently visualized using python. For the distance calculation, parallax data is accessed from the Gaia Archive of ESA. The calculated distance is then used to estimated the mass of the structure (Young et al., 1993).



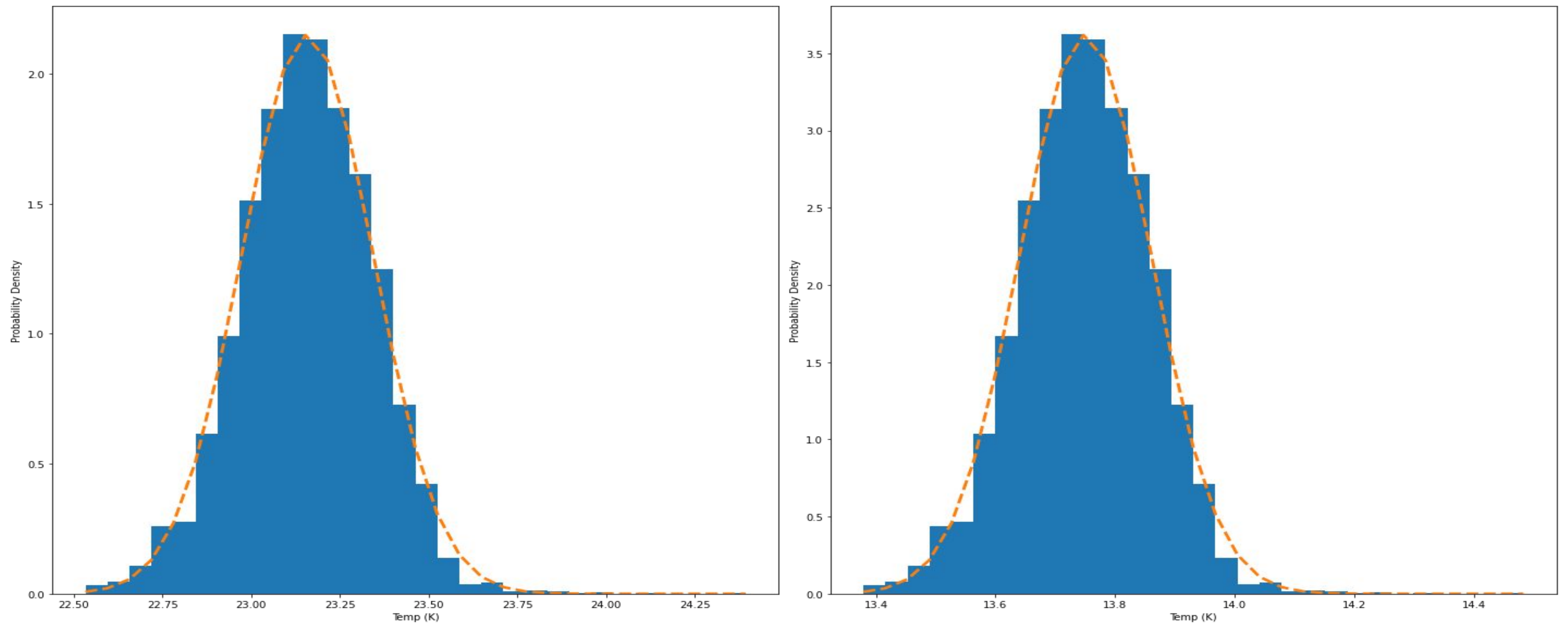
a) b)

Figure 2: Dust Color Map of IRIS Relative Flux Density Distribution at a) 60 µm and b) 100 µm



a) b)

Figure 3: Dust Color Map of AKARI Relative Flux Density Distribution at a) 90 µm and b) 140 µm



a) b)

Figure 5: Gaussian Fit of the Temperature Distribution in a) IRIS and b) AKARI data

RESULTS

The size of the cavity within the region is 23.18 pc × 11.97 pc with an inclination angle of 61.53°. With the IRIS data, the temperature of the whole region was found between a maximum value 24.39 ± 0.61 K to a minimum value 22.53 ± 0.31 K with an offset of 1.86 K and an average temperature of $23.16 \pm 18.55\times10^{-3}$ K. Similarly, using AKARI data, the temperature was found between a maximum of 14.48 ± 0.37 K and a minimum of 13.38 ± 0.18 K with an offset of 1.12 K and an average temperature of $13.75 \pm 1.10\times10^{-3}$ K. Distribution of the temperature in both the surveys was found to be Gaussian.

ANALYSIS

The inclination angle of the cavity indicates that it is neither a face-on (i→0°) nor an edge-on (i→90°) object. Very low offset temperatures (< 5K) suggest that the cavity might be evolving independently with less disruption from background radiation sources. Also, the Gaussian distribution of the temperature in both the surveys implies that the region might be in a local thermodynamic equilibrium.

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