Do the arching HI filaments show in local reddening data ?

Jens Knude

Copenhagen University Observatory

Probable dust counterparts of arching structures are looked for in two cases. (a) the Eridanus expanding shell, Heiles (1976) and (b) the extended Sco-Cen feature, Weaver (1977). Apparently the color excess data may be used to derive distance and dimension estimates of these structures.

(a). Color excesses from two areas SA 121 and SA 144 situated on the position of the 3.2 - 6.3 km/s velocity-slice are applied. Some stratification of the color excesses is noticed for both areas but extreme patchiness typifies particularly the dust in the SA 144 region,Figure 1. This Figure differs from the normal appearence of such diagrams for magnitude limited stellar samples by having an upper reddening limit,constant with distance. This fact alone may indicate the presence of a wall like structure. Three distinct reddening levels E(b-y) are present: 0.012, 0.018 and 0.030 mag. But not over the complete area, only in certain cross sections. If these reddenings are assumed to be due to dust in the HI shell when it is first met, for the second crossing and for lines of sight penetrating the shell twice respectively, the distance to the shells center and its radius may be estimated from the spatial location of the dust. Velocities of interstellar absorption lines for these stars are required to justify this assumption. Figure 2 displays the level E(b-y) = 0.012 mag attributed to the near part of the shell in a 20′by 300′section along the NW-SE diagonal of the area. Stars in this subsample have constant longitude. The distance to the 0.012 mag dust is accurately determined to 110 pc, because the dust is known to be within 115 pc and some unreddened stars are observed in front of it as far out as 100 pc. The 0.018 and 0.03 mag levels are displayed in Figure 3 and 4 respectively. The distance to the 0.018 level is similarly derived to 165 pc whereas only an upper limit,170 pc, for the combination 0.030 mag is deducible. As SA 144 is 14 deg from the shells center a simple calculation results in a distance 137 pc to the shells center and a radius of 46 pc. Only three stars are found to have reddenings above 0.03 mag, indicating the presence of a level at 0.05 mag within 300 pc, about the minimum distance to the H filaments studied by Reynolds and Ogden (1979) at this latitude.Reddenings in SA 121 also display the three levels and their distances result in an estimate 126 pc to the shell center and a ra-

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dius of 51 pc. Originaly Heiles (1976) suggested a distance 150 pc to the shells center and a radius 49 pc.

(b). Color excesses in the direction of the proposed Sco-Cen bubble show an organized variation with distance.Most stars more distant than 150 pc have reddenings above 0.02 mag and levels off at 0.07 mag, Figure 5. Such a behaviour may be due to a spatialy confined,non coherent structure with some diffuse matter inside it. Sampling effects can cause biased interpretations. Figure 6 and Figure A = Figure 5 in Knude (Local Interstellar Extinction) go fainter than Figure 5 and more reddened parts of the same volume are picked up. These two figures have a clearly defined lower envelope fitting well to the upper confinement of Figure 5. A sample of B stars beyond 300 pc has also a distinct lower reddening limit. Within the shell concept excesses on the lower envelope of Figure 5 originate either on the front or on the backside; excesses on the upper envelope of Figure 5 are caused by two crossings and a contribution from the matter behind the shells backside. The lower envelopes of Figure 6 and A are populated by reddenings from two encounters, points above in addition by non swept up dust inside. The absence of distant low excess stars may be taken as an indication of a pervasive homogeneous medium.

Shell dimensions are estimated from SA 193,(l,b)= (293,0). Figure 7 shows the excess levels pertaining to the first and combined encounters. From this reddening distribution the shell radius is estimated to 140 pc and the distance to the expansion center to 190 pc. With this dimension and the reddening variation for stars beyond 400 pc in Figure A,which is postulated to be similar to that in the medium before the bubble was blown. The slope of the envelope gives an estimate of a density in a postulated homogeneous medium : 0.22 atoms cm -3. This translates to a swept up gas mass 10**5 solar masses, as a lower limit because the diffuse dust clouds have not been accounted for. The mass of the moving gas has been computed to 10**6 solar masses, Weaver (1977).

References

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Weaver,H.F.,1977,in IAU Symposium 84,ed.W.B.Burton,p.295 .

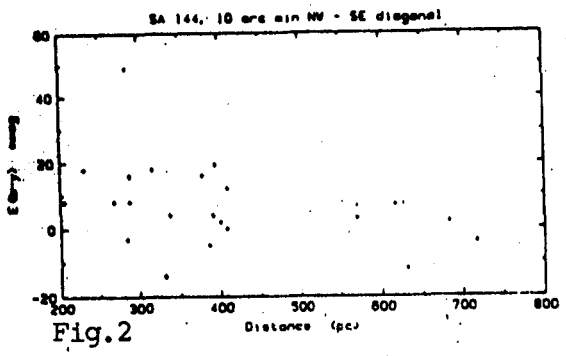

Fig.2

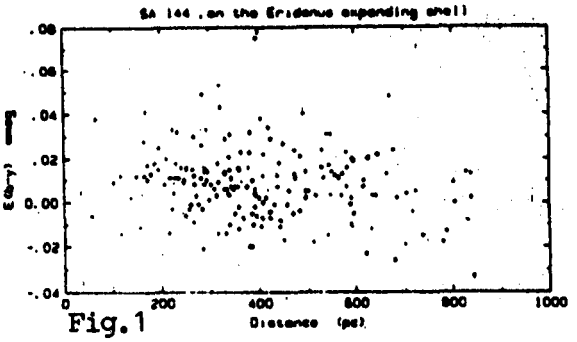

Fig.1

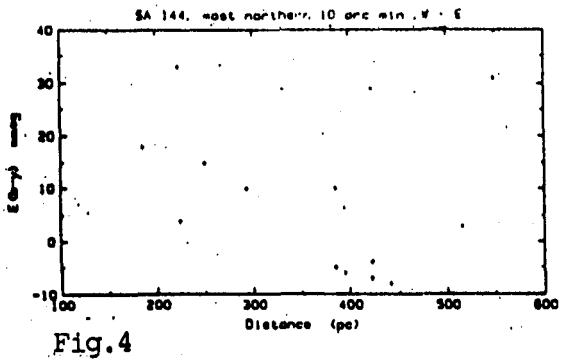

Fig.4

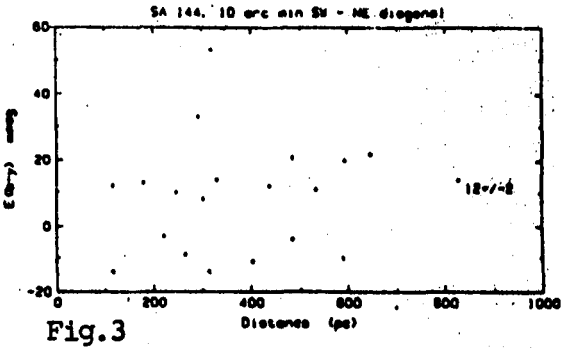

Fig.3

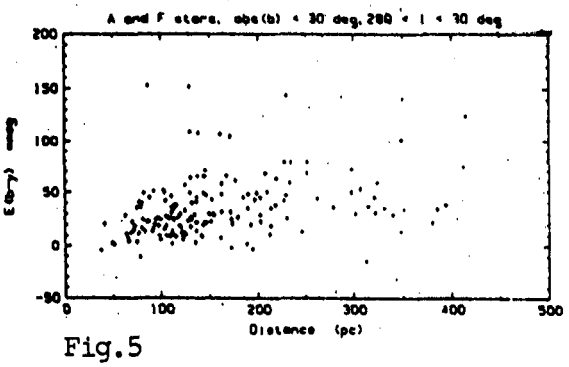

Fig.5

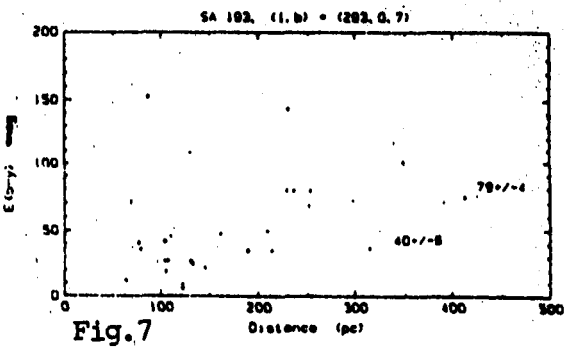

Fig.7

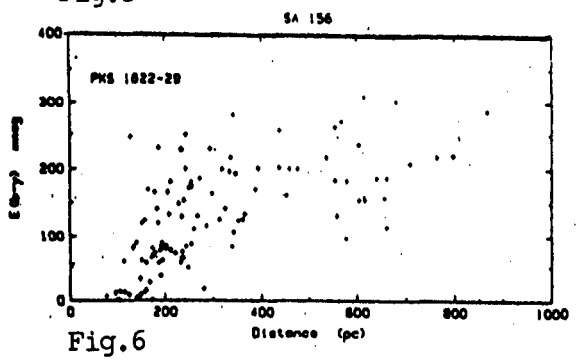

Fig.6

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