Magellanic Clouds

Those samples are compared and analysed in Bozzetto et al. (2016). There are 40 objects in Large Magellanic Cloud and 19 objects in Small Magellanic Cloud sample. The data density distribution is also reconstructed for the joint sample in Bozzetto et al. (2016), where the existence of two subsamples is implied. The subsample of larger \( \Sigma \) is argued as objects evolving in a denser environment with a non-zero ambient density gradient while. As seen from the above plots, the LMC data is most concentrated in the region of lower \( \Sigma \) which is indicative of the remnants evolving in a smaller ambient density, while the SMC remnants are more likely to be brighter.

Milky Way

These samples are distinguished in Pavlovic et al. (2013) from the sample of 60 Galactic SNRs, with high density objects. The high density sample (28 objects) selection criteria was high ambient density while low density sample is from \( 5 \) Balmer-dominated remnants expanding in low density environment. The Balmer-dominated SNRs are clearly at lower \( \Sigma \) values. The remnants associated with the ambient of lower density are scattered across areas of both, higher and lower brightness. If \( \Sigma \) depends on ambient density as argued in Arbutina & Urošević, 2005, Kostić et al., 2016 then the scatter to lower \( \Sigma \) of the remnants associated with high density ambient might be indicative of ill determined density.

Small Magellanic Cloud mixed samples

If appears that a low \( \Sigma \) evolutionary track is evident in both cases but because of the small number of data points (Galactic low density sample) and scatter (Galactic high density sample) strong conclusions should be avoided.

All samples

Even for the reconstructed data distribution for all samples together it appears that the sample is largely incomplete. There are many "empty" areas. Also, the plot does not show any distinctive evolutionary features, in addition to the ones already discussed for other samples.

Selected mixed sample

This sample was selected as the most compact.

Summary

We reconstructed \( \Sigma - D \) data density distribution for several samples of Magellanic Clouds and Galactic SNRs. We distinguished these evolutionary features in single and combined samples:

(i) The largest data grouping is a compact for the low brightness remnants at \( \log D \sim 1.5 \) and results from the LMC sample.

(ii) Resulting from the SMC data but less apparent than (i) is an evolutionary track of bright remnants possibly expanding in ambient with a non-zero density gradient.

(iii) Contributed from SMC and Galactic samples is a feature of lower brightness than (i), appearing as a single track in a \( \Sigma - D \) plane but consistent with the areas of missing data.

Although some evolutionary \( \Sigma - D \) features are present the reconstructed data density distributions still appear with "empty" areas and are not reliable for calibration of a distance scale on a full \( \Sigma - D \) range. The theoretical conclusions about \( \Sigma \) dependence on ambient density from Arbutina & Urošević (2005); Kostić et al. (2016) are likely to be validated but further sample selection and better surveys are a prime target for future studies on this subject.