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CHEMICAL ENRICHMENT IN FOUR LOCAL DSPH GALAXIES

L. Carigi[1], X. Hernandez[1] and G. Gilmore[2]

We calculate chemical evolution models for 4 dwarf spheroidal satellites of the Milky Way (Carina, Ursa Minor, Leo I and Leo II) for which reliable non-parametric star formation histories (SFH) have been derived (Hernandez et al 2000, HGV). We can then trace the metallicity and abundance ratios of the stars formed, the gas present at any time within the systems and the details of gas ejection, of relevance to enrichment of the galaxies environment. Systems showing extended star formation histories (Carina and Leo I) however, are consistent with the idea that their tidally limited dark halos provide the necessary gravitational potential wells to retain their gas. The complex time structure of the star formation in these systems remains difficult to understand. Observations of detailed abundance ratios for Ursa Minor strongly suggest that the star formation history of this galaxy might in fact resemble the complex picture presented by Carina or Leo I, but localized at a very early epoch.

We first fixed our Ursa Minor model to comply with SFH_{HGV}, which shows a single burst; however, the inference of HGV loses all temporal resolution for ages greater than 10 Gyr. The time structure inferred for Ursa Minor could be only an artifact of the method.

In comparing with the detailed observational determinations for Ursa Minor, we find that for values of [Fe/H]<-1.6 our corresponding predictions for [O/Fe] closely match observations for this galaxy. The most metal-rich data point for Ursa Minor of [Fe/H]≈-1.4 corresponds to an upper limit of [O/Fe] ≈ 0.0. Our single burst models can not reproduce such low values of oxygen at such high values of iron.

Comparing with results for galaxies with more than one burst, the first wind manages to clear the galaxy of the heavy elements produced, which resulted in low values of oxygen in the second burst. The SNae type Ia due to binary stars formed during the first burst have such long evolution times that they alter the element ration for stars formed during the second burst. In this way, stars formed during the second episode have large amounts of iron, but little oxygen. We present an alternative model for Ursa Minor where we have modeled the star formation rate with two discrete bursts (see Fig. 1). A more complete description, together with results for Carina, Leo I and Leo II, can be found in Carigi et al. 2002.

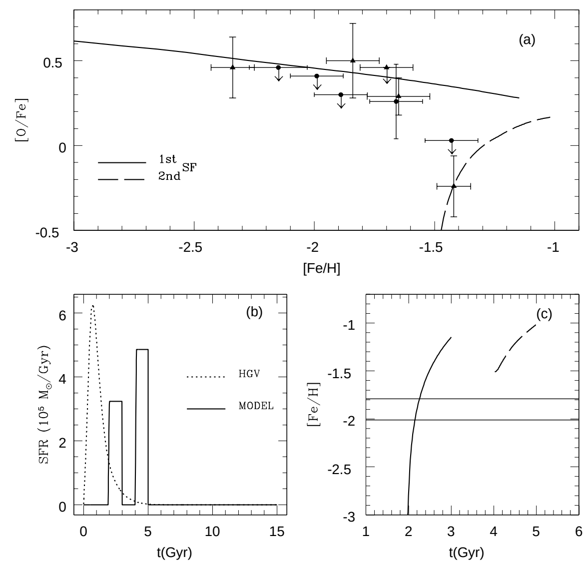

Fig. 1. Predictions from the Ursa Minor variant model. Panel (a): solid curve gives the [O/Fe] vs. [Fe/H] ratios for the first burst of the model, with the dashed curve showing results for the second. Panel (b): the star formation for the alternative Ursa Minor model, showing two distinct bursts. Panel (c): the temporal evolution of [Fe/O] in the gas for this model.

REFERENCES

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[1]Instituto de Astronomía, Universidad Nacional Autónoma de México, A.P. 70-264, 04510 México, D.F.

[2]Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, England