XV Latin American Regional IAU Meeting (Cartagena de Indias, Colombia, 3-7 October 2016)
Editors: Mario Armando Higuera Garzón & Santiago Vargas Domínguez

GAS DEPLETION DRIVEN BY SUPERNOVAE IN DWARF SPHEROIDAL GALAXY URSA MINOR: HYDRODYNAMICAL RESULTS

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The dwarf spheroidal (dSph) galaxy Ursa Minor shares a same characteristic found in other classical dSph galaxies in the Local Group: a low amount of gas inferred nowadays. Using non-cosmological, three-dimensional hydrodynamical simulations, we analyzed the impact of supernovae blasts on an initial isothermal gas configuration in hydrostatic equilibrium with a cored dark matter gravitational potential suitable for the Ursa Minor galaxy. Our results indicates that supernovae can remove more than a half of the initial gas mass inside the tidal radius of Ursa Minor after 3 Gyr of evolution (the estimated duration of the star formation episodes in Ursa Minor).

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GRAVITATIONAL WAVE IN LINEAR GENERAL RELATIVITY

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General relativity is the best theory currently available to describe the interaction due to gravity. Within Albert Einstein's field equations this interaction is described by means of the spatiotemporal curvature generated by the matter-energy content in the universe. Weyl worked on the existence of perturbations of the curvature of space-time that propagate at the speed of light, which are known as Gravitational Waves, obtained to a first approximation through the linearization of the field equations of Einstein. Weyl's solution consists of taking the field equations in a vacuum and disturbing the metric, using the Minkowski metric slightly perturbed by a factor ϵ greater than zero but much smaller than one. If the feedback effect of the field is neglected, it can be considered as a weak field solution.

After introducing the disturbed metric and ignoring ϵ terms of order greater than one, we can find the linearized field equations in terms of the perturbation, which can then be expressed in terms of the Dalambertian operator of the perturbation equalized to zero. This is analogous to the linear wave equation in classical mechanics, which can be interpreted by saying that gravitational effects propagate as waves at the speed of light. In addition to this, by studying the motion of a particle affected by this perturbation through the geodesic equation can show the transversal character of the gravitational wave and its two possible states of polarization. It can be shown that the energy carried by the wave is of the order of $1/c^5$ where c is the speed of light, which explains that its effects on matter are very small and very difficult to detect.

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