

Chaotic enhancement of dark matter density in binary systems

G. Rollin¹, J. Lages¹ and D. Shepelyansky²

¹ Institut UTINAM, Observatoire des Sciences de l'Univers THETA, CNRS & Université de Franche-Comté, 25030 Besançon, France

² Laboratoire de Physique Théorique du CNRS, IRSAMC, Université de Toulouse, UPS, F-31062 Toulouse, France



Historic

1933 → First mention of dark matter to explain missing mass in Coma's galaxies cluster (Zwicky).

1957 → First curves of rotations of galaxies using emission of hydrogen (21 centimeter line), rotations curves confirms that rotation don't follows the Keplerian variation in $1/\sqrt{r}$.

1969 → Adding mass with spherical halo to stabilize galaxies structure (Ostriker).

Dark matter nature

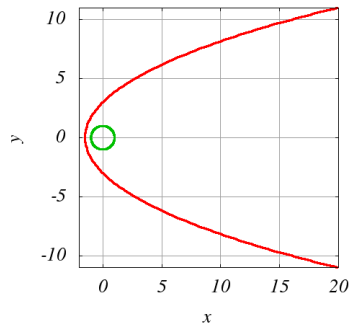
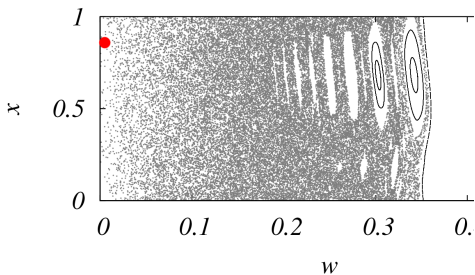
- MACHOs : Massive Compact Halo Objects
- WIMPs : Weakly Interacting Massive Particule

Mapping

The mapping leads to Poincaré section :

$$w_{n+1} = w_n + F(x_n)$$

$$x_{n+1} = x_n + w_{n+1}^{-3/2}$$

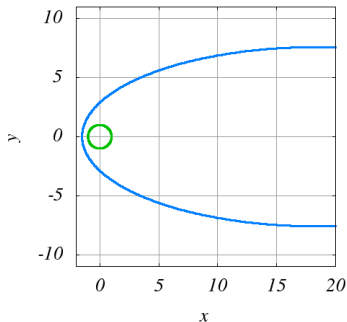
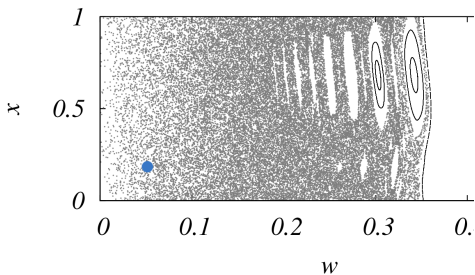


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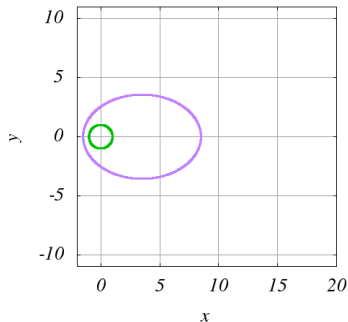
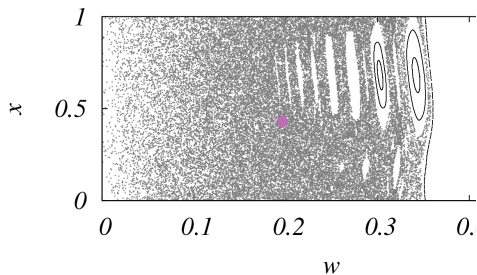


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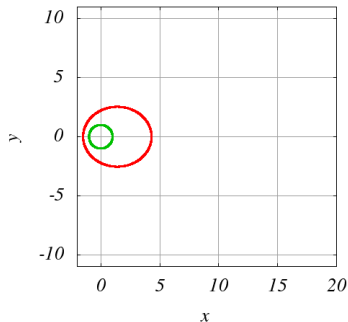
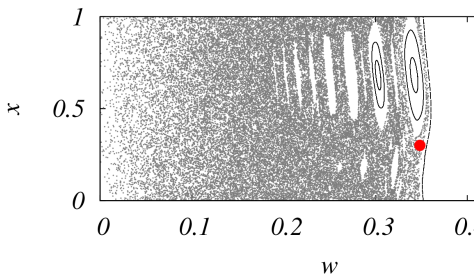


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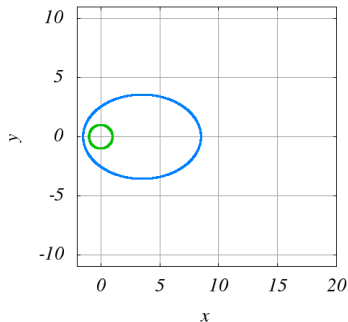
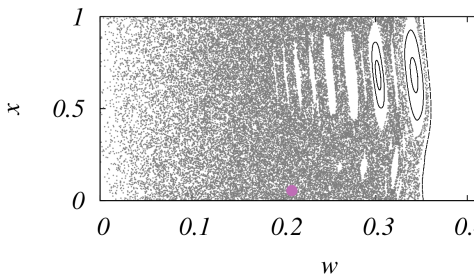


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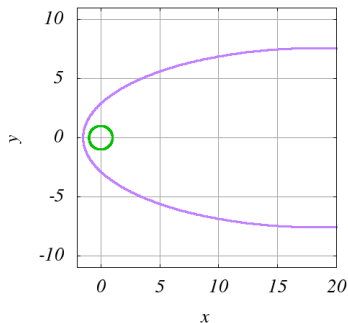
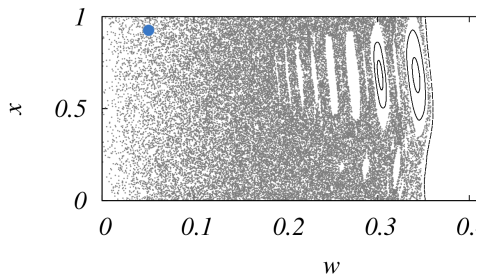


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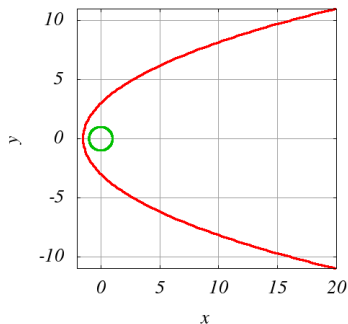
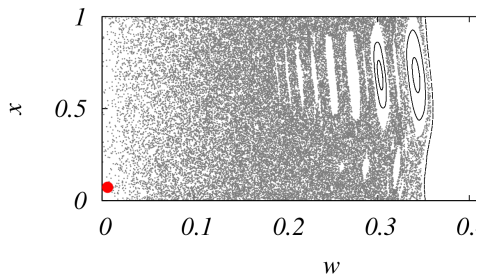


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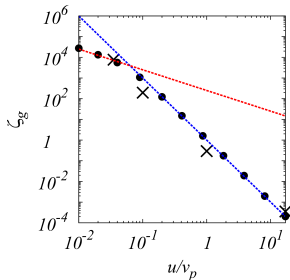
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Conclusion



- We have simulated the dynamics of a large number of DMP (here 10^{16}) in a binary system during a long time 10^8 rotations of the second body without integration of motion equations.
- We have found a large enhancement density of dark matter in this kind of binary system.
- Problem : this technique is limited by the small mass ratio of the binary : $\frac{1}{1000}$.