



NagBody lectures: How visualization help

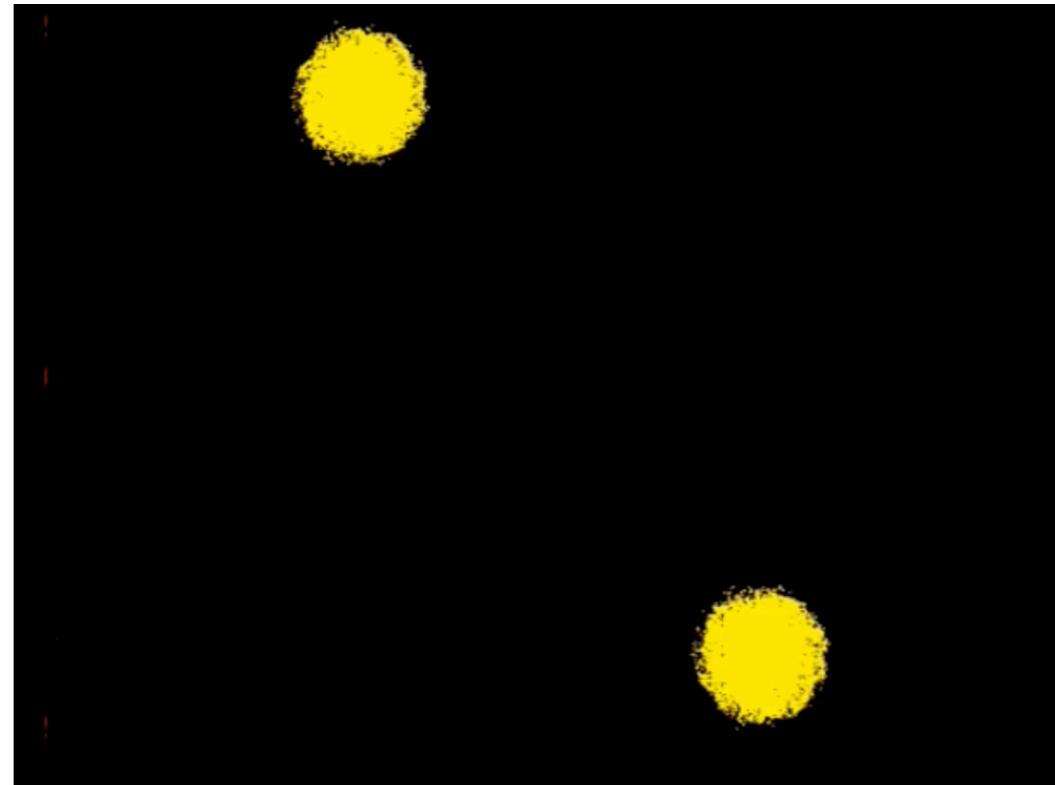
Mario Alberto Rodríguez-Meza

Instituto Nacional de Investigaciones Nucleares

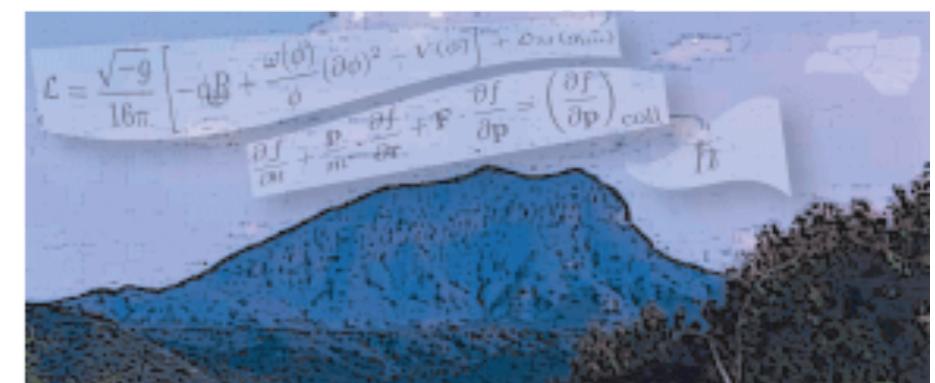
Correo Electrónico: marioalberto.rodriguez@inin.gob.mx

<http://bitbucket.org/rodriguezmeza>

Seminario de investigación,
Departamento de Física,
Universidad de Guanajuato
3 de febrero al XX de junio de 2022
Sesiones virtuales (Zoom, Meet, etcétera)

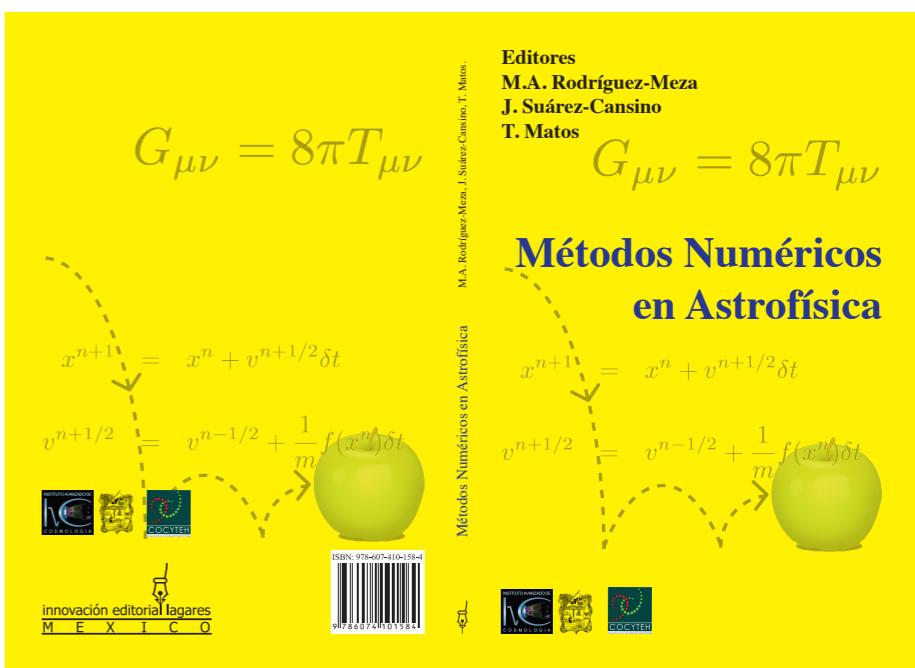


quintessence
Group



References and material

- Cosmología numérica y estadística: NagBody kit (<http://bitbucket.org/rodriguezmeza>). Mario A. Rodríguez-Meza. And: https://github.com/rodriguezmeza/NagBody_lectures.git
 - Métodos numéricos en astrofísica, capítulo I, Método de N-cuerpos en astrofísica. (https://www.researchgate.net/publication/316582859_Metodo_de_N-Cuerpos_en_Astrofisica)
 - La estructura a gran escala del universo. Capítulo 22 en Travesuras cosmológicas de Einstein et al. https://www.researchgate.net/publication/316582400_La_estructura_a_gran_escala_del_universo_simulaciones_numericas
 - https://www.researchgate.net/profile/Mario_Rodriguez-Meza
 - https://www.researchgate.net/publication/314281416_Los_agujeros_negros_y_las_ondas_del_Dr_Einstein
 - M.A. Rodriguez-Meza, Adv. Astron. 2012, 509682 (2012). arXiv: 1112.5201. (https://www.researchgate.net/publication/51967093_A_Scalar_Field_Dark_Matter_Model_and_Its_Role_in_the_Large-Scale_Structure_Formation_in_the_Universe)



Content:

Visualization

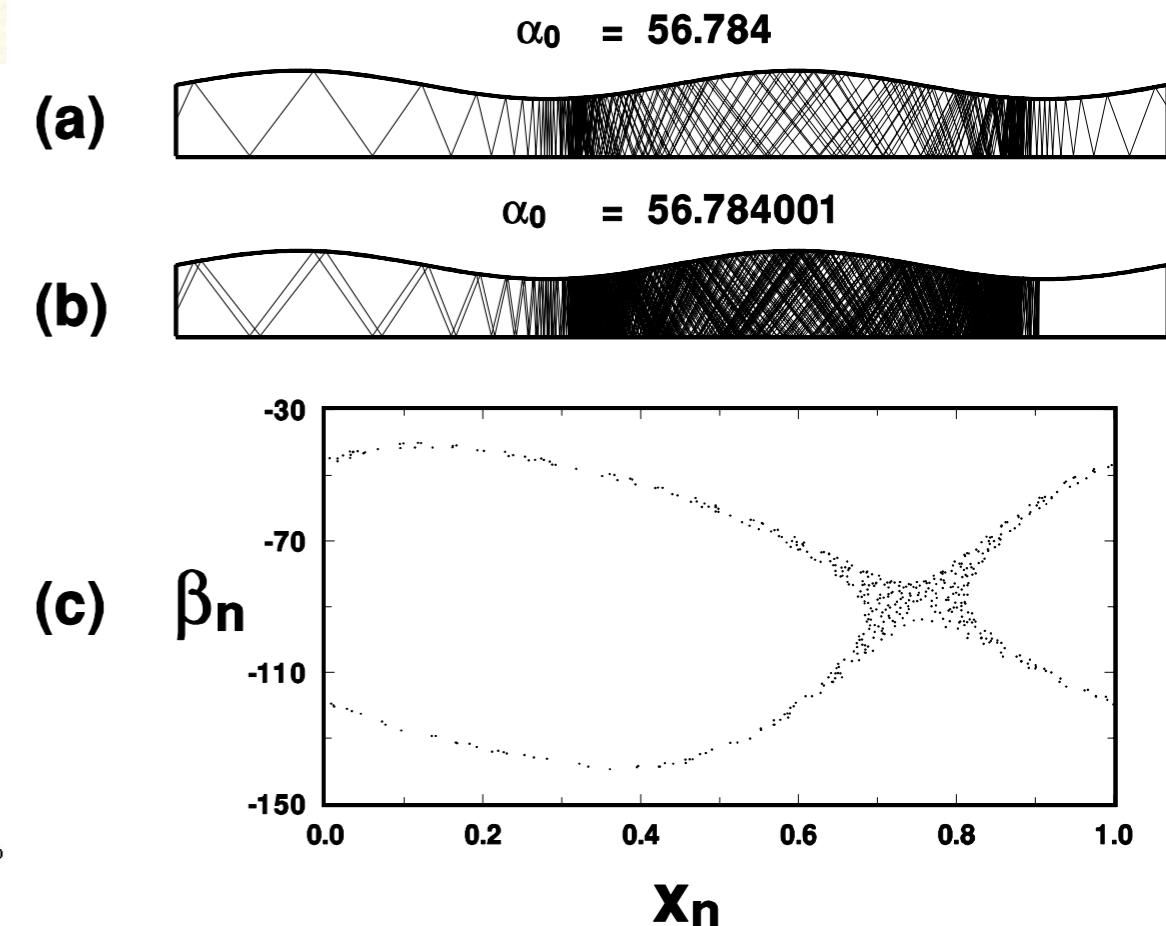
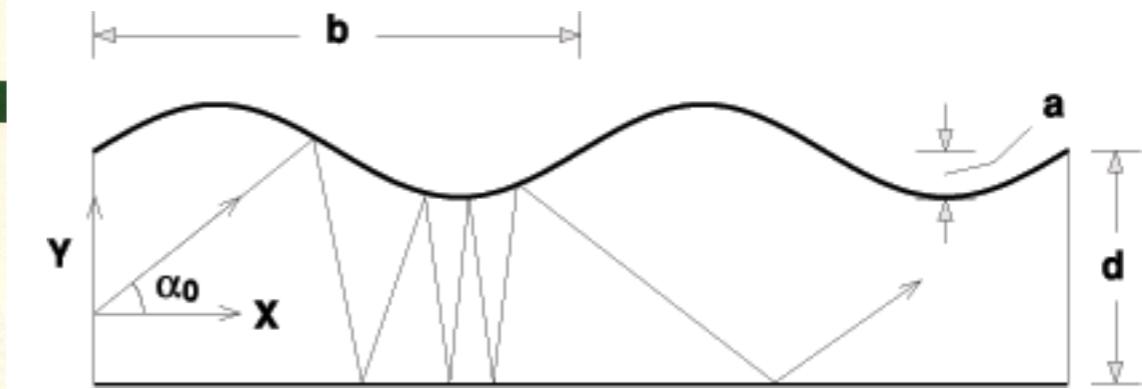
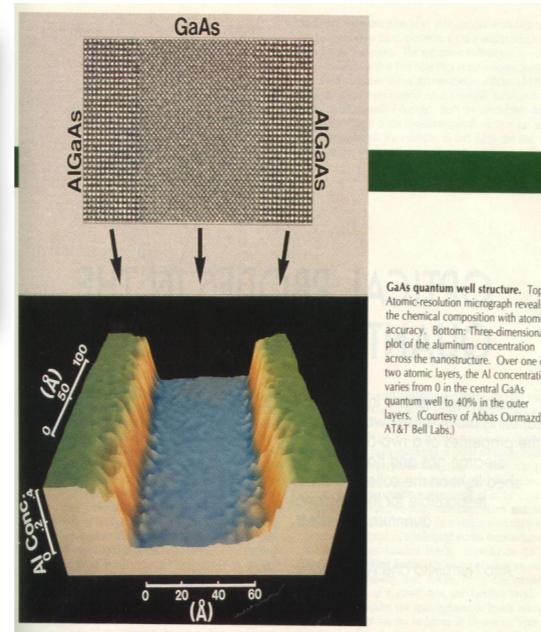
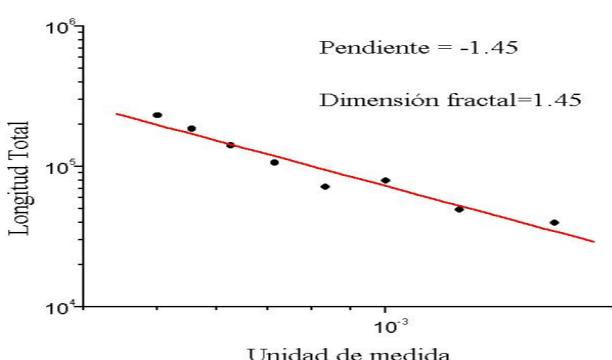
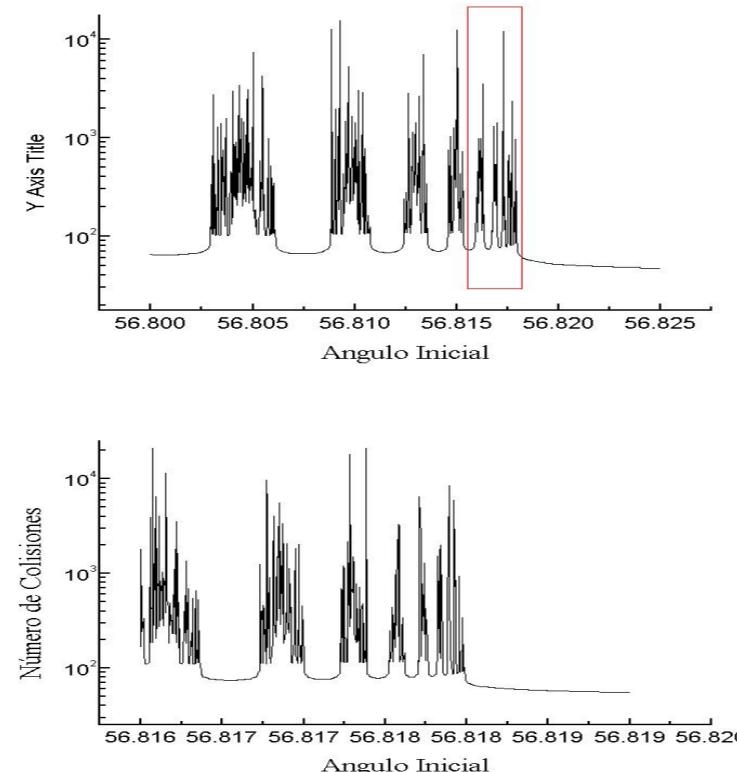
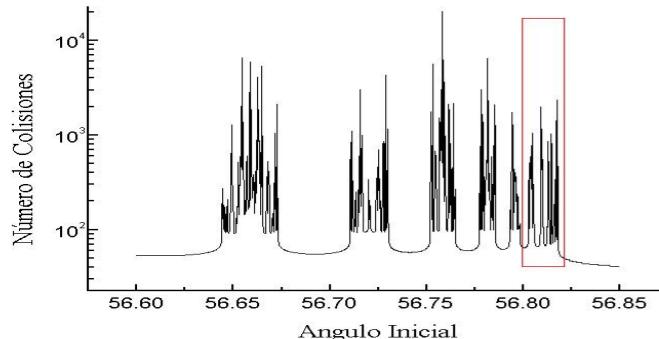
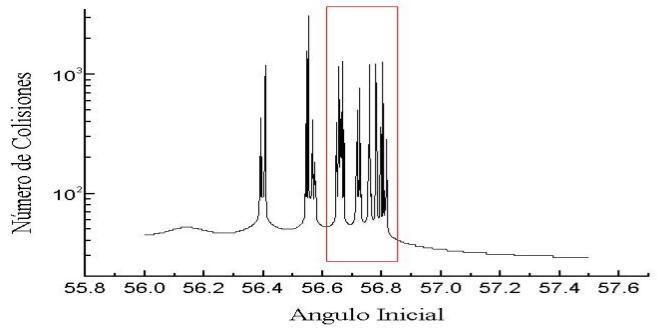
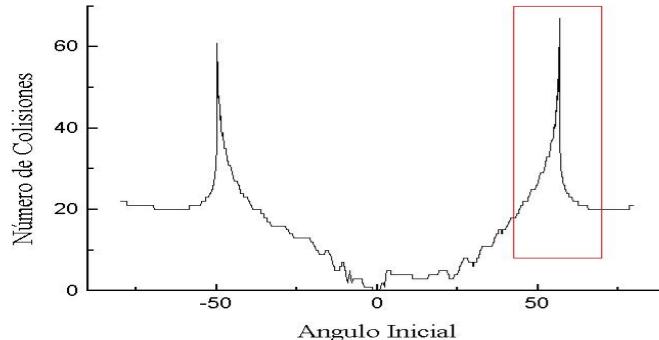
- Examples in complex systems.
- Examples in complex fluid simulations.
- Examples in influenza (md) simulations.
- Examples in galactic simulations.
- Examples in cosmological simulations.



Content:

Complex systems

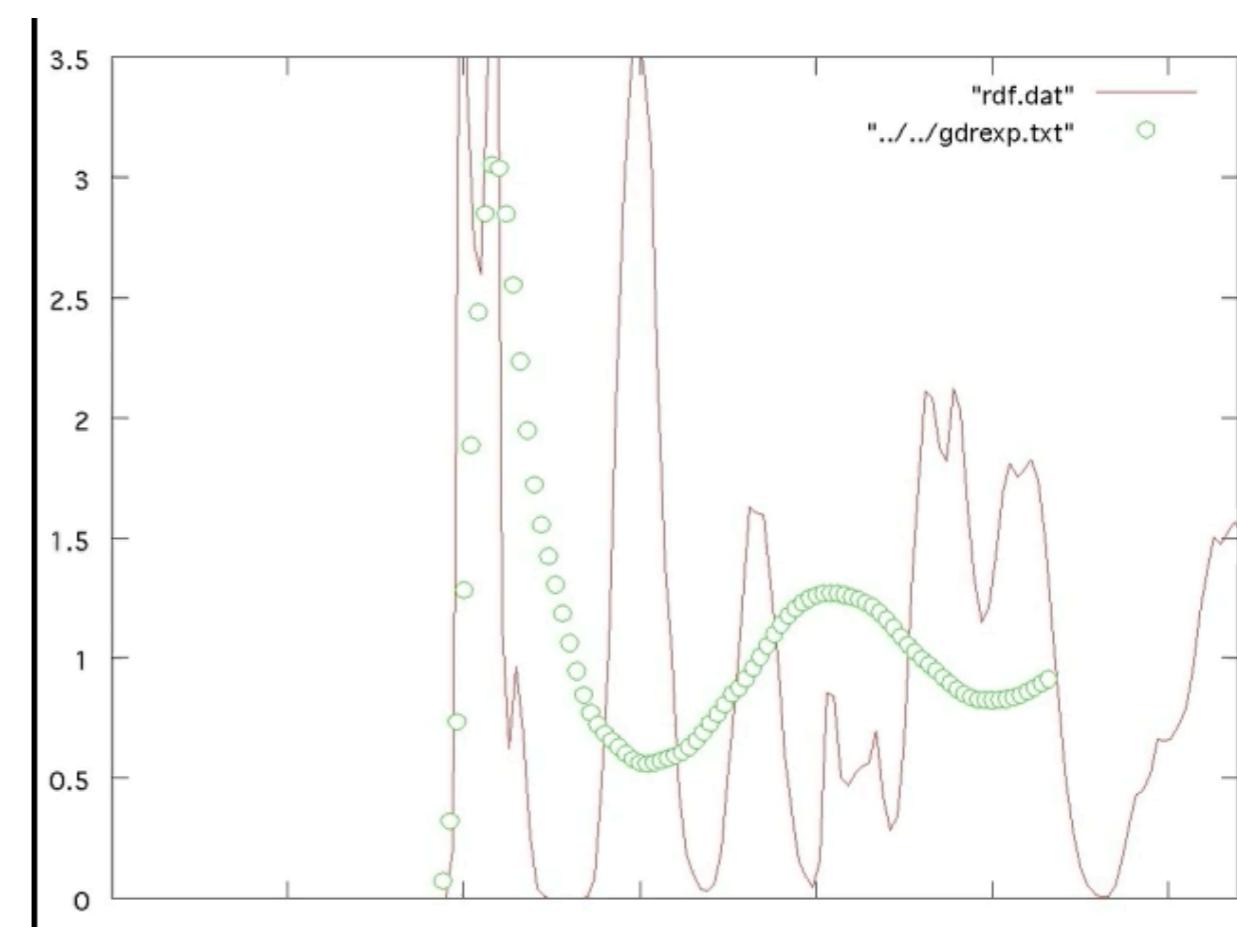
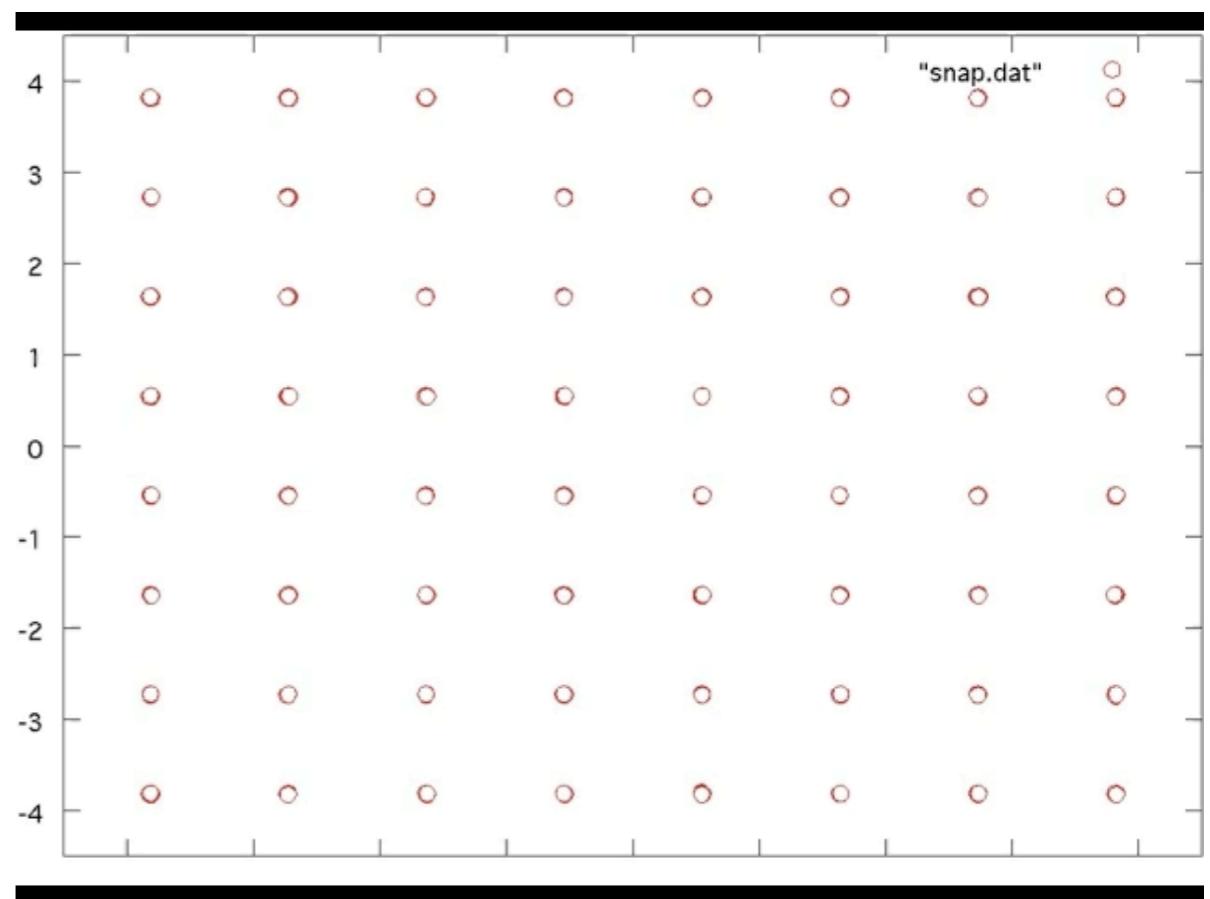
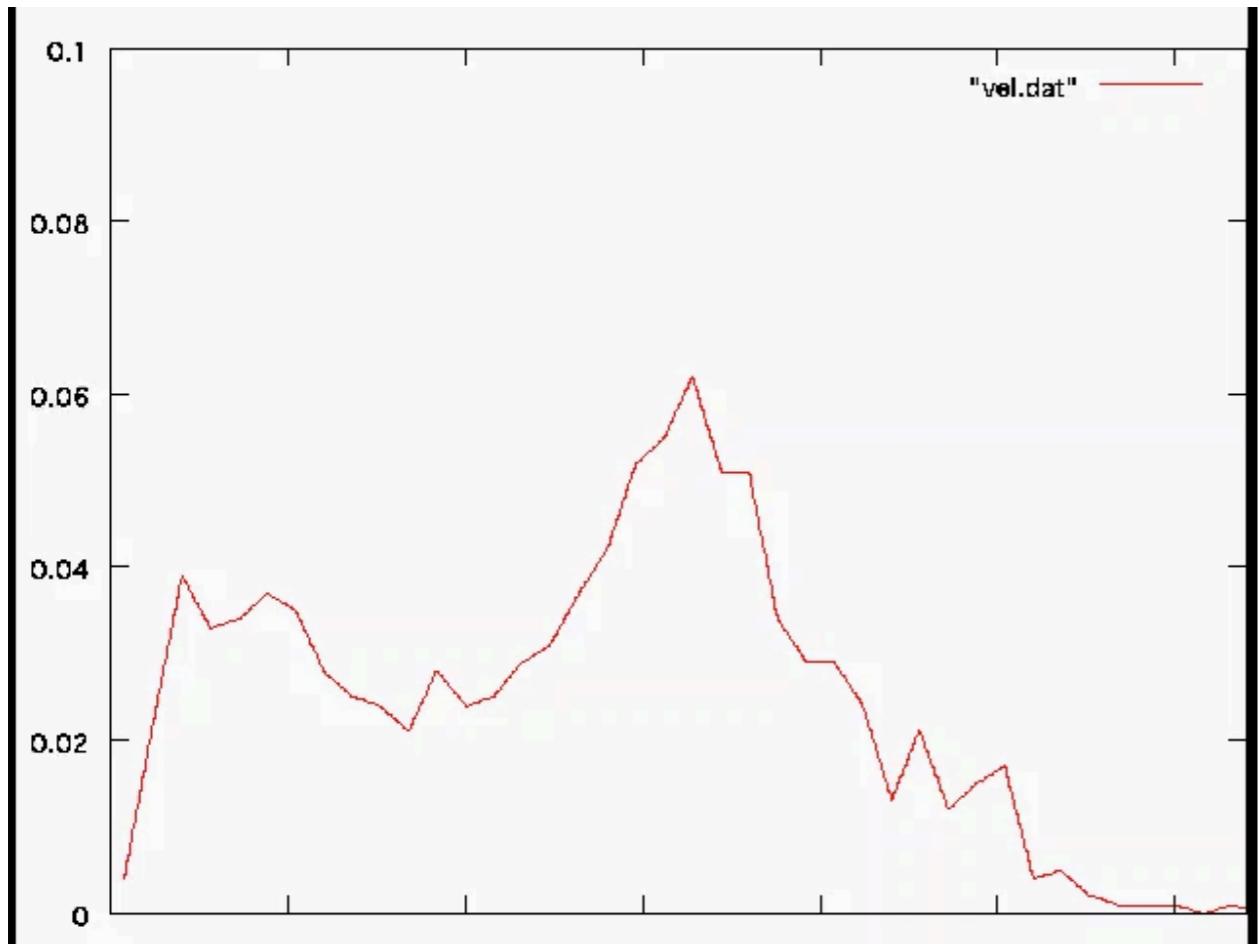
Balistic transport:



Content:

Complex fluids

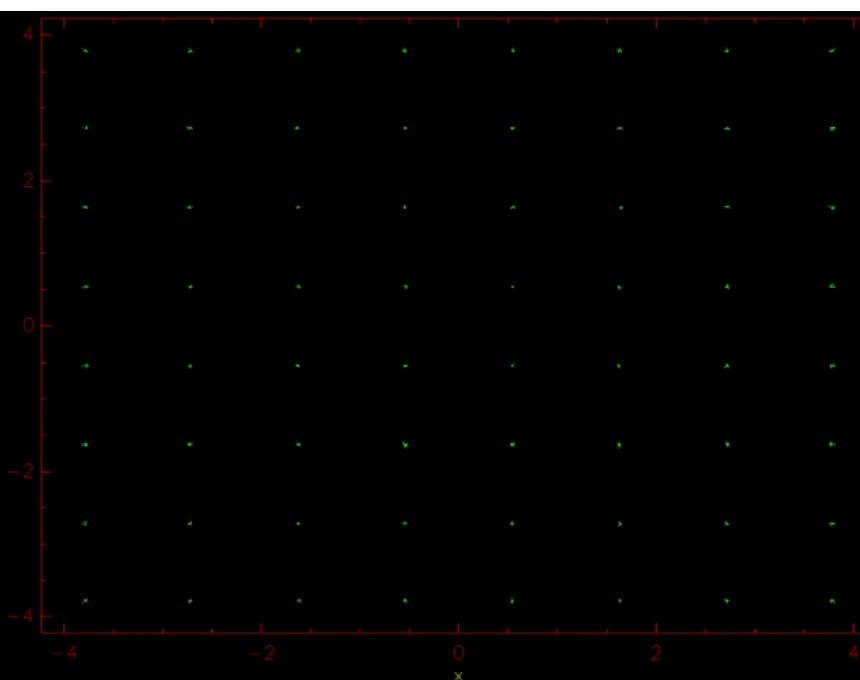
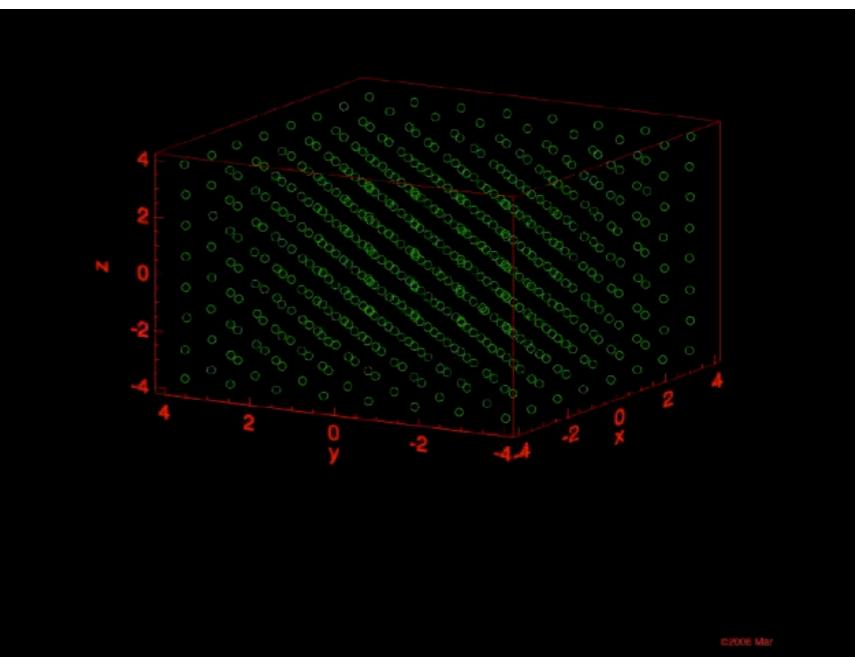
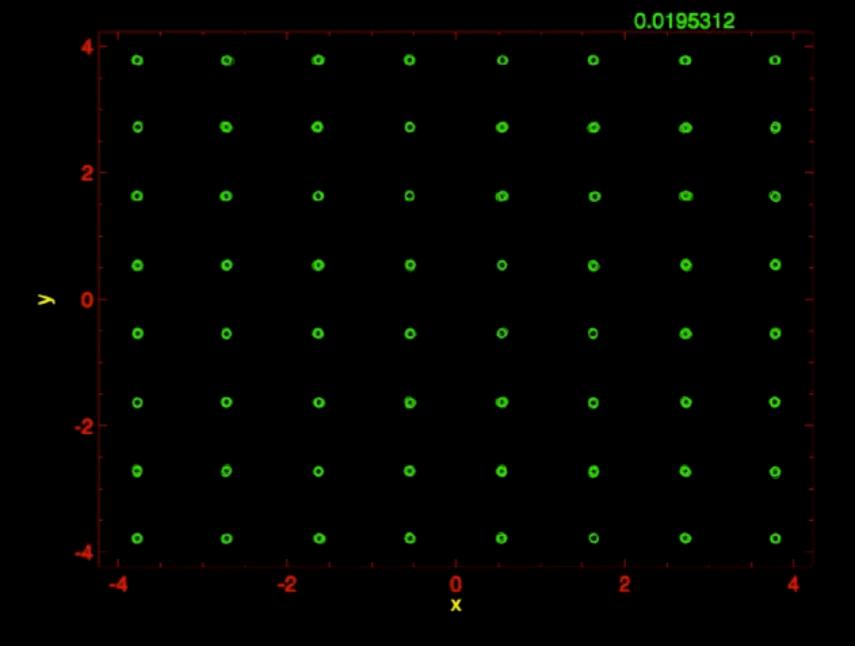
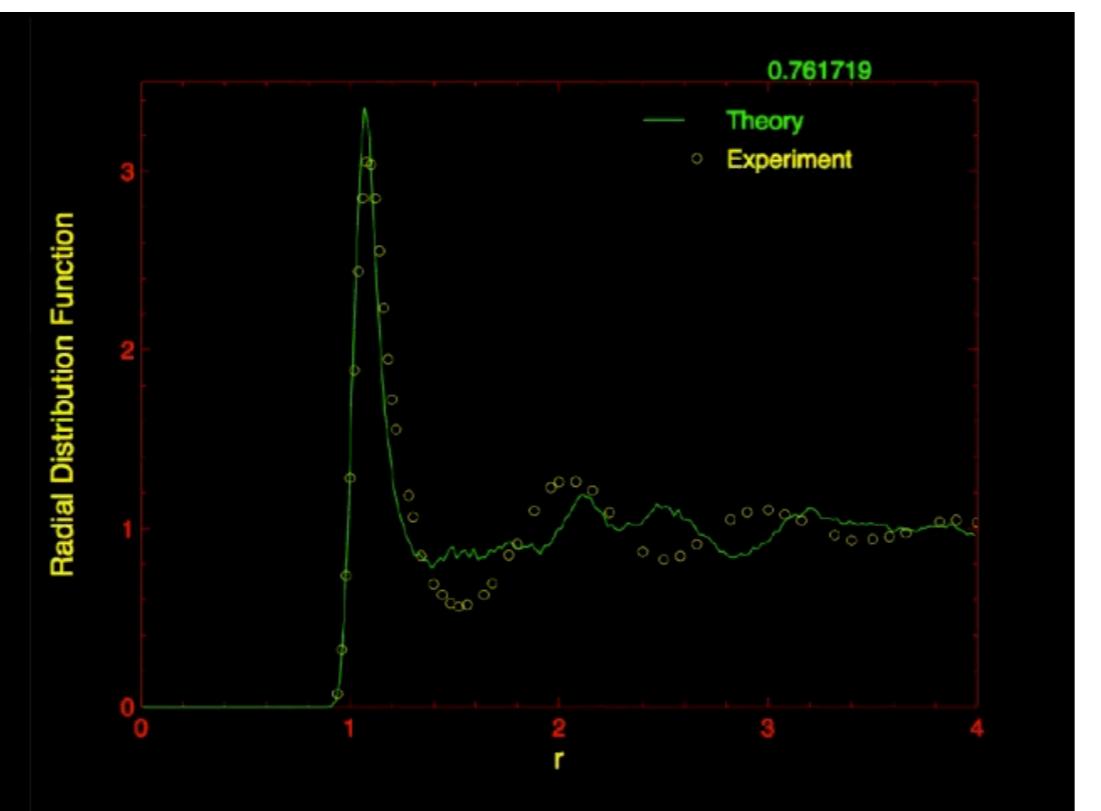
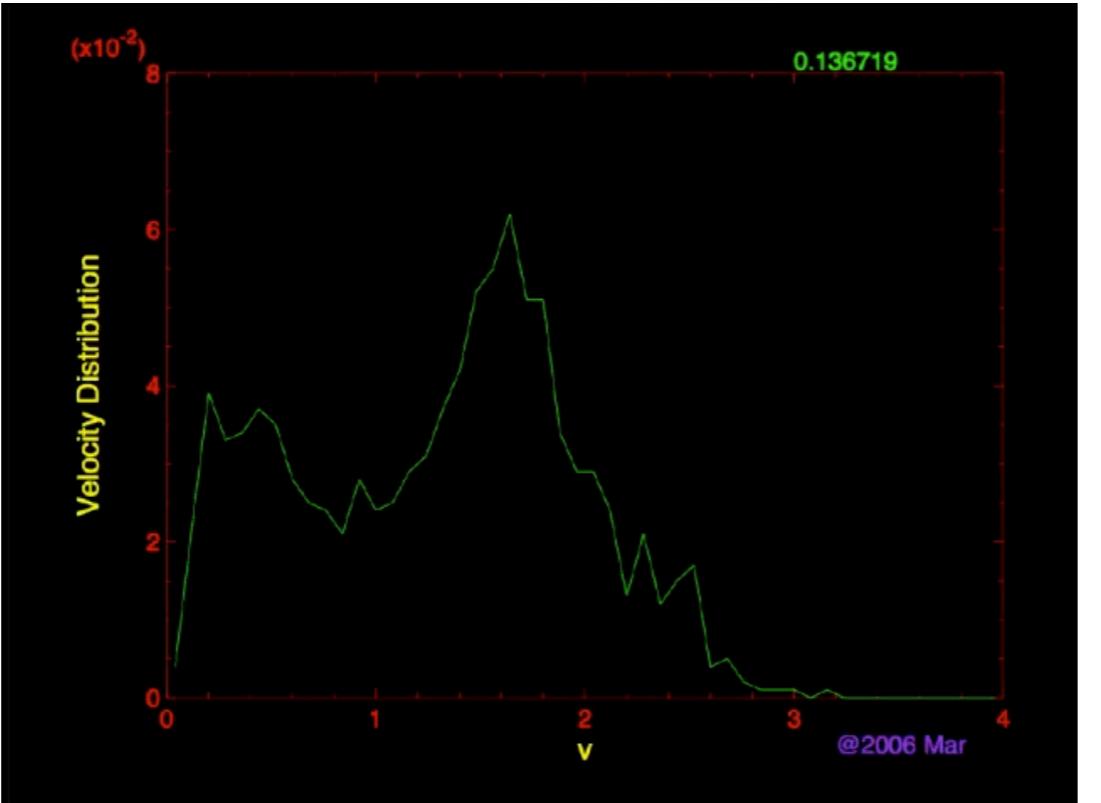
gnuplot:



Content:

Complex fluids

analysis_md:

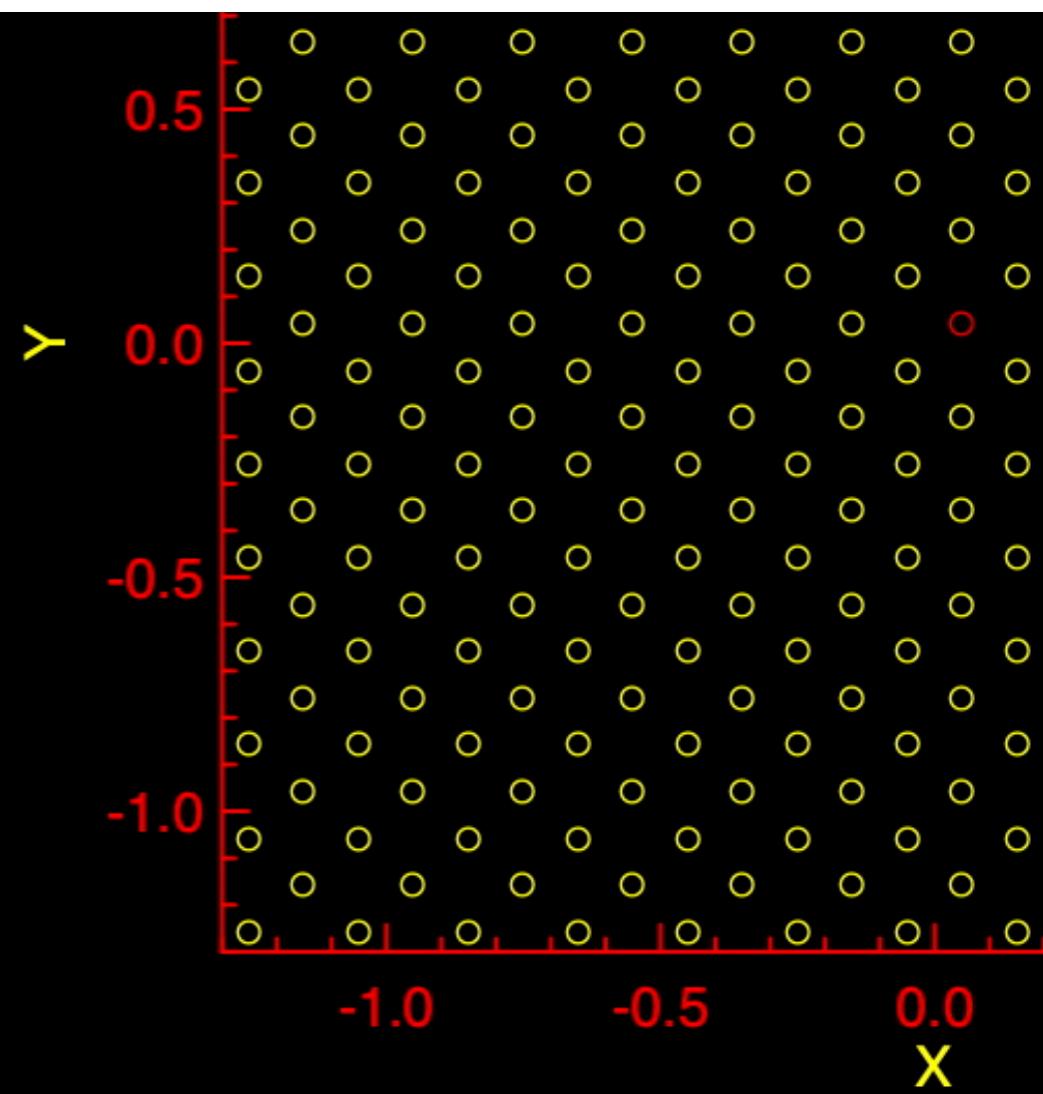
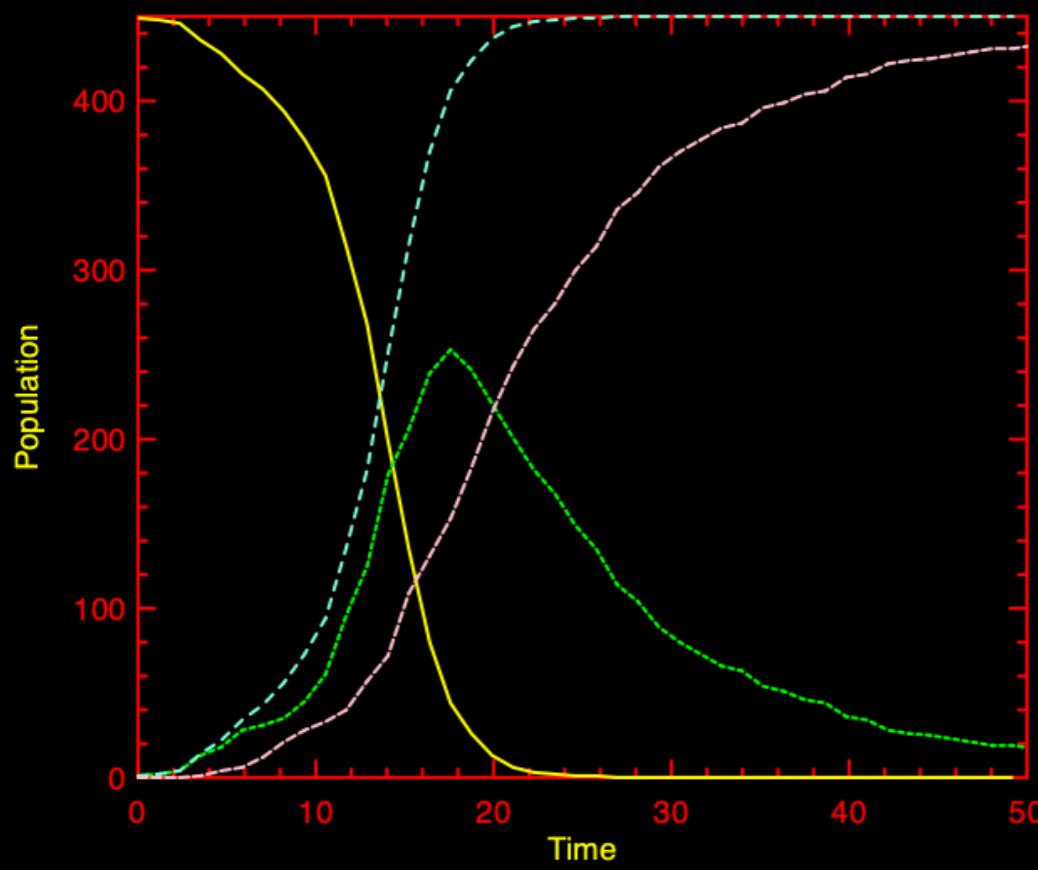


Content:

Complex fluids: influenza

analysis_md:

Caso I

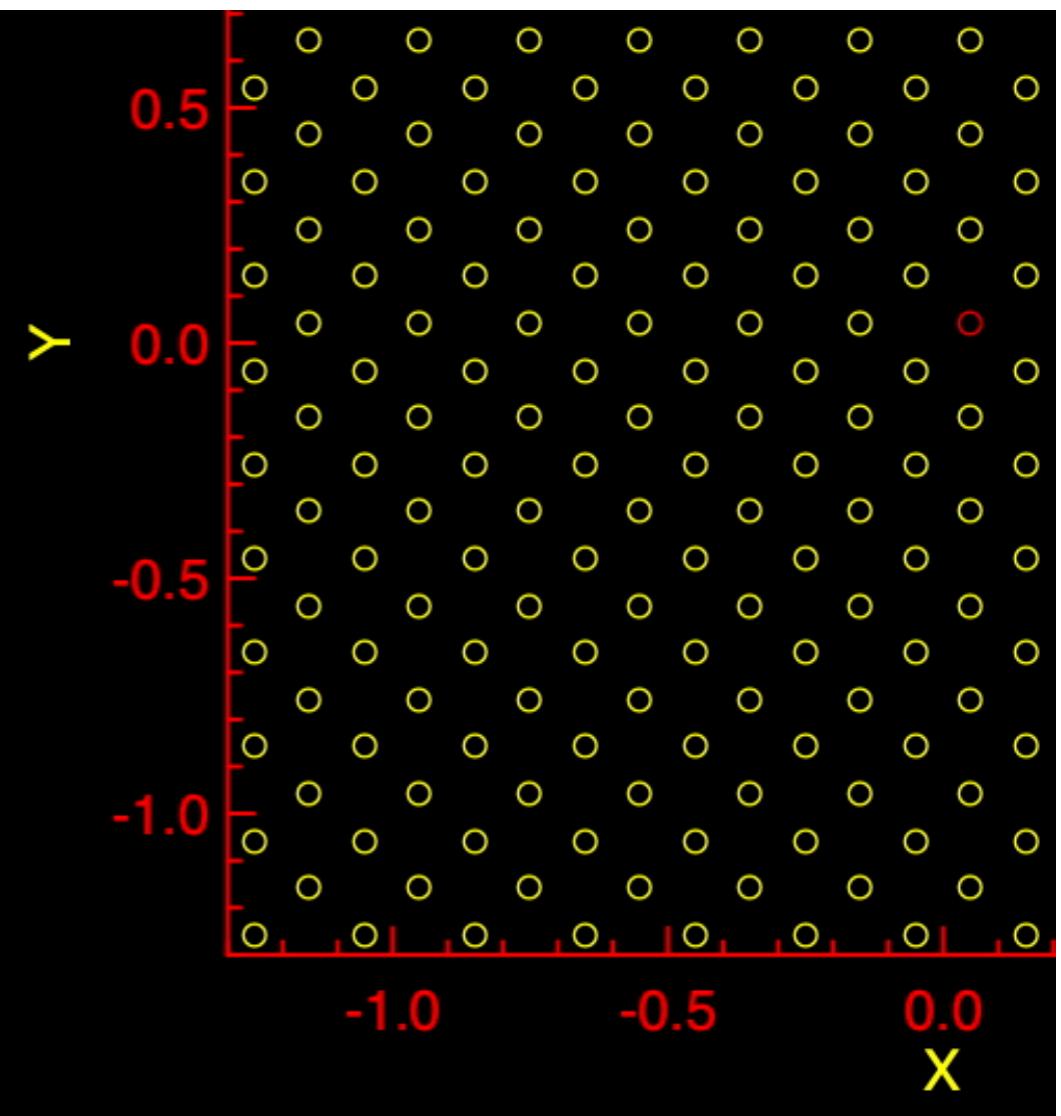
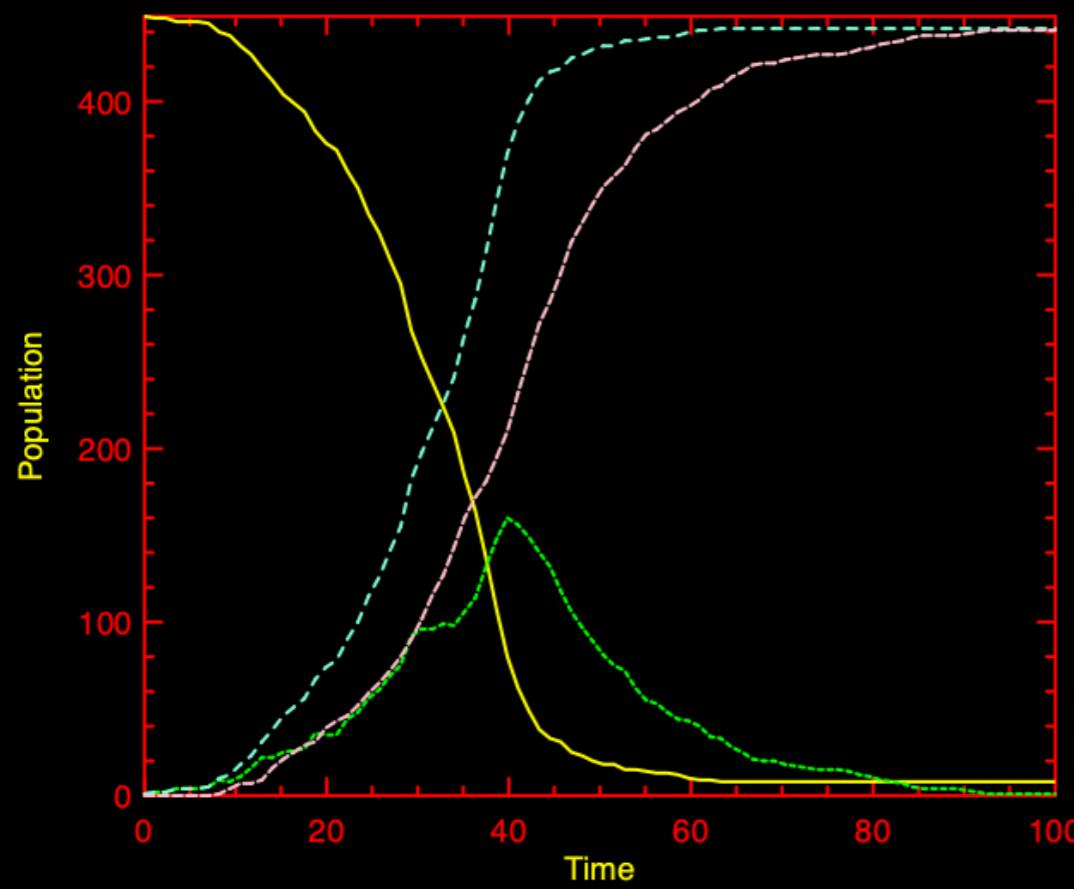


Content:

Complex fluids: influenza

analysis_md:

Caso 2

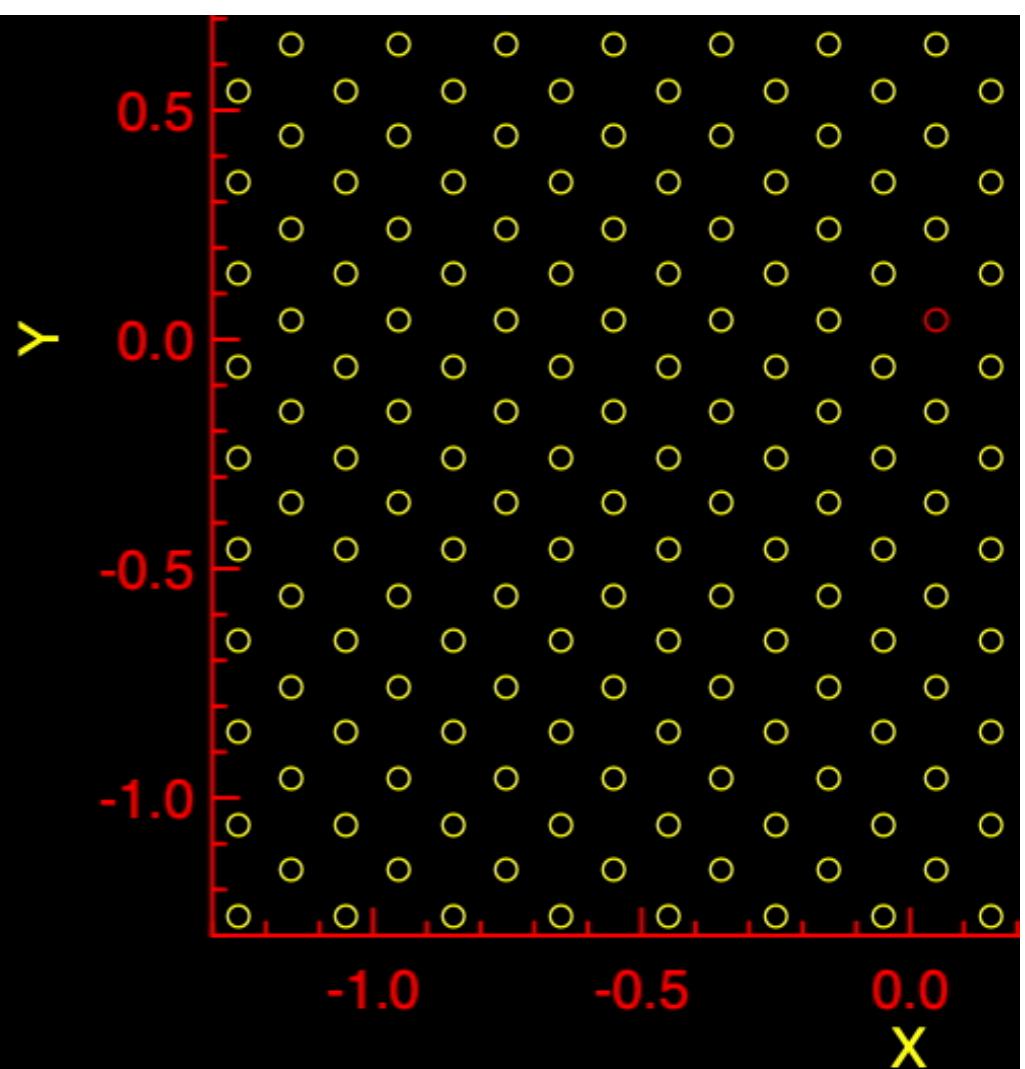
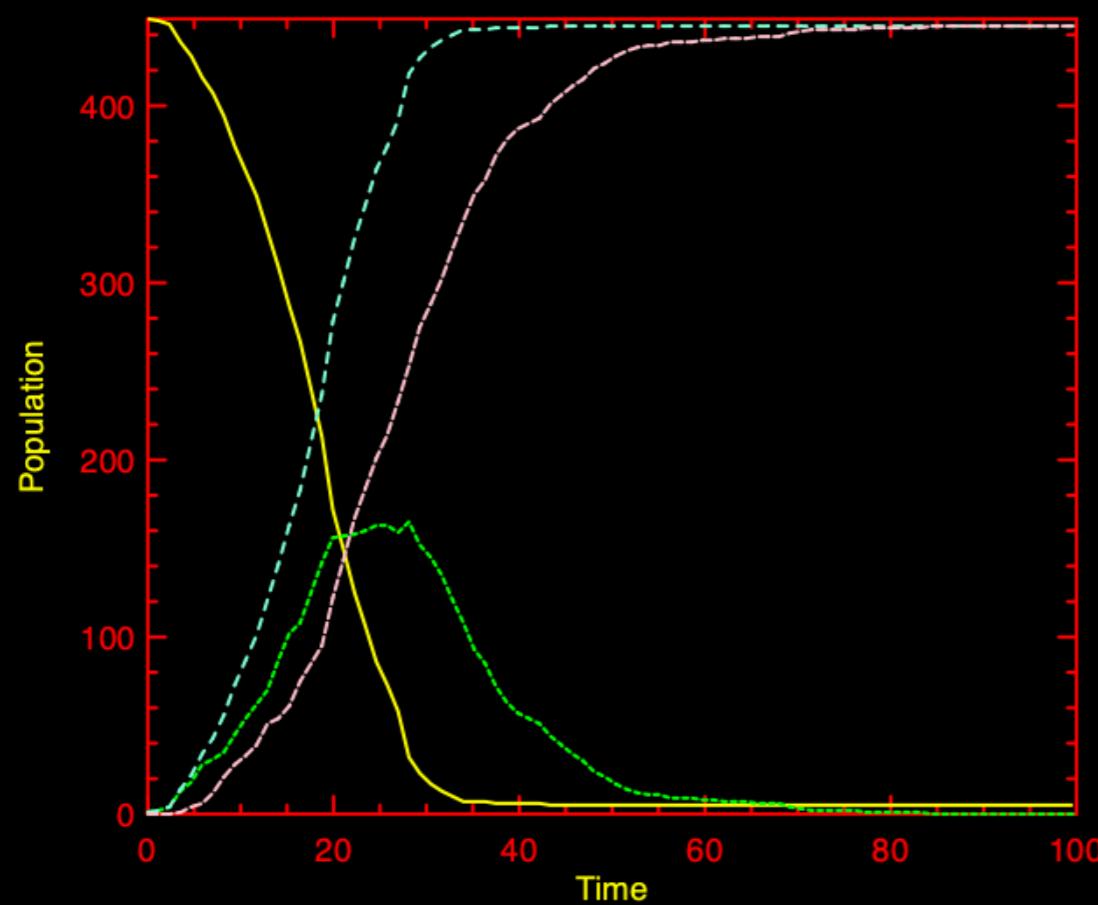


Content:

Complex fluids: influenza

analysis_md:

Caso 3

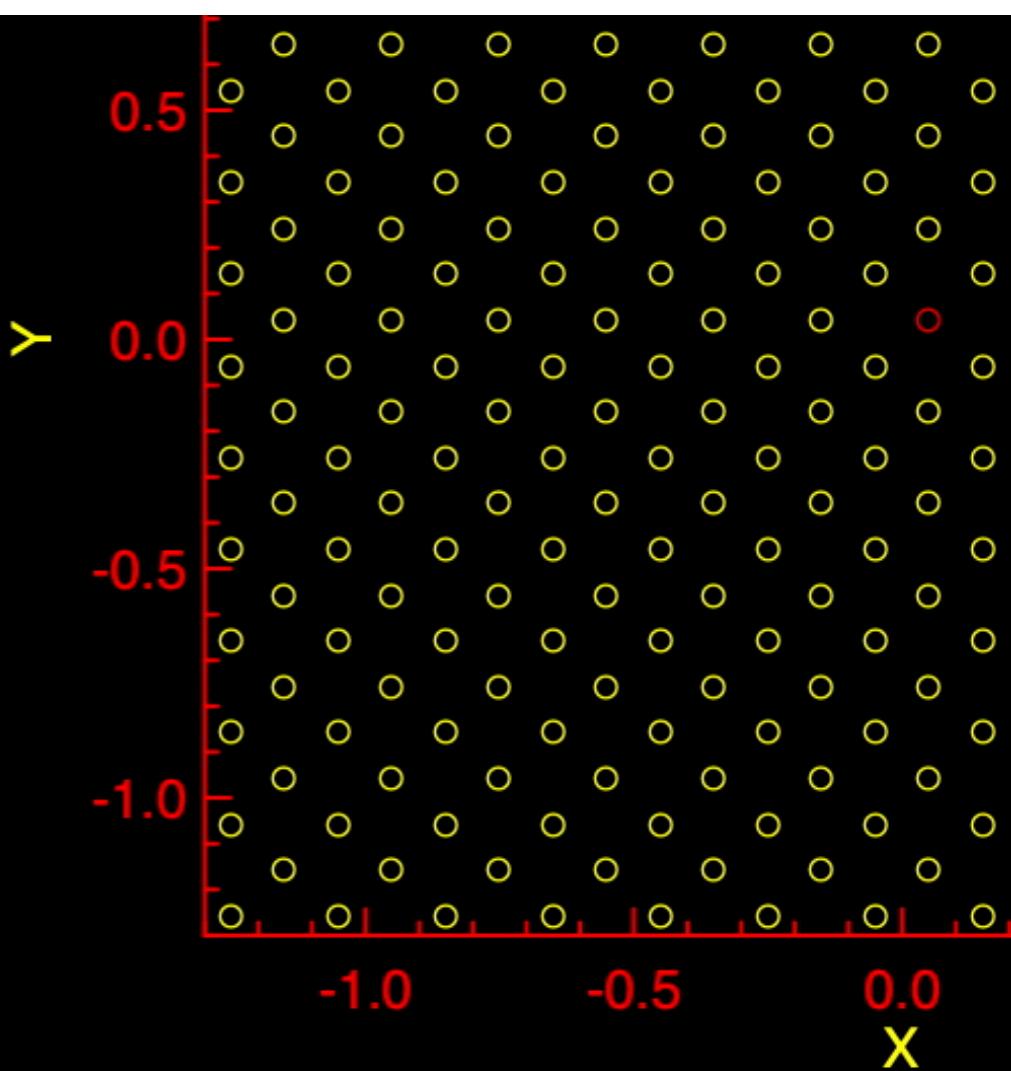
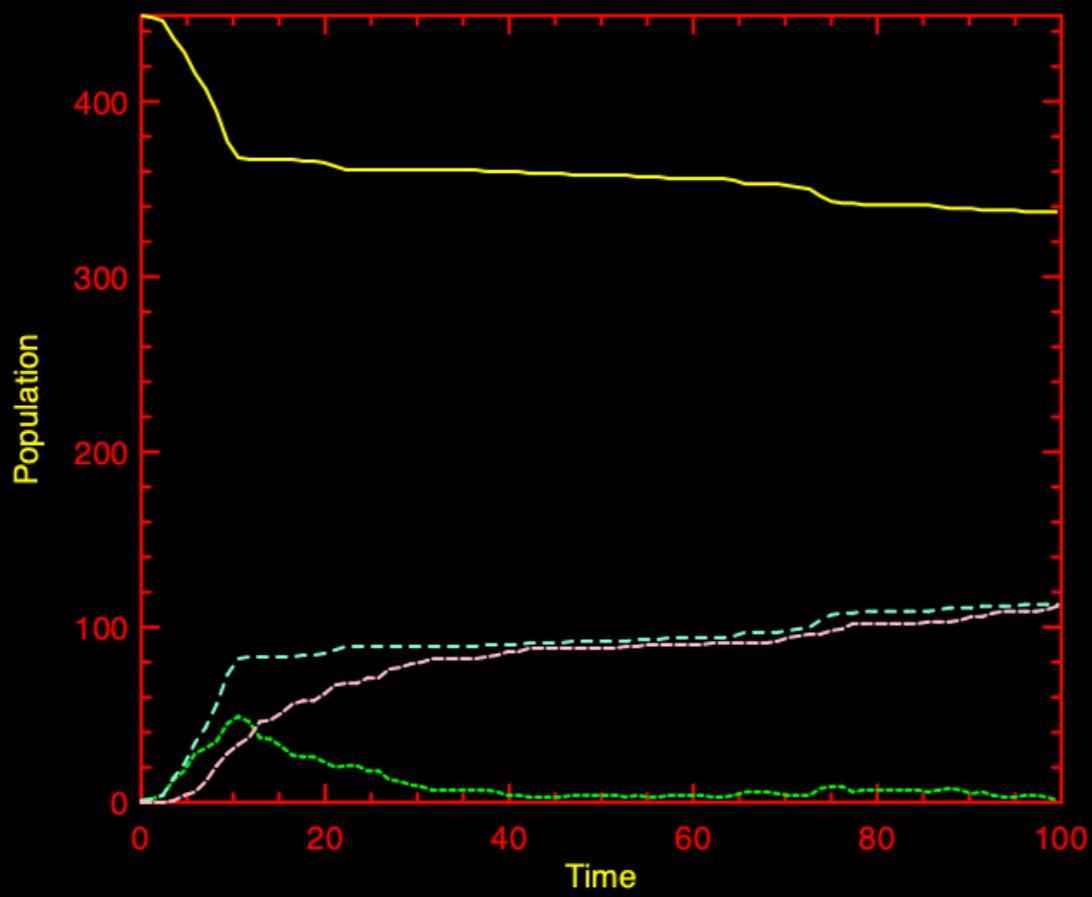


Content:

Complex fluids: influenza

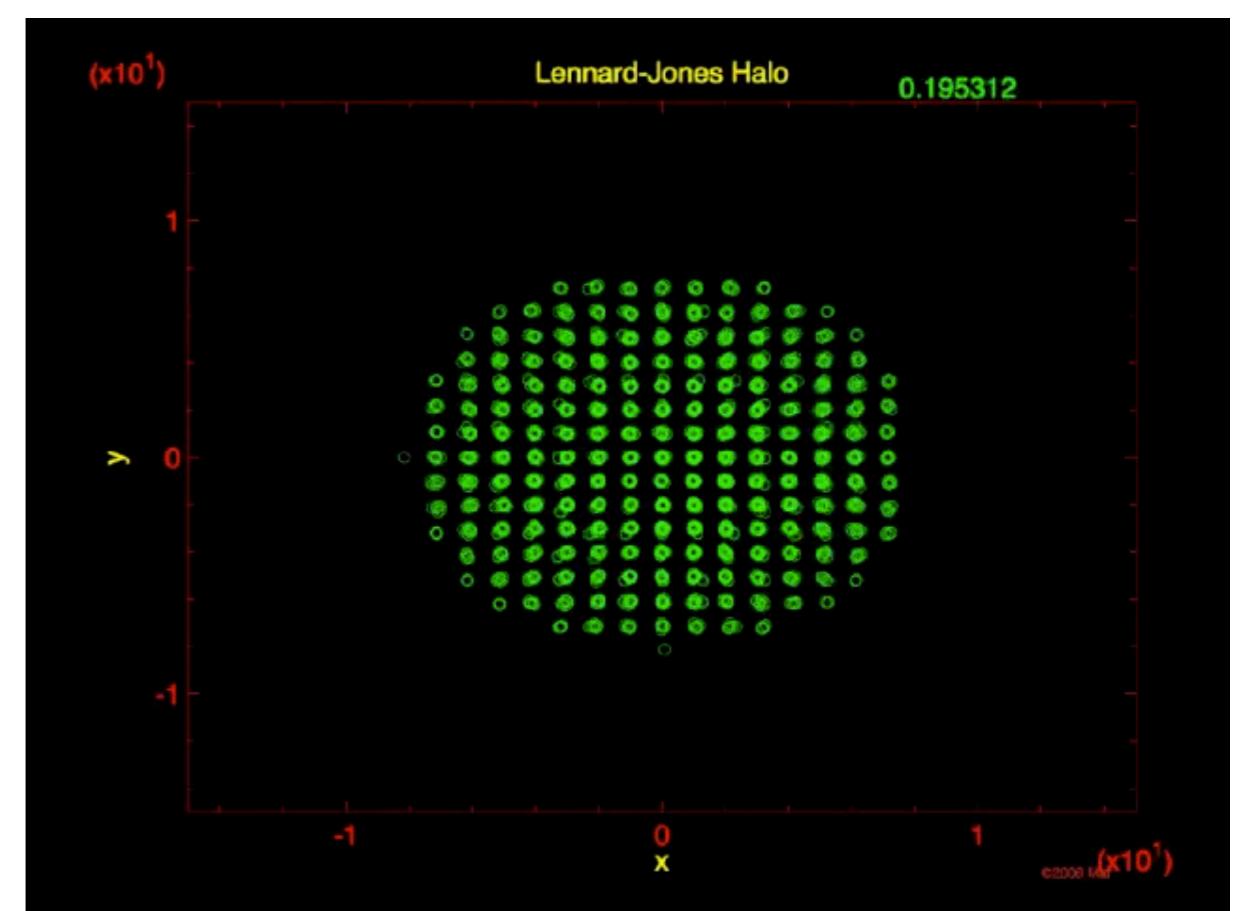
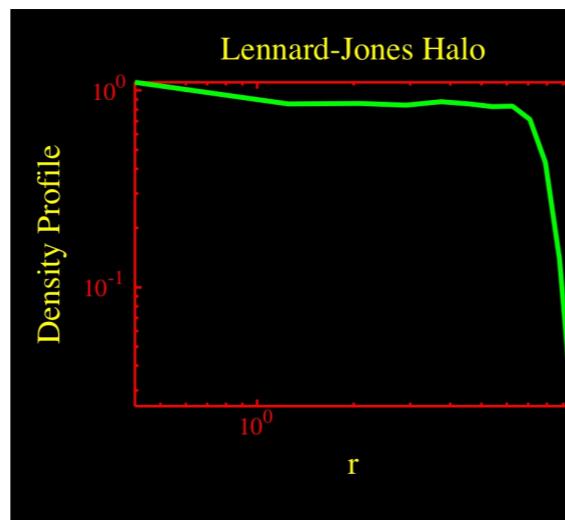
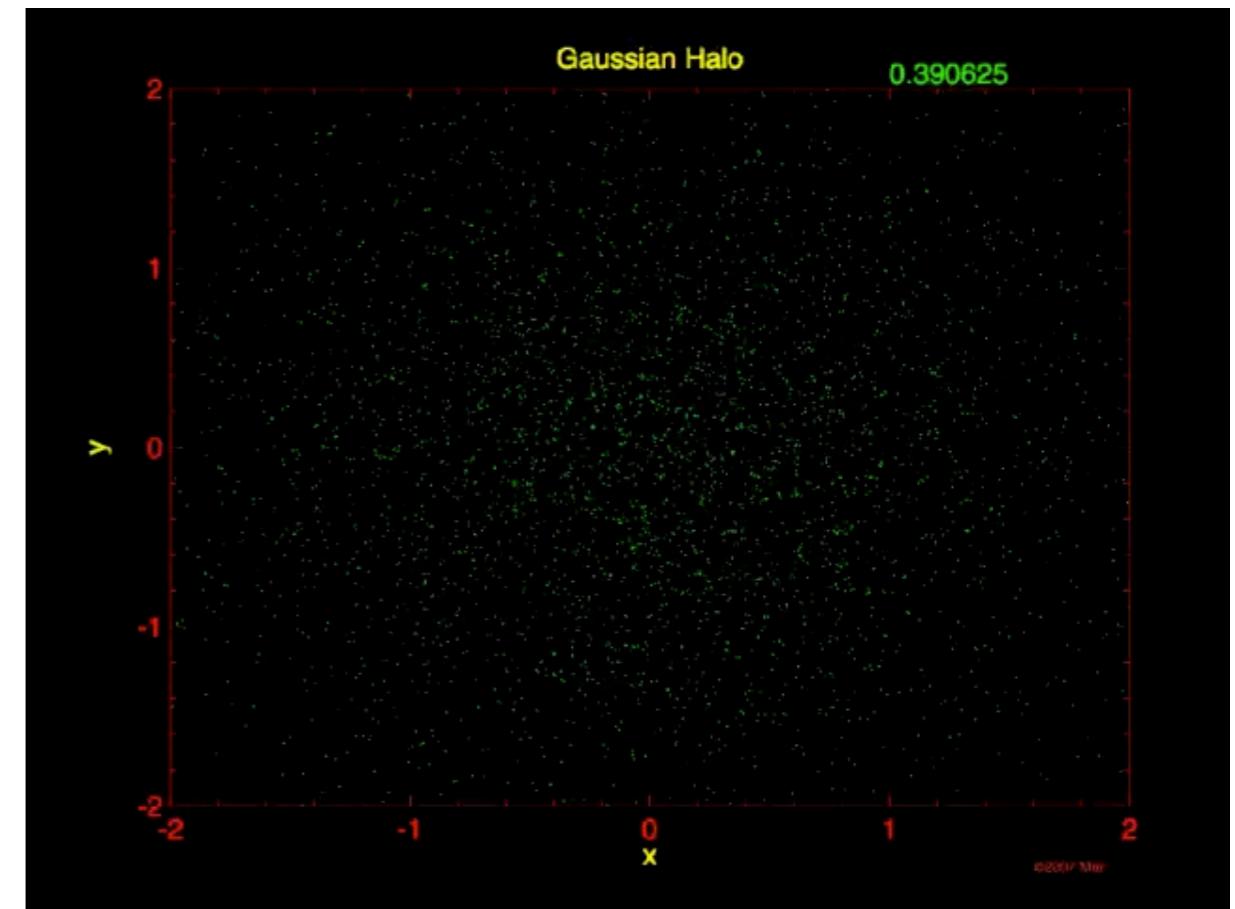
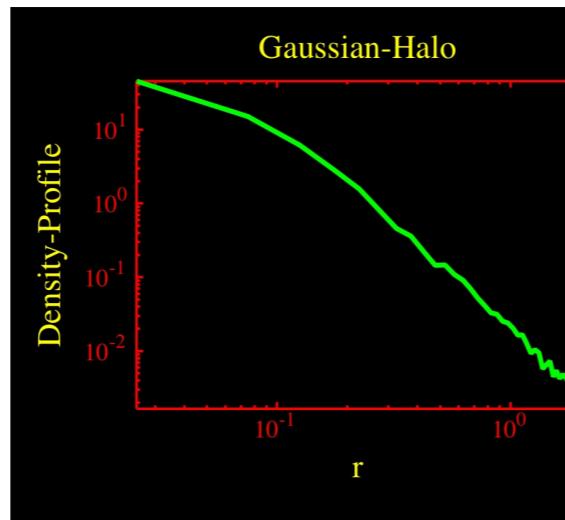
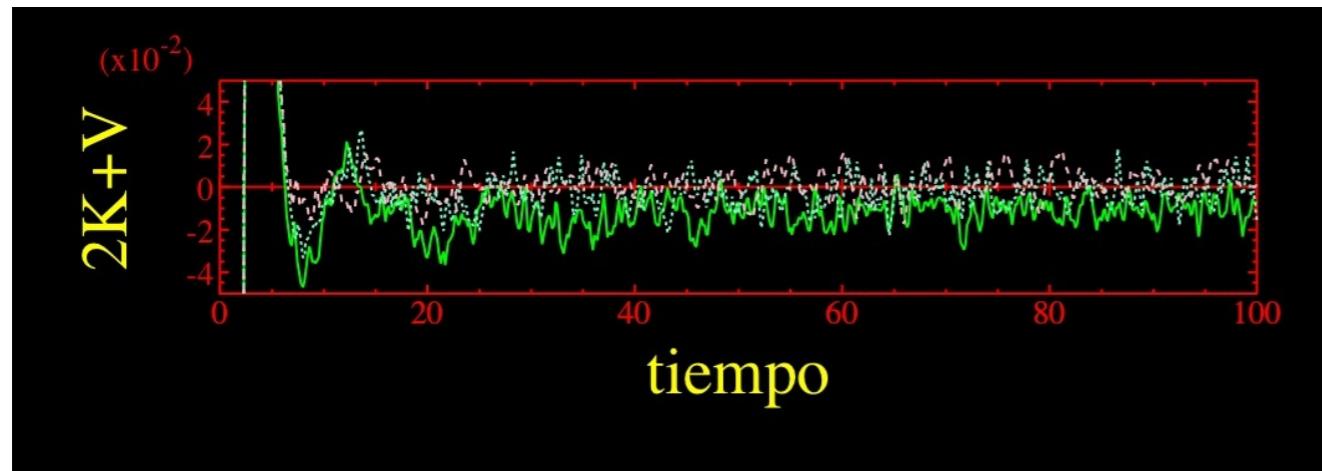
analysis_md:

Caso 4



Content: Halos

analysis_grav:

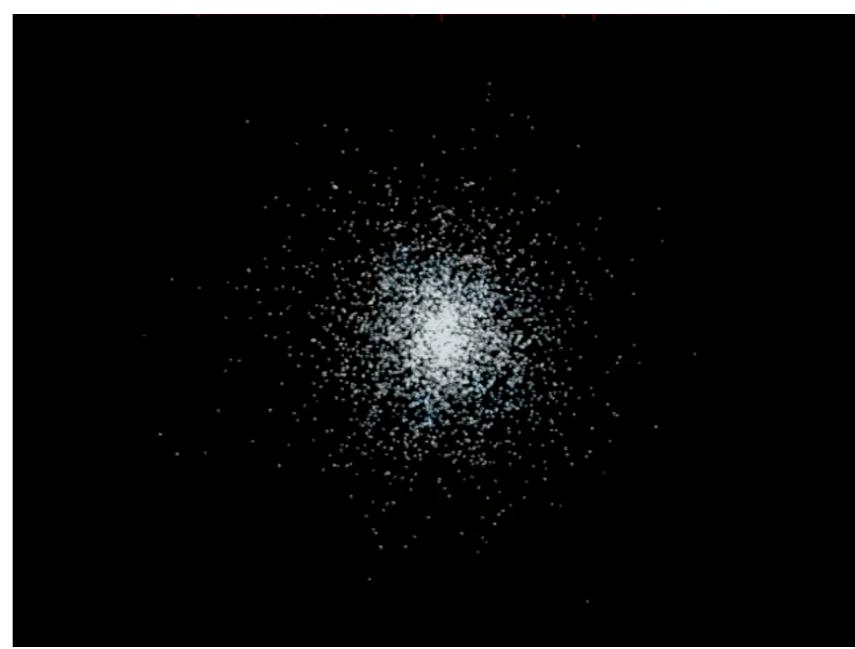
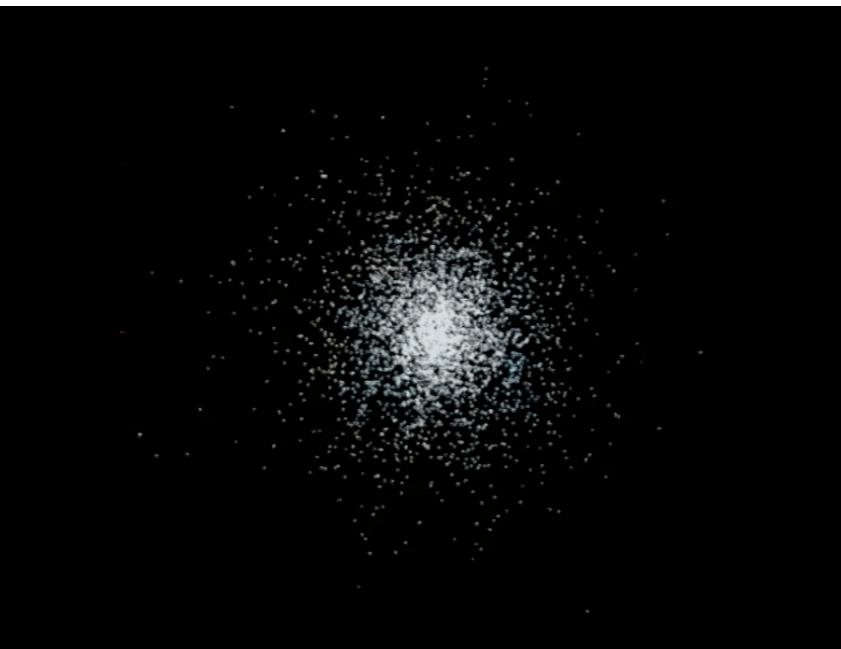
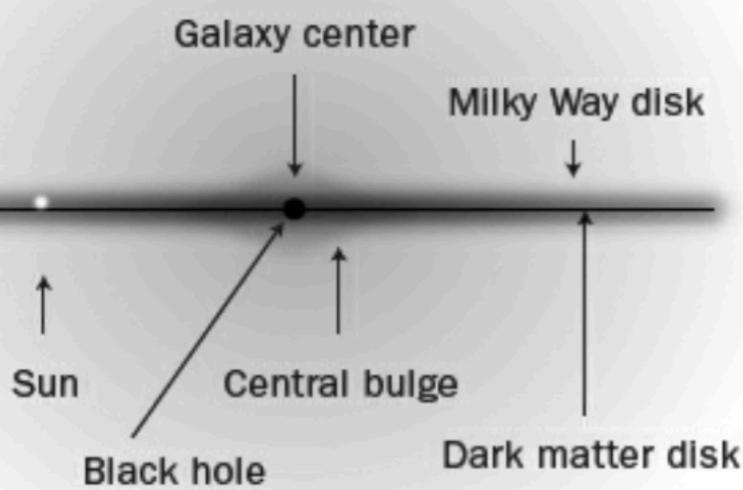


Content:

Halos: galaxies

analysis_galaxy:

- ¿Puede haber brazos espirales en el disco de materia oscura?
¿puede condensarse en el plano galáctico?



Content:

Galactic dynamics

analysis_galaxy:

Loss of angular
momentum

Parabolic encounter N2

Parameters:

Ngal=16384

Rh=1.5

Rp=0.4

Tp=1.5

w=i=0.0

Parabolic encounter N2

Parameters:

Ngal=16384

Rh=1.5

Rp=0.4

Tp=1.5

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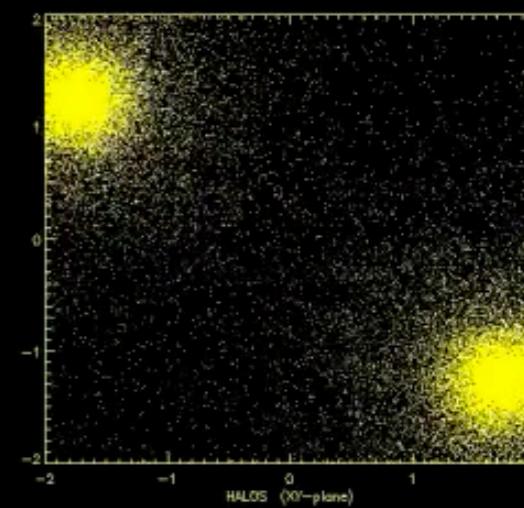
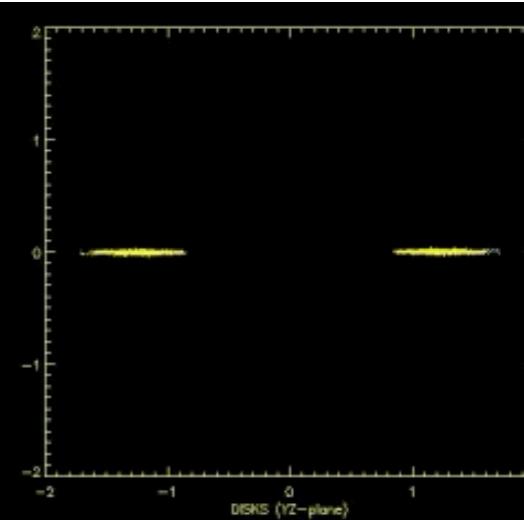
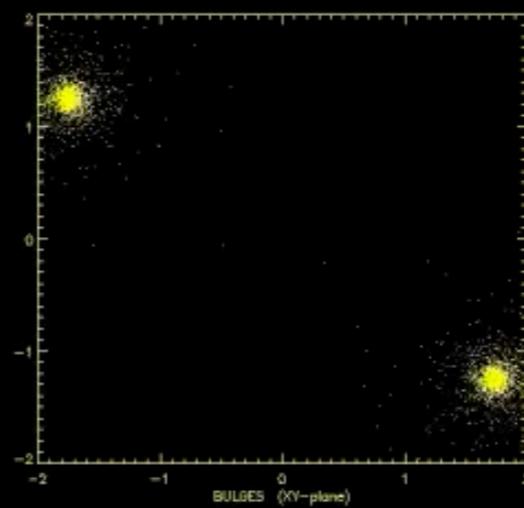
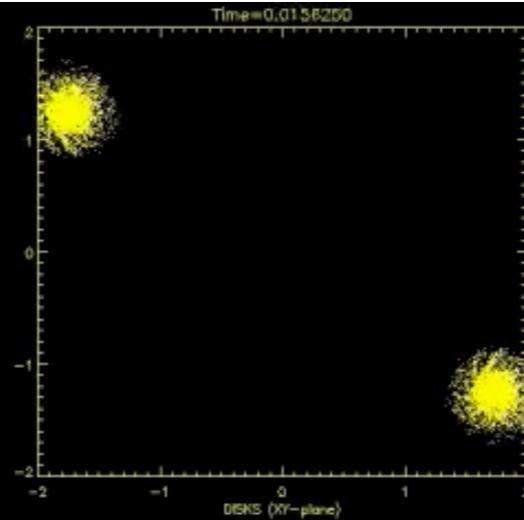
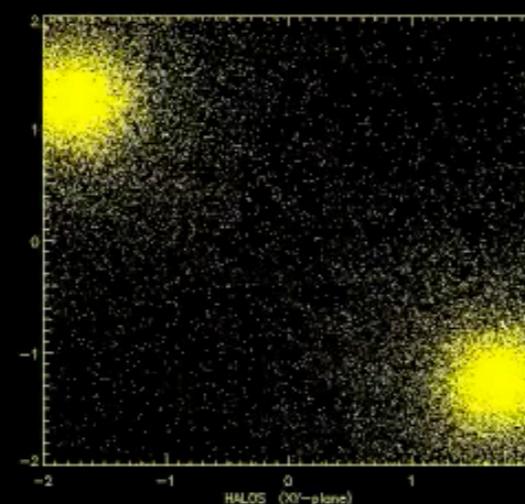
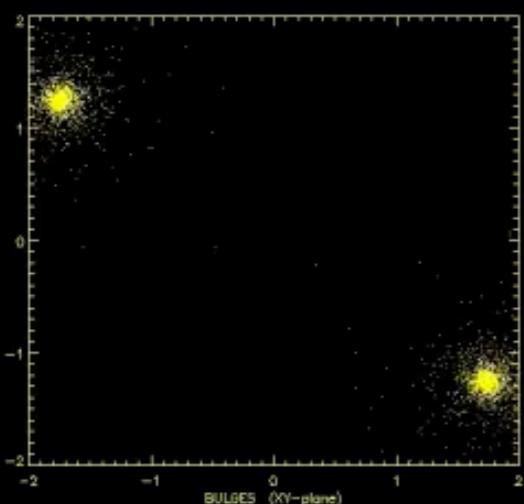
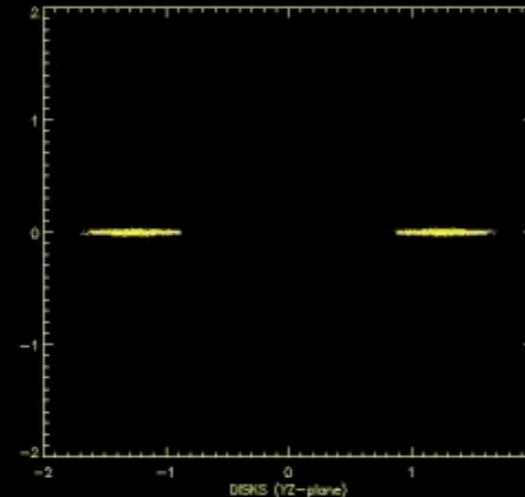
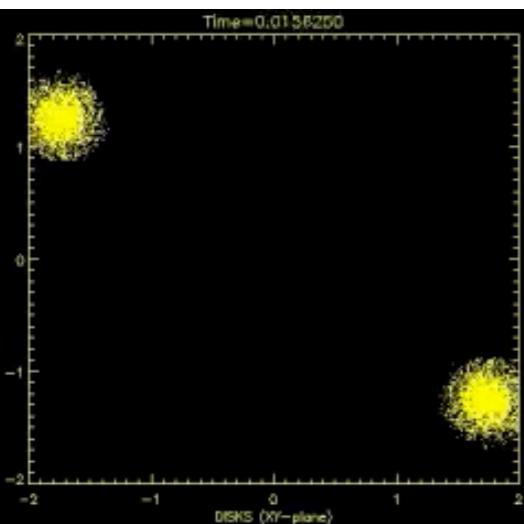


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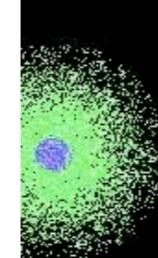
Galactic dynamics

analysis_galaxy:

Loss of angular
momentum



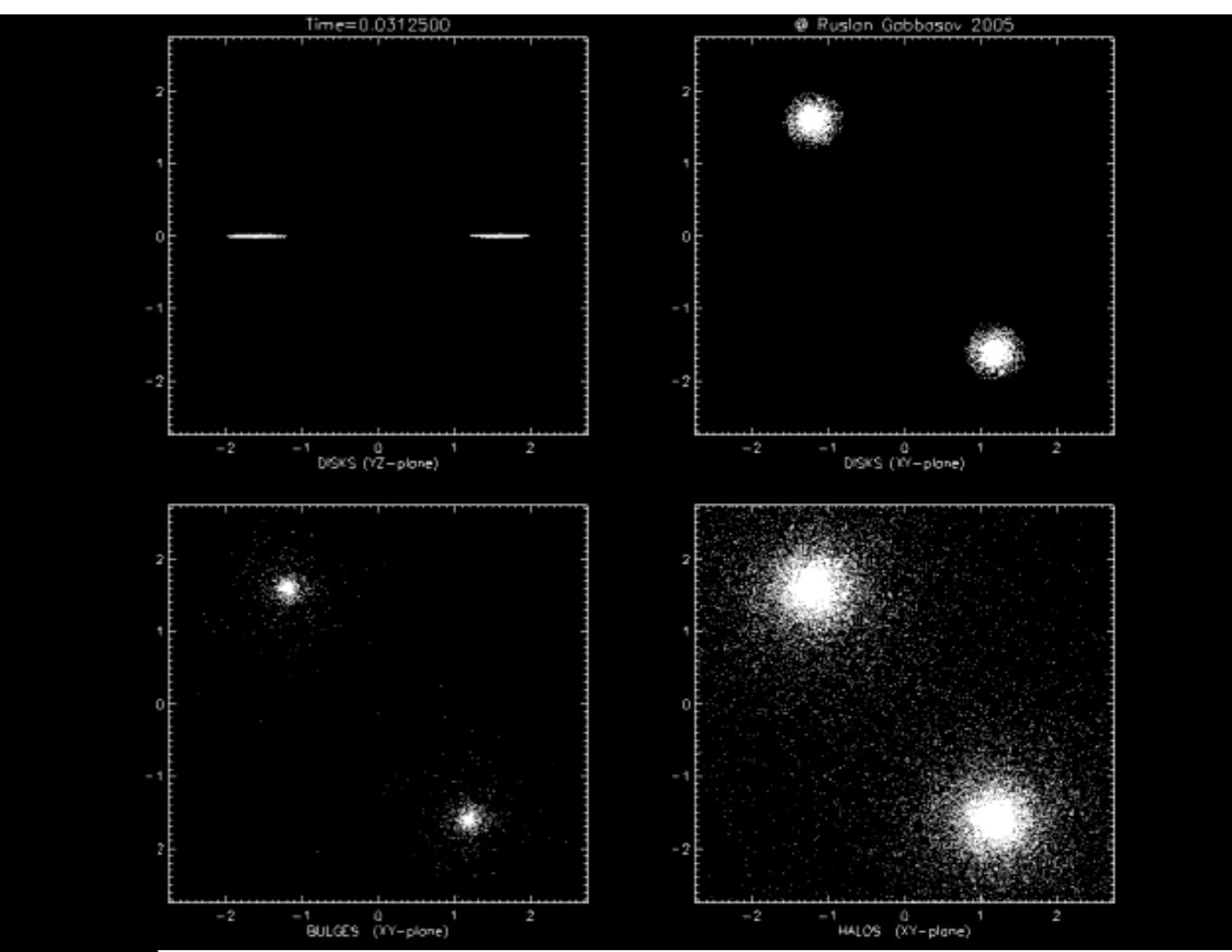
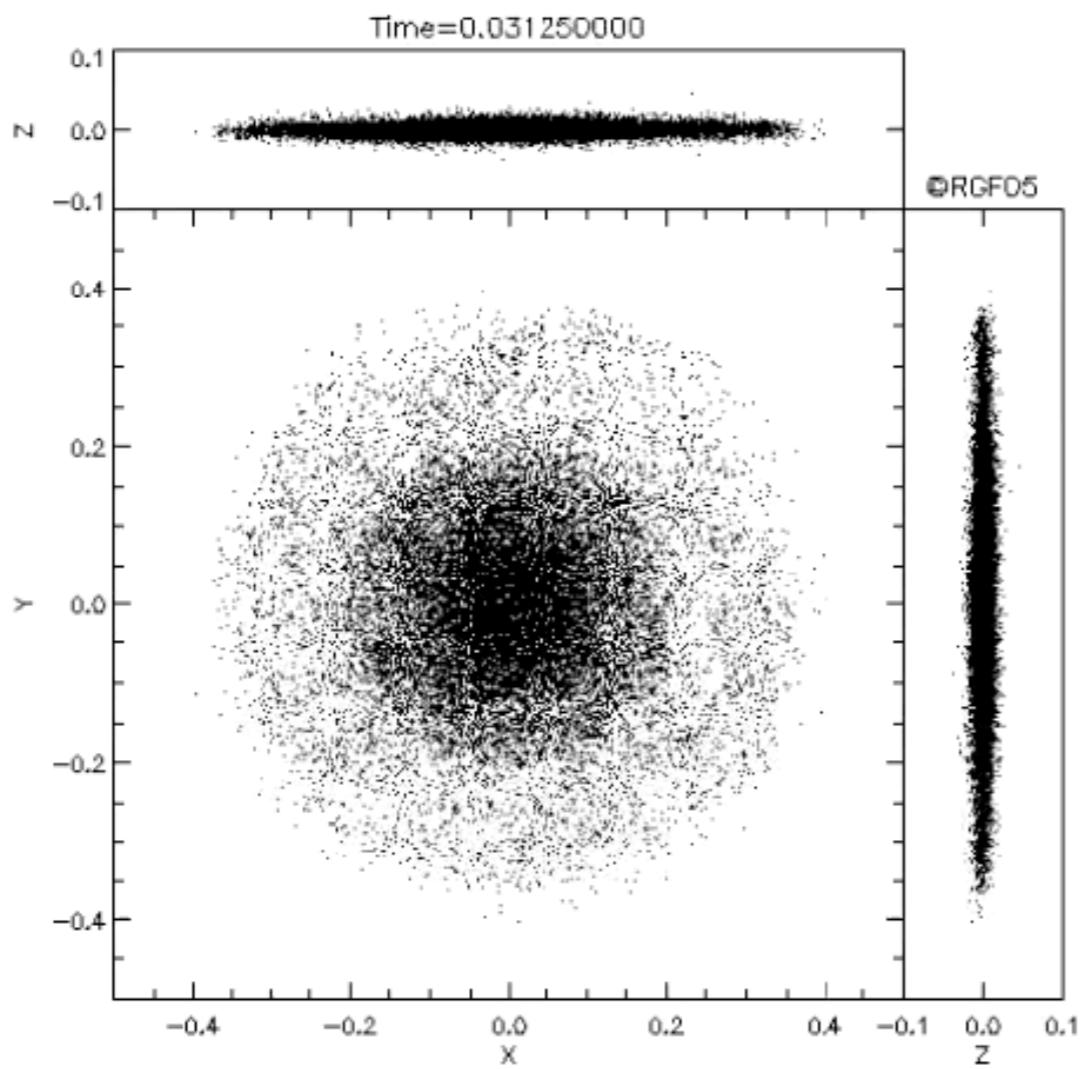
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Galactic dynamics

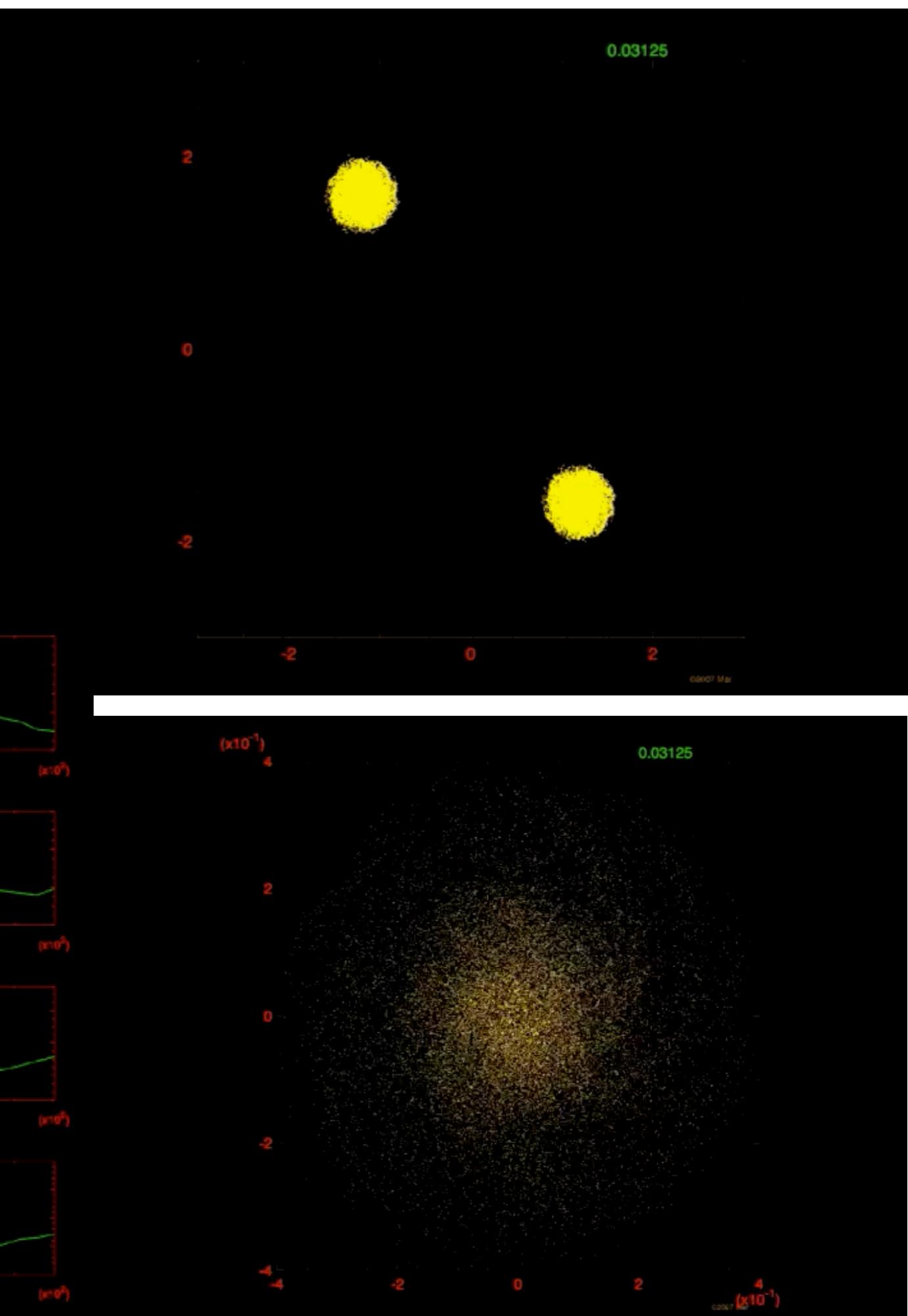
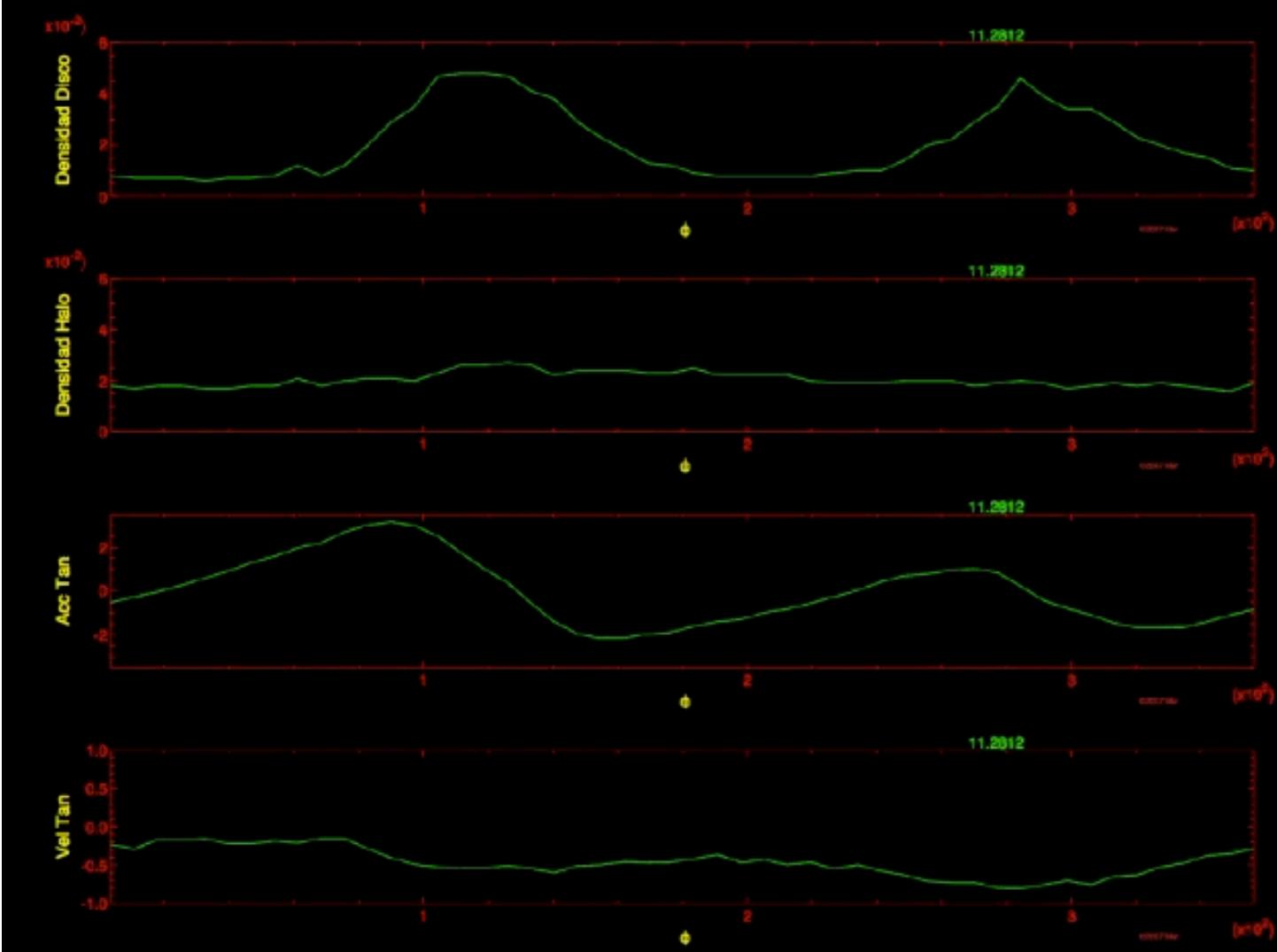
Wiggle:



Content:

Galactic dynamics

Wiggle:



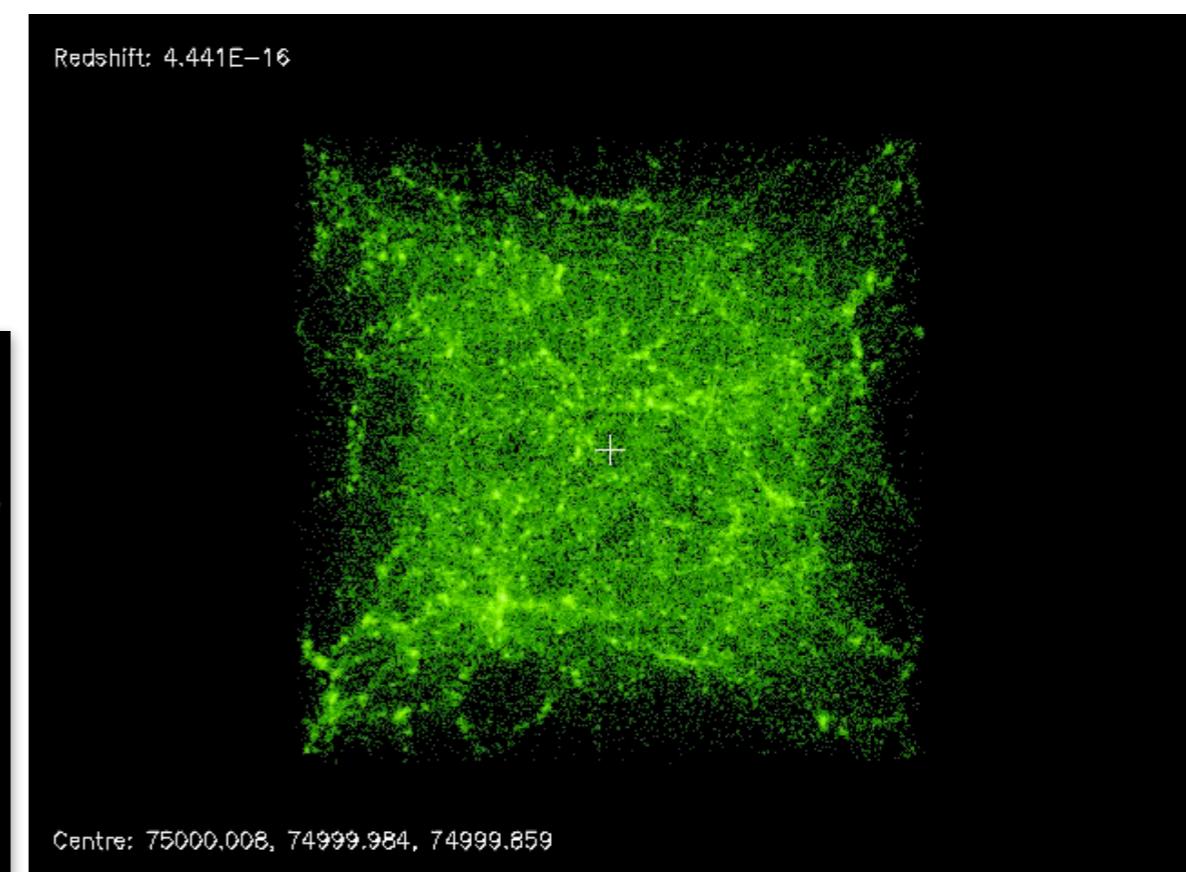
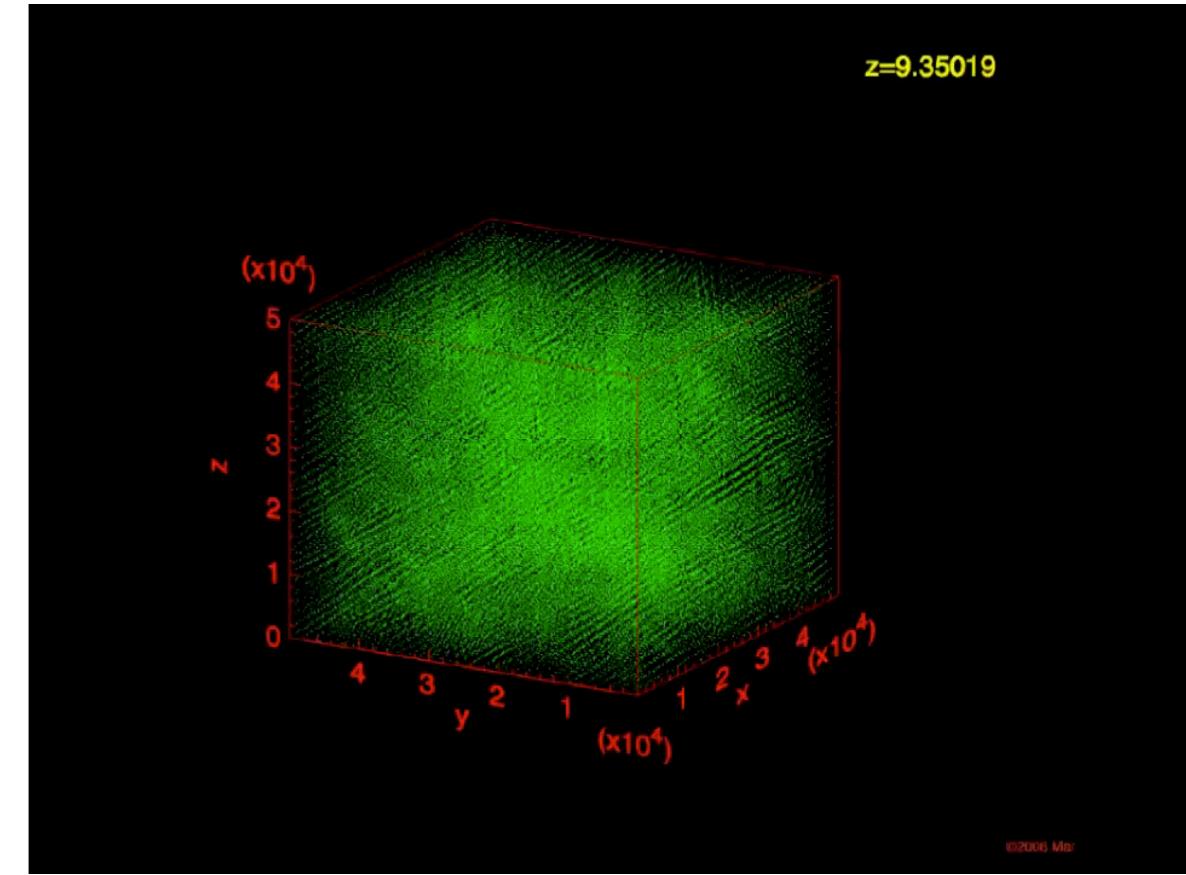
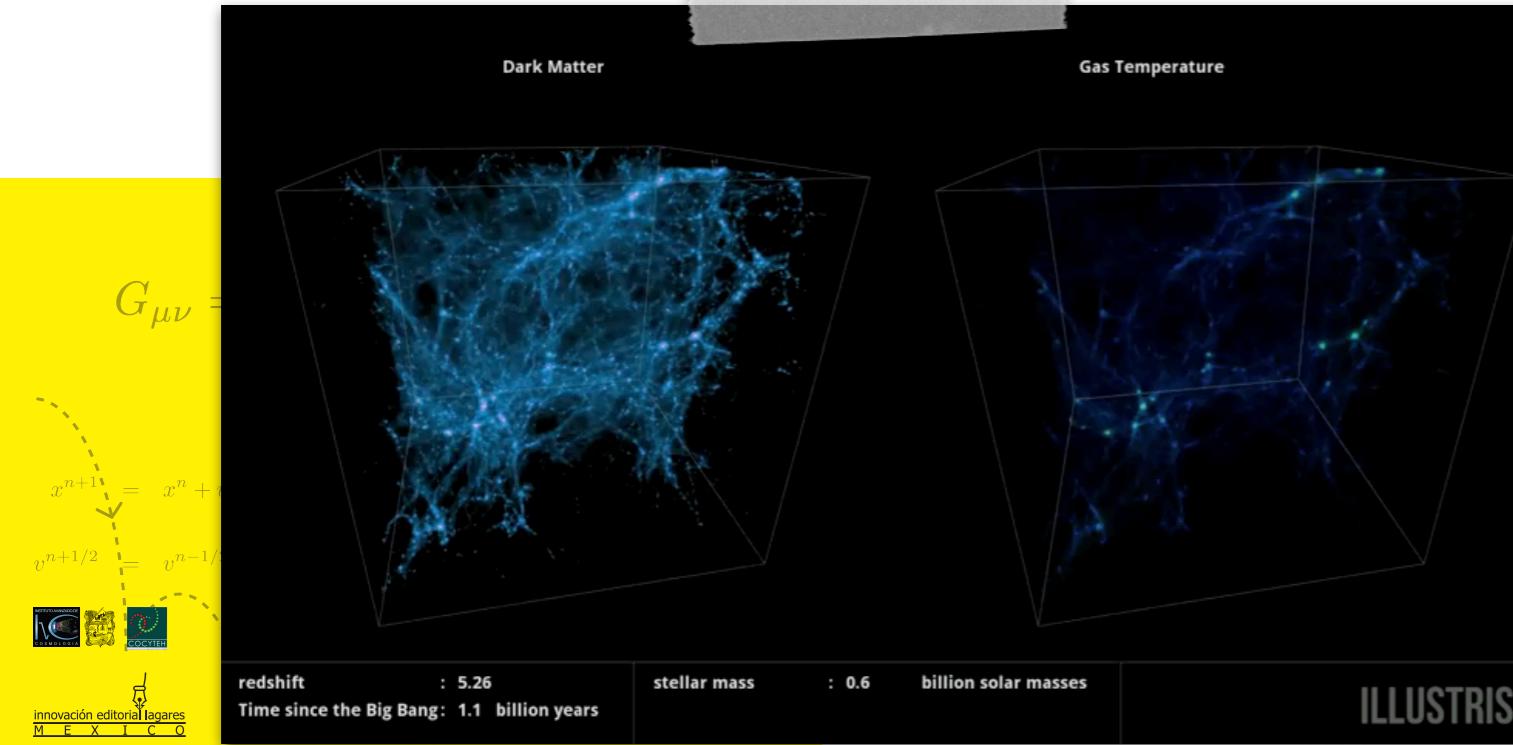
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LSS simulations

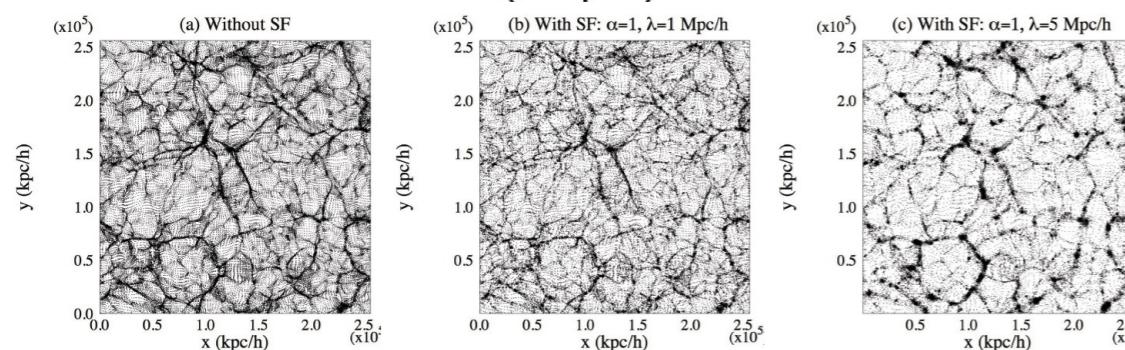
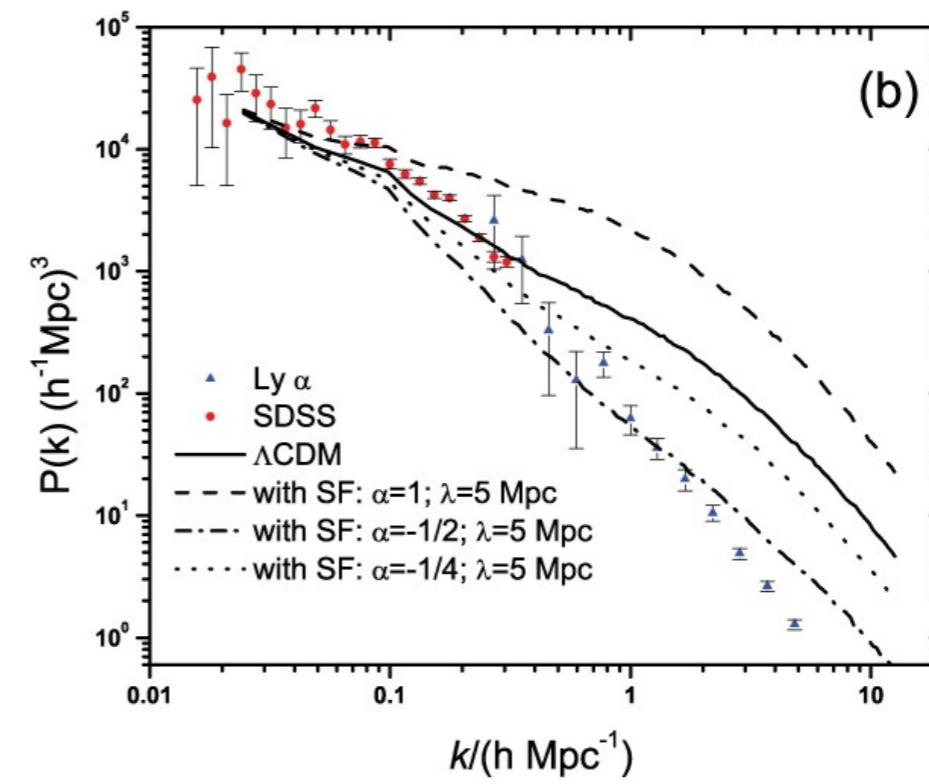
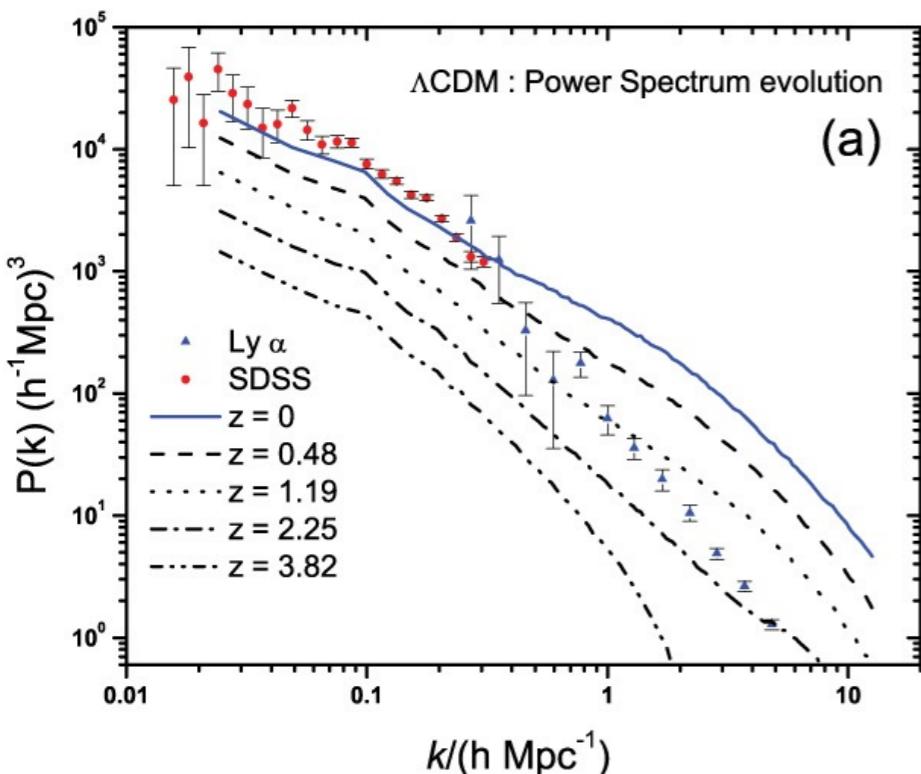
analysis_grav:

$$\mathbf{F} = m_i \mathbf{a}_i$$

$$\mathbf{F} = -\frac{Gm_i m_j}{r_{ij}^2} \mathbf{r}_{ij}$$



Espectro de potencia de la estructura que vemos



Conclusions: Visualization

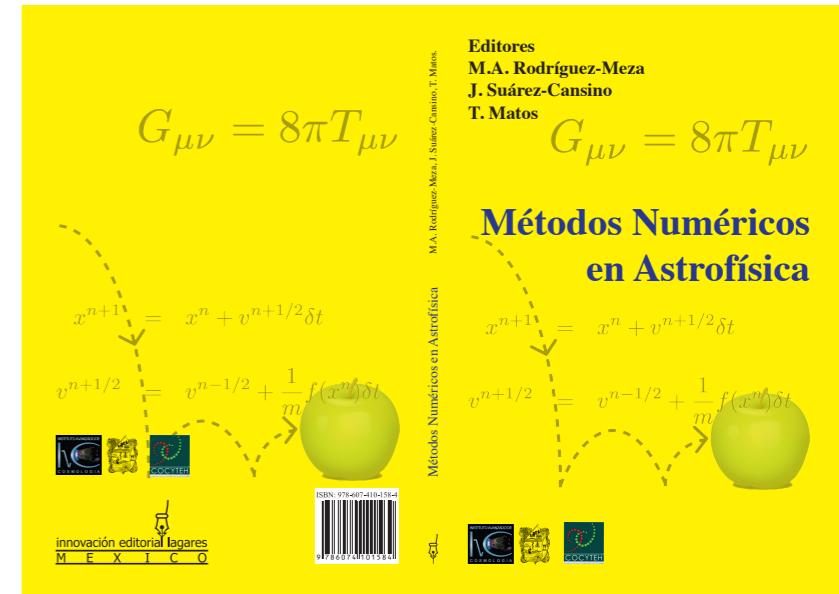
We have seen:

- How visualization helps.
- Examples in dynamic simulations.
- Visualizations codes. Gnuplot, gadgetviewer, plplot and pgplot.



References and material

- Cosmología numérica y estadística: NagBody kit (<http://bitbucket.org/rodriguezmeza>). Mario A. Rodríguez-Meza. And: https://github.com/rodriguezmeza/NagBody_lectures.git
- Métodos numéricos en astrofísica, capítulo I, Método de N-cuerpos en astrofísica. (https://www.researchgate.net/publication/316582859_Metodo_de_N-Cuerpos_en_Astrofisica)
- La estructura a gran escala del universo. Capítulo 22 en Travesuras cosmológicas de Einstein et al. https://www.researchgate.net/publication/316582400_La_estructura_a_gran_escala_del_universo_simulaciones_numericas
- https://www.researchgate.net/profile/Mario_Rodriguez-Meza
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- M.A. Rodriguez-Meza, Adv. Astron. 2012, 509682 (2012). arXiv: 1112.5201. (https://www.researchgate.net/publication/51967093_A_Scalar_Field_Dark_Matter_Model_and_Its_Role_in_the_Large-Scale_Structure_Formation_in_the_Universe)



See you!

