Simulaciones de Sistemas Hiperbólicos-Parabólicos en Física y Astrofísica

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Colaboradores:

- Luis Lehner [Colisión Agujeros Negros, Jets Relativistas, AMR, Multigrids]
- Carlos Palenzuela [Colisión Agujeros Negros, Jets Relativistas, IMEX]
- Federico Carrasco [Skyrmions, Fluidos en S^2]
- Florencia Parisi [Ricci Flow]
- Santiago Gomez [Ricci Flow, Relatividad General en S^3]
- Andrea Costa [Magneto-hidrodinámica Solar]
- Mariana Cécere [Magneto-hidrodinámica Solar, AMR-HAD, Kurganov-Tadmor]
- Carlos Bederián [GPGPU, AMR ….]
- Germán Ceballos [GPGPU, AMR ….]
- Facundo Fabre [GPGPU, AMR ….]

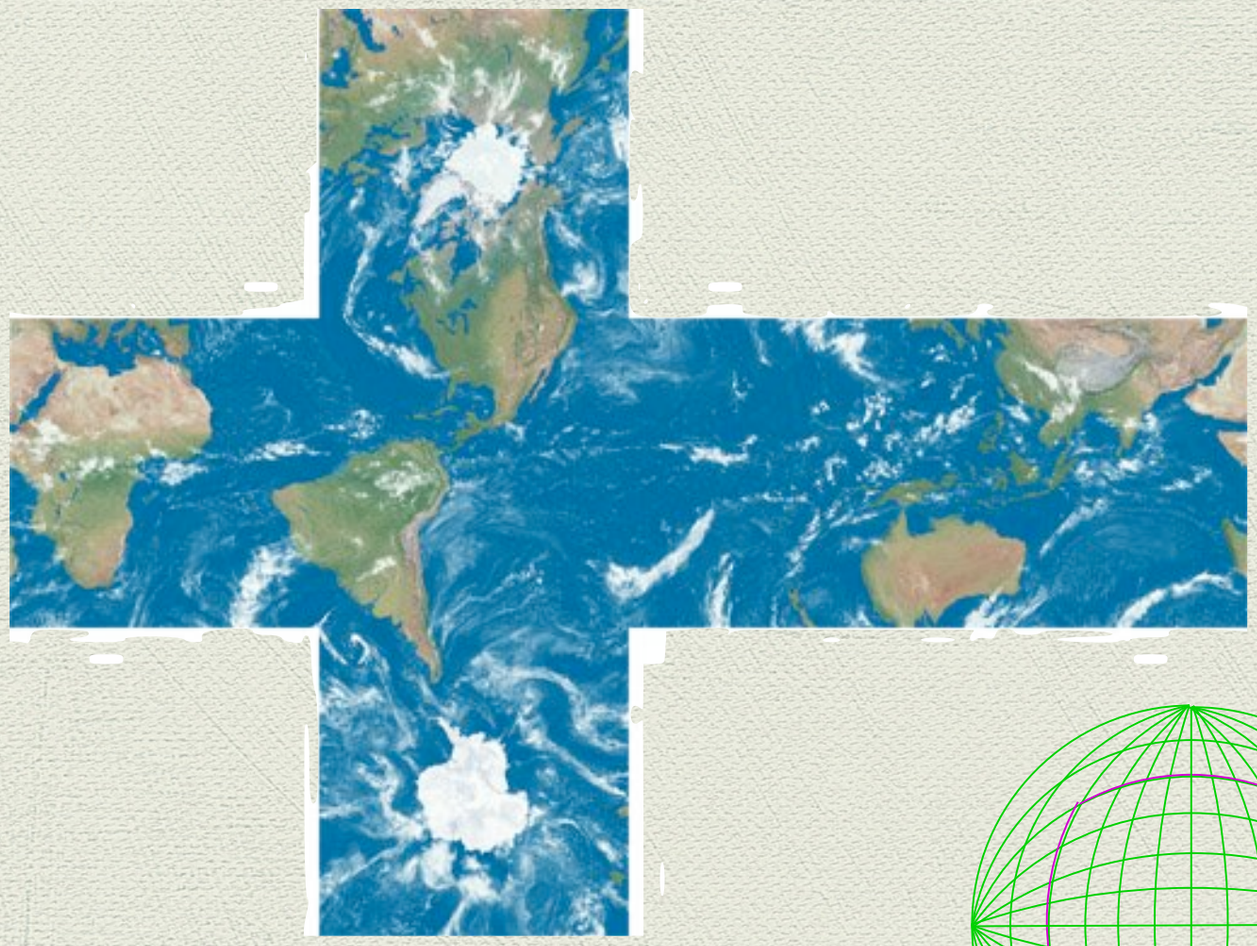
Códigos Usados:

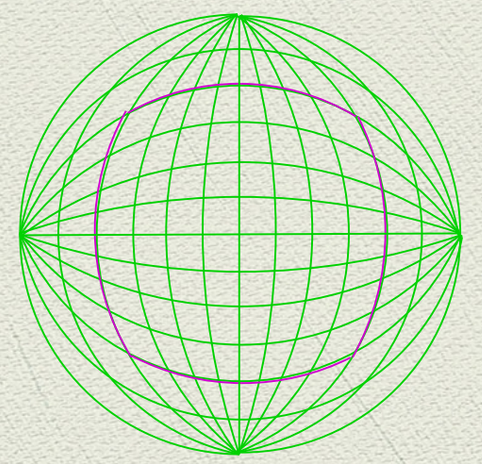
- HAD - AMR [Jets, Agujeros Negros][Fortran-MPI]

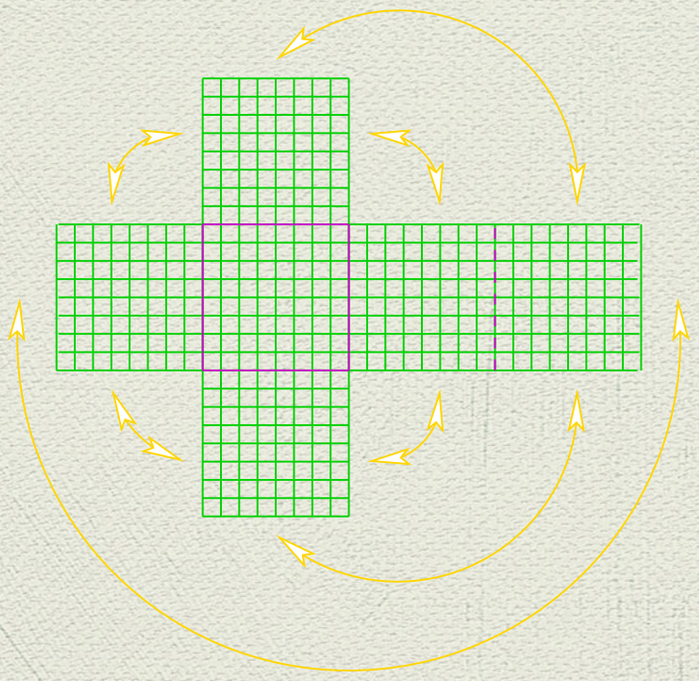
- Multi-grids [Agujeros Negros, MHD, Fluidos, Shallow Water, Maxwell, Force-Free, etc.] [C,MPI,GPGPU]

- Multi-grids / AMR [Todo lo anterior] [C,MPI,GPGPU,Bases de Datos Distribuidas]

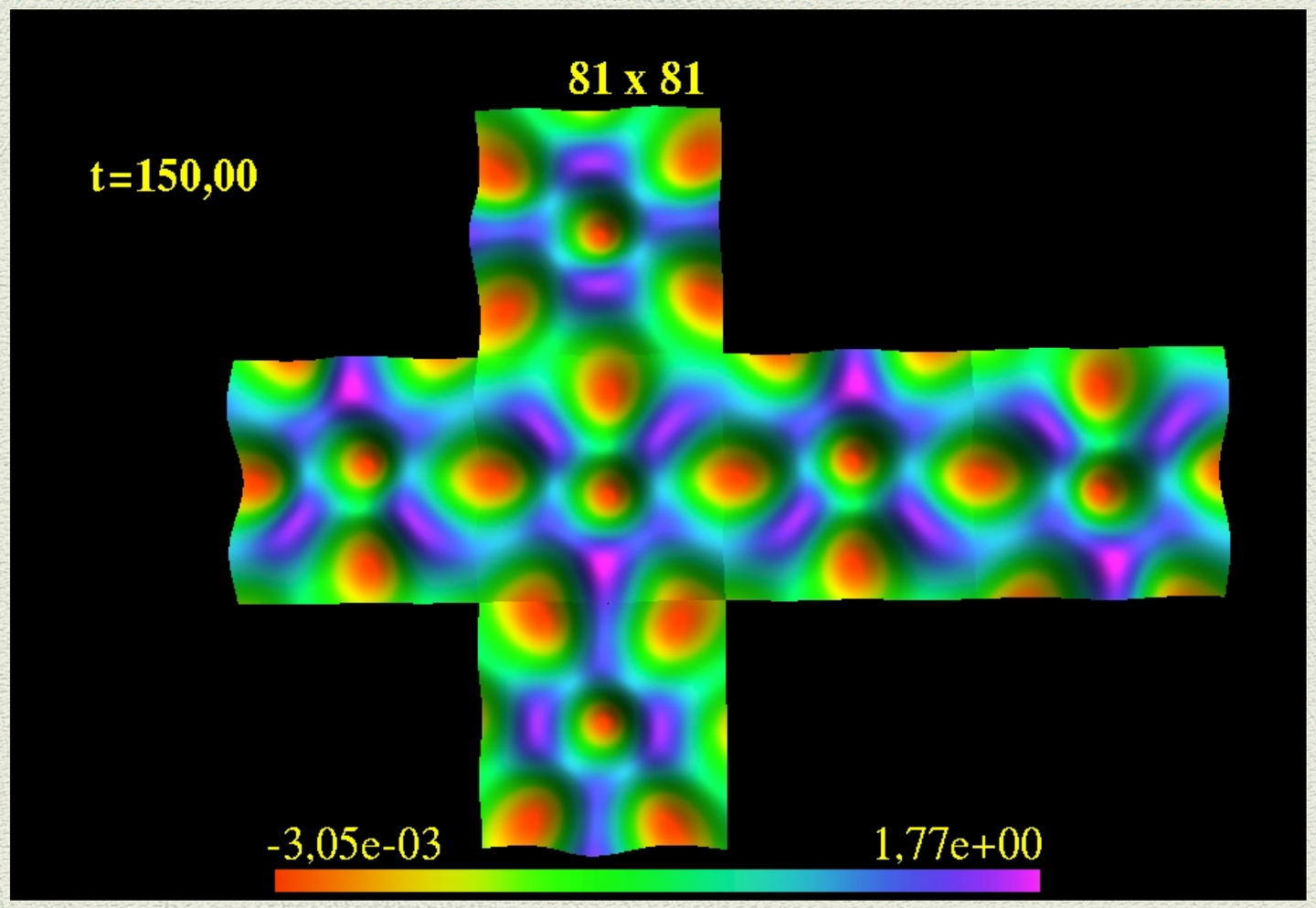
Multi-grids / AMR

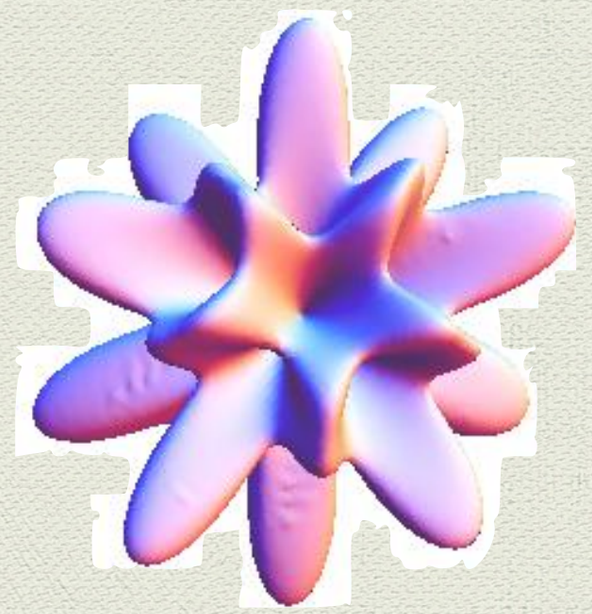




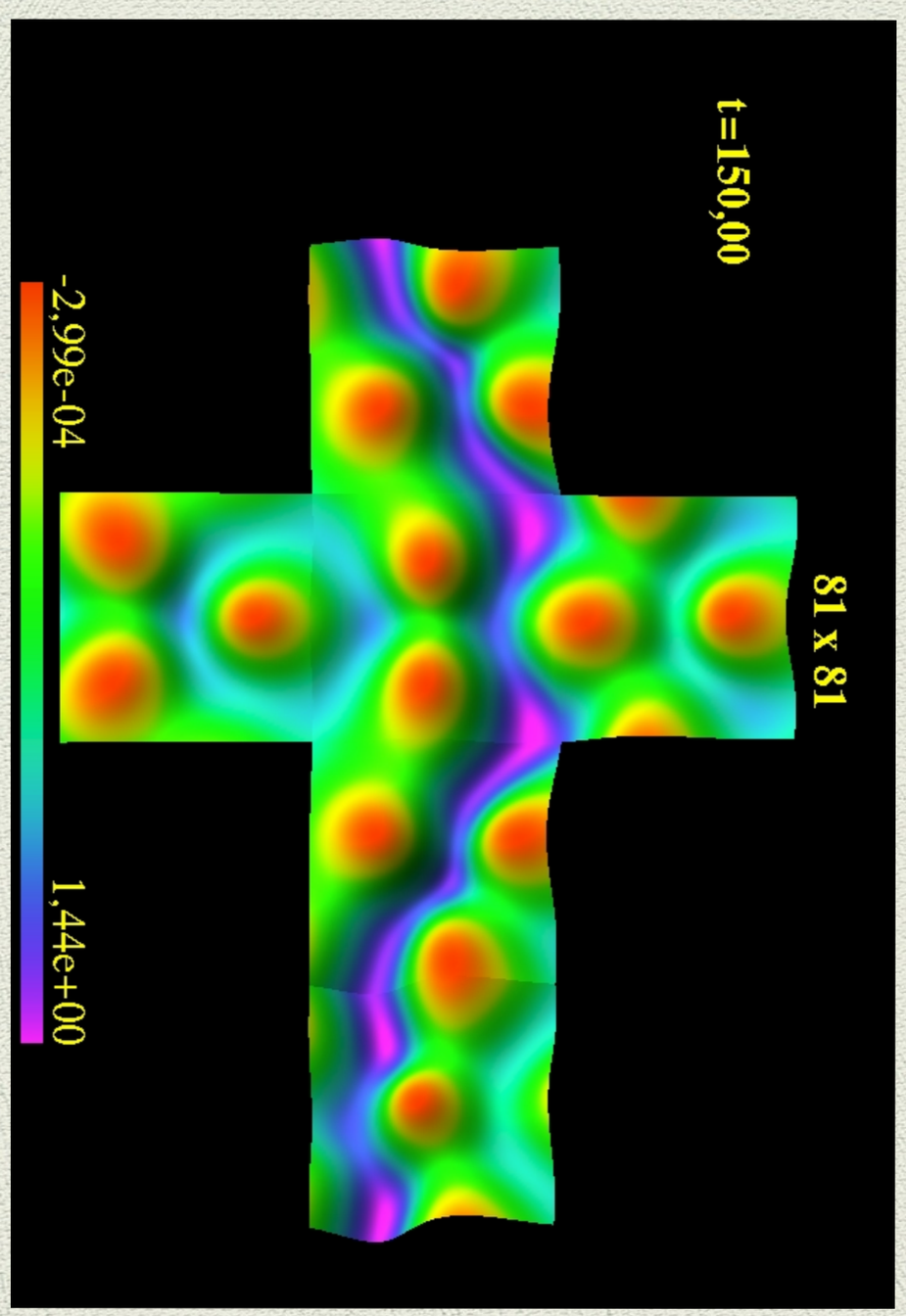


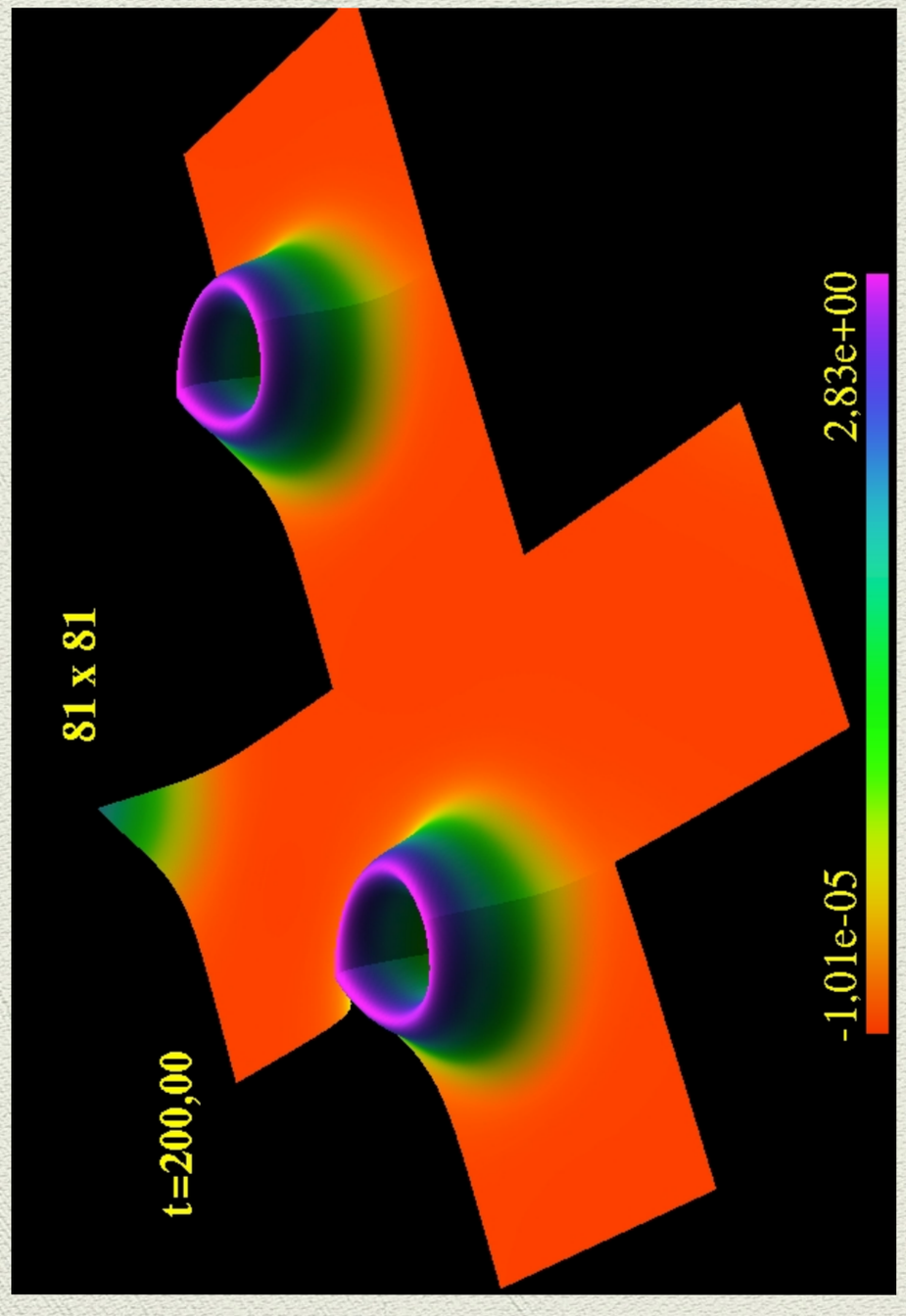
Multi-grids: Skyrmions en S^2



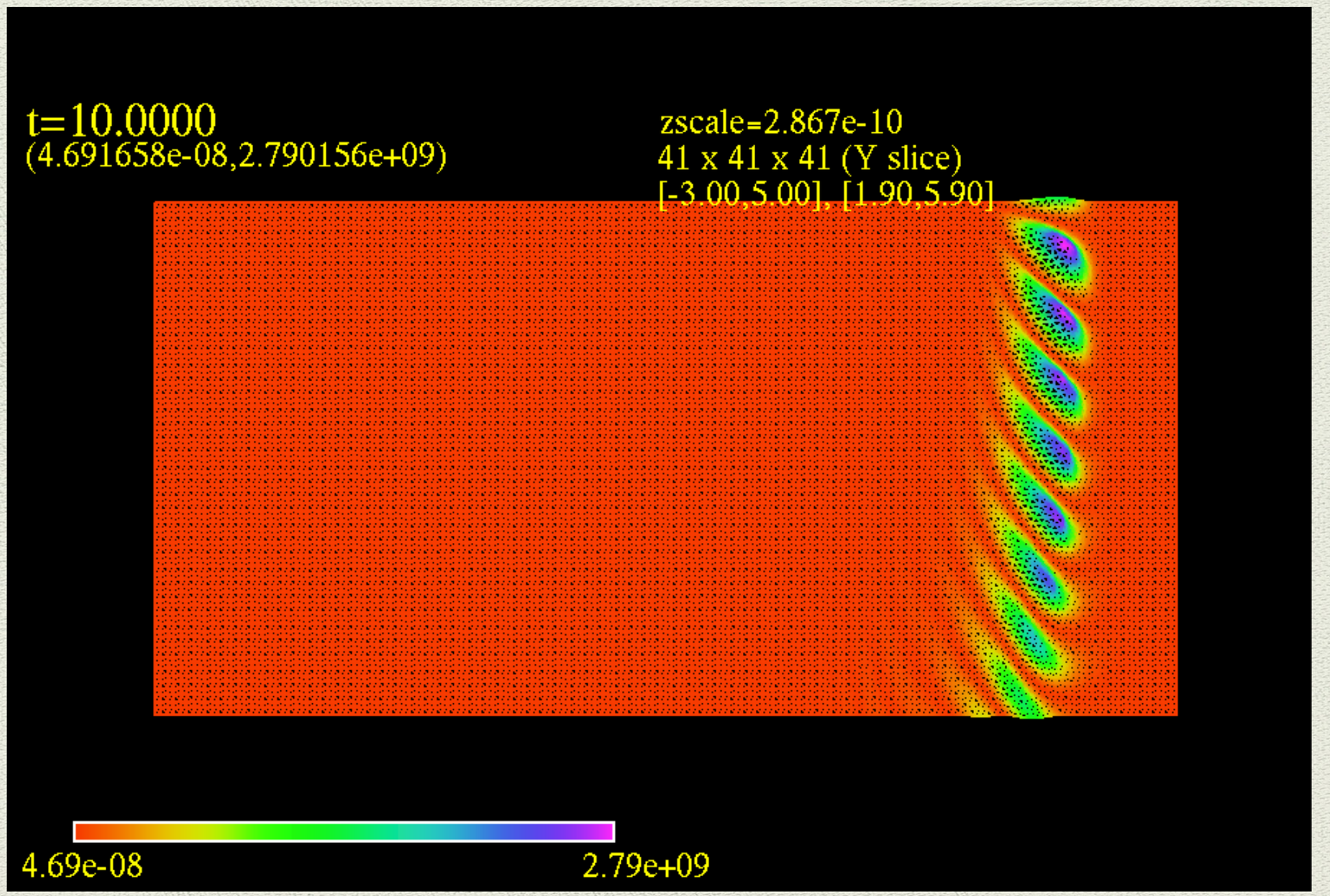


Multi-grids: Skyrmions en S^2

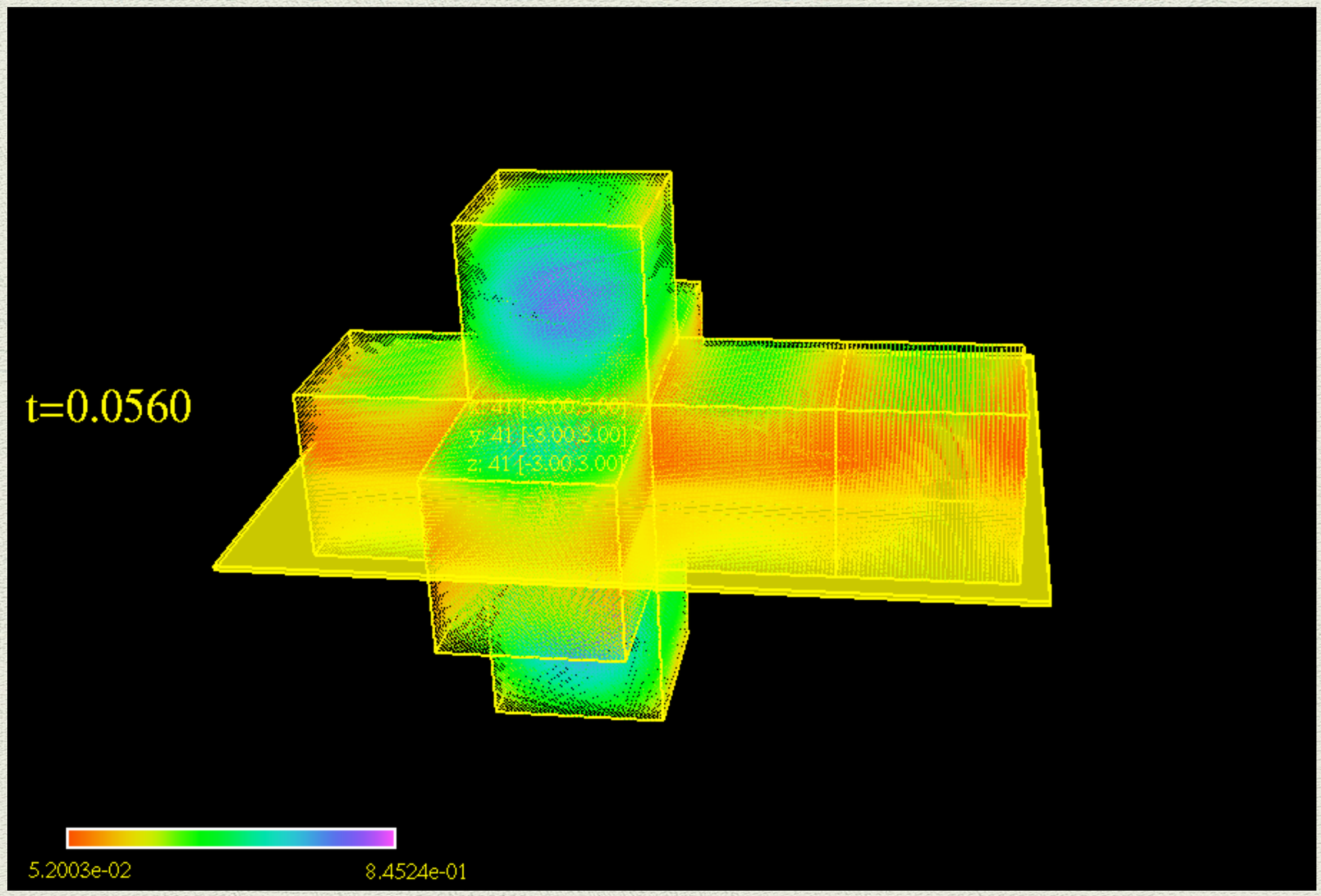




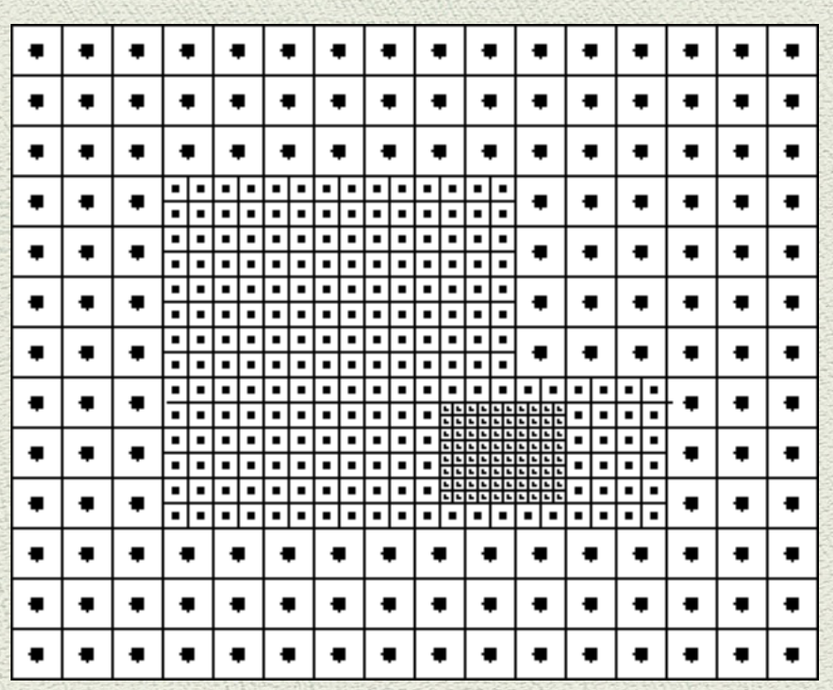
Multi-grids: Maxwell en Kerr

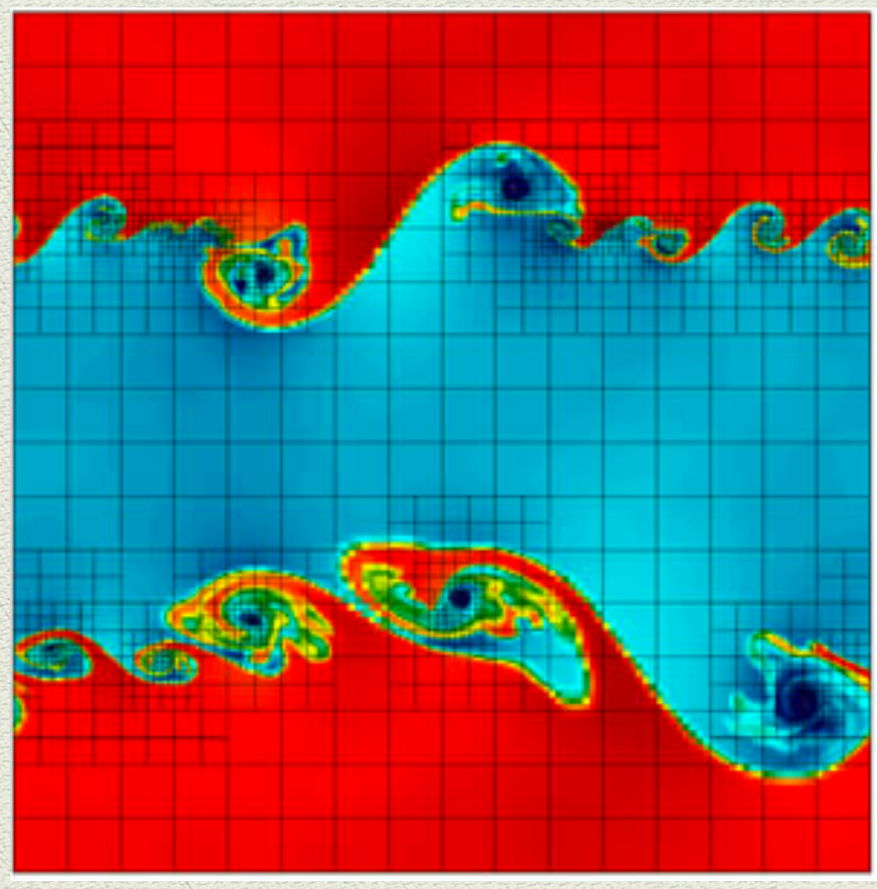


M-grids: Flujo de Ricci en S^3



Adaptive Mesh Refinement:





Adaptive Mesh Refinement:

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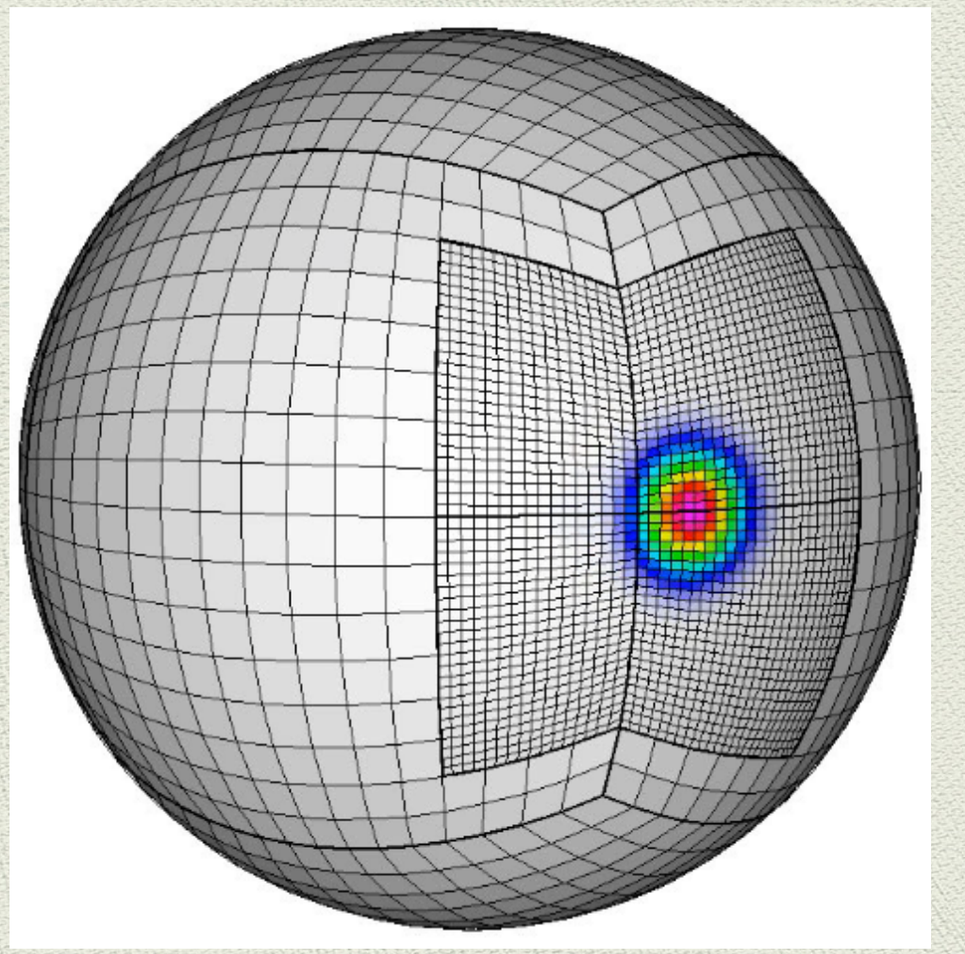
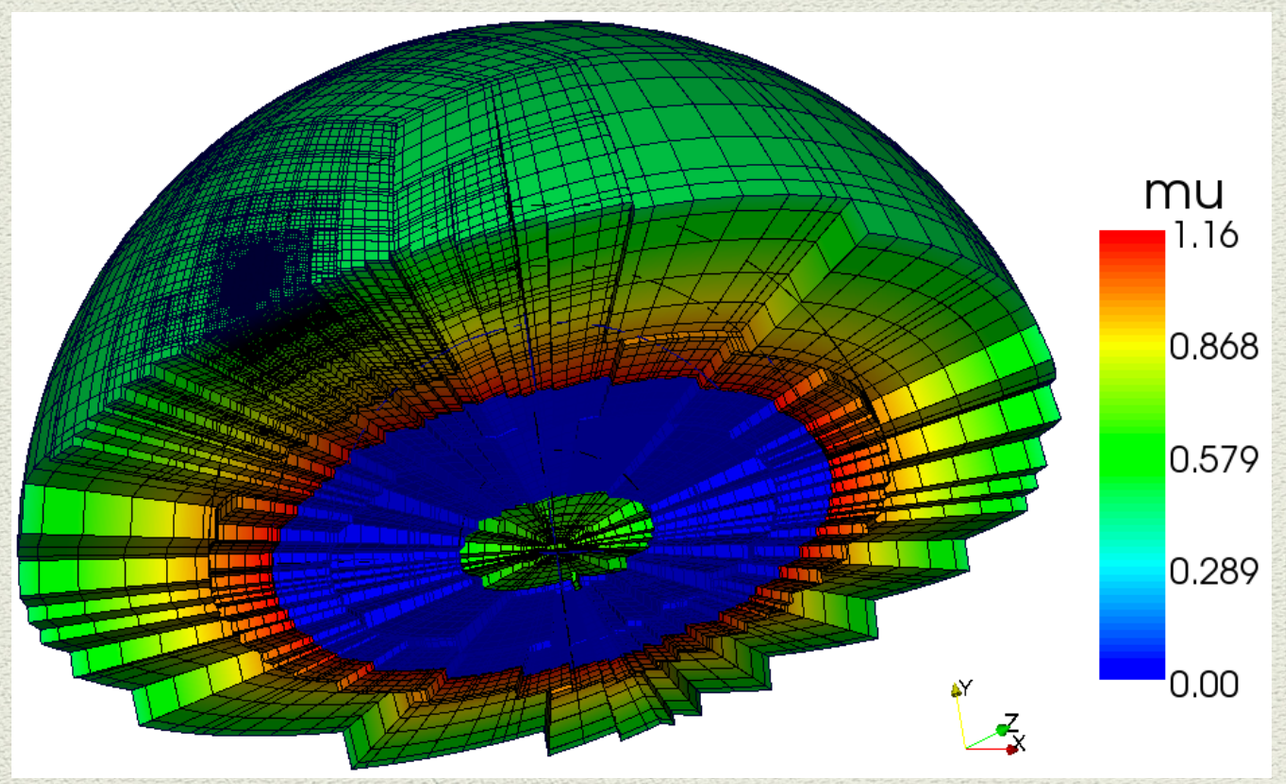
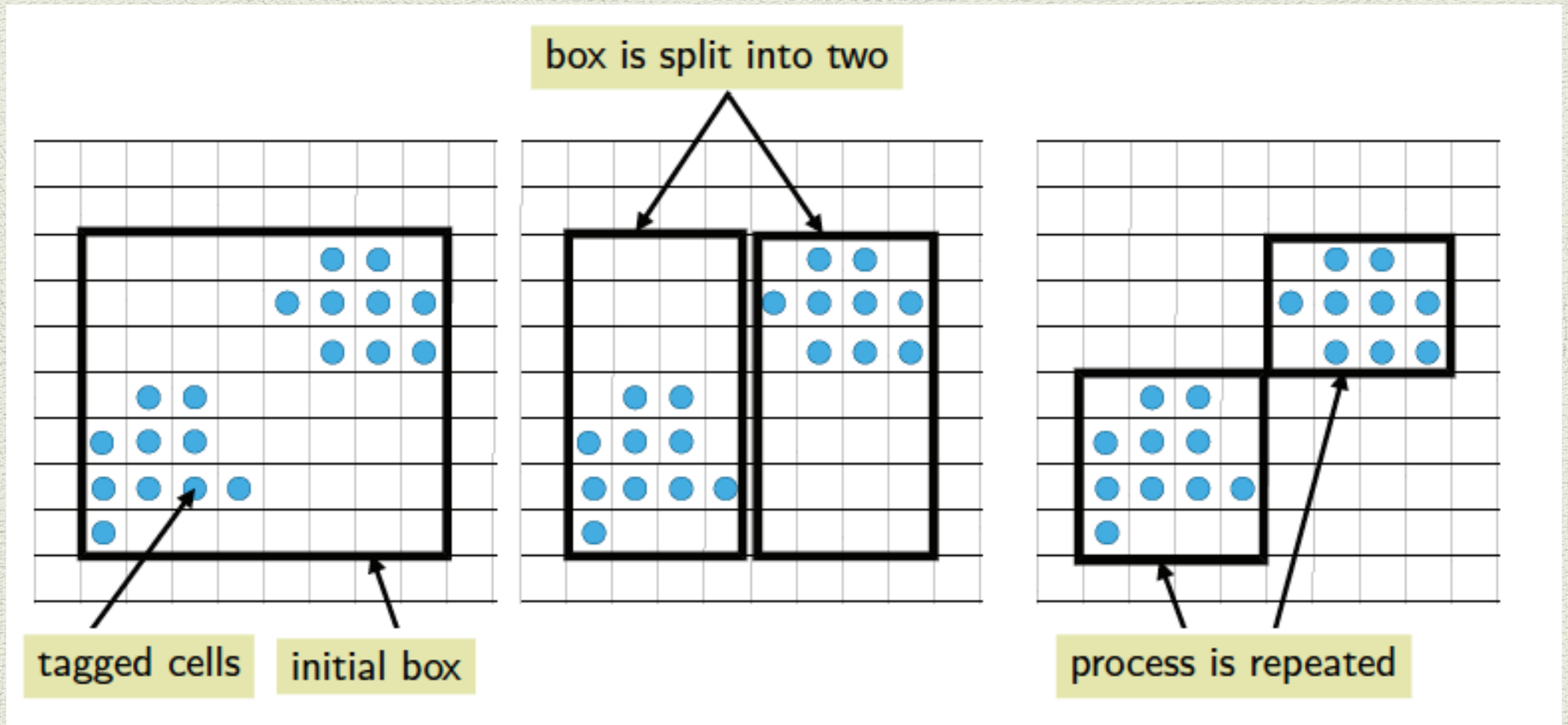




http://burstedde.ins.uni-bonn.de/research/images/dgel_f05_mu.png

Adaptive Mesh Refinement:

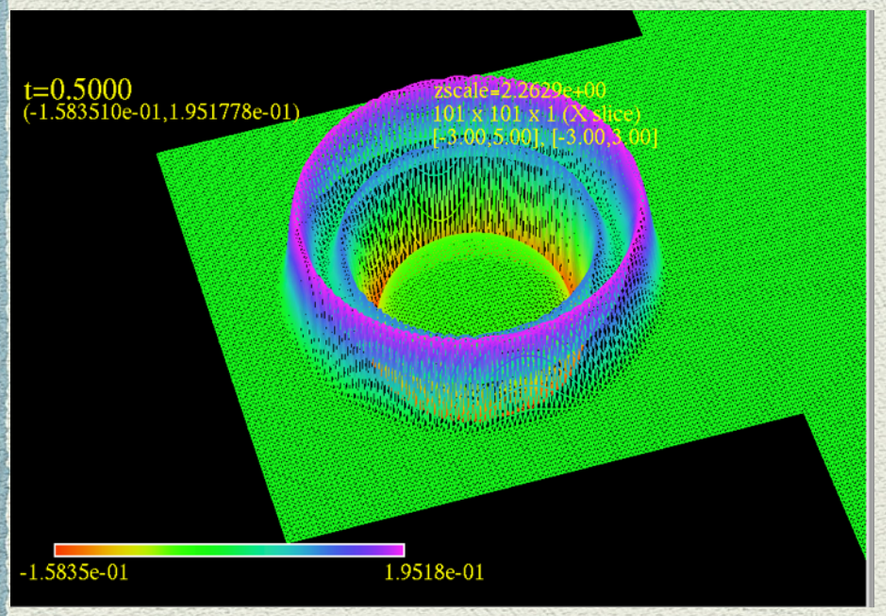


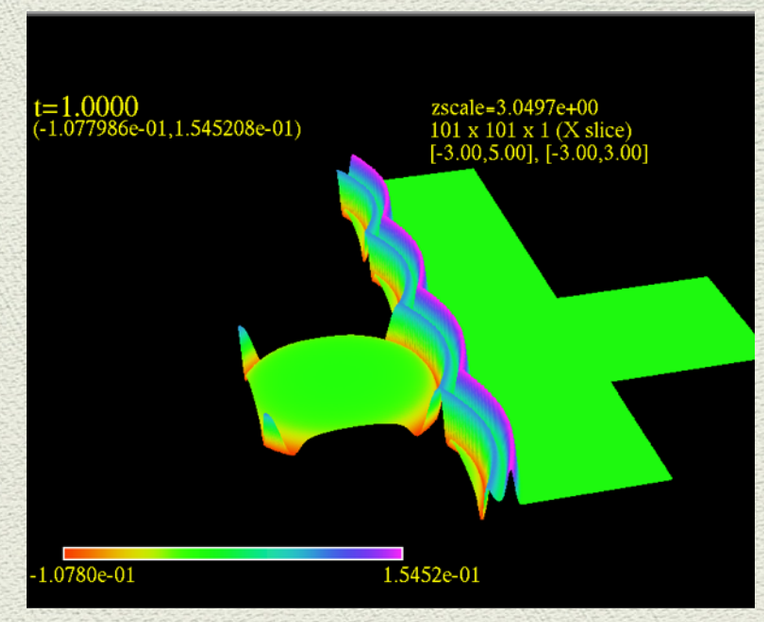
Algoritmo de Clustering

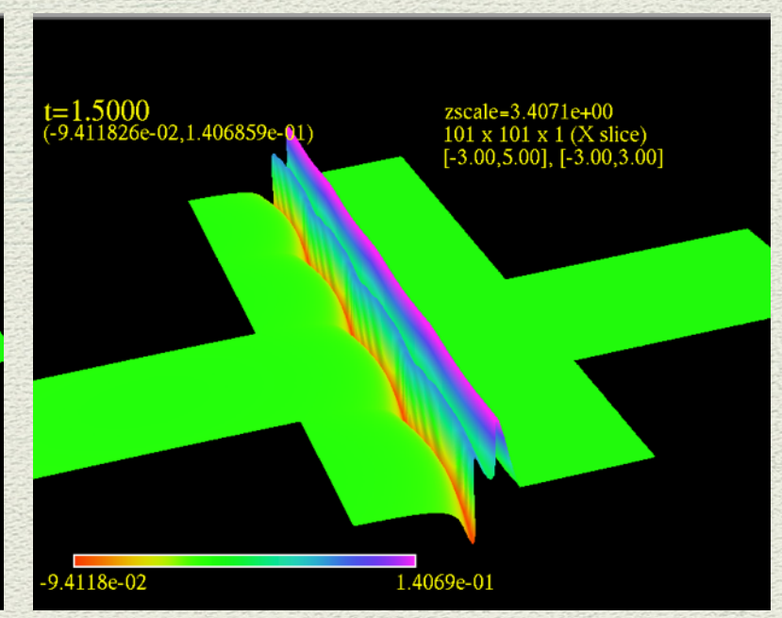
AMR (nuestro desarrollo):

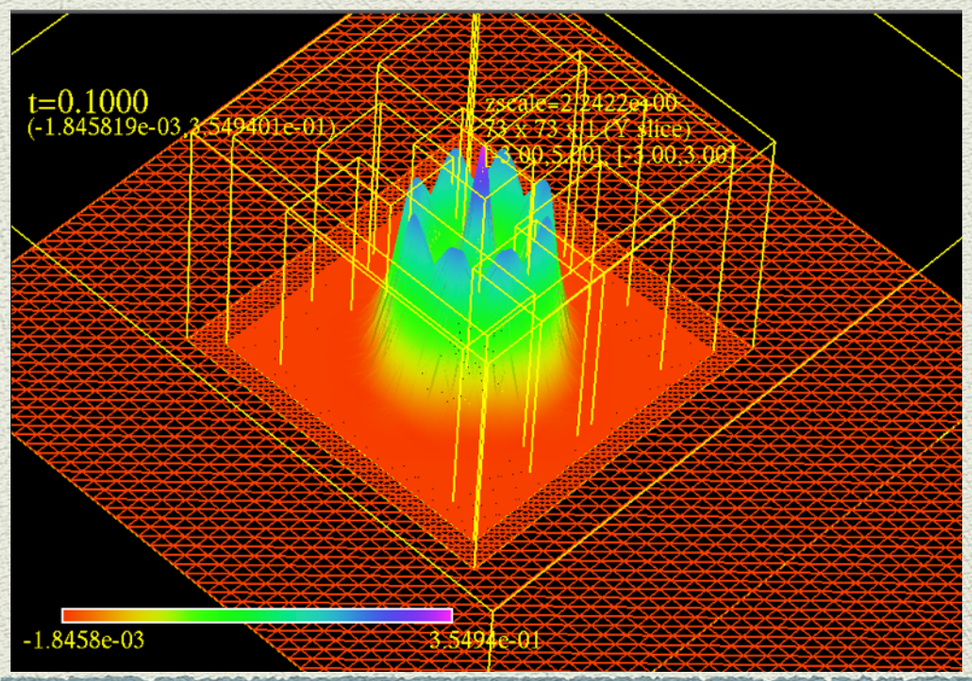
- Basado en el multi-grids (para permitir distintas topologías).
- Cada grilla es un proceso MPI, se crea cuando se lo necesita y luego se destruye.
- Las distintas grillas son alocadas de acuerdo al mapa de los recursos disponibles y de forma balanceada.
- Cada grilla hace uso de los recursos computacionales que haya (GPU's) de forma transparente para el usuario.
- Los datos (serán) manejados por una base de datos distribuida.

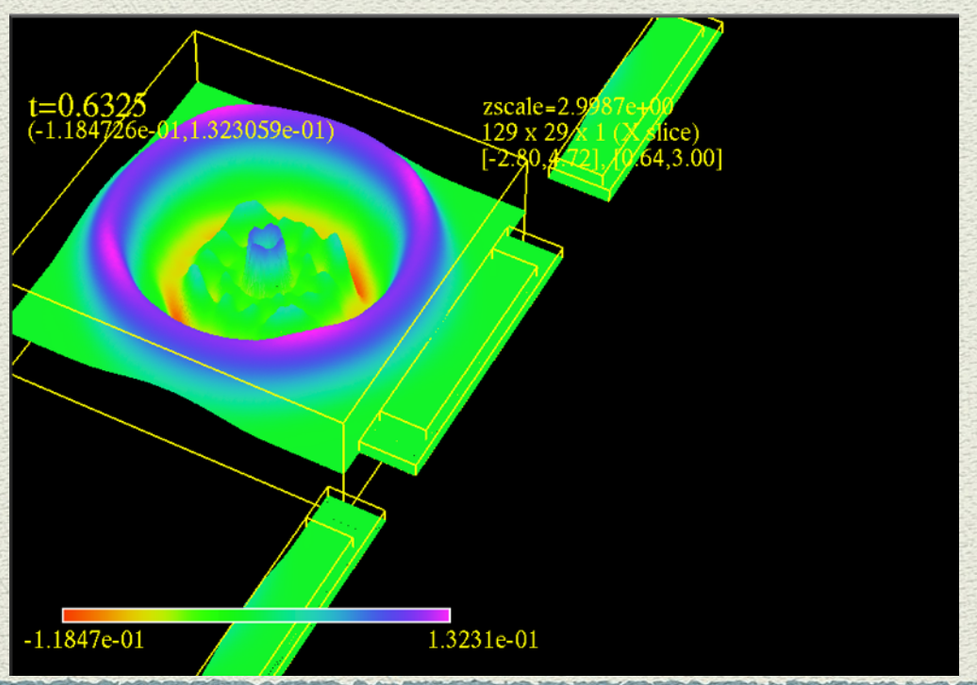
AMR (nuestro desarrollo):











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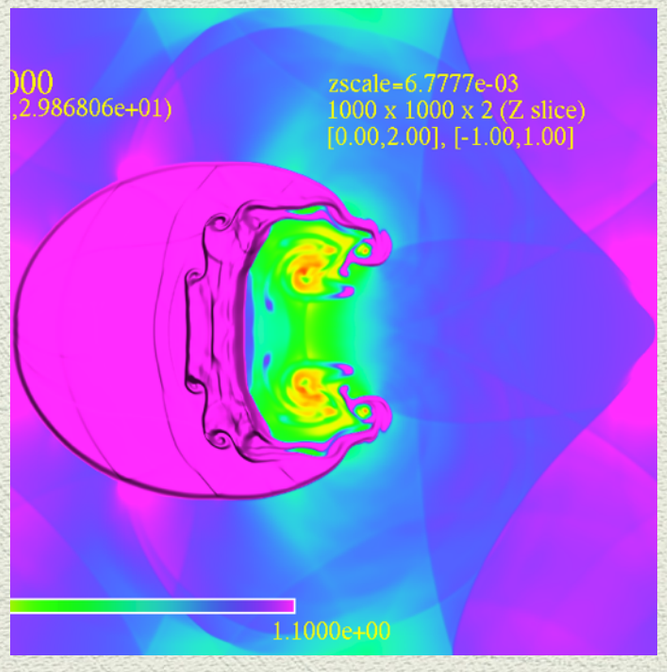
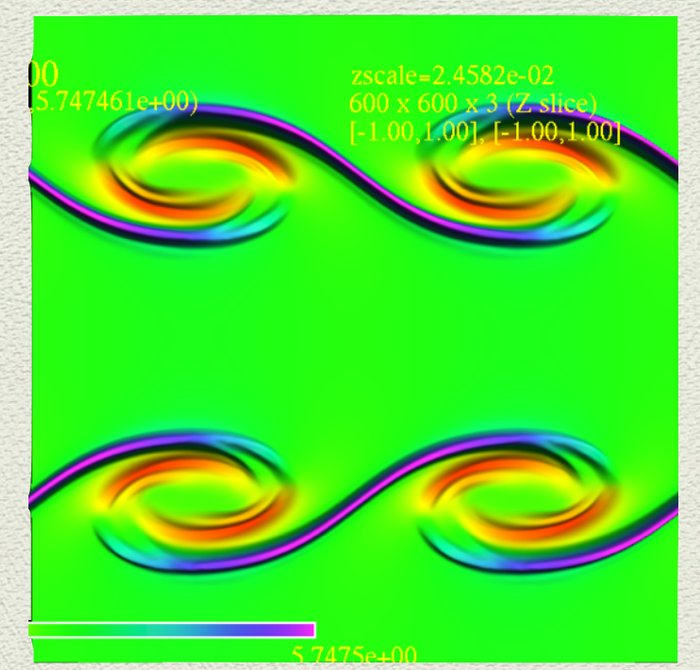
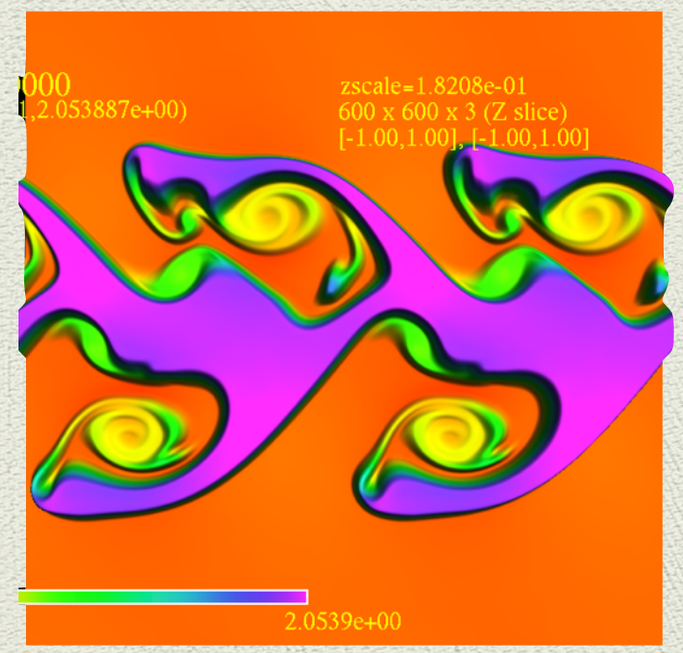
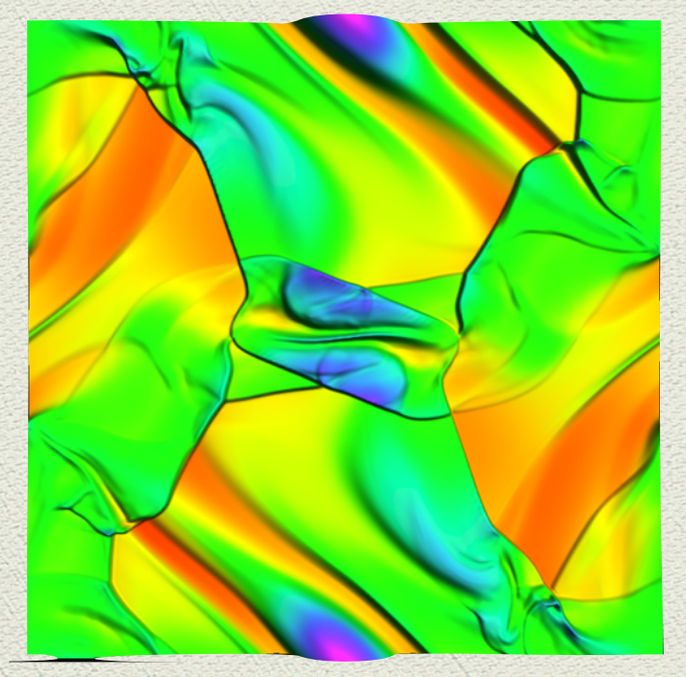
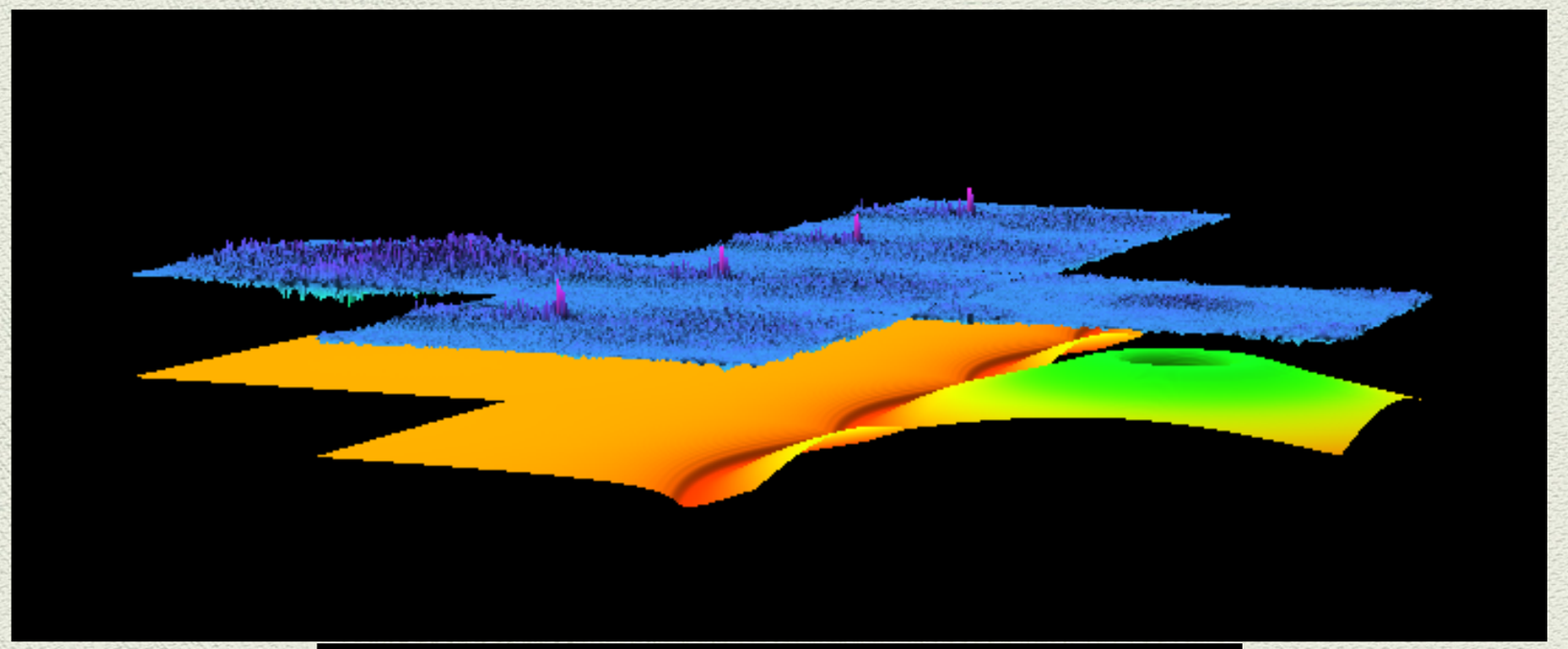


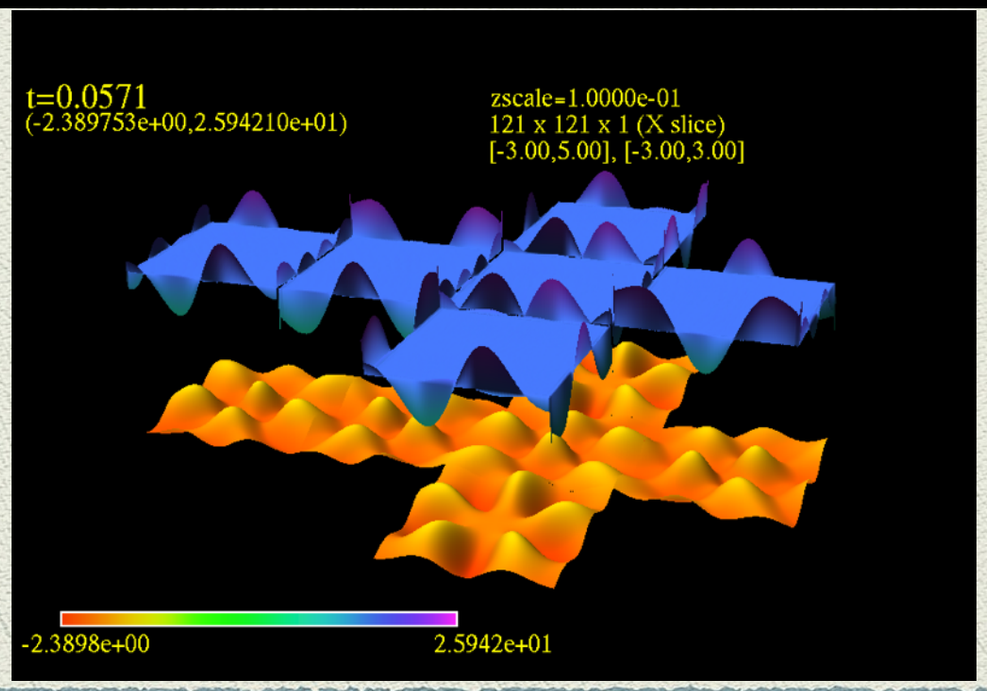






Multi-grid: Scrödinger eqn.





Preguntas para la tarde:

- Podemos darnos el lujo de no tener una infraestructura de HPC en nuestro país?

- Tenemos en cuenta cuanto nos cuesta en tiempo y recursos tener una miríada de sistemas computacionales pequeños?

- Afirmación: El sistema humano (equipos) no va a pegar un salto hasta que no tengamos los recursos apropiados.