Making Scientific Computing Available to Everyone

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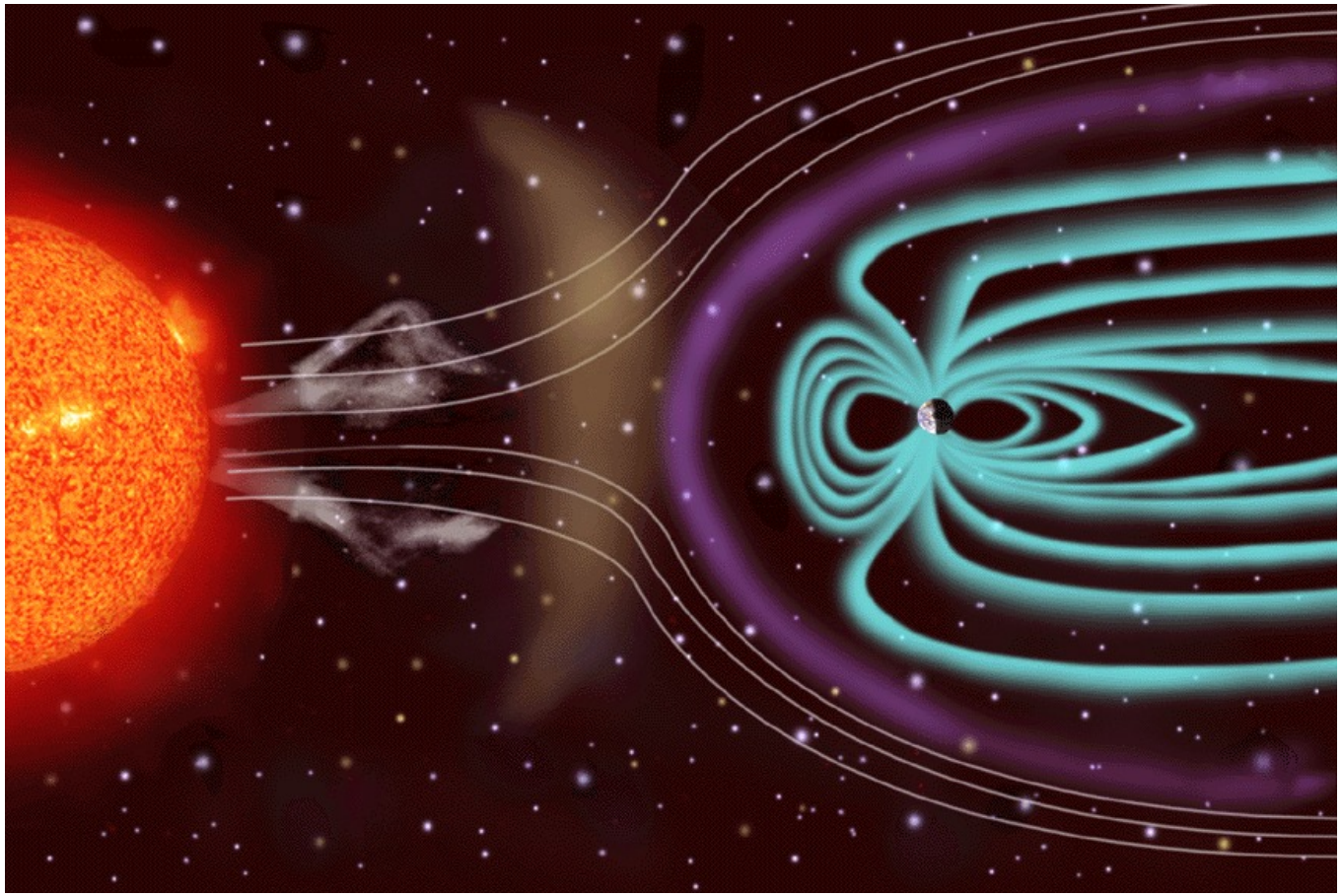
JSHS, Reno, 18 March 2010

Aurora

Aurora



Aurora

$$\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho \mathbf{v}) = 0$$

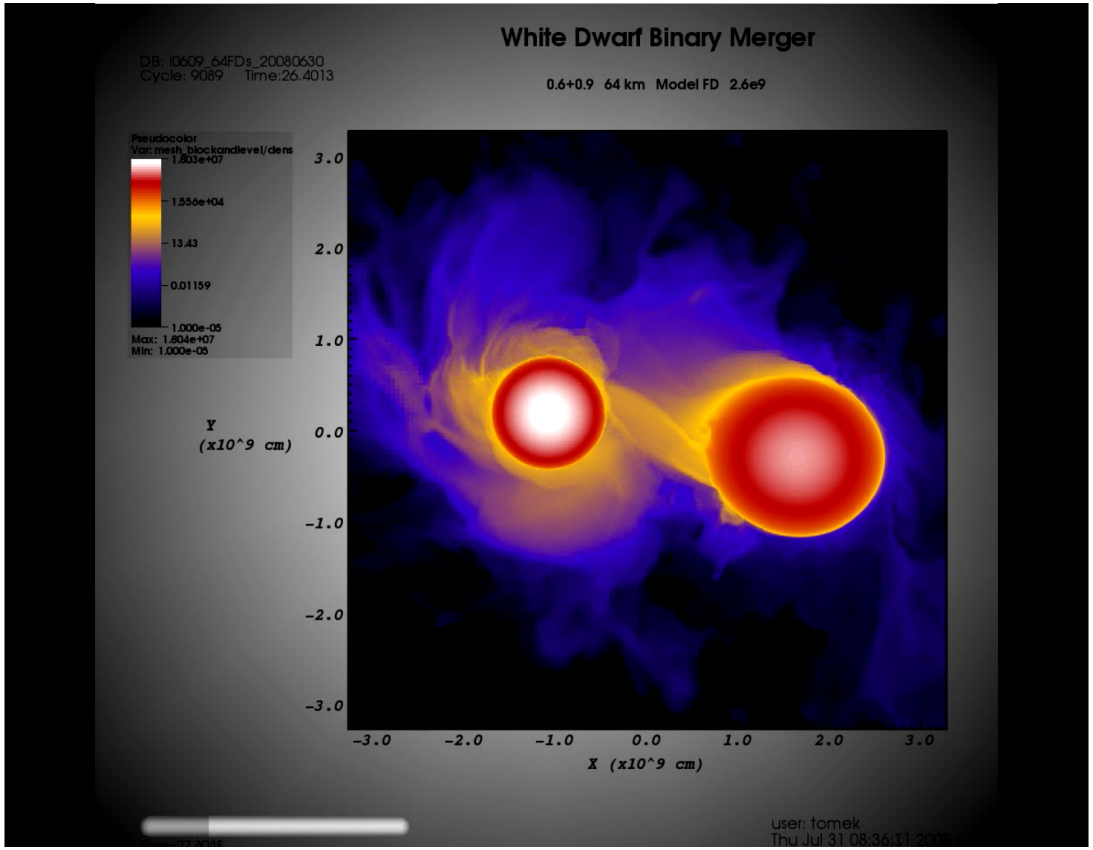
$$\rho \left(\frac{\partial \mathbf{v}}{\partial t} + (\mathbf{v} \cdot \nabla)\mathbf{v} \right) = -\nabla p + \frac{1}{\mu}(\nabla \times \mathbf{B}) \times \mathbf{B} + \rho \mathbf{g}$$

$$\frac{\partial \mathbf{B}}{\partial t} = \nabla \times (\mathbf{v} \times \mathbf{B}) + \eta \nabla^2 \mathbf{B}$$

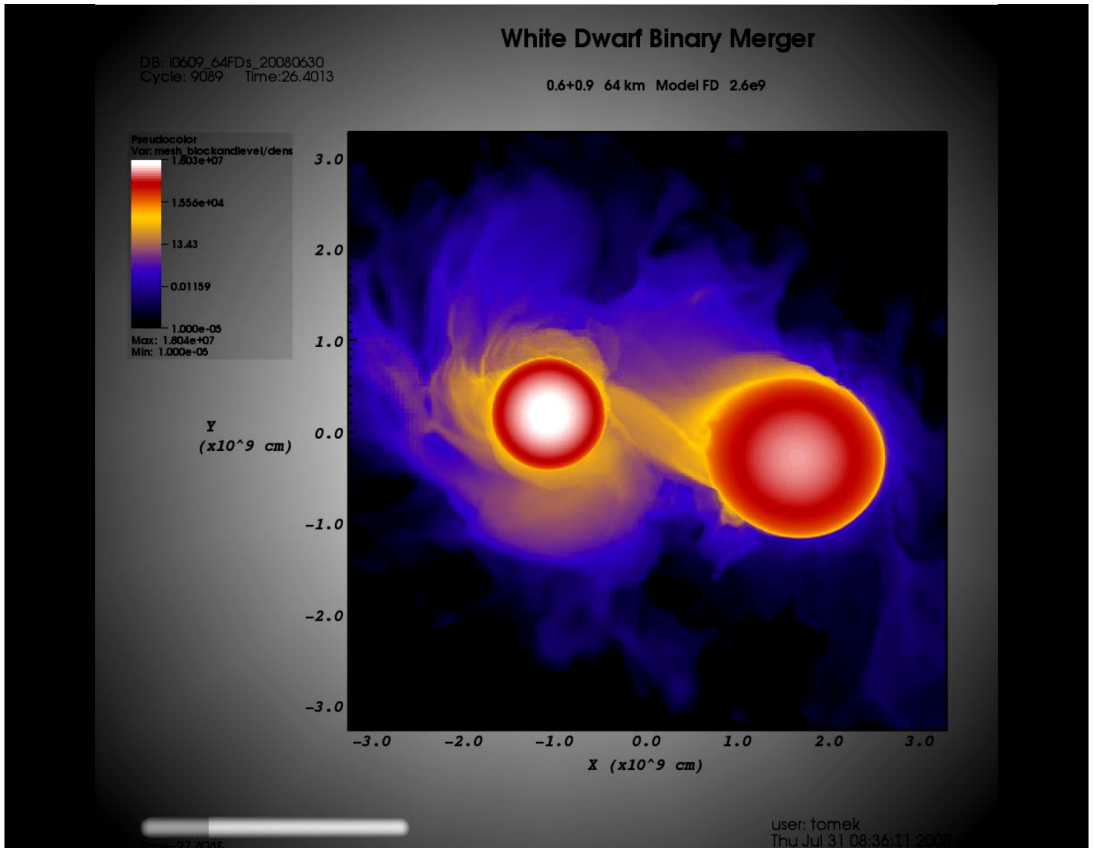
$$\nabla \cdot \mathbf{B} = 0$$

Aurora

Life of the Stars



Life of the Stars



Tacoma Narrows Bridge, 1940

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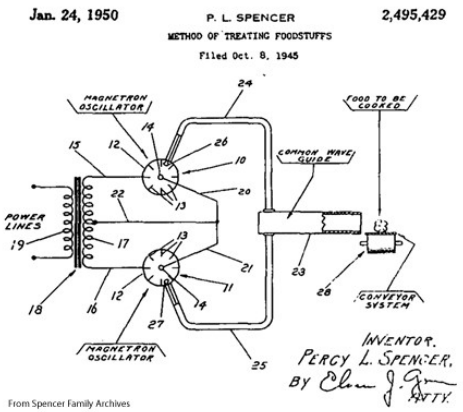
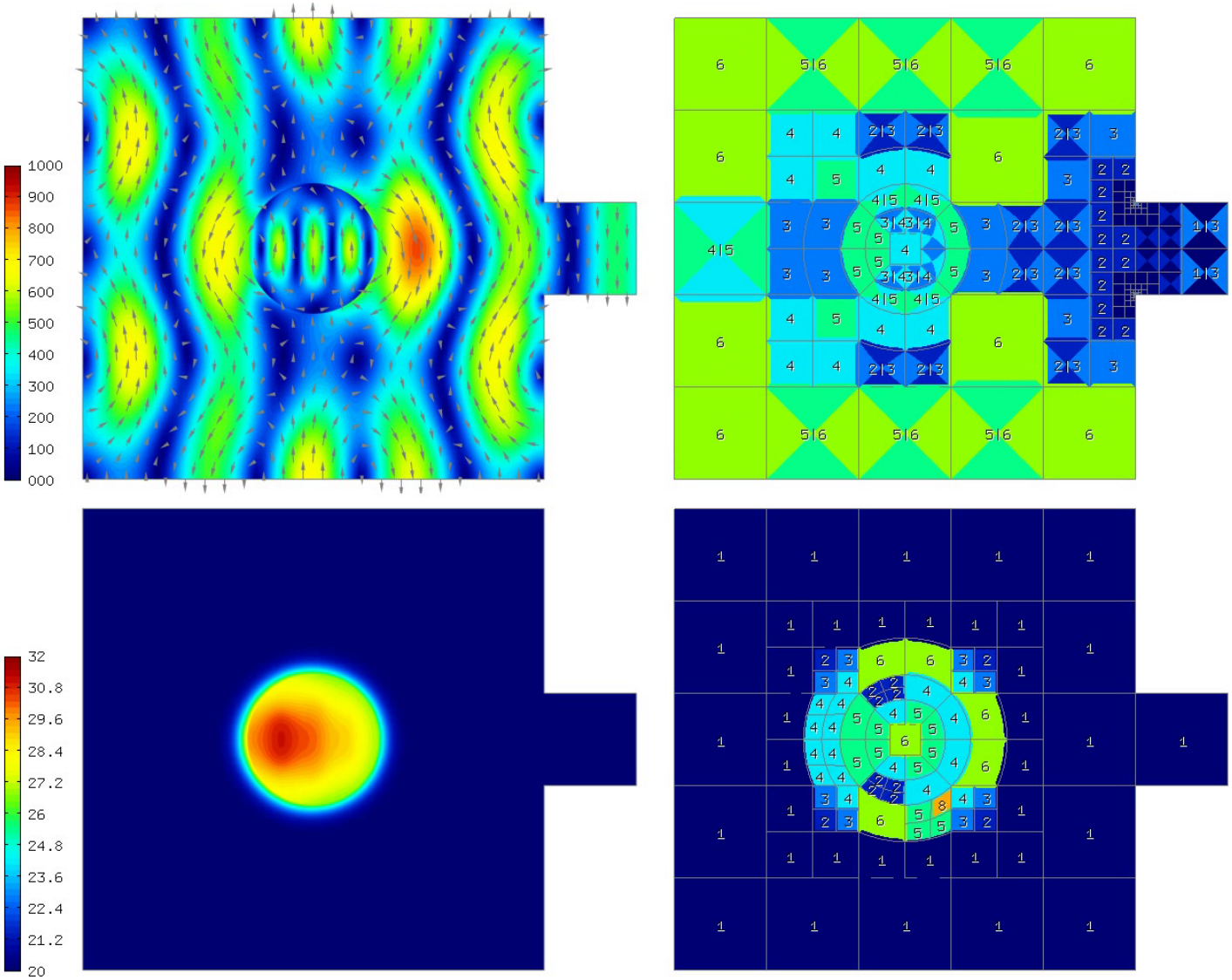
Quiz

Dr. Spencer's Microwave Oven



- 1946 – microwaves discovered as by-product of military research.
- 1946 – first popcorn microwaved.
- 1947 – 5 1/2 feet tall, 750 pounds, $3,000. Water cooled.
- 1967 – first countertop unit, $500, smaller and safer than previous models.
- 1975 – sales of microwave ovens exceed that of gas ranges.
- 1999 – Dr. Spencer inducted into the National Inventors Hall of Fame.

Dr. Spencer's Microwave Oven



Scientific computing in medicine

Figure: Magnetic resonance imaging (MRI) – Maxwell's equations.

Scientific computing in material sciences

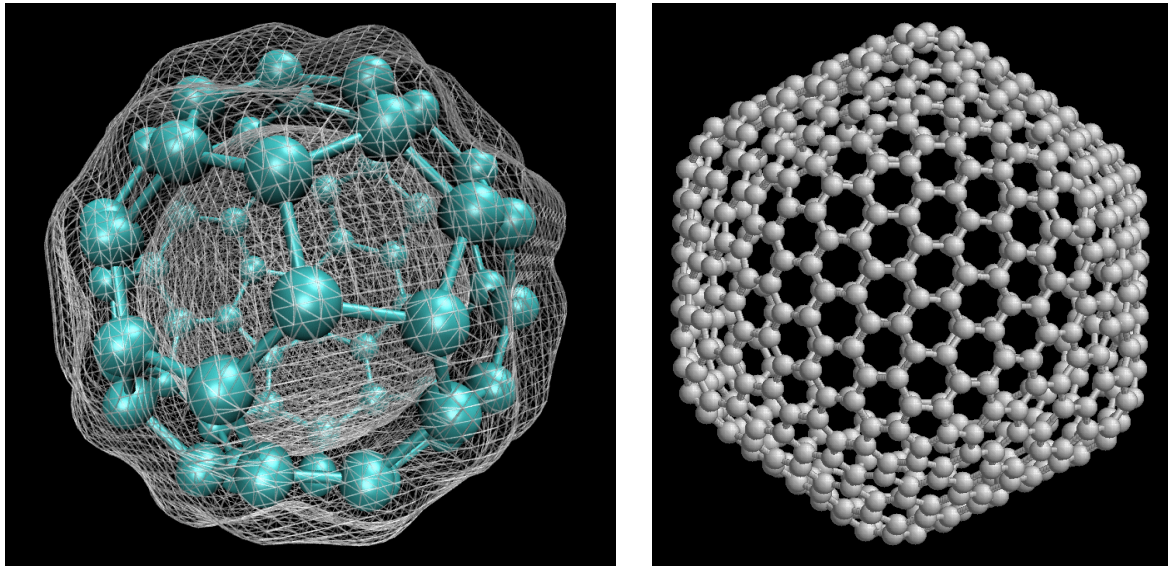


Figure: Fullerene molecules C_{60} and C_{540} – Schrödinger equation.

Scientific computing in geophysics

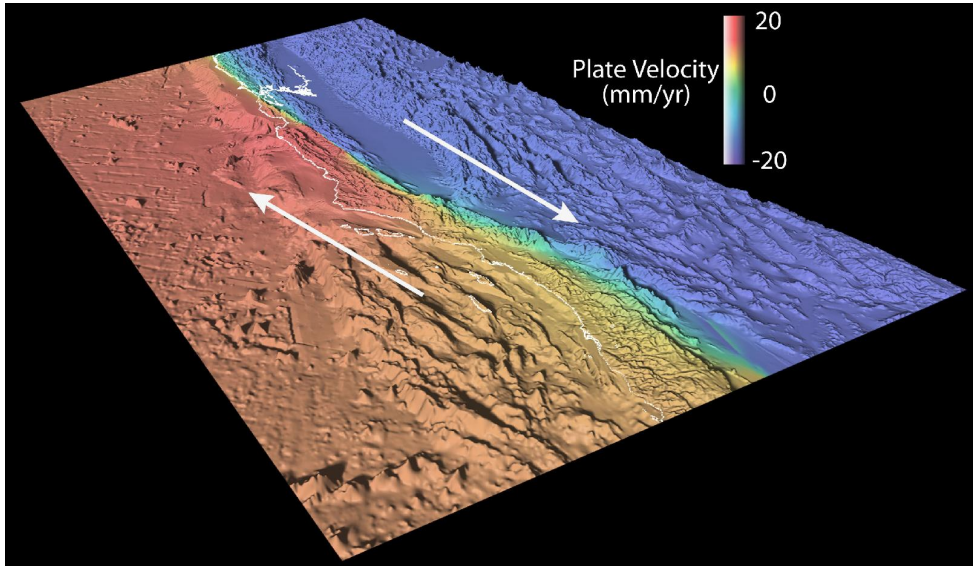


Figure: Contact problems in geodynamics – viscoplastic flow.

Scientific computing in atmospheric sciences

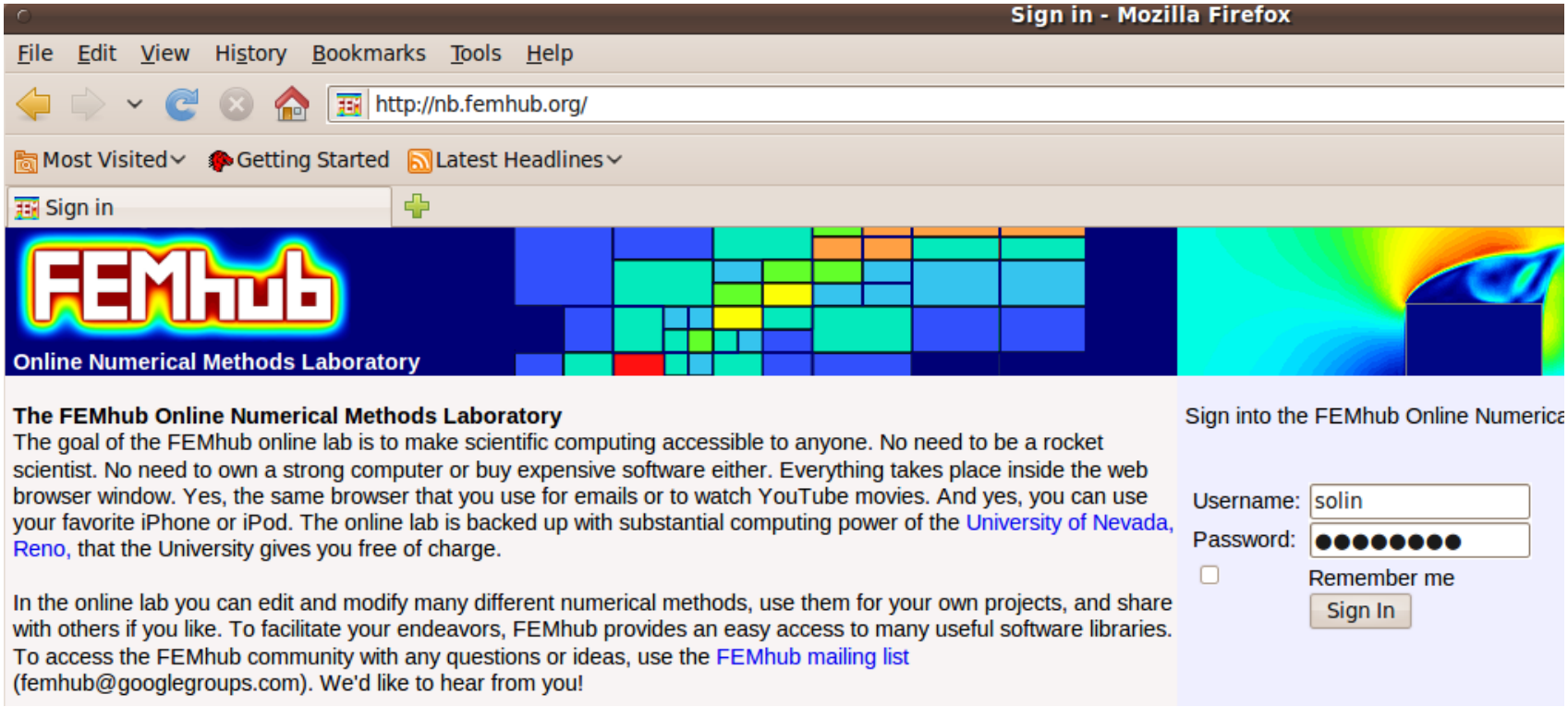
Figure: Tornado (Navier-Stokes equations).

Scientific computing in finance

Figure: Black-Scholes equation (Nobel Prize 1997).

Example Simulation

Neutron Flux Inside a Nuclear Reactor

Interested?

It's easy to try!