SNe Ia Simulations with CASTRO

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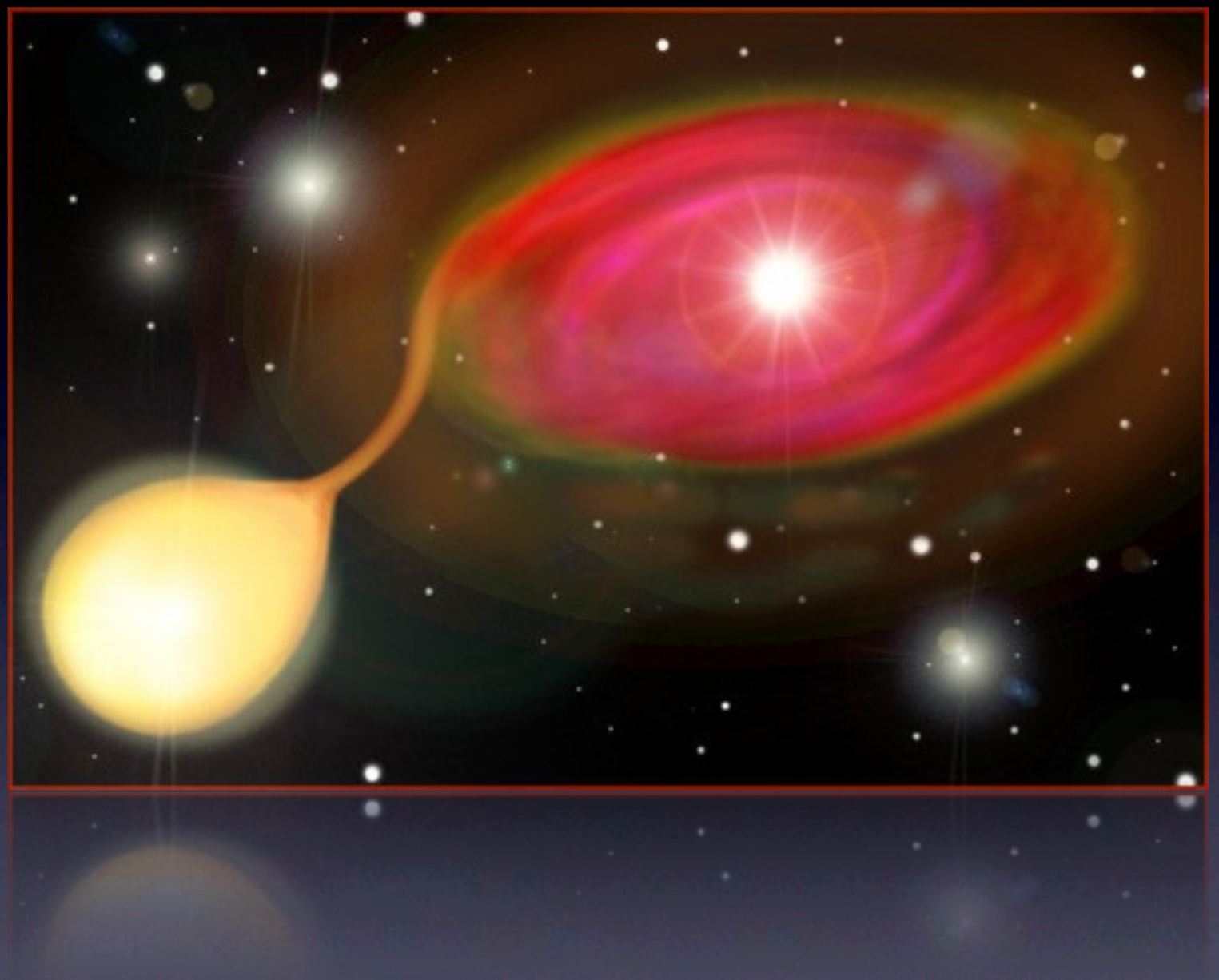
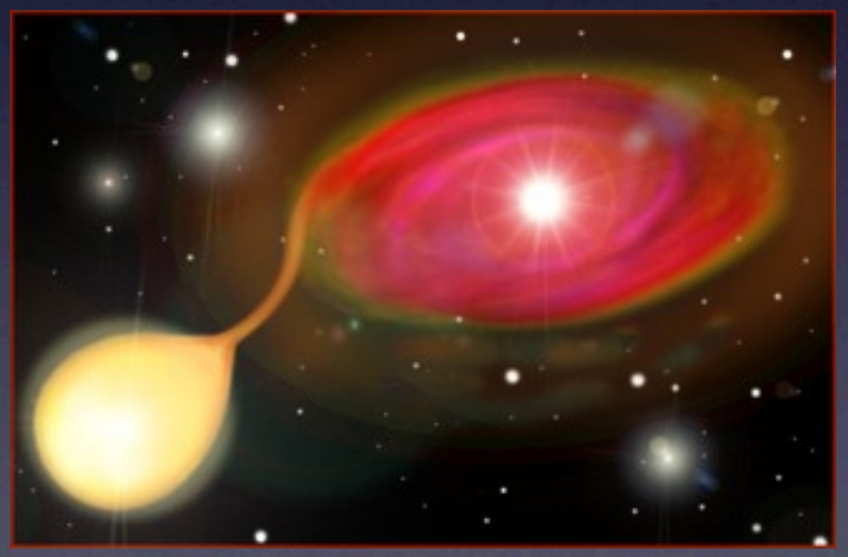


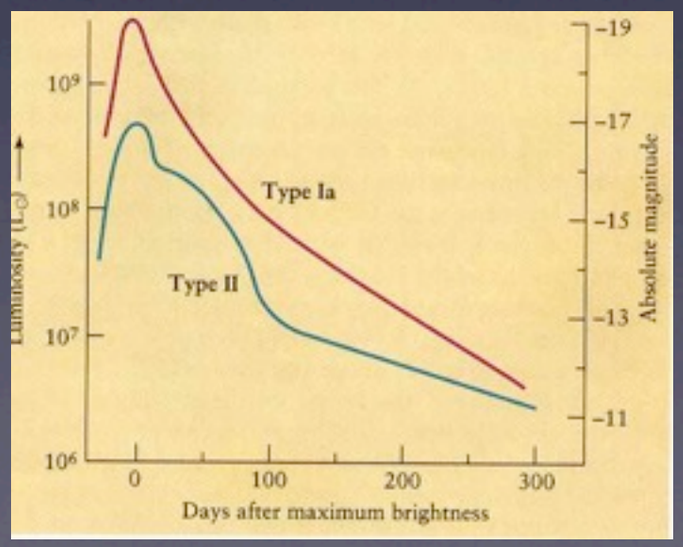
Type Ia Supernovae

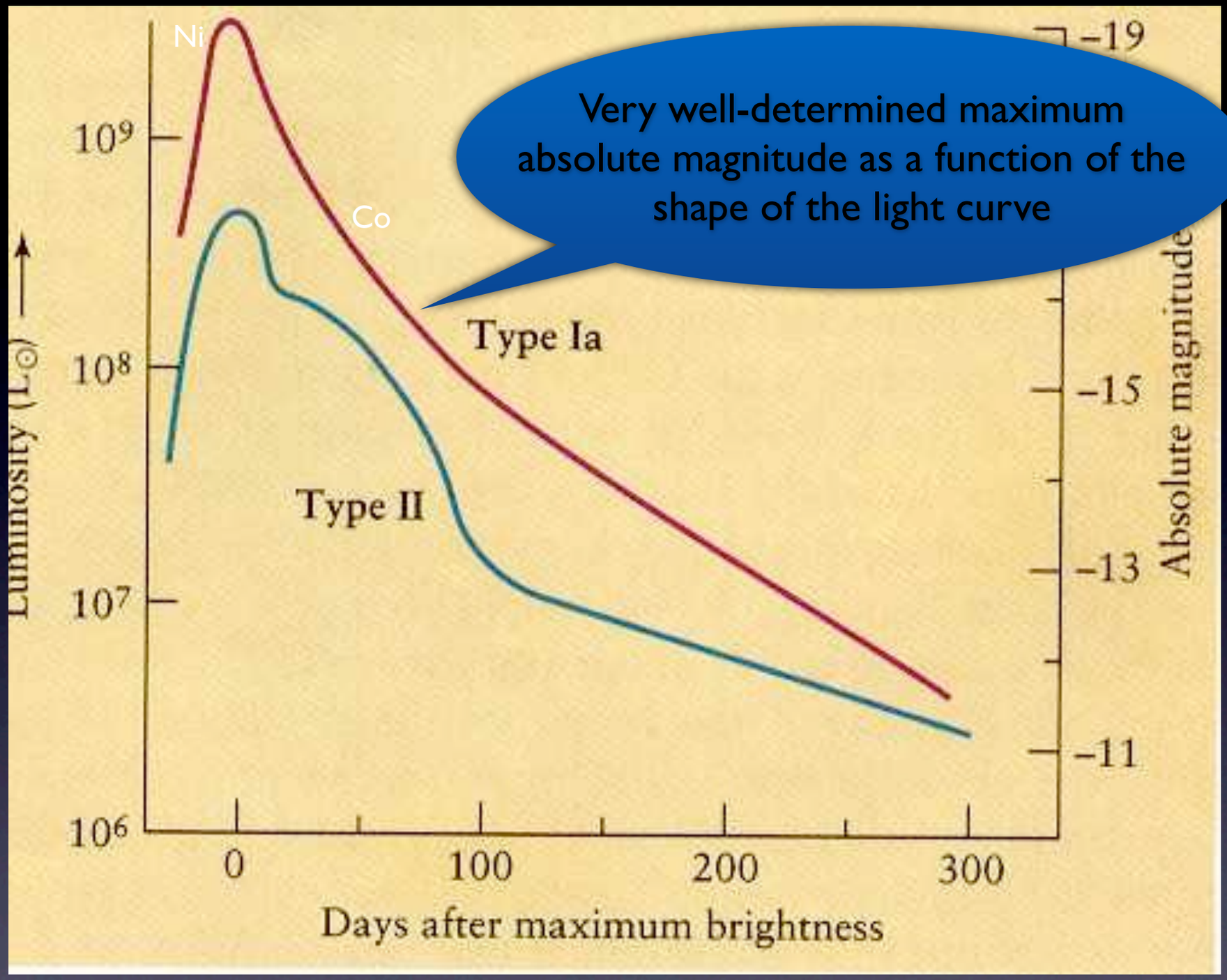
Type Ia Supernovae

- Violent explosions of white dwarfs
  - Carbon-oxygen WD accretes from a companion
  - Chandrasekhar limit of 1.38 $M_\star$
  - Total energy of $1 - 2 \times 10^{44}$ joules



- Standard candles





Light Curves of SNe

SNe Ia Simulations

Modeling of very diverse scales and physics

- Ignition
- Flame propagation
- Transition to detonation
- Full star models
- Light curve and spectra


NO
TURN
CASTRO

CAC

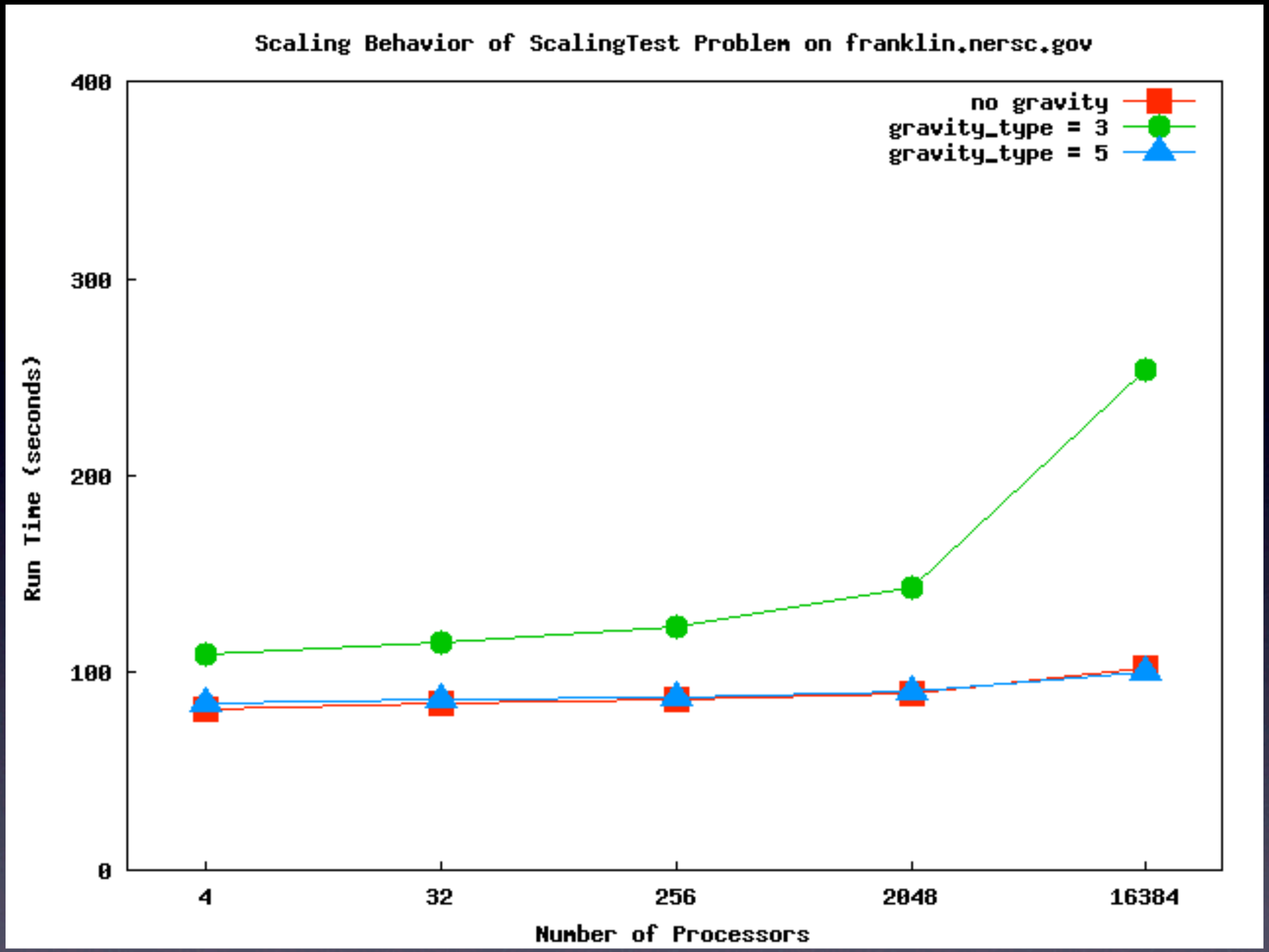
Computational Astrophysics Consortium

- DOE-SciDAC-2
- LBNL (PI: John Bell)
- UCSC (PI: Stan Woosley)
- UCB
- Stanford
- LLNL
- LANL
- SUNYSB

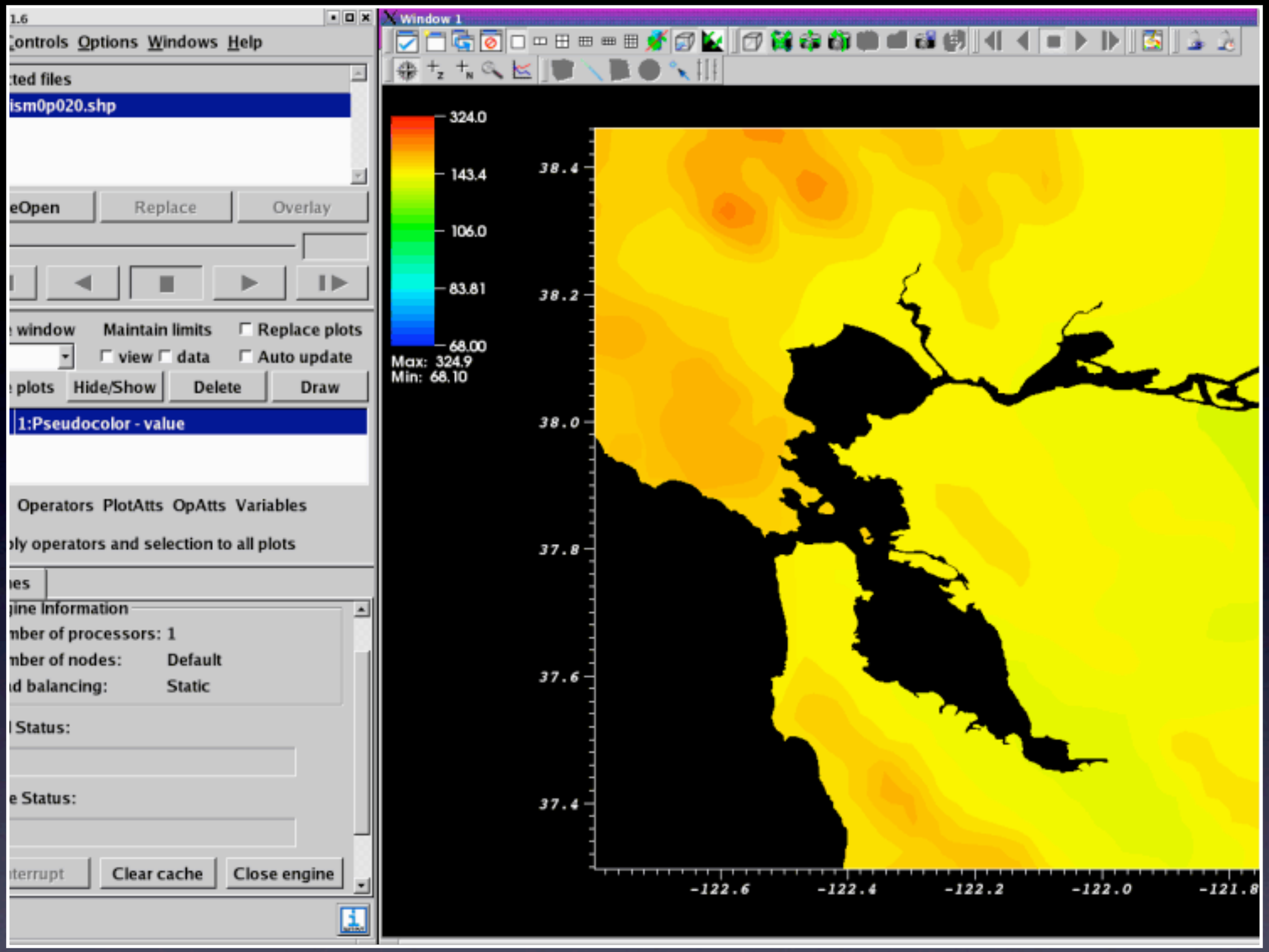
CASTRO

- Compressible hydrodynamics
- Self-gravity
- Multi-group flux-limited diffusion radiation
- Reaction network
- Level set method for front tracking
- Subgrid model for turbulence

CASTRO	FLASH
Unsplit hydro schemes	Operator split scheme
Refinement in space and time	Purely spatial refinement
Array of grid patches of variable size	Octree of fixed-size patches
Multi-group radiation diffusion	None



Scaling of CASTRO



Visualization

Visualization tools

- Amrvis
- VisIt
- Amira
- OpenDX
- ParaView
- OpenDX
- IDL