The Phantom SPH code

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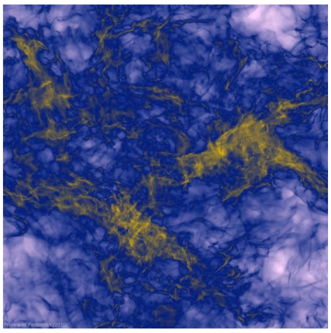
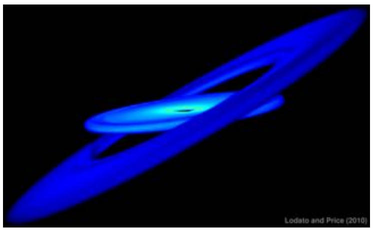
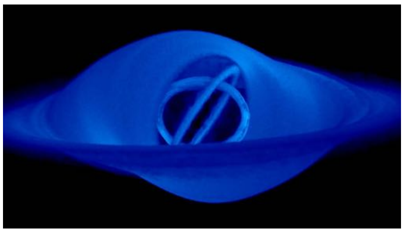


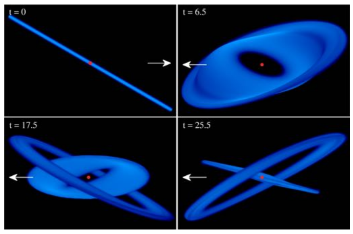
Mach 10 isothermal turbulence at 512^3 particles
Price & Federrath (2010)



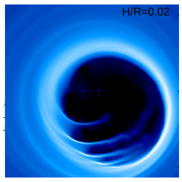
Propagation of warps in thin accretion discs
Lodato & Price (2010)



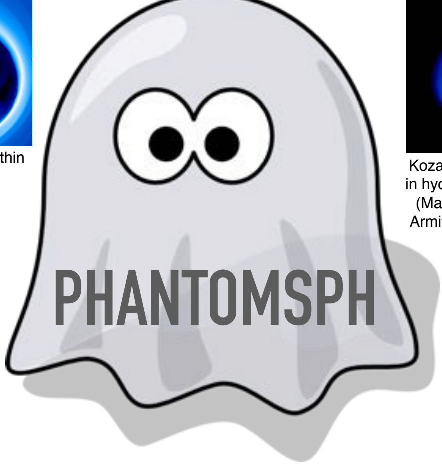
Misaligned accretion discs around spinning black holes
(Nixon, King & Price 2012; Nealon, Price & Nixon 2016)

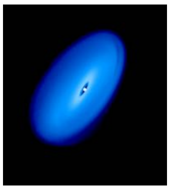


Tearing up a misaligned accretion disc with a binary companion (Doğan, Nixon, King & Price 2015)

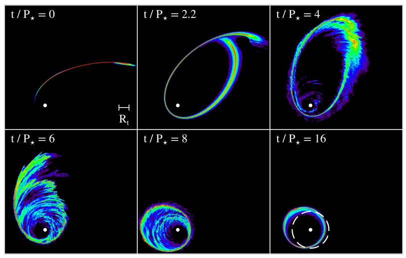


Eccentric cavities in thin circumbinary discs (Ragusa, Lodato & Price 2016)

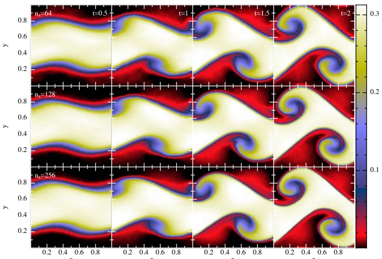




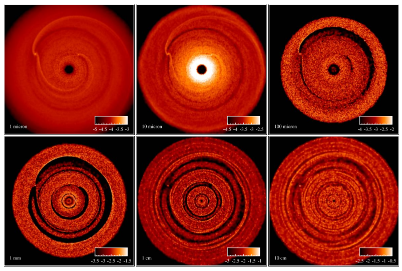
Kozai-Lidov oscillations in hydrodynamical discs (Martin, Nixon, Lubow, Armitage, Price, Doğan & King 2014)



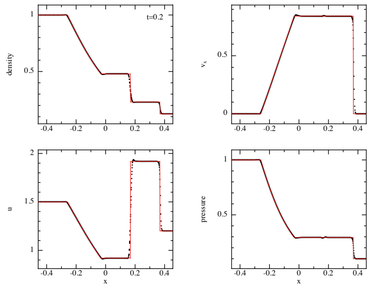
Disc formation from tidal disruptions of stars on eccentric orbits by Schwarzschild black holes (Bonnerot, Rossi, Lodato & Price 2016)



Well-posed Kelvin-Helmholtz instability test from Robertson et al. (2010), performed in 3D

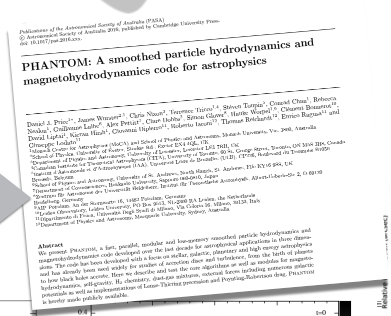


Gap carving by multiple planets in dusty discs, showing dust surface density in grains of different sizes
Dipierro, Price, Laibe, Hirsh, Cerioli & Lodato (2015)



Sod shock tube, performed in 3D with 256 x 12 x 12 particles initially in -0.5 < x < 0 and 128 x 12 x 12 initially in 0 < x < 0.5. Exact solution = red line.

Phantom will be free and open source once this paper is published



PHANTOM: A smoothed particle hydrodynamics and magnetohydrodynamics code for astrophysics

Collaborate now!
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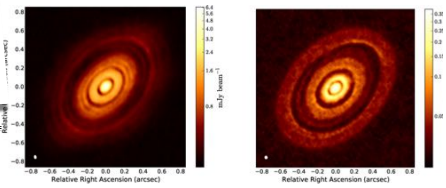
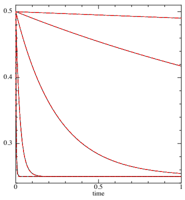
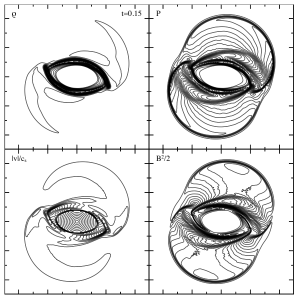


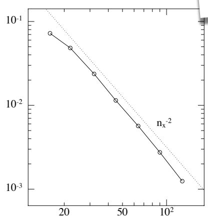
Dipierro et al. (2015), comparison of Phantom simulations (right) with observations of HL Tau (left)



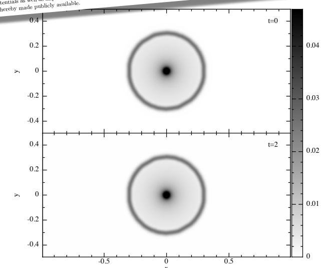
Dustybox test
from Laibe & Price (2011)



Magnetic rotor test (Balsara & Spicer 1995), performed in 3D using 256 x 293 x 12 particles

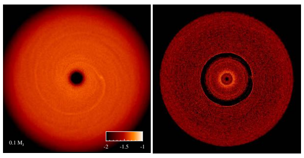


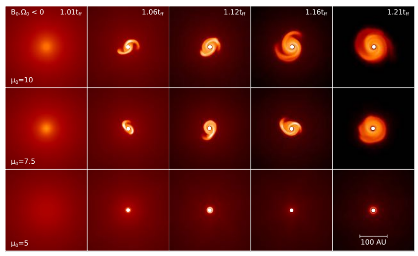
Convergence in 3D circularly polarised Alfvén wave test. Phantom shows 2nd order convergence **even with all shock dissipation applied**.

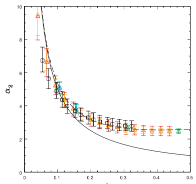


Advection of a current loop (Gardiner & Stone 2005). Performed with all shock dissipation terms switched on.

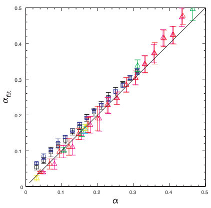
Gap opening by low mass planets in dust but not gas (Dipierro, Laibe, Price & Lodato 2016)



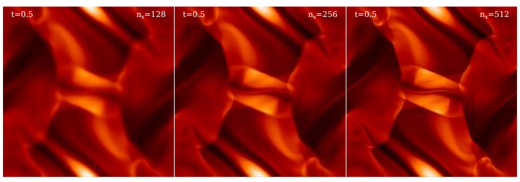




Measured diffusion rate of warps in thin accretion discs, compared to the non-linear analytic theory of Ogilvie (1999; dashed line). From Lodato & Price (2010)

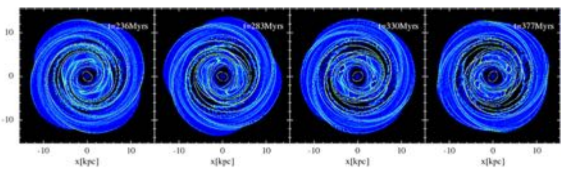


Calibration of alpha viscosity: Measurement of disc diffusion rate (alpha_fit) as a function of analytic expectation. From Lodato & Price (2010)

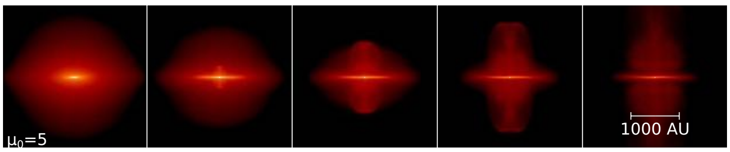


MHD Orszag-Tang vortex test, performed in 3D

Effect of ambipolar diffusion, resistivity and the Hall effect on protostellar disc formation (Wurster, Price & Bate 2016)



Barred-spiral Milky Way simulation with ISM chemistry (Pettitt, Dobbs, Acreman & Price, 2014)



Jets from the first core (Wurster, Price & Bate 2016)

Hydrodynamics — Accretion discs — Sink particles — Self-gravity
Magnetohydrodynamics (MHD) — Two fluid dust-gas — One fluid dust-gas
Non-ideal MHD — H_2 and CO interstellar medium chemistry — Wind injection