

## Meudon/Paris Group

- *LUTH* : Laboratoire de l'Univers et de ses THéories  
Observatoire de Paris  
F-92195 Meudon Cedex, France  
<http://www.luth.obspm.fr/>
- *GReCO* : Gravitation Relativiste et COsmologie  
Institut d'Astrophysique de Paris  
98bis boulevard Arago  
F-75014 Paris, France  
<http://www.iap.fr/>
- *IHES* : Institut des Hautes Études Scientifiques  
35, route de Chartres  
F-91440 Bures-sur-Yvette, France  
<http://www.ihes.fr/>

## Permanent staff:

- Luc Blanchet (Directeur de Recherche CNRS, GReCO)
- Silvano Bonazzola (Directeur de Recherche CNRS, LUTH)
- Brandon Carter (Directeur de Recherche CNRS, LUTH)
- Thibault Damour (Professeur IHES)
- Gilles Esposito-Farèse (Chargé de Recherche CNRS, GReCO)
- Ericourgoulhon (Chargé de Recherche CNRS, LUTH)
- Jérôme Novak (Chargé de Recherche CNRS, LUTH)

## Post-docs:

- Dorota Gondek-Rosińska (EU-Network post-doc, LUTH)
- Christian Klein (Marie Curie post-doc, LUTH)

## Graduate students:

- Nicolas Chamel (LUTH)
- Olivier Poujade (GReCO)
- Loïc Villain (LUTH)

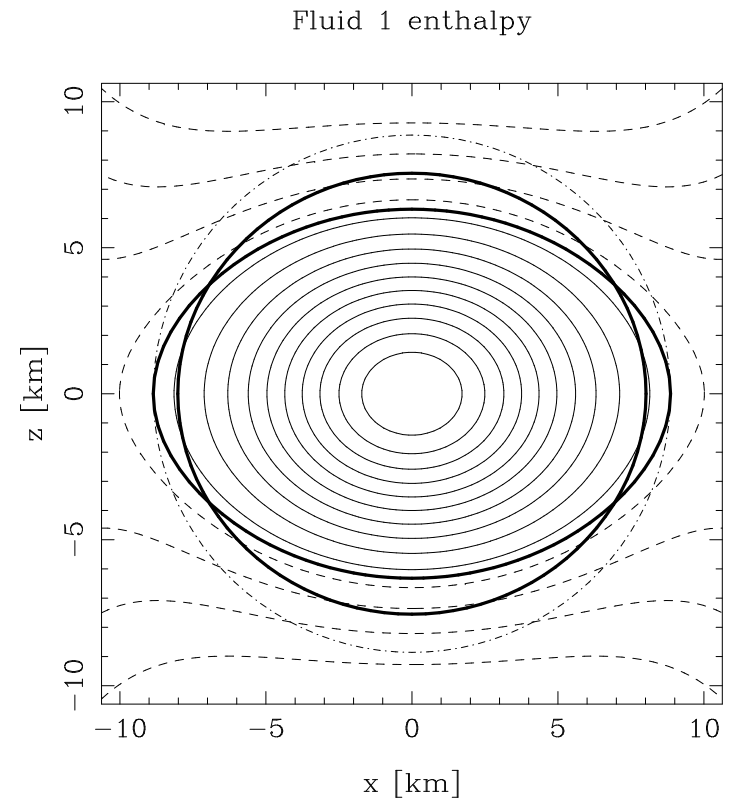
# Superfluidity inside neutron stars

*B. Carter, N. Chamel & J. Novak*

Collaborations: Erevan, Southampton (SO-TON)

## *Recent results:*

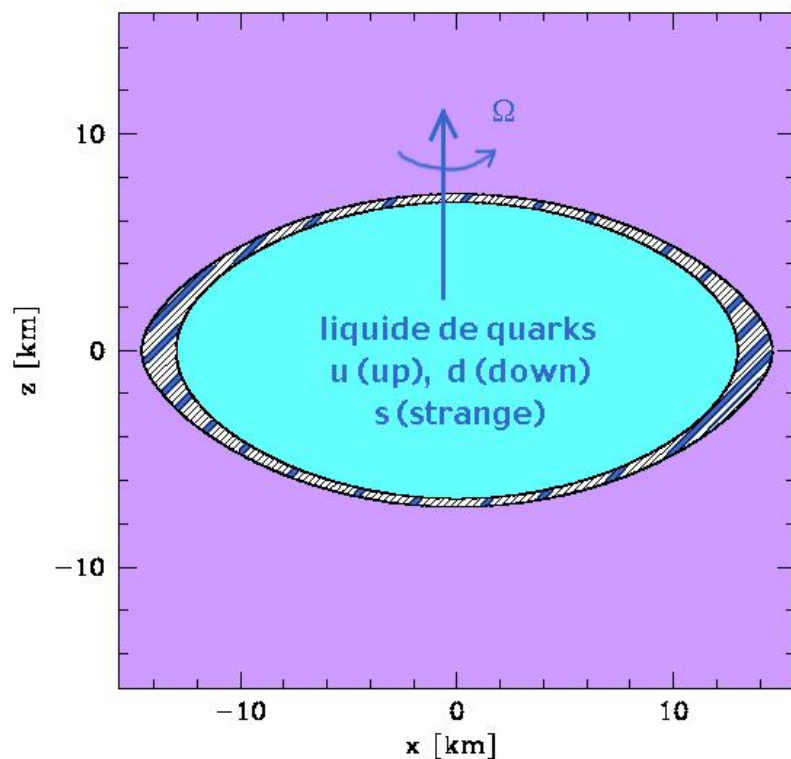
- Treatment of magnetic vortices in a rotating superconductor
- Global numerical models of superfluid neutron stars in general relativity
- Pinning between the solid crust and the vortices
- New mechanism (centrifugal buoyancy) to explain the glitches observed in pulsars



## Rapidly rotating strange stars

*D. Gondek-Rosińska & E. Gourgoulhon*

Collaborations: Warsaw, Thessaloniki (AUTH)



### *Recent results:*

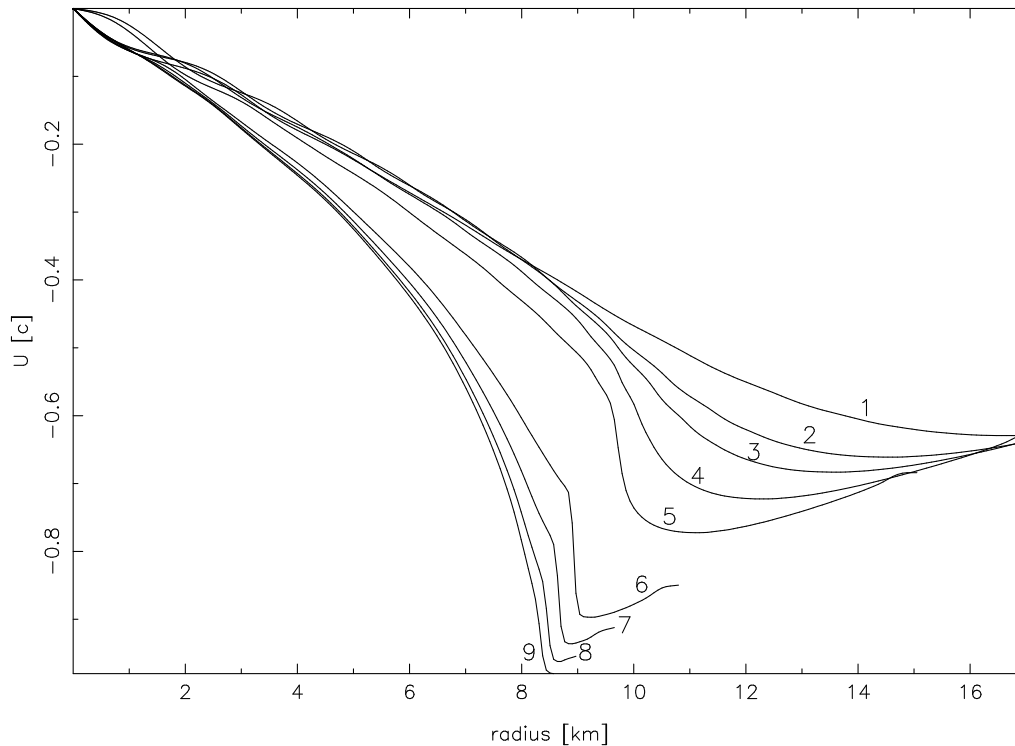
- Constraints on strange quark matter lead by QPO observations in X-ray binaries
- Viscosity-driven bar-mode instability in rapidly rotating strange stars and prospect for gravitational wave detection

# Gravitational collapse

*J. Novak*

Collaborations: Valencia (UVEG)

Radial velocity seen by eulerian observer



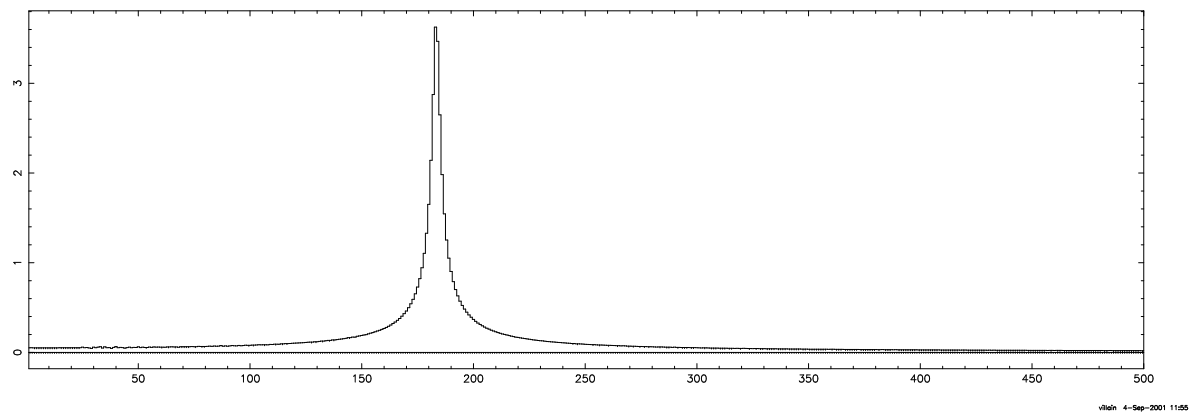
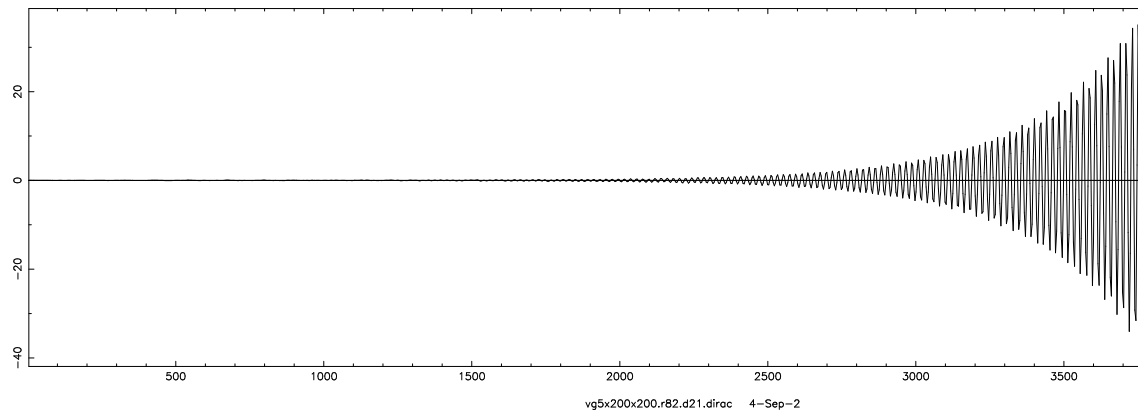
## *Recent results:*

- Computation of the monopolar gravitational waves emitted by a supernova in the framework of tensor-scalar theory of gravitation
- Minimal mass of a black hole formed in the gravitational collapse of a neutron star

# Instabilities in rotating neutron stars

*S. Bonazzola & L. Villain*

Computation of the inertial modes in the non-linear regime

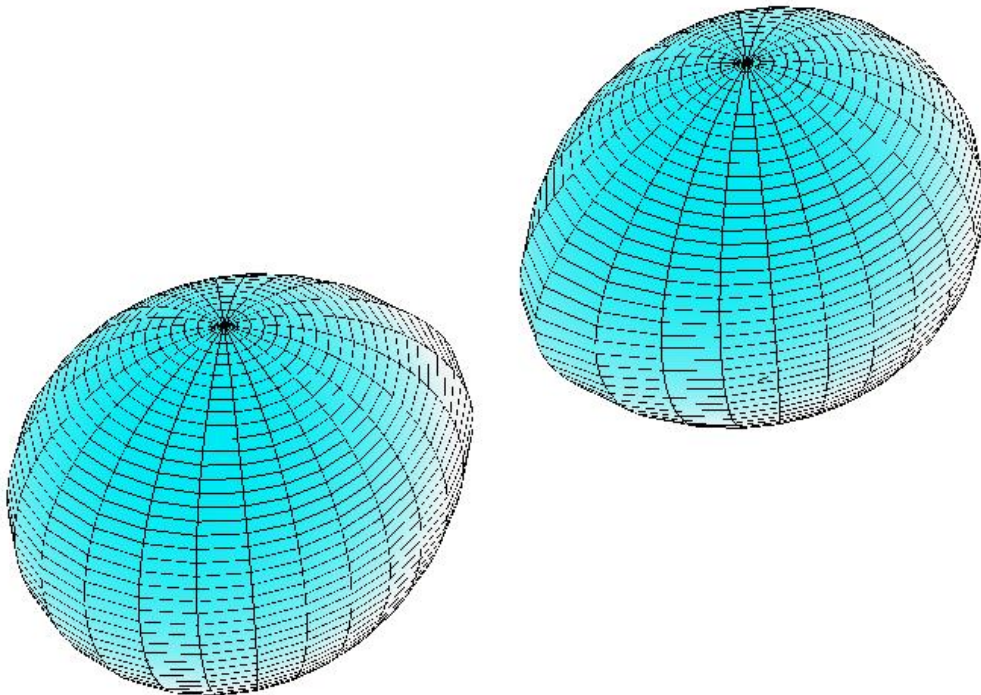


## Binary neutron stars

*S. Bonazzola, E. Gourgoulhon & P. Grandclément*

Collaborations: Golm (AEI)

Quasi-equilibrium configuration of binary stars in general relativity (5/10 Einstein equations)



Multi-domain spectral  
methods (C++/LORENE)

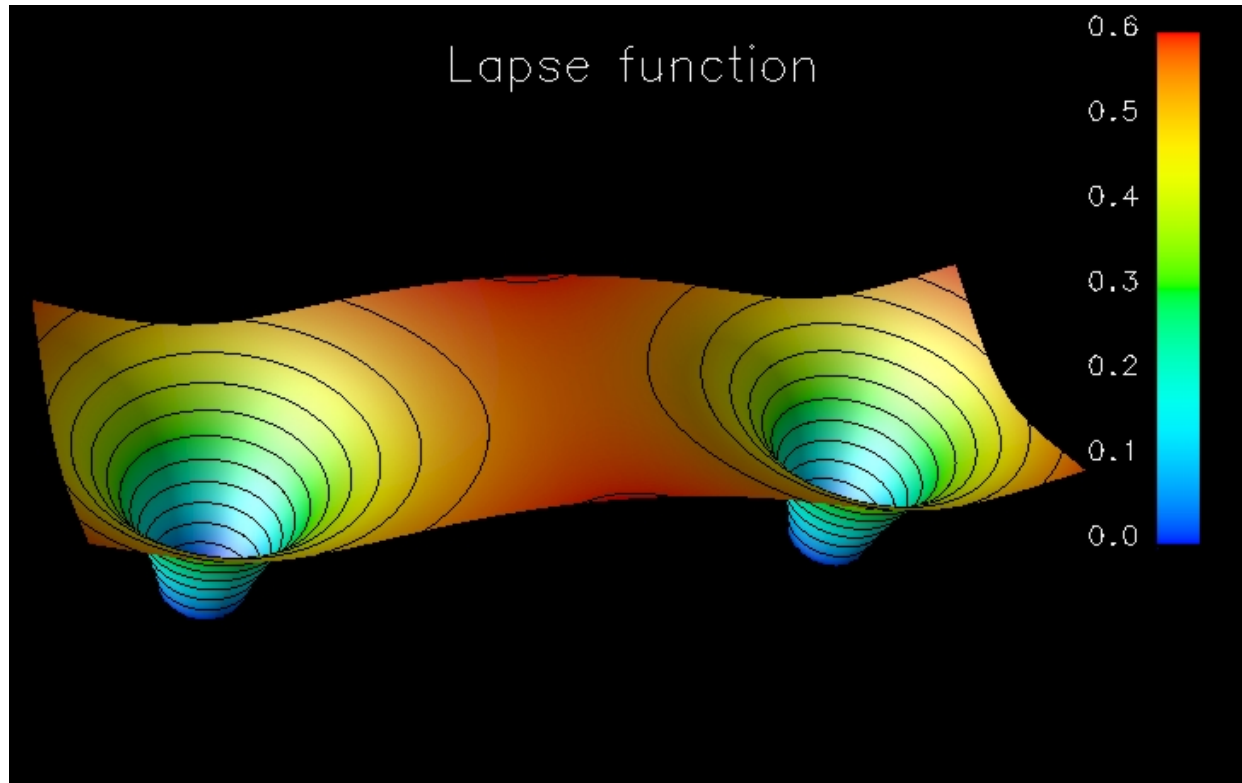
Irrotational binary neutron  
stars

⇒ initial data for Cactus

## Binary black holes

*S. Bonazzola, E. Gourgoulhon & P. Grandclément*

First realistic computations of quasiequilibrium configurations of a black hole binary system



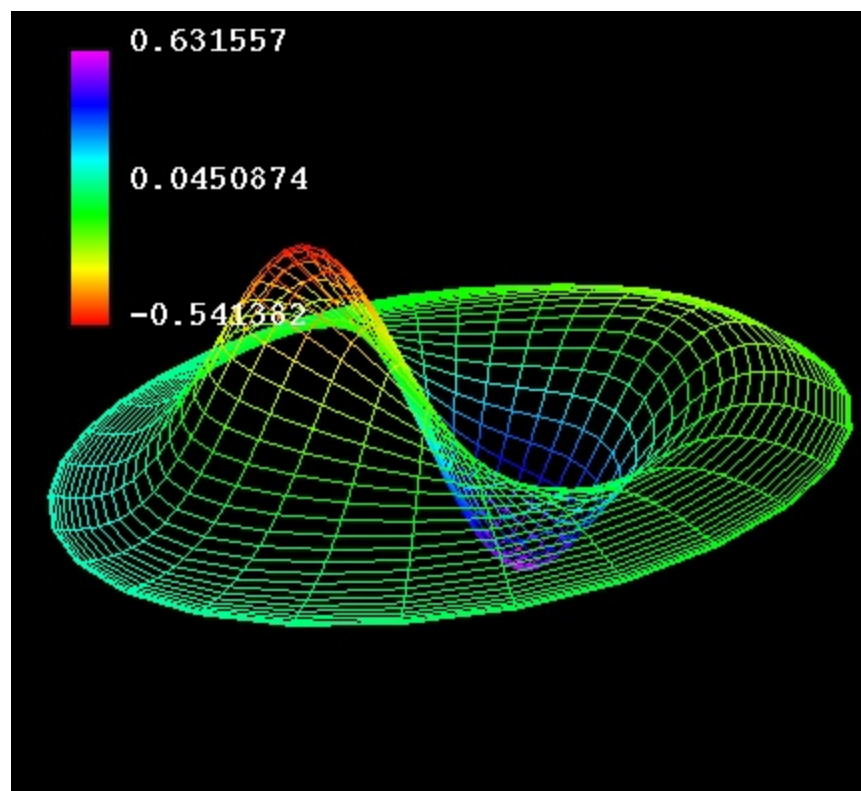
⇒ Initial data for Cactus



# Spectral method for the wave equation

*J. Novak*

New numerical method with accurate outgoing boundary conditions



## Post-Newtonian studies

*L. Blanchet, T. Damour, G. Esposito-Farèse & O. Poujade*

Collaborations: Jena (FSU)

*Recent results:*

- Equations of motion of two particles at the 3PN order
- Gravitational wave flux at the 3.5PN order
- Phase evolution of inspiraling binary system at 3.5PN order
- Resolution of the divergence problems in the iterative PN expansion
- Inclusion of spin effects in the effective one body approach to binary systems