

Superfluid Neutron Stars and Gravitational Waves



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ANNUAL MEETING 2024

Polish Academy of Sciences

NICOLAUS COPERNICUS ASTRONOMICAL CENTER



What is ASN 02/C1?


- Italian Scientific Habilitation (02/C1 is Astronomy and Astrophysics)
- 2 levels: II level (like dr hab), I level (prof.) [I obtained 02/C1, I level]



ita

eng

Per assistenza contattare il [Supporto](#)



National Scientific Qualification (art.16 of the law 30 December 2010, n.240)
This regulation defines a new procedure for the University Professor position recruiting, based on scientific qualification criteria. A national commission evaluates and assesses the candidates scientific qualification.

NEWS E SCADENZE

- **26 July 2012**
The Italian Ministry of Education, universities and research (MIUR) has opened the procedure for obtaining the national scientific qualification to function as associate or full professor in Italian Universities. Applications must be submitted no later than 5 pm (Italian time)... [continua »](#)

[tutte le news »](#)

- Lasts 10 years...Polish title of Professor is more valuable!

Ankan Sur
Danai Antonopoulou
LIGO/Virgo/KAGRA

Lorenzo Gavassino
Giovanni Camelio
Sam Lander

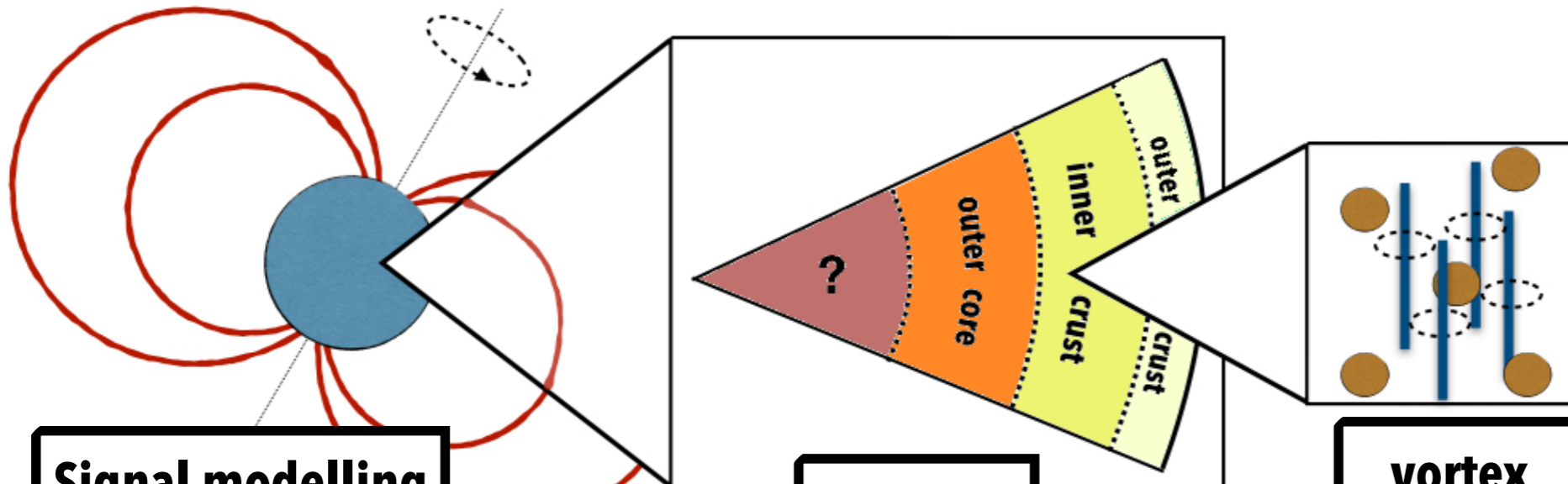
Vadym Khomenko
Marco Antonelli
Monica Sanjinez Ortiz

whole
star

fluid
elements

superfluid vortices
pinning sites

subatomic
particles



**Signal modelling
and searches**

GR Hydro

**vortex
filaments**

10^4 m

10^2 m

10^{-2} m

10^{-15} m

Pulsar glitch observations
(Radio and X-ray)
CW searches...

Dissipation in GR
Magnetic fields in NS,
Accretion and GWs...

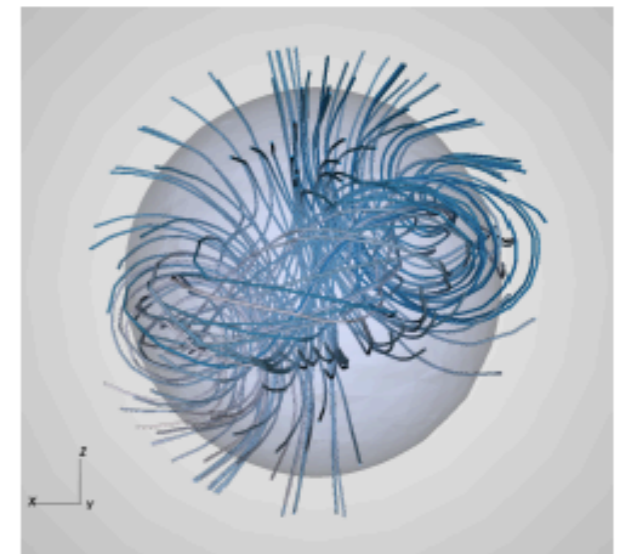
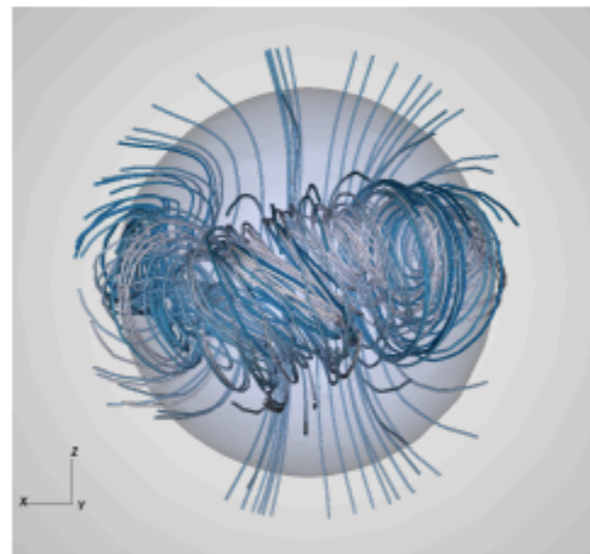
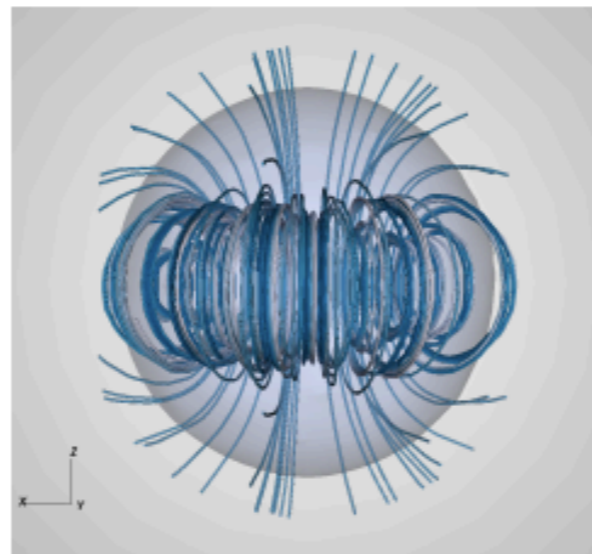
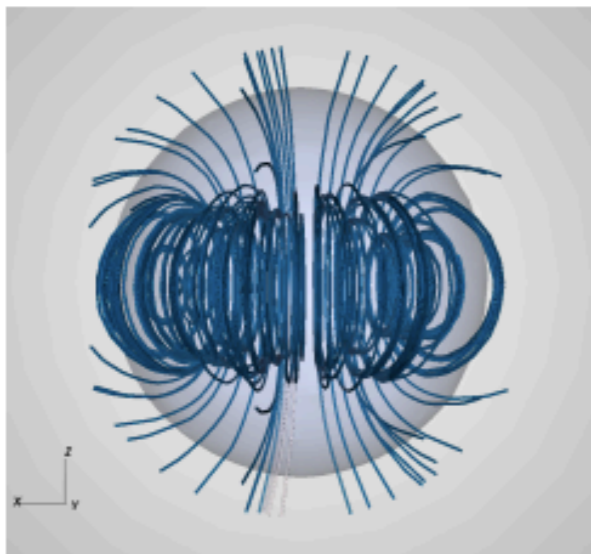
Vortex motion in NSs
Superfluid dissipation in NSs
Superfluid instabilities...

- OPUS-LAP grant (joint NCN-DFG) with Sebastiano Bernuzzi in Jena

<https://merlin-neutronstars.bitbucket.io/>

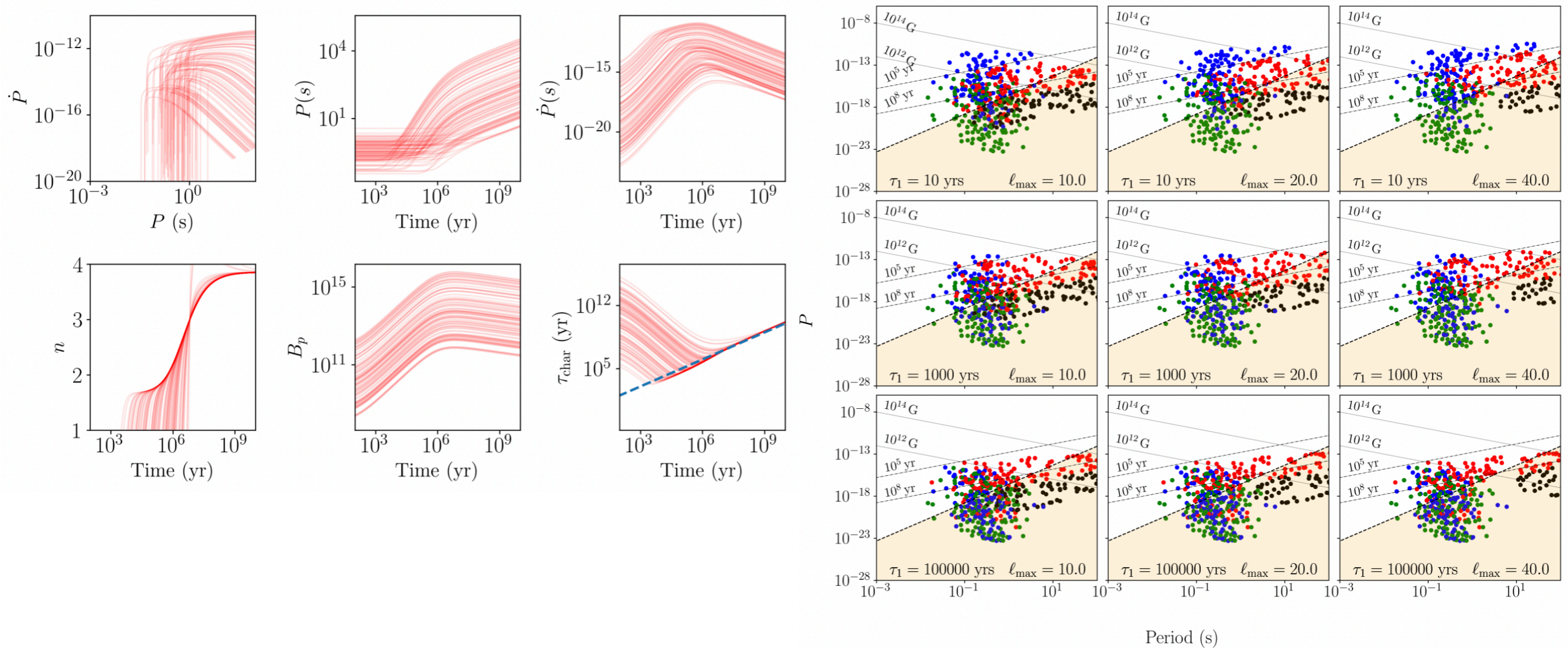
1 PhD student in Jena
1 Postdoc at CAMK

Builds on the PhD work of
Ankan Sur



- MHD turbulence in NSs. What if the field is not fossile?

Sarin, Brandenburg & BH (2023), ApJ Letters 952, L21



- Can only get correct populations if there is a thin resistive layer in the crust



Nuclear Pasta?

Other projects

- LVK work on continuous GWs (OPUS grant obtained as part of Polish Consortium, PI: Bulik)

Review commissioned by Nature Astronomy → Haskell & Bejger 2023, Nat. Ast. 7, 1160

- Numerical work on dissipation in GR (finished work with G. Camelio and L. Gavassino)
- Vortex motion simulations (with M. Antonelli)
- Contacts with superfluid experimentalists (in Newcastle, Leicester and Florence)