The Athena Science Working group SWG3.3 "End points of Stellar Evolution"

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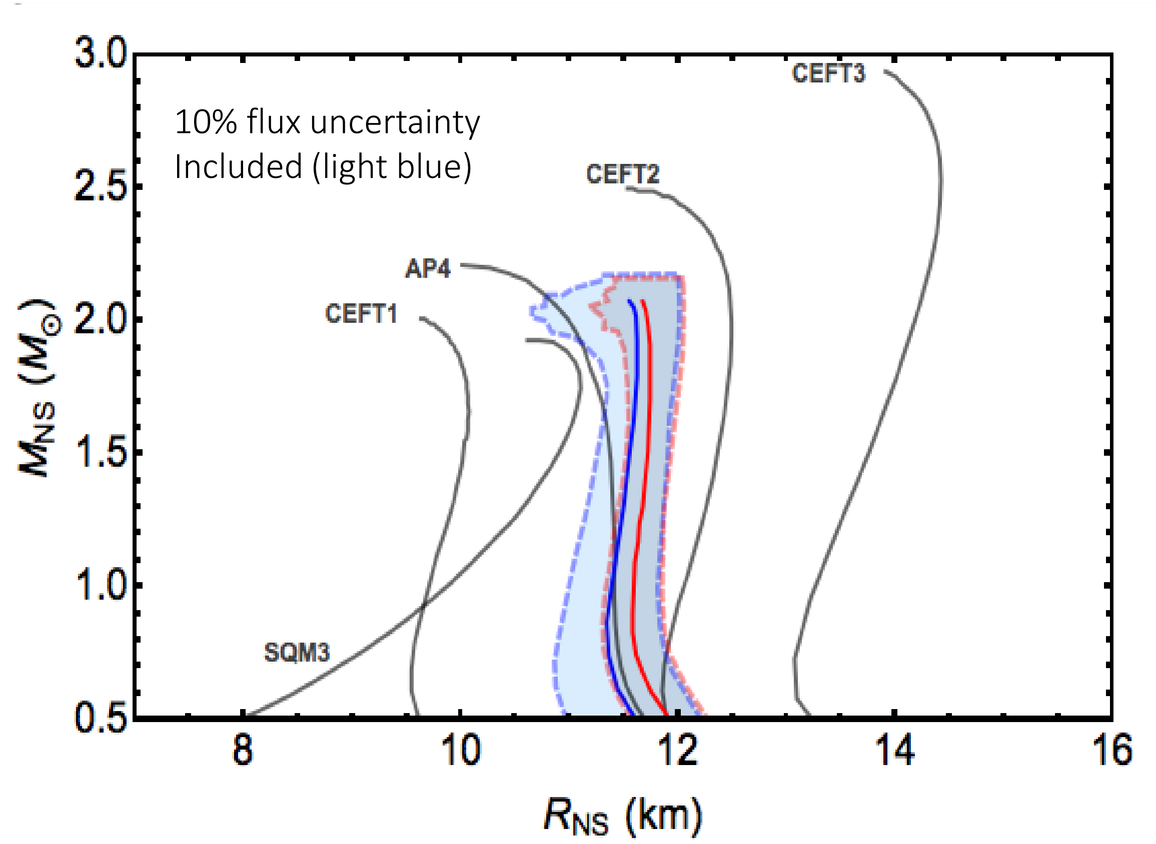
on behalf of the Athena SWG3.3

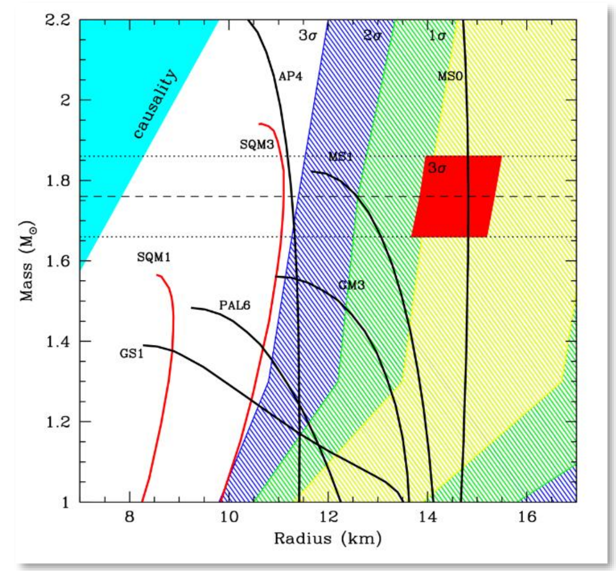
The SWG3.3 & activities (2015-present)

- SWG3.3: large and broad (scientific interests) group: 130 members
- Revised, broaden and improved the Athena observatory science case to include additional classes of sources:
  - Revision of two (already existing) science requirements
    - **R-SCIOBJ-331**: Neutron star equation of state
    - **R-SCIOBJ-332**: Massive star winds & HMXBs
  - Inclusion of 6 additional science requirements:
    - **R-SCIOBJ-333**: Accreting white dwarfs
    - **R-SCIOBJ-334**: Magnetars
    - **R-SCIOBJ-335**: Pulsar Wind Nebulae
    - **R-SCIOBJ-336**: Novae
    - **R-SCIOBJ-337**: Double Degenerates
    - **R-SCIOBJ-338**: Neutron star cooling
- Support call Athena related activities to evaluate impact of instruments/mission baseline evolution on all science requirements (with simulations)
- Production of corresponding technical notes



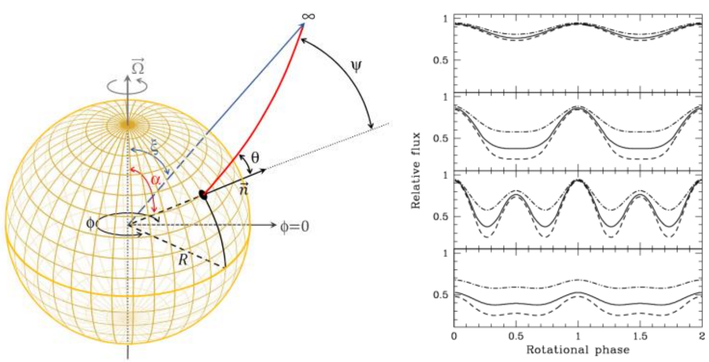
(Courtesy Guillot)

1. X-ray spectra of 7 quiescent low mass X-ray binaries in GCs with a good distance estimate

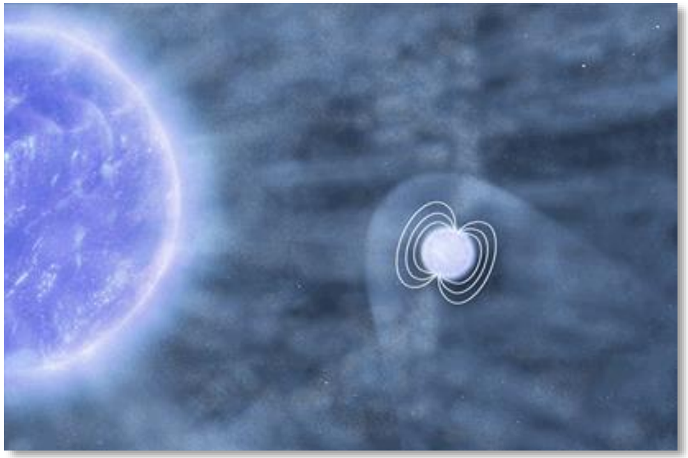


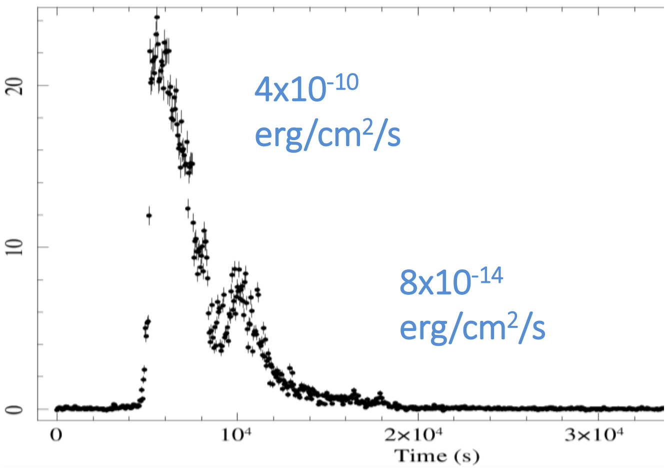
(Courtesy Bogdanov)

2. Energy dependent folded light curves of millisecond pulsars for pulse profile studies (see NiCER)

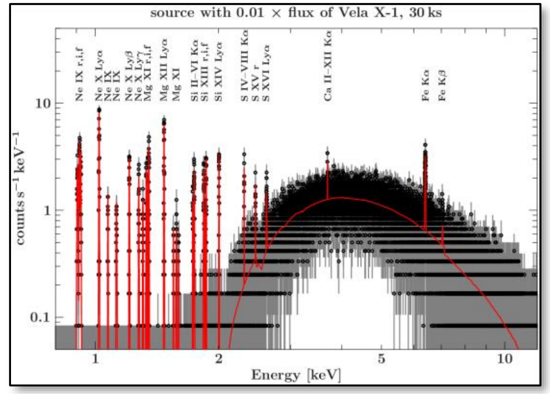


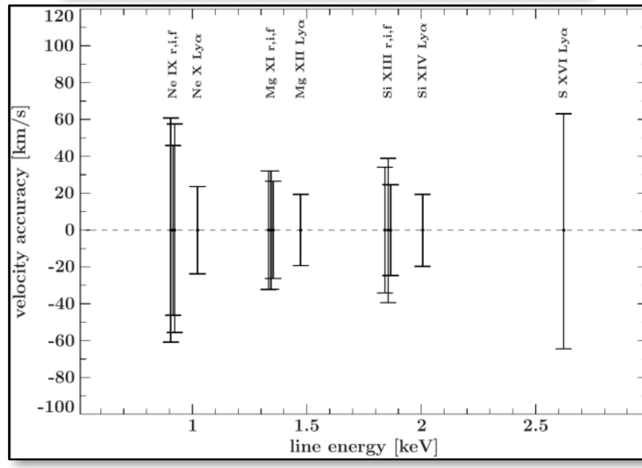
Targets: OmCen, M13, NGC6397, NFC6304, 47Tuc, M80, NGC362





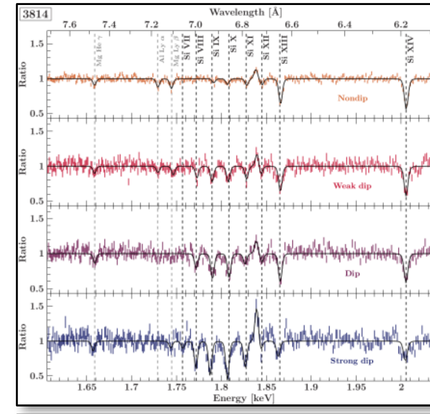
1. Simulations of clump accretion processes

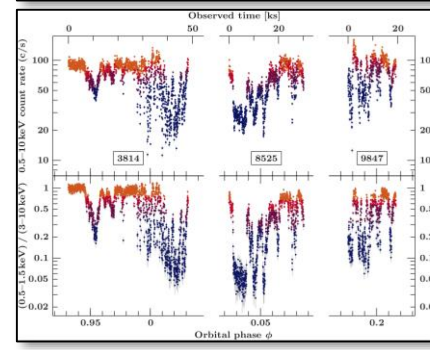




2. Simulations for the wind parameter derivation from emission lines of highly ionized ions

(Courtesy Grinberg)





3. Simulations of clumps through the observer's line of sight

(Courtesy Grinberg)

Targets: IGRJ17544-2619, 4U1700-377, VelaX-1, IGRJ08408-4503, Cyg X-1, GX301-2, IGRJ16320-4751

See V. Grinberg talk on the 27th!

R-SCIOBJ-333: accreting white dwarfs

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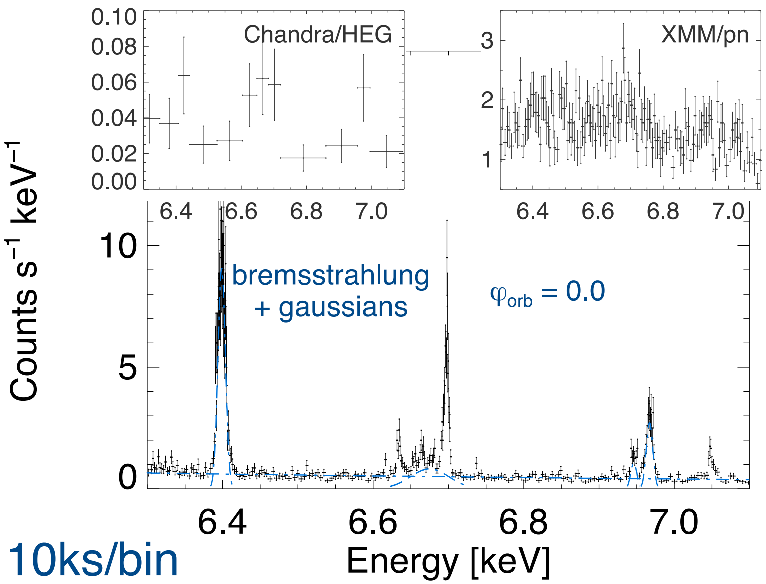
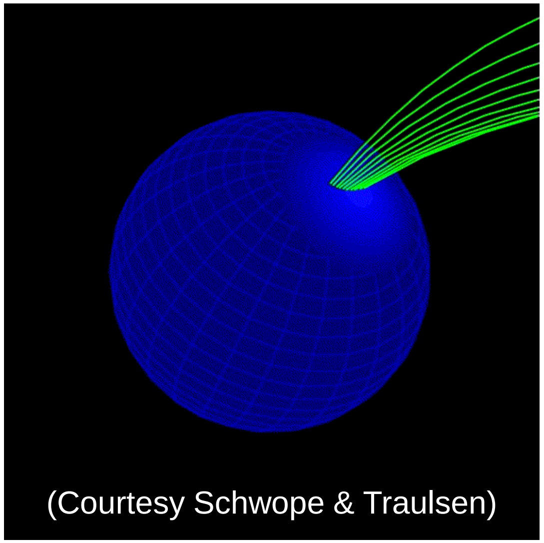
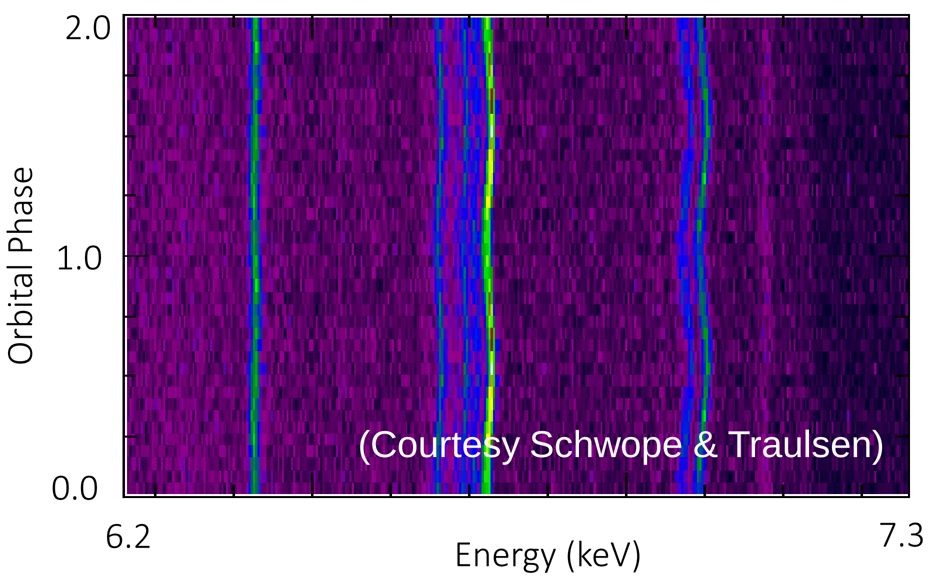




1. Constrains on the WD mass are obtained by detecting the Fe Kα line produced by reflection of the X-rays onto the NS surface at different spin phases.



Fe Kα (Reflection)
Grav redshift
+ Orbital motion

Fe XXV and XXVI (Plasma)
GR & Orbital motion +
streaming bulk motion

2. The radial velocities of plasma lines in the accretion columns can disentangle different accretion models

Targets: AM Her, T CrB, OY Car, HT Cas, Z Cha, EX Hya, UX Uma, HU Aqr, V709 CAS

R-SCIOBJ-334: magnetars cyclotron lines

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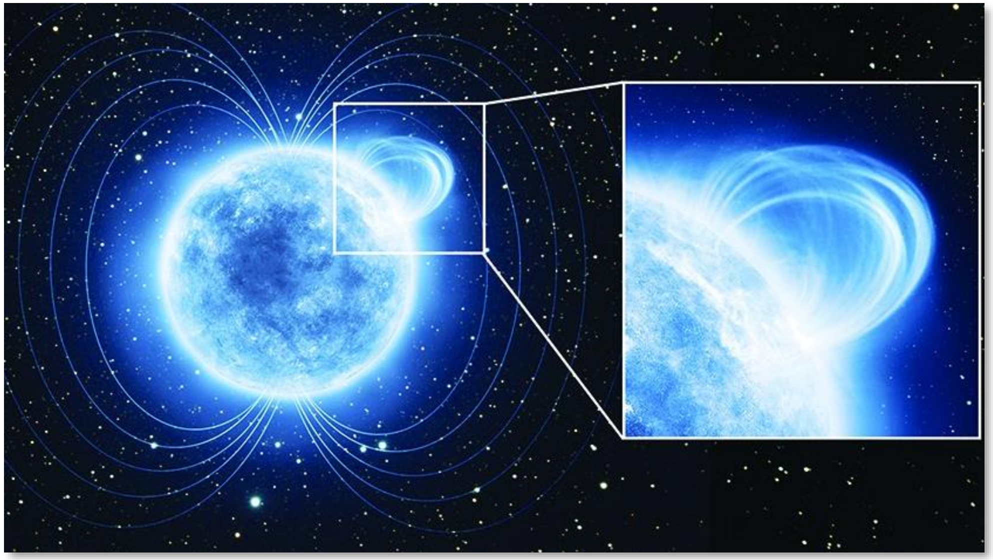
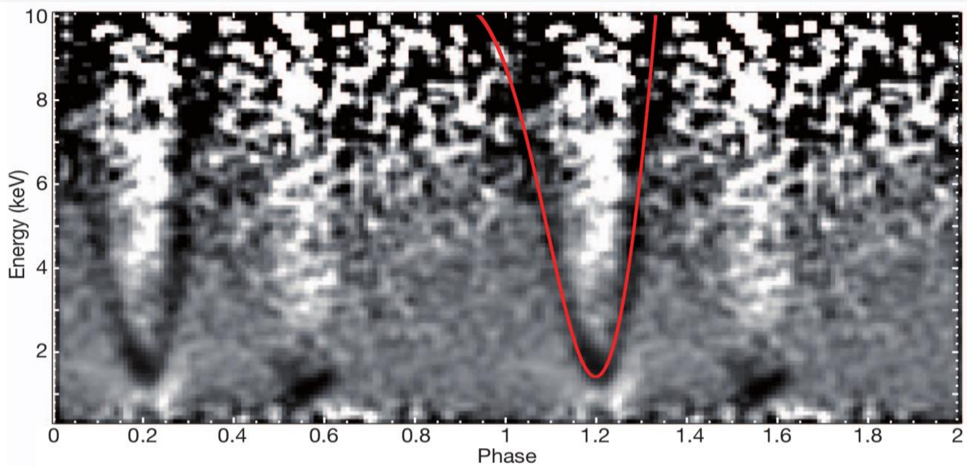
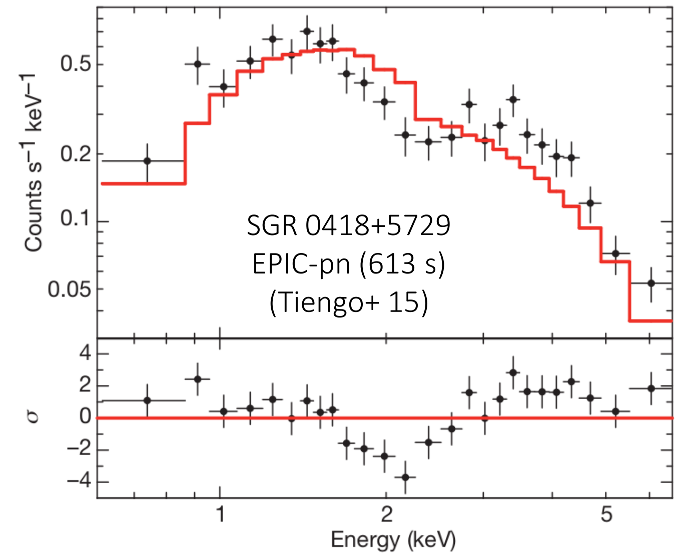
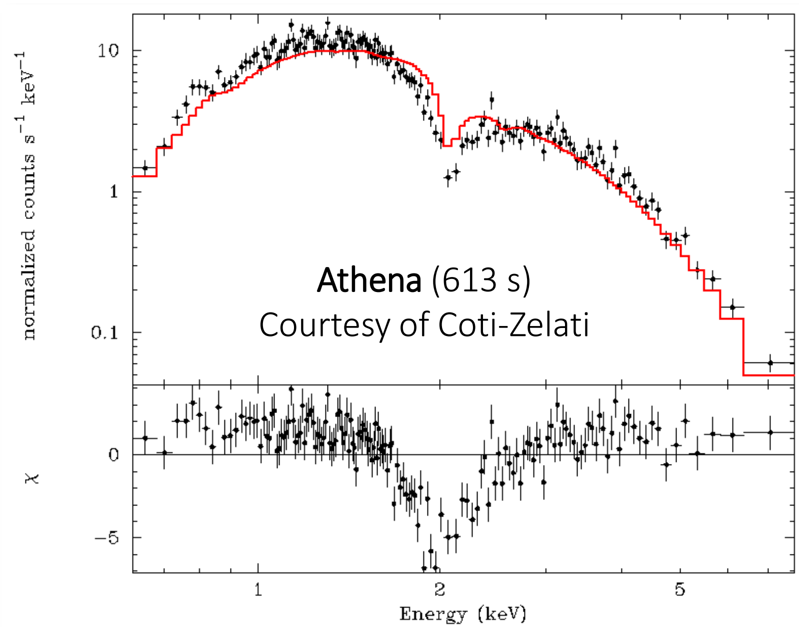




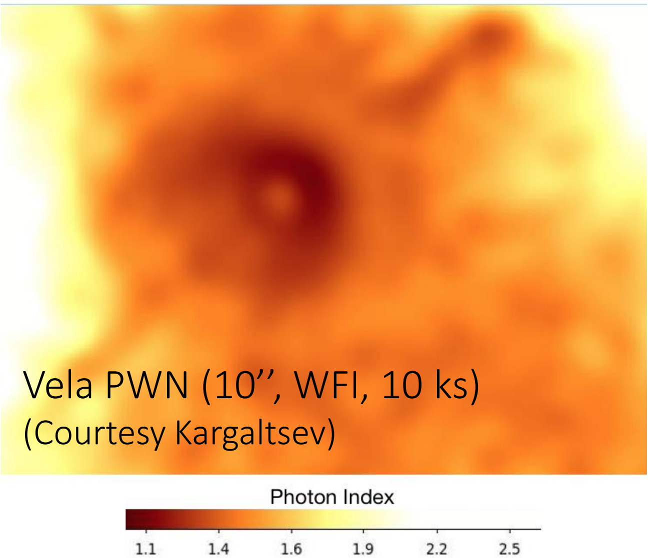
1. Energy & ϕ dependence of magnetar proton cyclotron lines



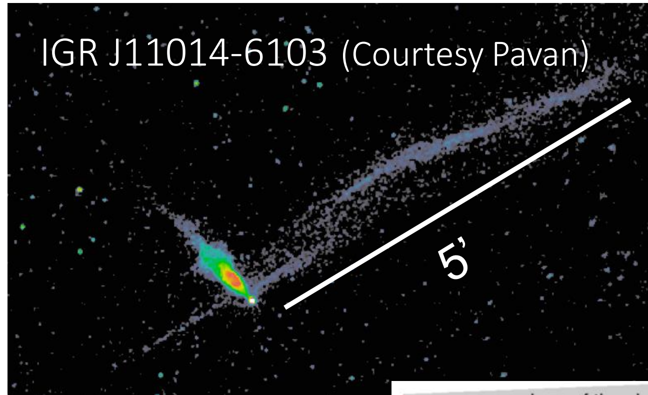


Targets: RX J0720.4-3125, RX J1308.6+2127, SGR 1806-20, 30 ks, 1RXS J170849.0-400910, XTE J1810-197, SGR 0418+5729, 1RXS J170849.0-400910, SGR 0418+5729, Magnetar in outburst

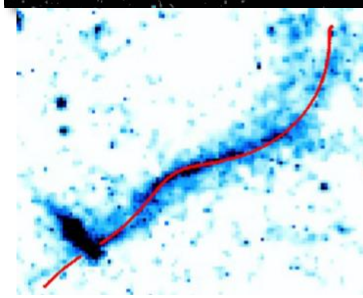
R-SCIOBJ-334: Pulsar wind nebulae

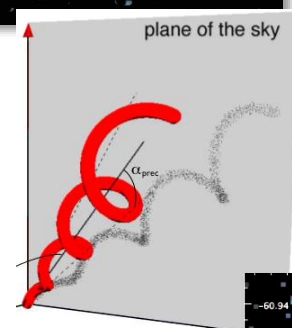


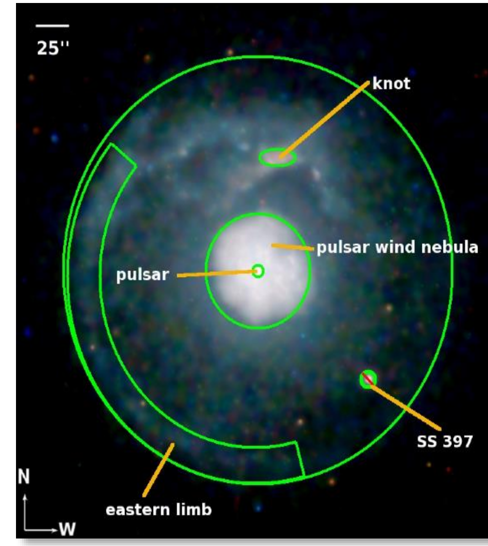
Vela PWN (10'', WFI, 10 ks)
(Courtesy Kargaltsev)



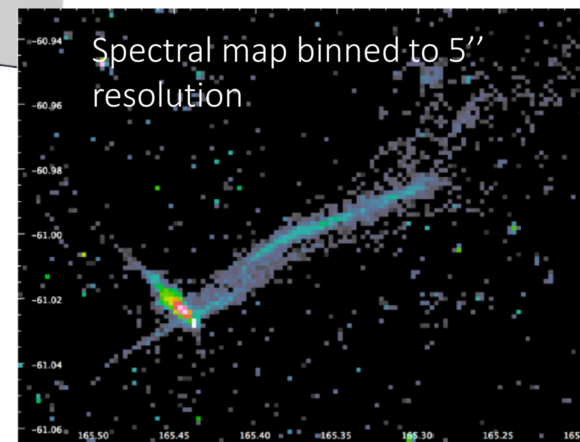
IGR J11014-6103 (Courtesy Pavan)







G21.5-0.9 X-ray image
(Courtesy Safi-Harb)



Spectral map binned to 5'' resolution

1. Constrain transport and particle acceleration mechanisms and the magnetization of ultra-relativistic plasmas, together with the progenitors and energetics of supernova explosions making pulsar-wind nebulae, through observations of extended and relatively bright PWNe

Targets: Vela PWN, IGR J11014-6103, PSR J1509-5850, PSR B1823-13, 3C58, G21.5, G320.4-1.2, Vela X (relic PWN)

See N. Klinger talk on the 27th!

R-SCIOBJ-336: Novae

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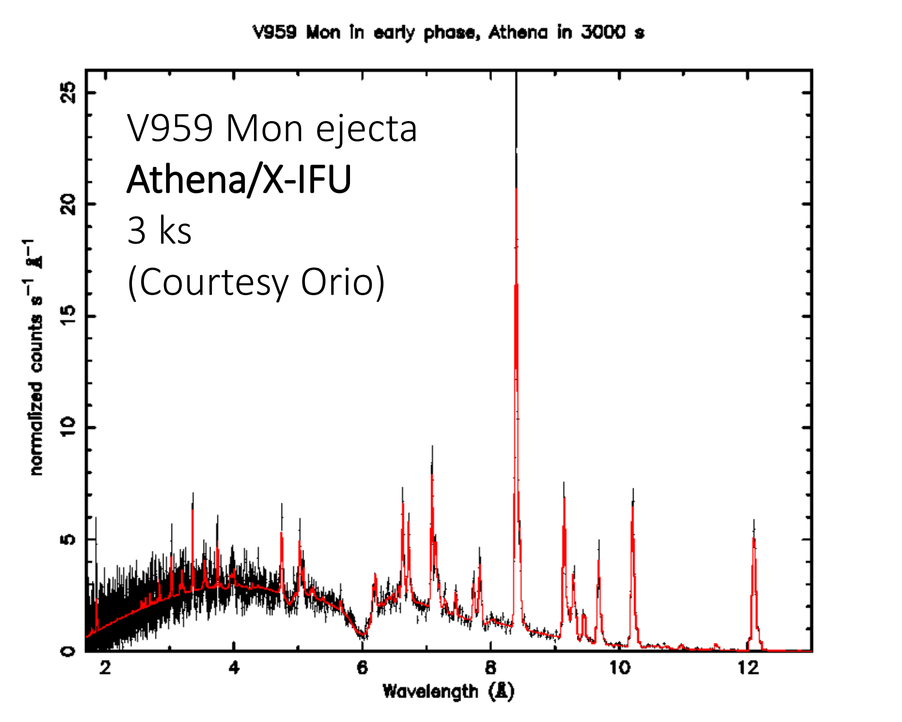
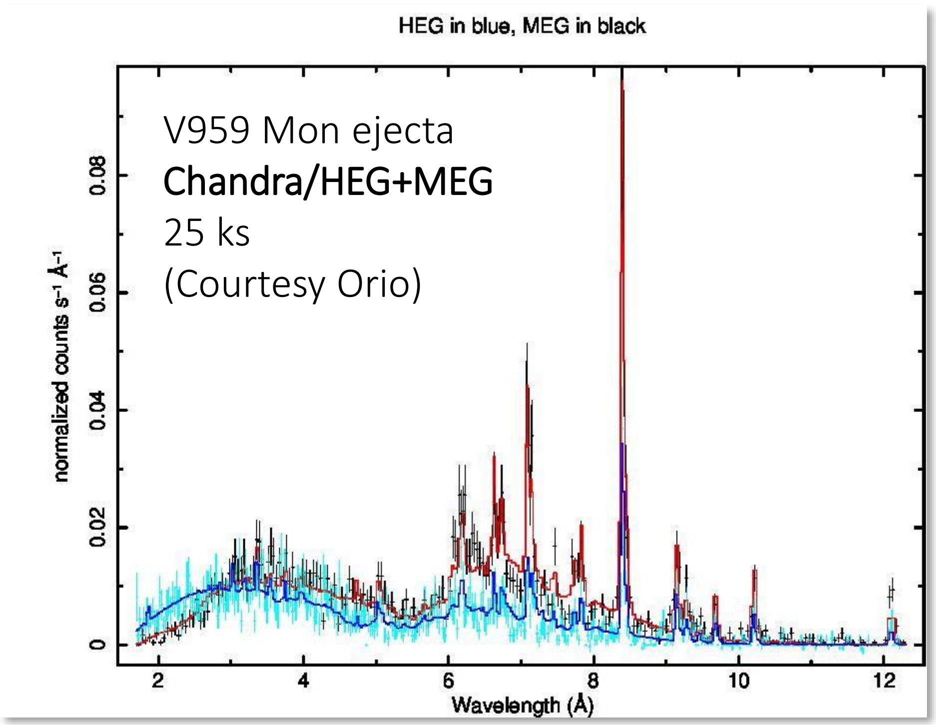
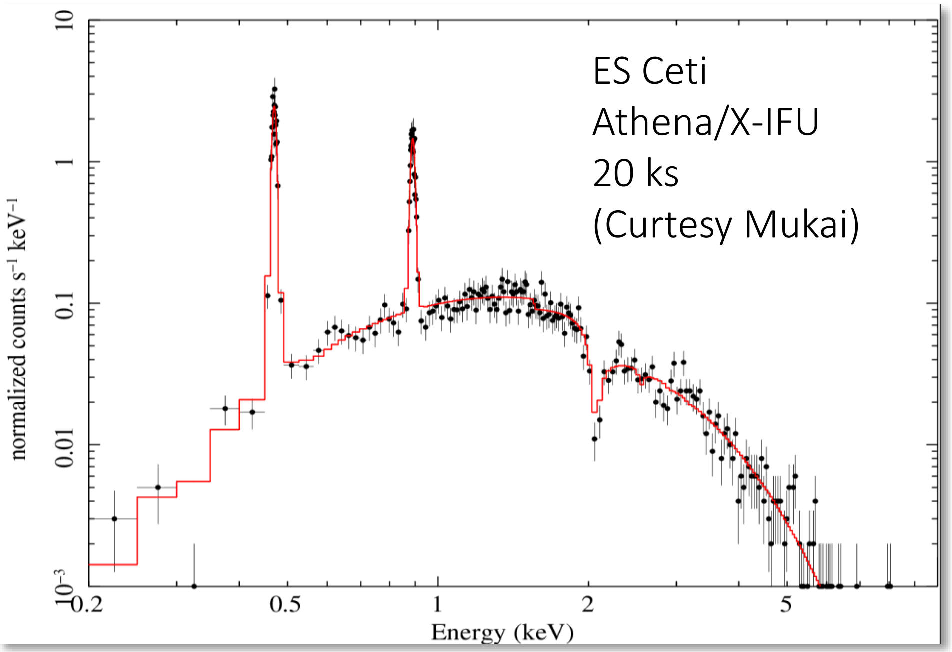


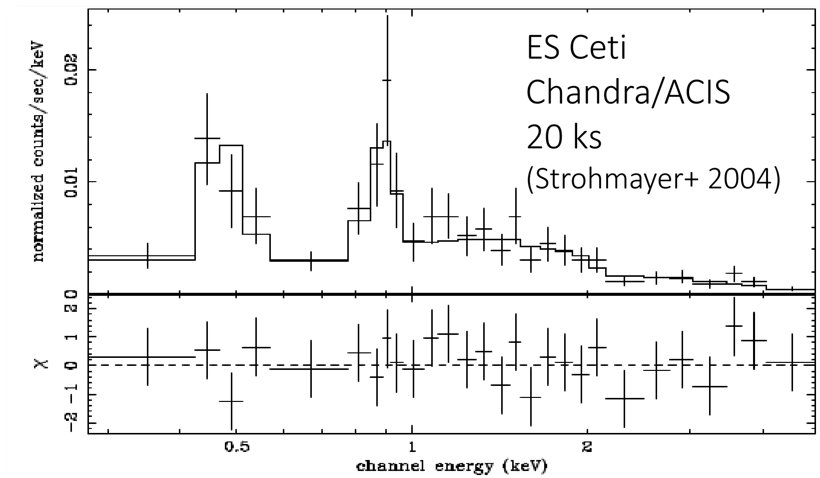


1. Measure the chemical composition of Novae ejecta, testing SN type Ia progenitor scenarios via the single-degenerate channel and determining the corresponding chemical enrichment of the Galaxy

Targets: New or known Nova, monitoring during the outburst with spaced observations

R-SCIOBJ-337: Double Degenerates





1. test different evolutionary scenarios for double degenerate binaries and identify the most promising gravitational wave sources and Type Ia Supernova progenitors among these systems.

Targets: GP Com, HP Lib, Cr Boo, CP Eri, V406 Hya, New Supernova