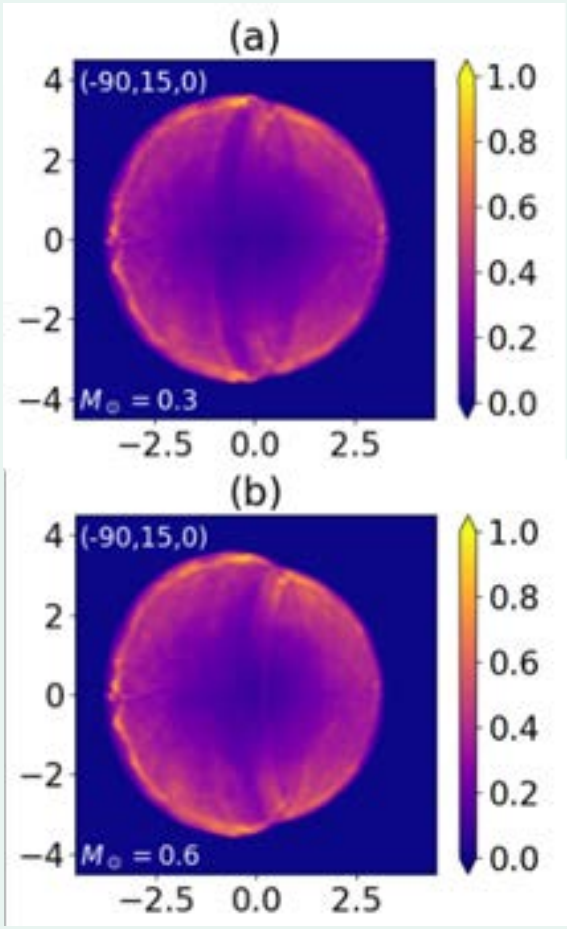
S8.1: Asymmetries in young supernova remnants: the case of Tycho

Moranchel-Basurto A., Velázquez, P. F., Schneiter M. and Esquivel A.

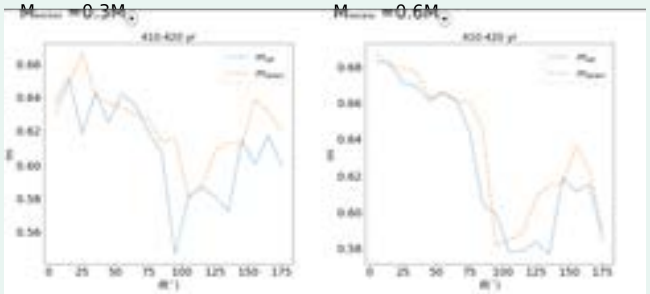
Synchrotron emission



Model

Similar as the model proposed by Vigh et al. 2011

expansion parameter

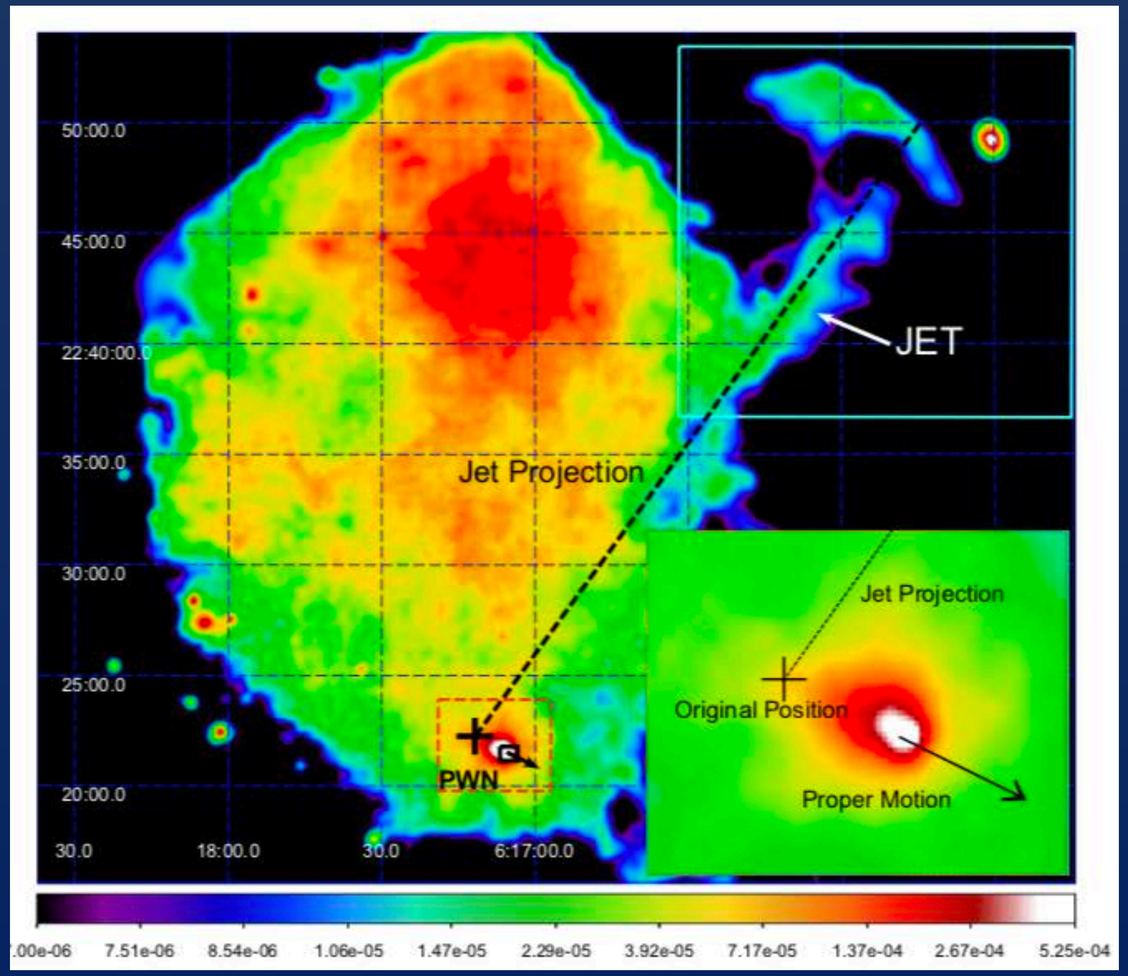


S9.1

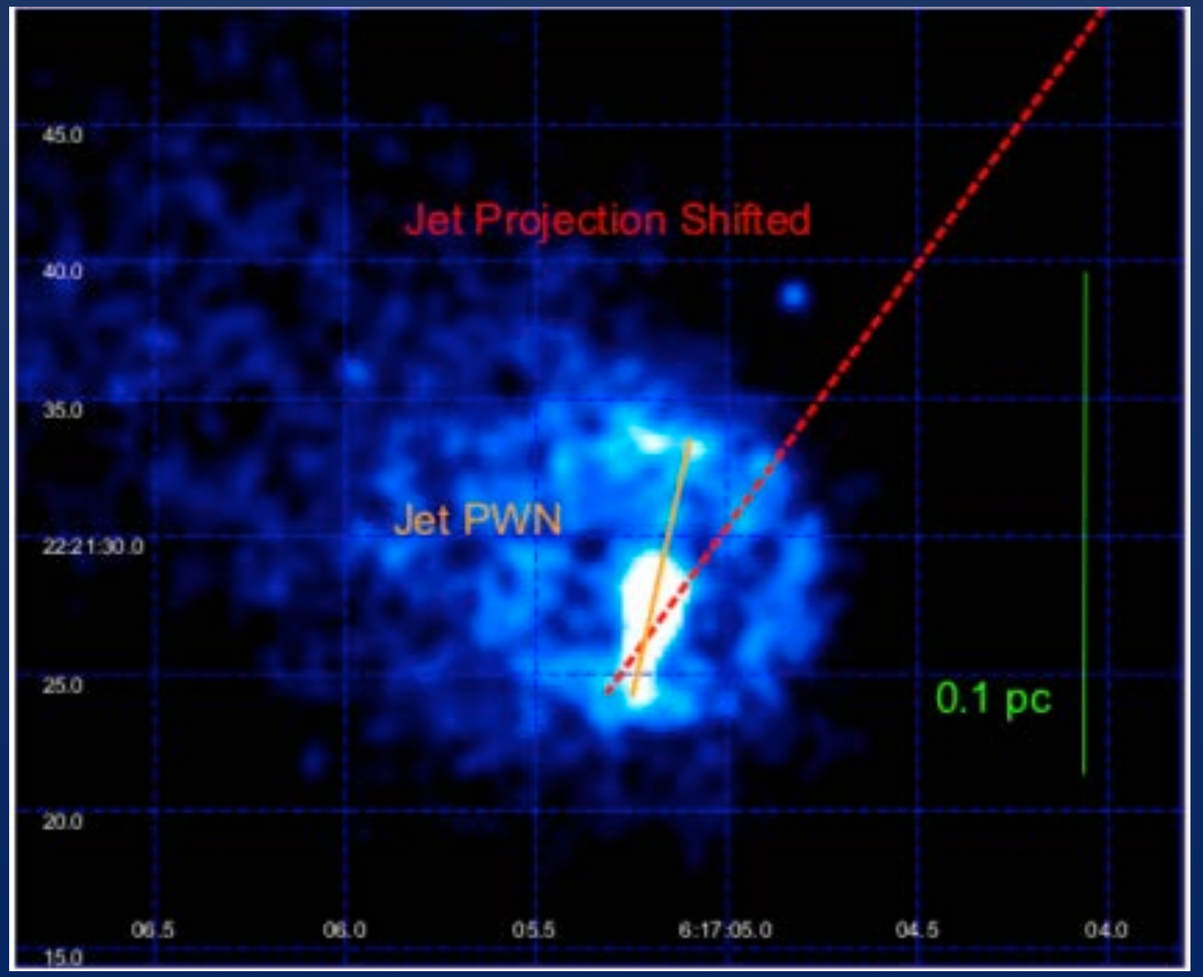
Discovery of a jet-like structure with overionized plasma in the SNR IC 443

E. Greco(1,2), M. Miceli(1,2),G. Peres(1,2), E. Troja(3,4), F. Bocchino(2), S. Orlando(2)

(1)Università di Palermo, Dip. Di Fisica e Chimica; (2)INAF-Osservatorio Astronomico di Palermo; (3) NASA, Goddard Space Flight Center; (4) Department of Astronomy, University of Maryland



IC 443 in the 1.4-5 kev band



Chandra image of the PWN CXOUJ061705.3+222127

S9.5

3D HD MODELLING OF SNR IC 443:

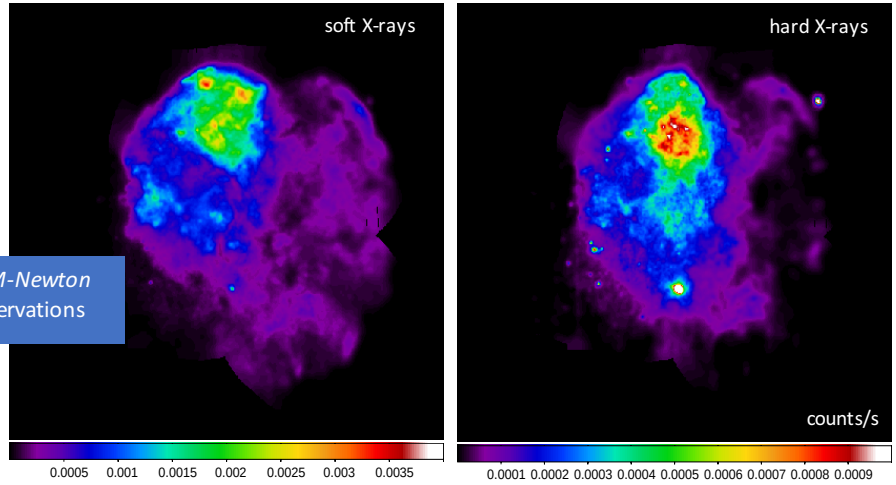
effects of the inhomogeneous medium in shaping the remnant morphology

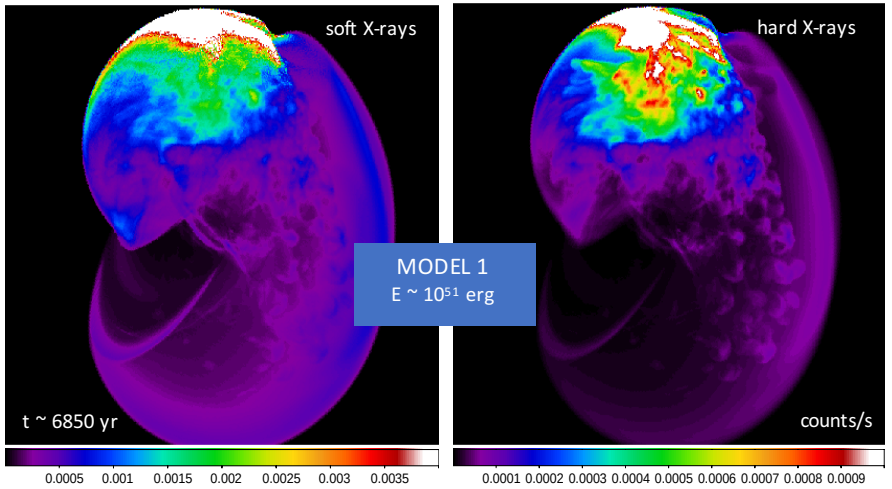
S. Ustamujic[1], S. Orlando[1], E. Greco[2,1], M. Miceli[2,1], F. Bocchino[1], and G. Peres[2,1]

1 INAF-Osservatorio Astronomico di Palermo, Piazza del Parlamento 1, 90134 Palermo, Italy
2 Dipartimento di Fisica e Chimica, Università di Palermo, Piazza del Parlamento 1, 90134 Palermo, Italy

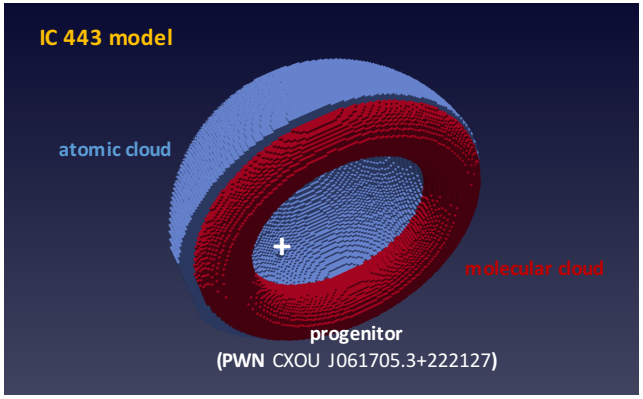
Email: sabina.ustamujic@inaf.it

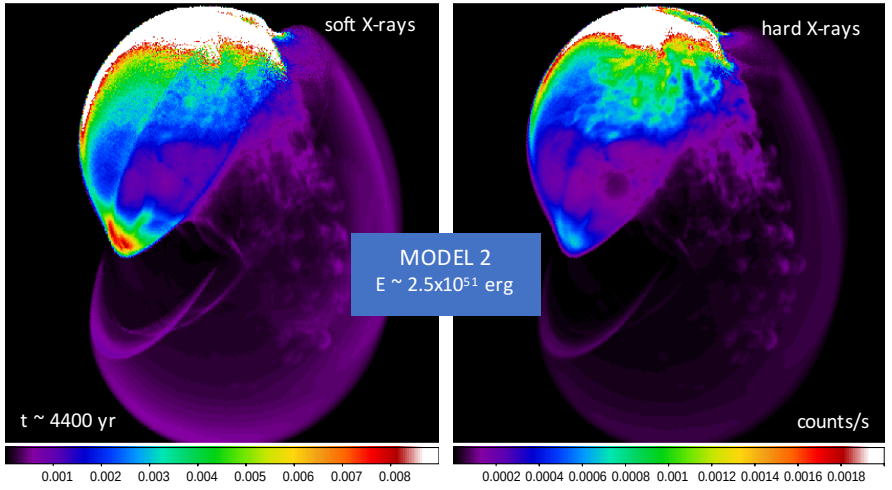
XMM-Newton observations





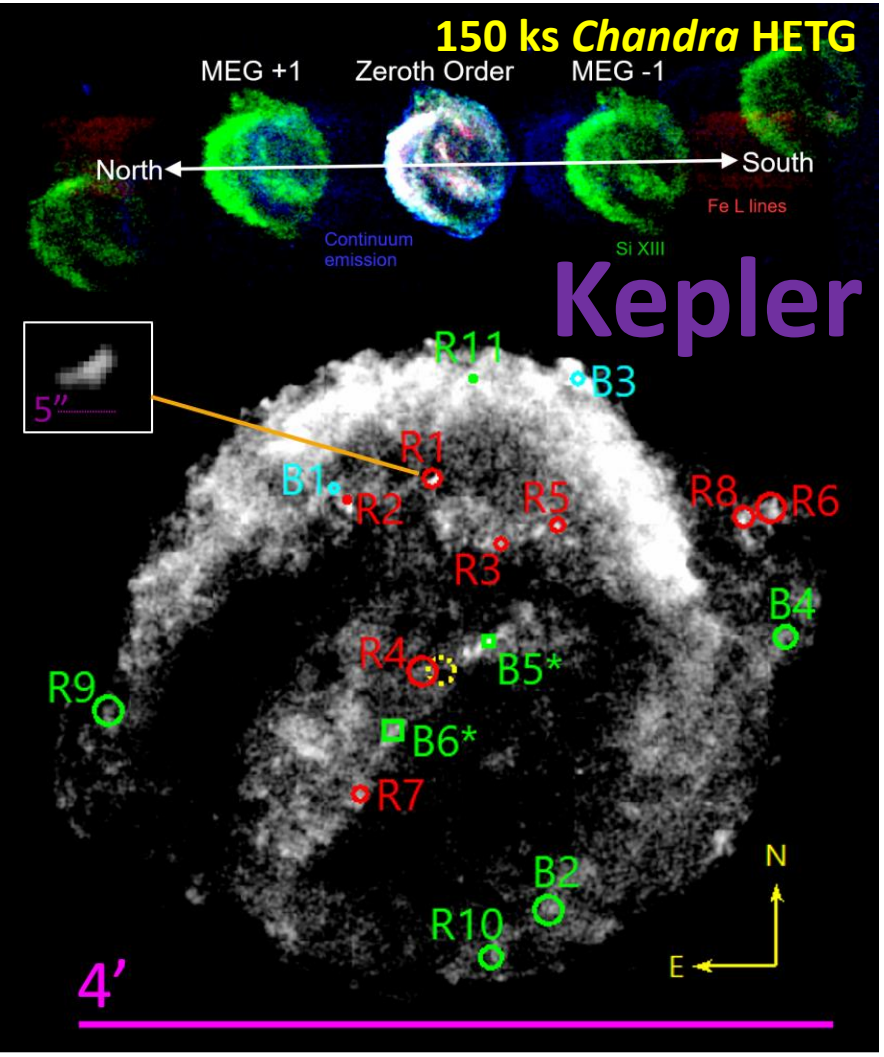
SNR interaction with molecular clouds



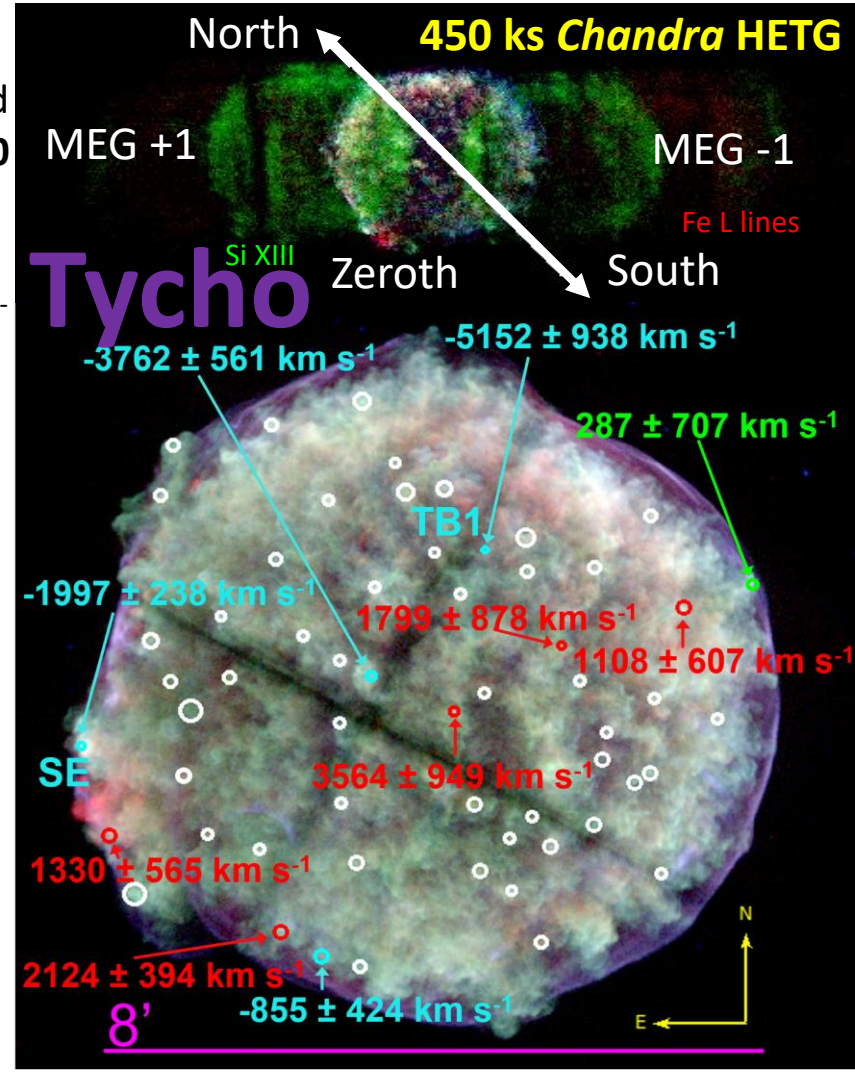


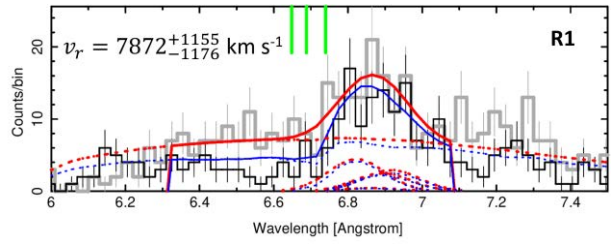
S 9.2: Measuring Ejecta Velocities in Tycho's and Kepler's Supernova Remnants with the *Chandra* HETGS

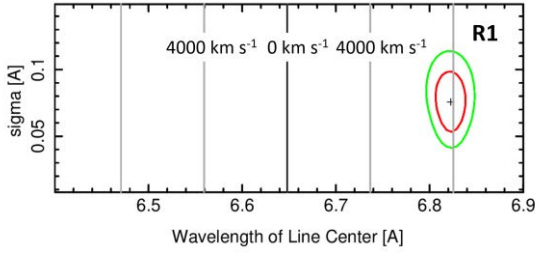
Matthew Millard - University of Texas at Arlington

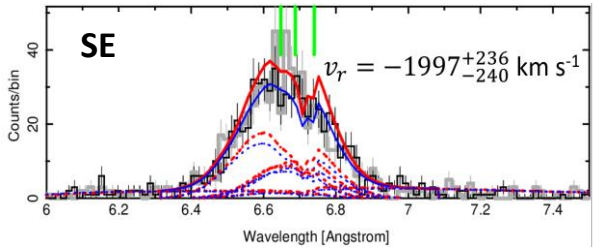


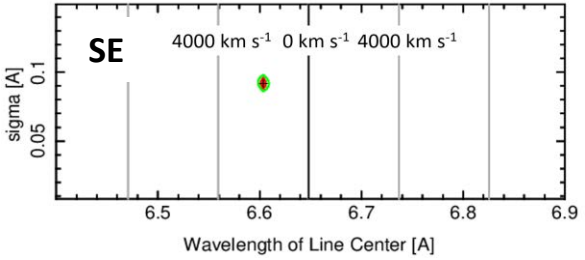
- V_r measurements of small ejecta knots based on Doppler shifts in Si Kα lines: **up to v_r ~ 8,000 km s^{-1} for Kepler, v_r ~ 5,000 km s^{-1} for Tycho**
- PM measurements of ejecta knots based on archival *Chandra* ACIS data: up to 0.2 arcsec yr^{-1} for Kepler, 0.3 arcsec yr^{-1} for Tycho.
- Nearly freely expanding knots with **space velocities up to v_s~ 9,000 km s^{-1} in Kepler.**
- From expansion of knot R1, **we estimate a distance to Kepler of d ~ 4.8 – 8.2 kpc**.
- **Apparent line-of-sight asymmetry in Si-rich ejecta in Kepler**
- **Longer HETG observation of Kepler needed for "complete" velocity census**, especially in the southern shell
- In Tycho thus far, no freely-expanding ejecta knots reaching 10^4 km s^{-1} detected, in contrast to Kepler. However, our study of Tycho is ongoing; we will study more regions.







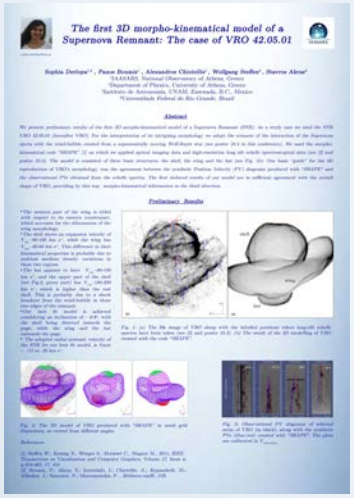


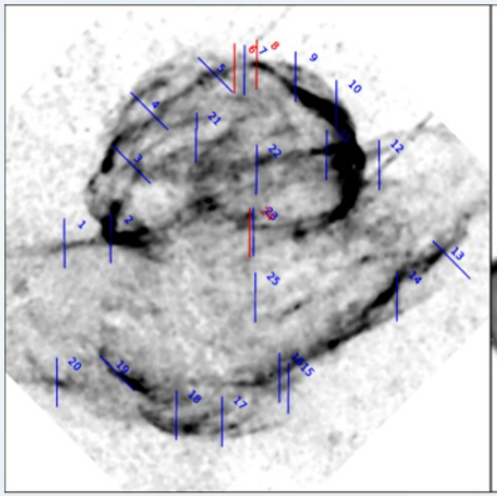


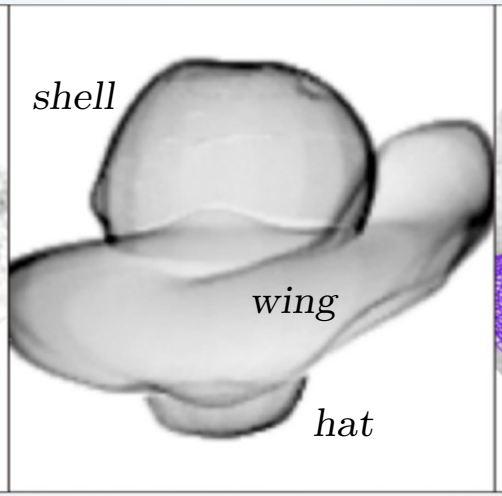
The first 3D morpho-kinematical model of a SNR
The case of VRO 42.05.01

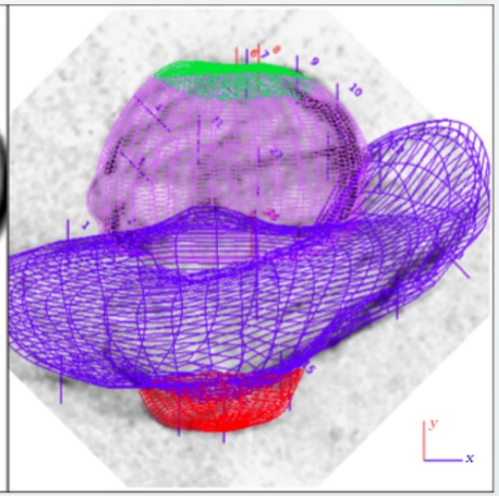
Sophia Derlopa, National Observatory of Athens, Greece

S10.5:

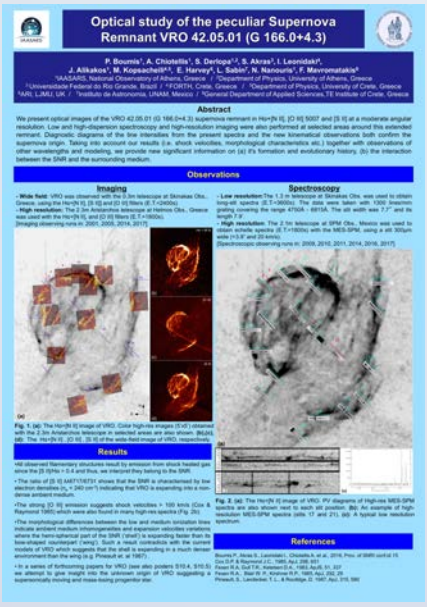




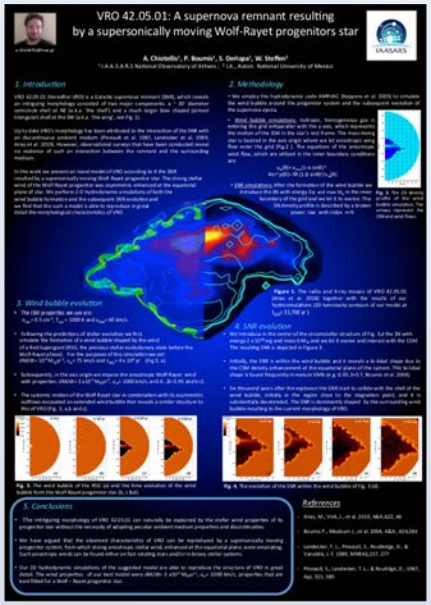




S10.3:



S10.4:



Methodology:

- *High-resolution optical imaging and spectra*
- *"SHAPE" code*

Results:

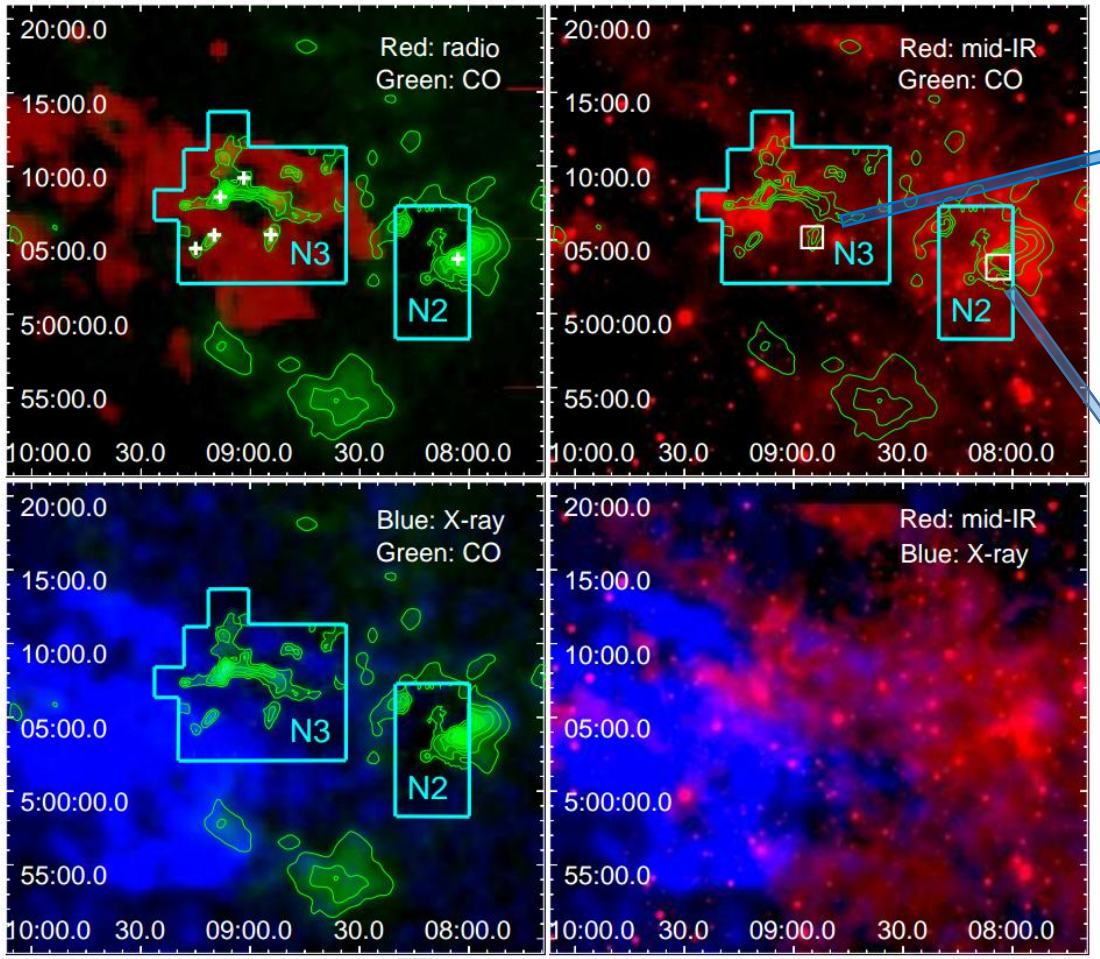
- *Vexp.shell > Vexp.wing*
- *Right part of the wing is tilted with respect to its left part*
- *Inclination ~ 6 - 8°*
- *Vsyst ~ -15 to -20 km s^{-1}*

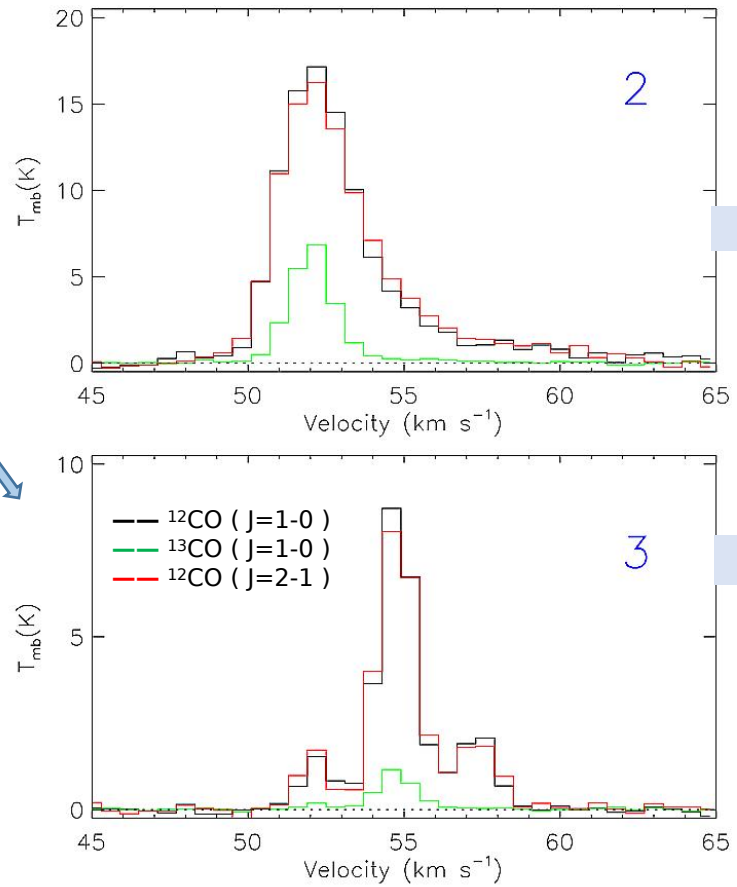
Co-authors: P. Boumis, A. Chiotellis, W. Steffen, S. Akras

MCs toward SNR W50/SS 433

Qian-cheng Liu, Nanjing University

S10.10





1.The peak of the temperature is high (~30K) compared to the typical interstellar MCs (~10K);
2. High 12CO J=2-1/1-0 line ratios;
3. Broad wing profiles of 12CO are found in regions N2 and N3

There are anti-correlations between the MCs and radio /X-ray emission

MCs in regions N2/N3 are likely perturbed by the jet of SS 433

Radio emission from Supernovae in the Very Early Phase

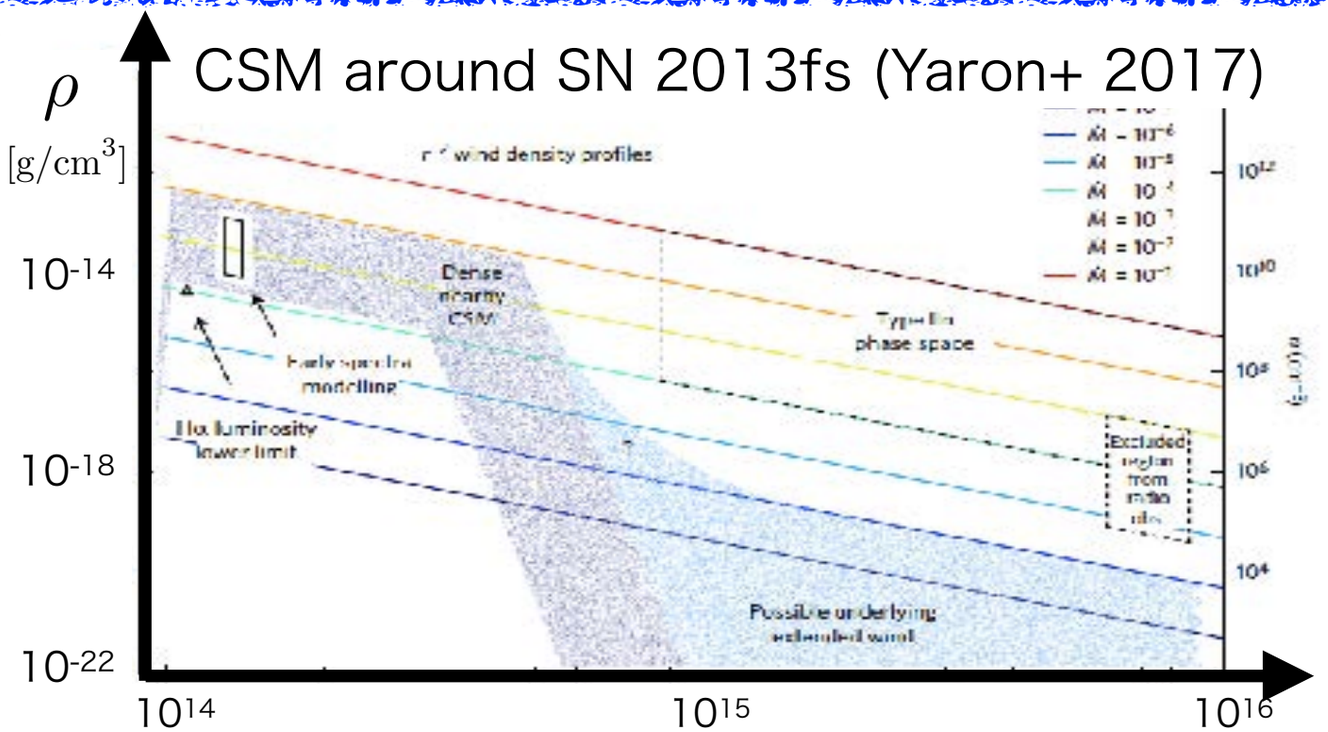
Tomoki Matsuoka (Kyoto University, §10.12)

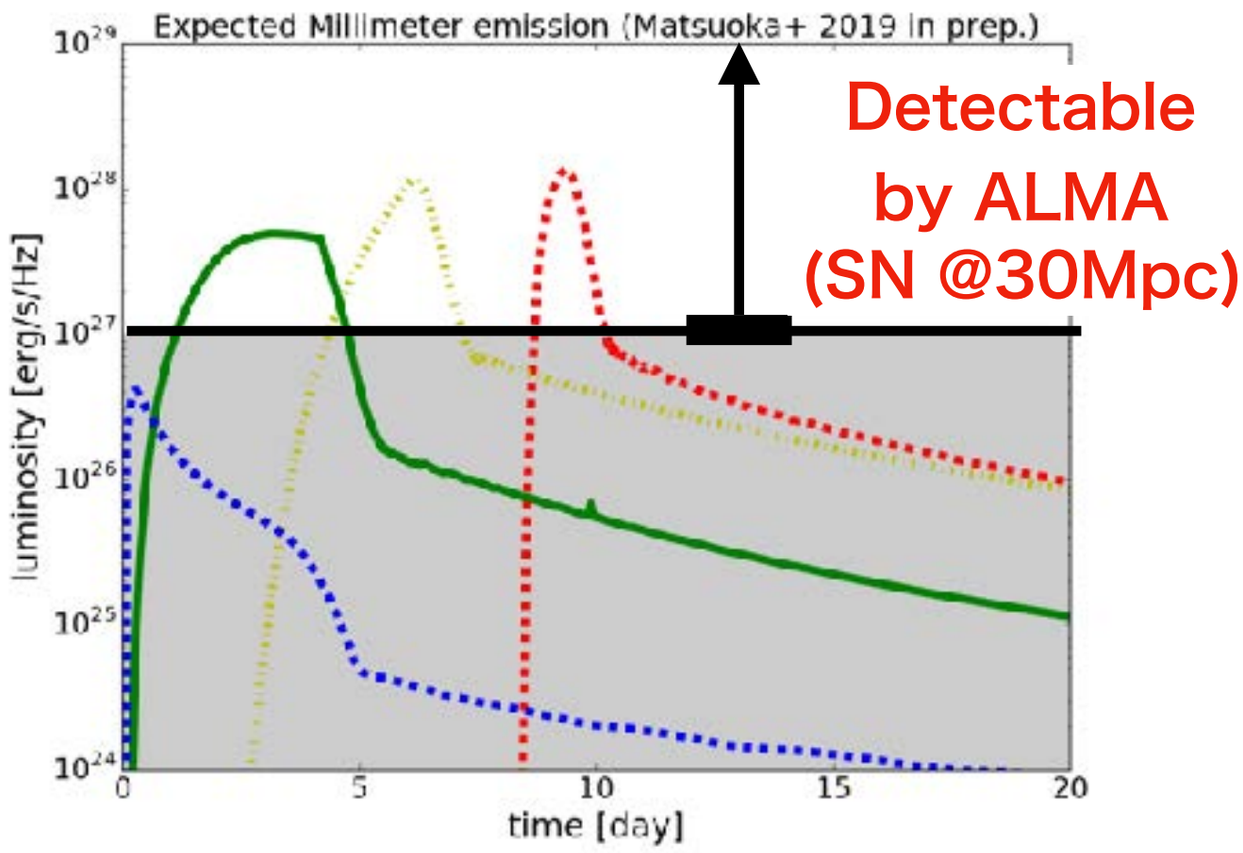
・**Confined circumstellar material** (CSM) is proposed by recent transient surveys and flash spectroscopy (e.g., Yaron+ 2017).

・We suggest that the **radio emission can be a diagnostic of the confined CSM**.

・We show that **the millimeter emission can be detectable by ALMA** in the first 10 days since the shock breakout

CSM around SN 2013fs (Yaron+ 2017)





Evolution of the X-ray Remnant of SN 1987A

(Aravind P.R. - Poster S10.16)

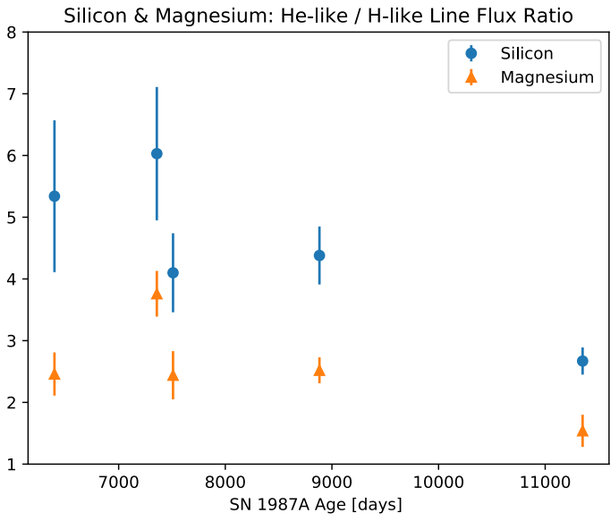


Fig 3: Temporal evolution (~ 6500 to ~ 11,300 days) of He-like / H-like ion line flux ratios of Si and Mg

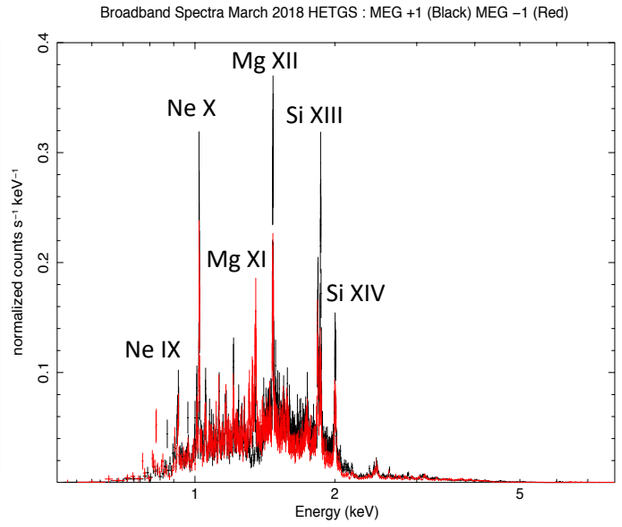


Fig 4: The 1st order dispersed X-ray spectrum (MEG +1 (black) MEG-1 (red)) of SN 1987A based on our 340 ks Chandra HETGS observation taken in March 2018.

He-like to H-like atomic line flux ratios for **Si and Mg** which had stayed **almost constant until day ~9000 (2011) now has dropped ~40% by day ~11,300 (2018). (Fig 3)**

Two component model fits to high resolution spectra from **March 2018 (day ~11,300) (Fig 4)** show **hard band electron temperature increasing from kT ~1.7 keV (day ~9000) to kT ~2.3 keV (day ~11,300).**

Soft band (0.5-2.0 keV) light curve has undergone **~15 % decline from day ~10,500 (September 2016) to day ~11,500 (September 2018)(Fig 1).**

For the latest observation of March 2019, we see a ~10% increase (Fig 1). Nature of this increase is unknown, **follow-up observations are essential.**

Radial expansion rate stays **almost constant at ~1600 km/s since day ~10,500 (2016), (Fig 2)** although showing potential signs of an increase, which needs to be monitored through follow-up observations.

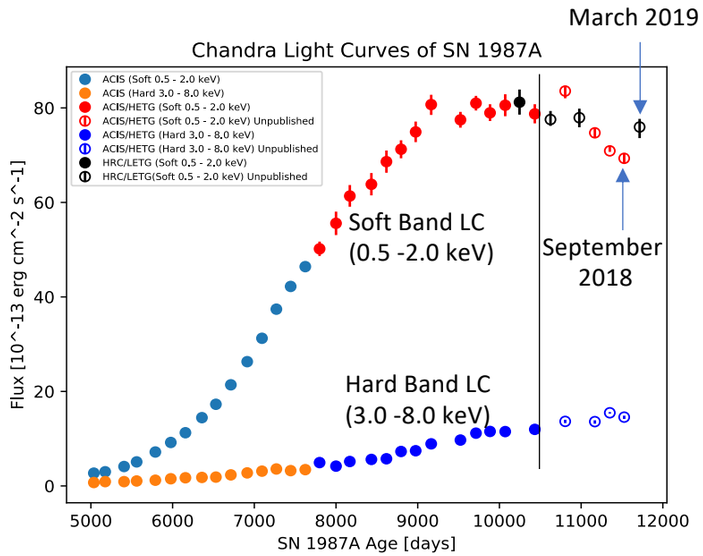


Fig 1: Soft (0.5-2.0 keV) and hard (3.0-8.0 keV) LCs. Data before the vertical line have been published.

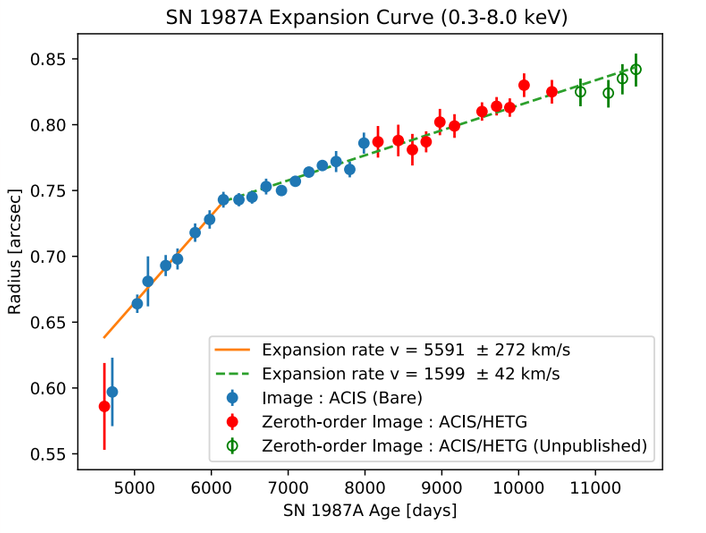
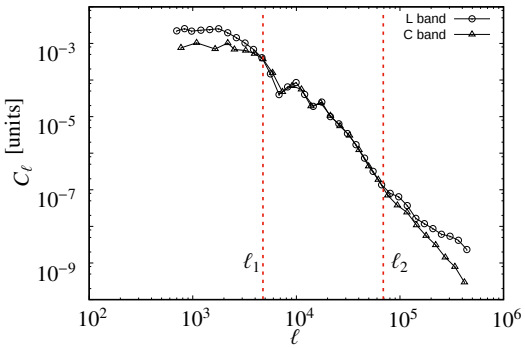


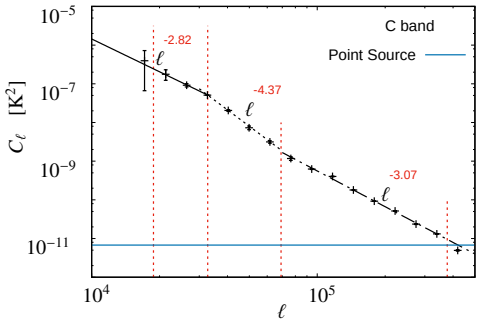
Fig 2: The 0.3-8.0 keV X-ray radius and expansion rate of SN 1987A (1999-2018). Our new updates (2016 – 2018) are show by green open circles.

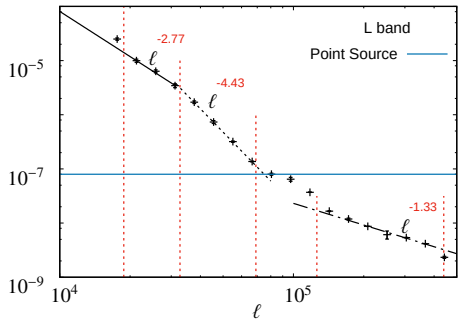
A study of Kepler SNR: C_ℓ from radio frequency data

S10.17

- Observed synchrotron intensity fluctuations $\Rightarrow$ angular power spectrum C_ℓ $\Rightarrow$ remnant's fine-scale structures
- VLA Archival Data : AD498, L band(1.5 GHz) & C band(5 GHz)







- scale invariant nature of C_ℓ
- intensity fluctuations arising from Gaussian random process like MHD turbulence
- transition from -2.8 to -4.4 $\Longrightarrow$ 2D to 3D turbulence
- steeper -4.4 maybe outcome of complex morphology

Time-evolution of broadband non-thermal emission from supernova remnants in different circumstellar environments

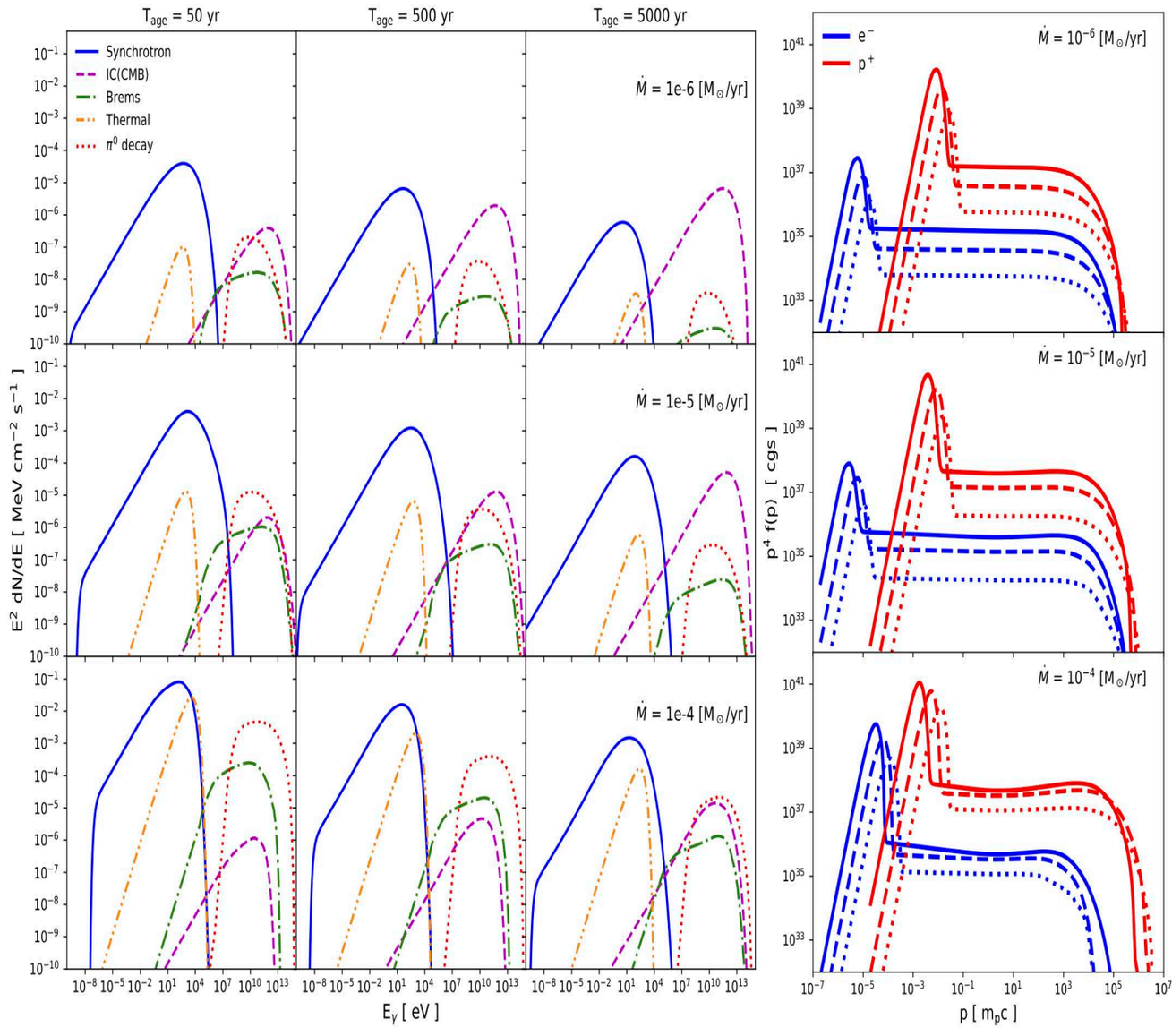
Haruo Yasuda (yasuda@kusastro.kyoto-u.ac.jp) & Herman Lee
Department of Astronomy, Kyoto University, Japan

We follow the time-evolution of SNR, cosmic-ray, and γ-ray using hydrodynamics coupled with efficient particle acceleration.

As the results, we find that there are **two characteristics** which determine the evolution of γ-ray from SNRs.

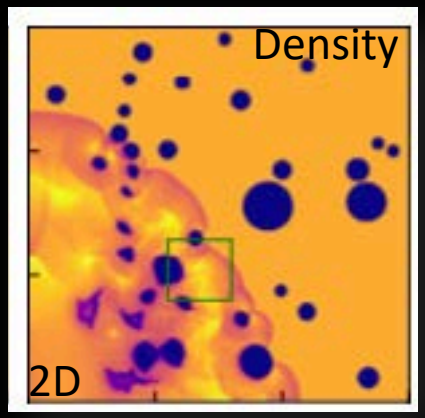
See you at Poster S10.19!

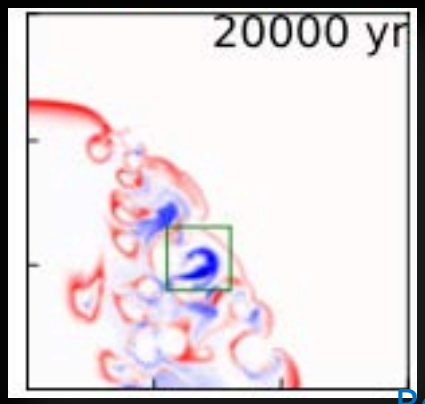
Time-evolution of cosmic-ray and γ-ray



NEI in MMSNRs

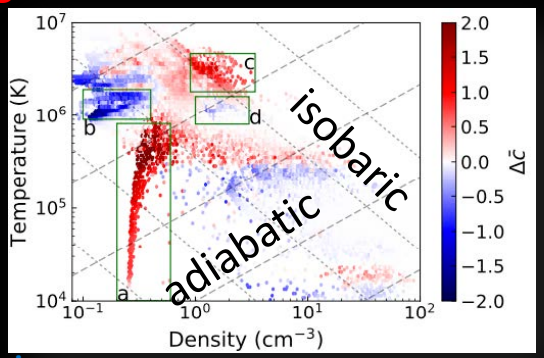
S10.20

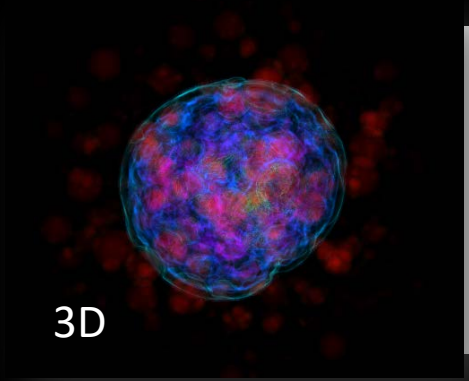


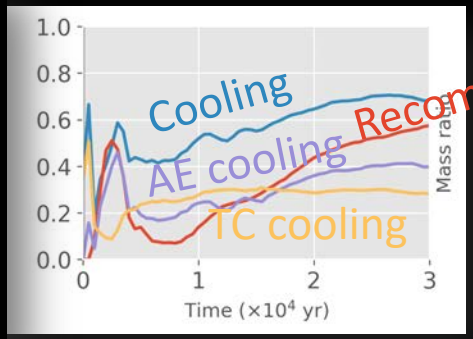


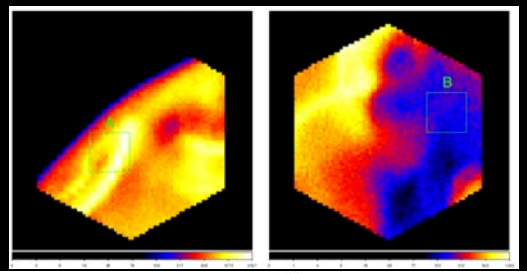
Ionizing

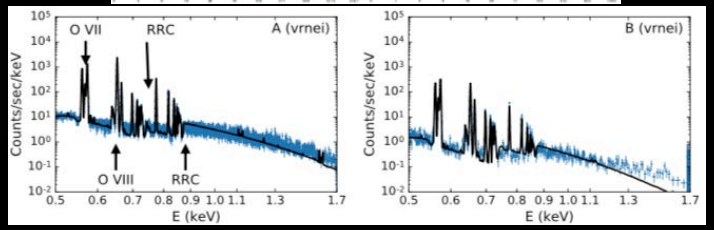
Recombining











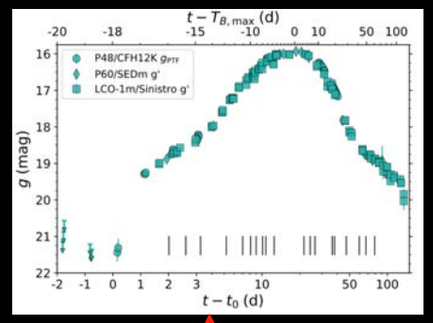
Gao-Yuan Zhang; Jonathan Slavin; Adam Foster; Randall Smith; John ZuHone; Ping Zhou; Yang Chen

Early high cadence monitoring of supernovae: key to identifying the progenitors

S1.17

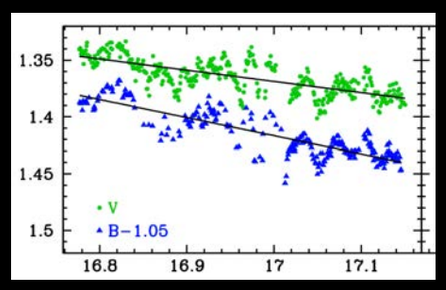
Motivation

rapid rise



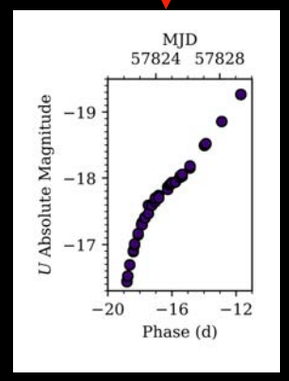
Miller et al. (2018)

SN 2014J | **iPTF16abc** | **SN 2017cbv**



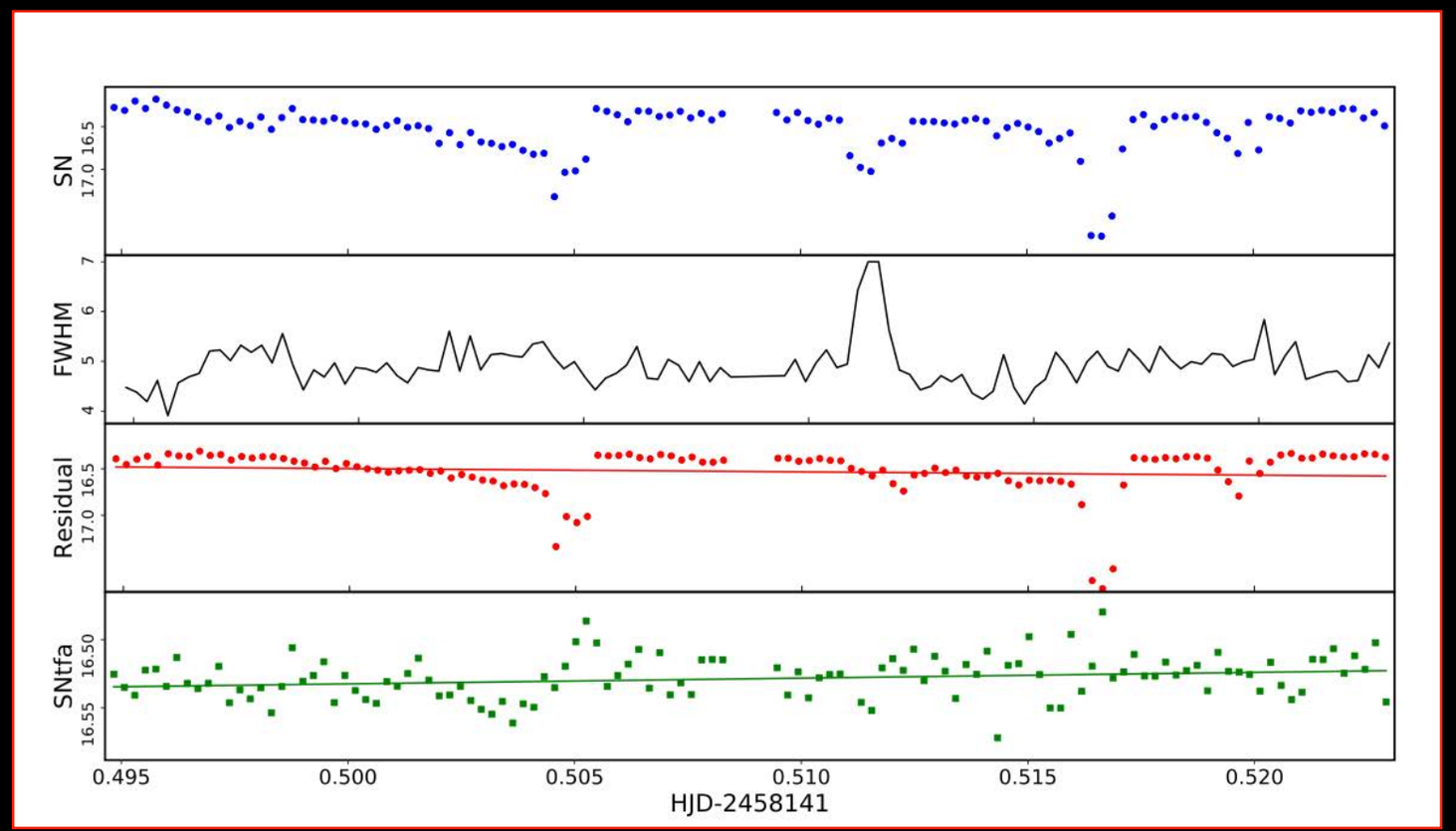
Bonanos et al. (2016)

signs of variability



Hosseizadeh et al. (2017)

Blue bumps



High cadence observations of 9 supernovae with 2.3m Aristarchos and 1.2m Kryoneri telescopes

Paraskeva et al. (in prep)