

La Scienza Universale



I GRB
Sonde per l'universo
cosmologico



Lecco

Martedì 24 novembre 2009

Stefano Covino

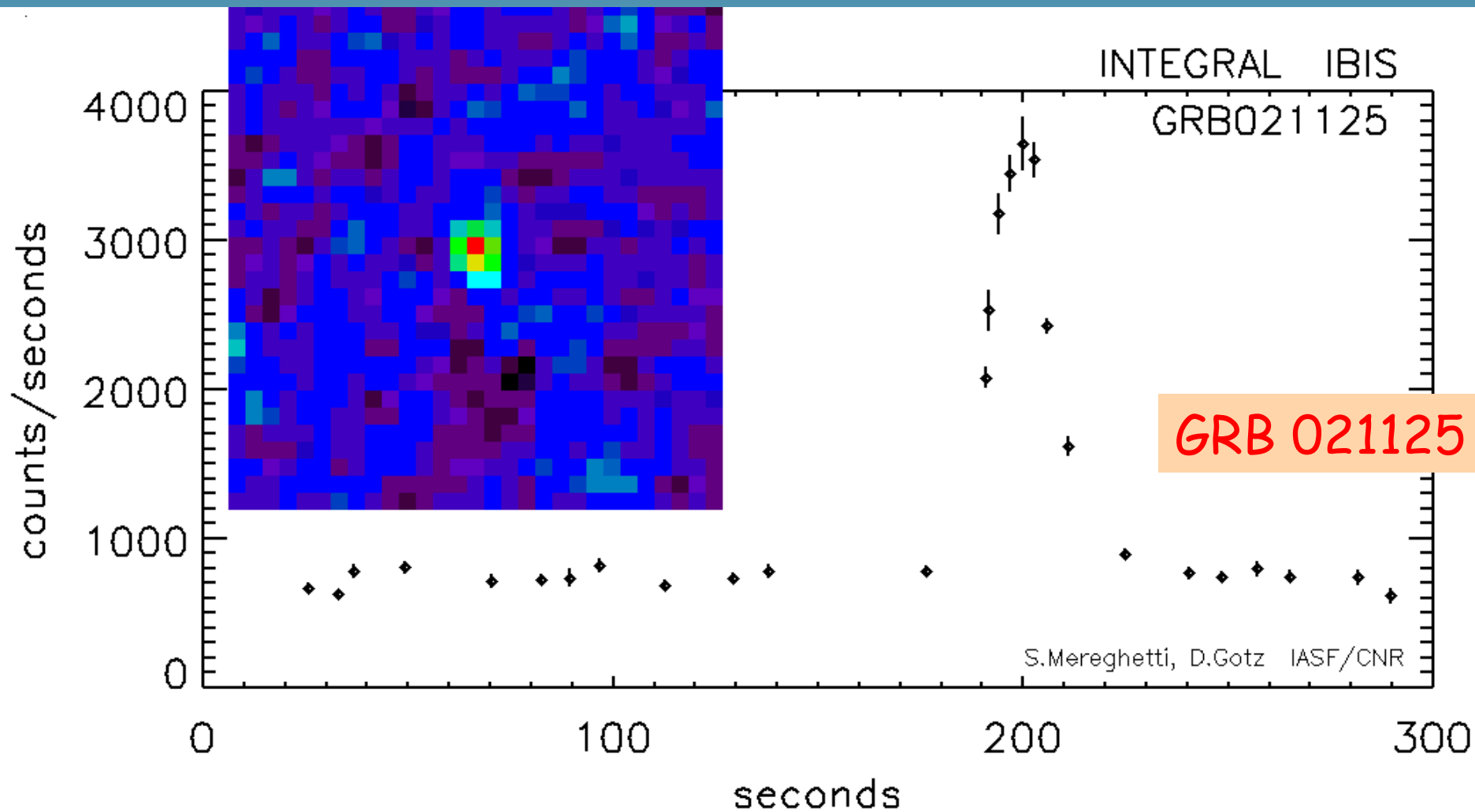
INAF / Osservatorio Astronomico di Brera

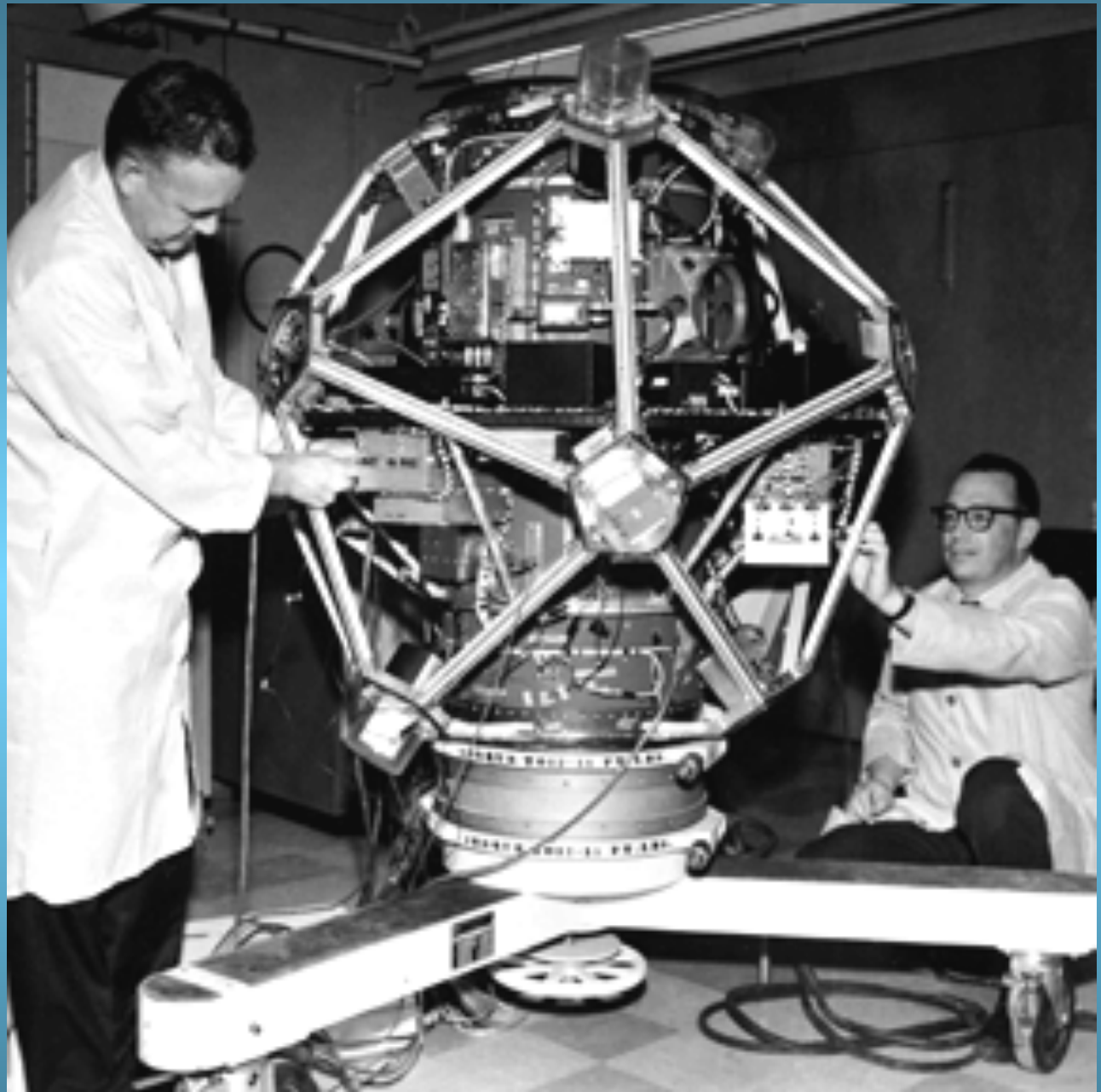
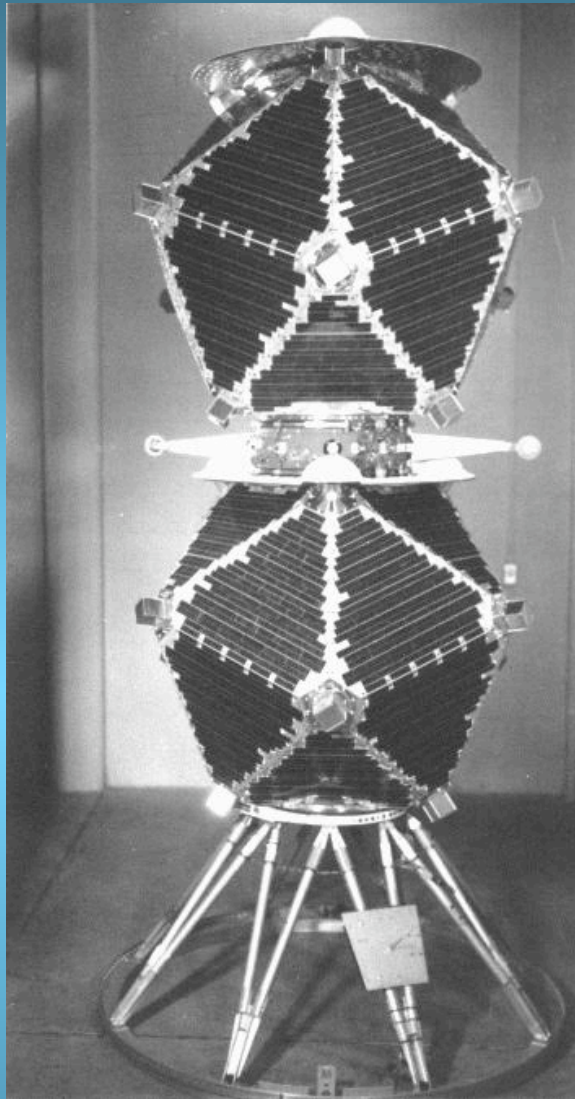
Dicesi *gamma-ray burst* (GRB)...

“Impulso **improvviso** ed **intenso** di raggi gamma,
“proveniente da una direzione casuale del cielo”



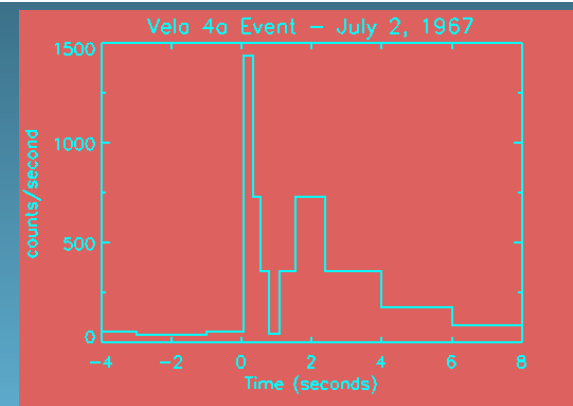
Cortesia di D. Gotz e S. Mereghetti, IASF Milano



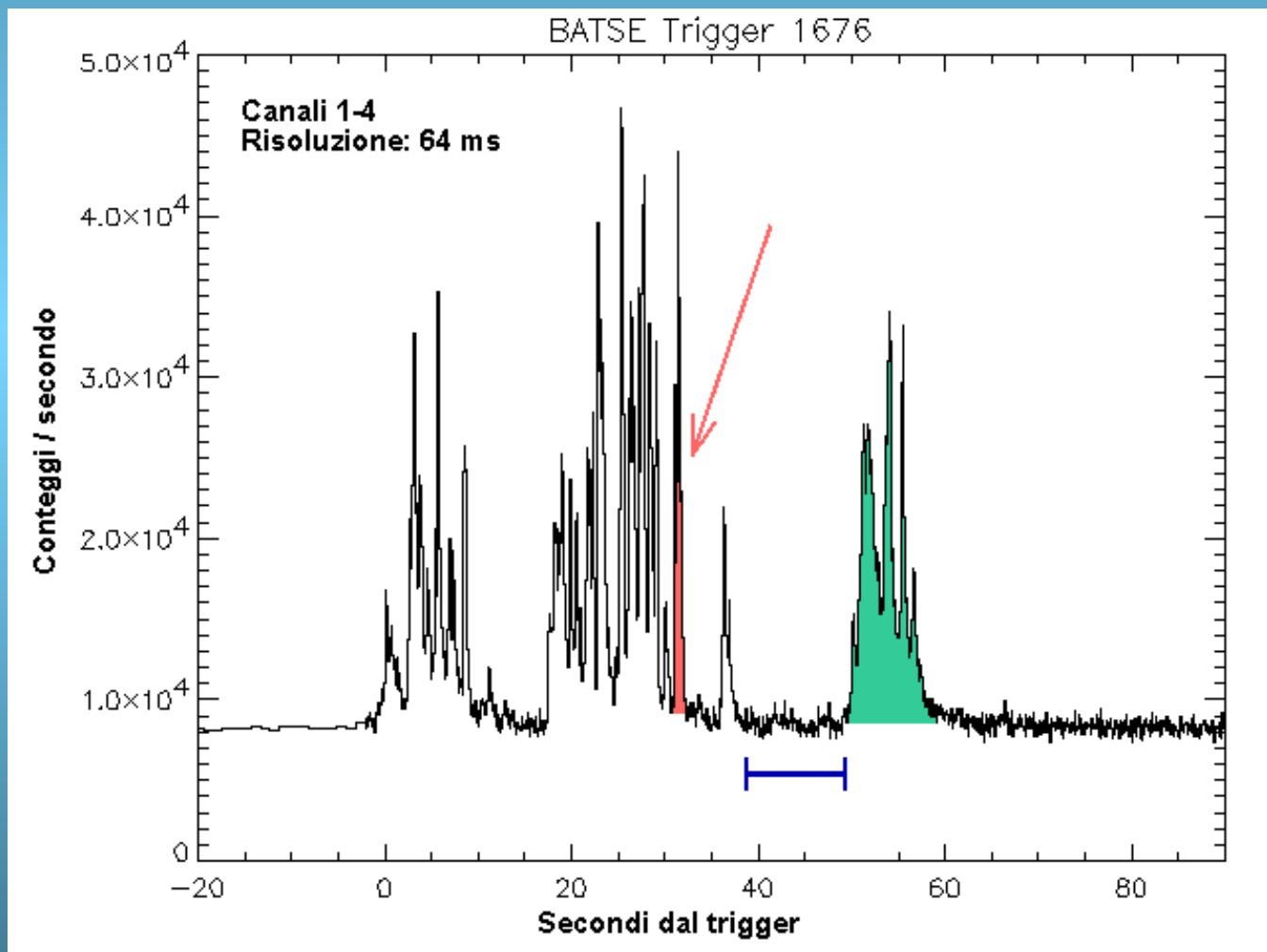


I satelliti Vela

Ed ecco i GRB...

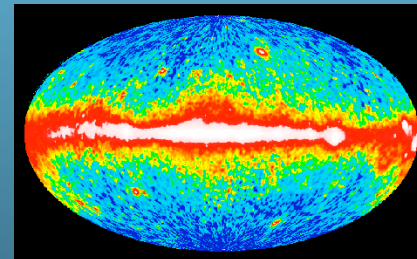
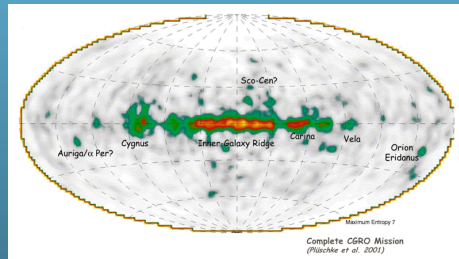
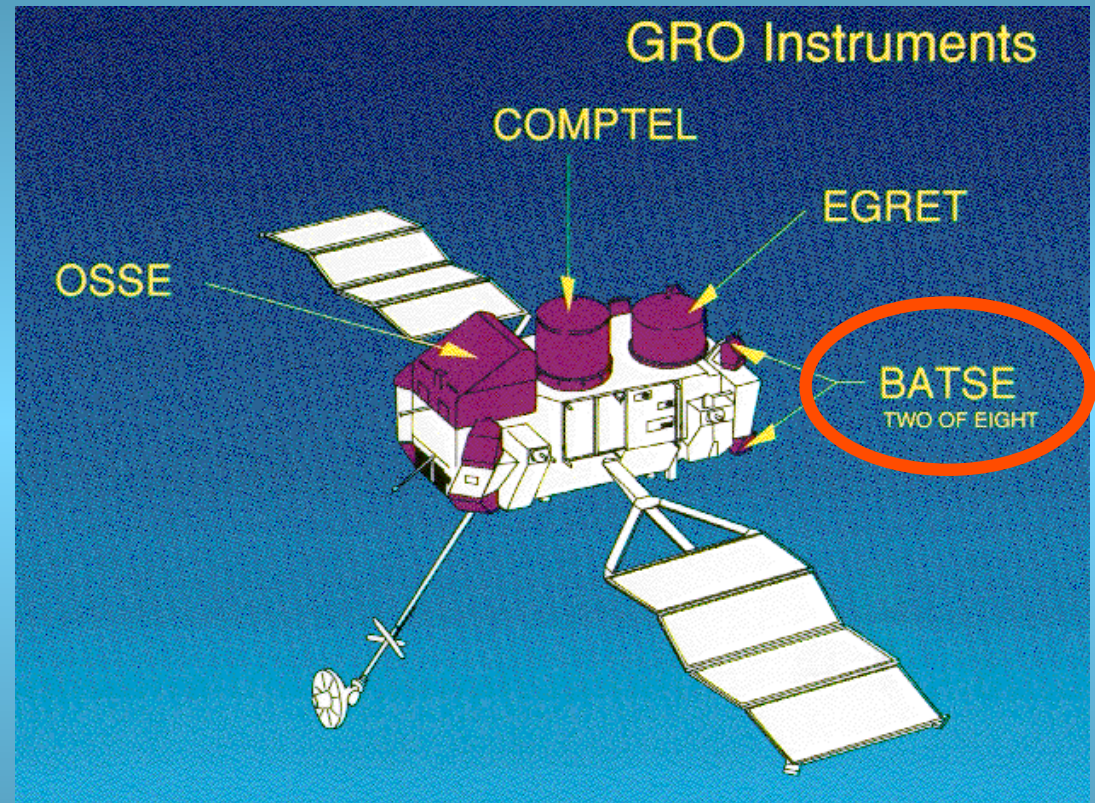


anni '60



anni '90

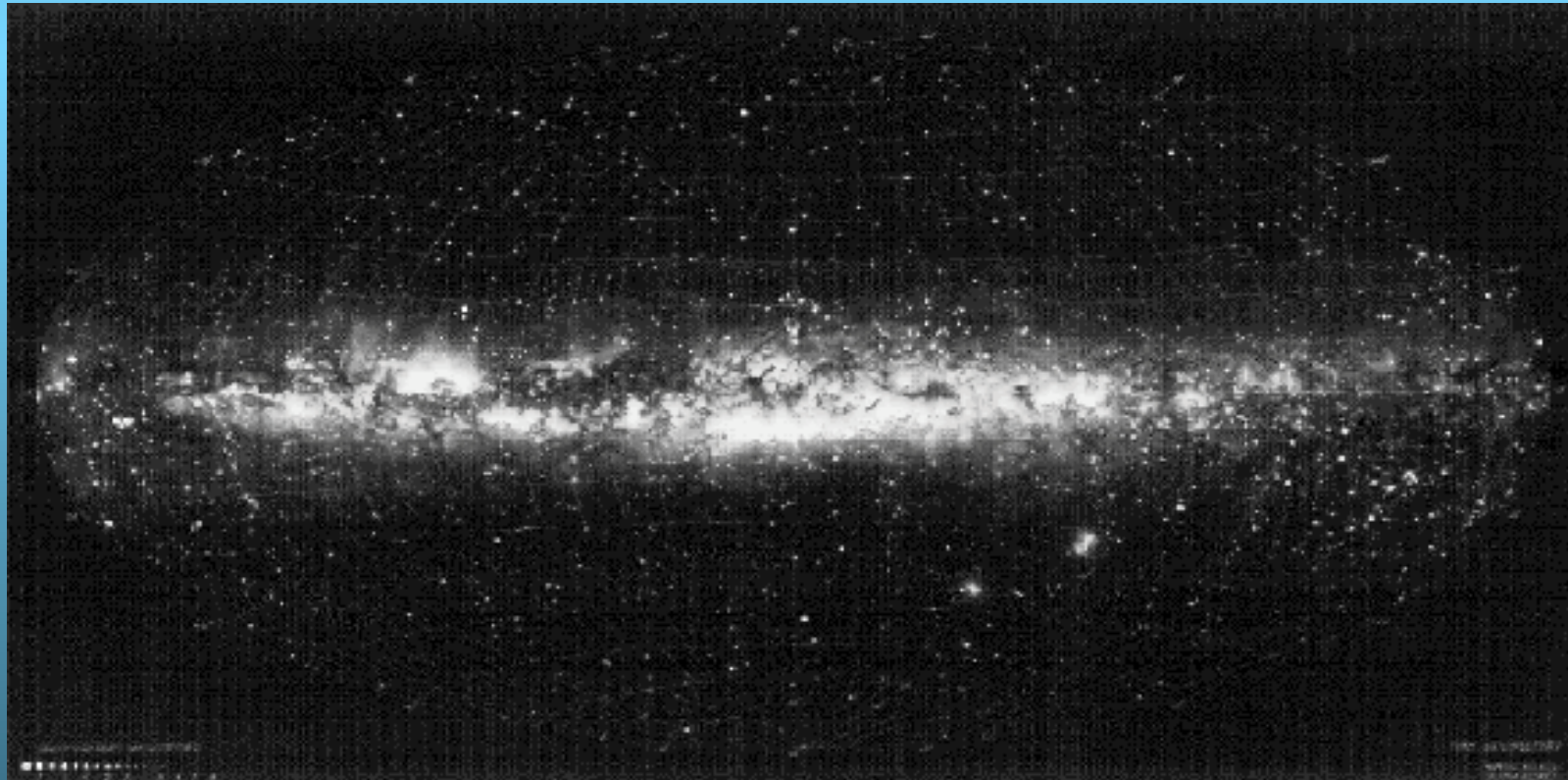
Compton - Gamma Ray Observatory





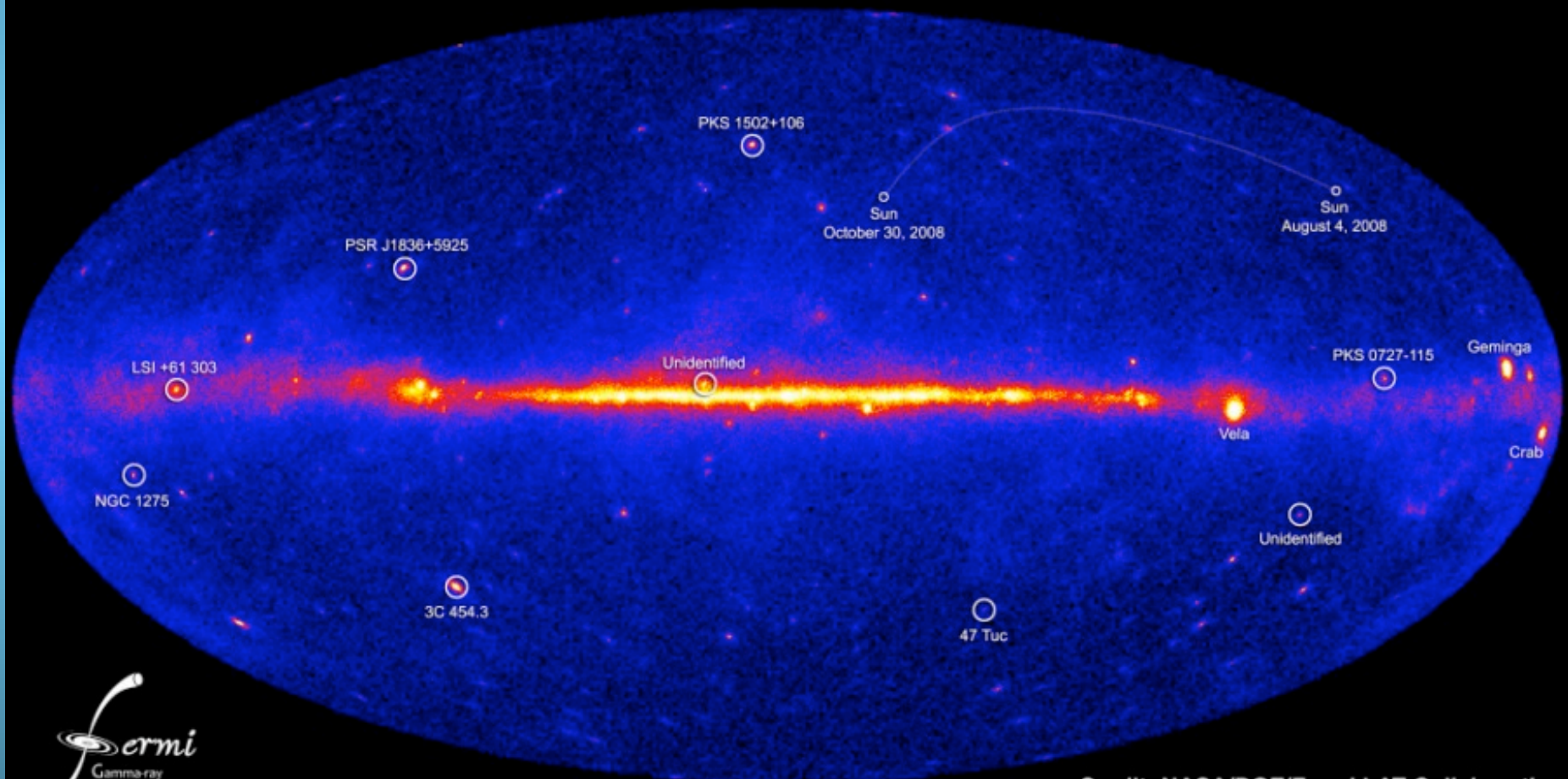
© Mark A. Garlick / space-art.co.uk

La Via Lattea dall'interno



Provengono dal piano galattico?

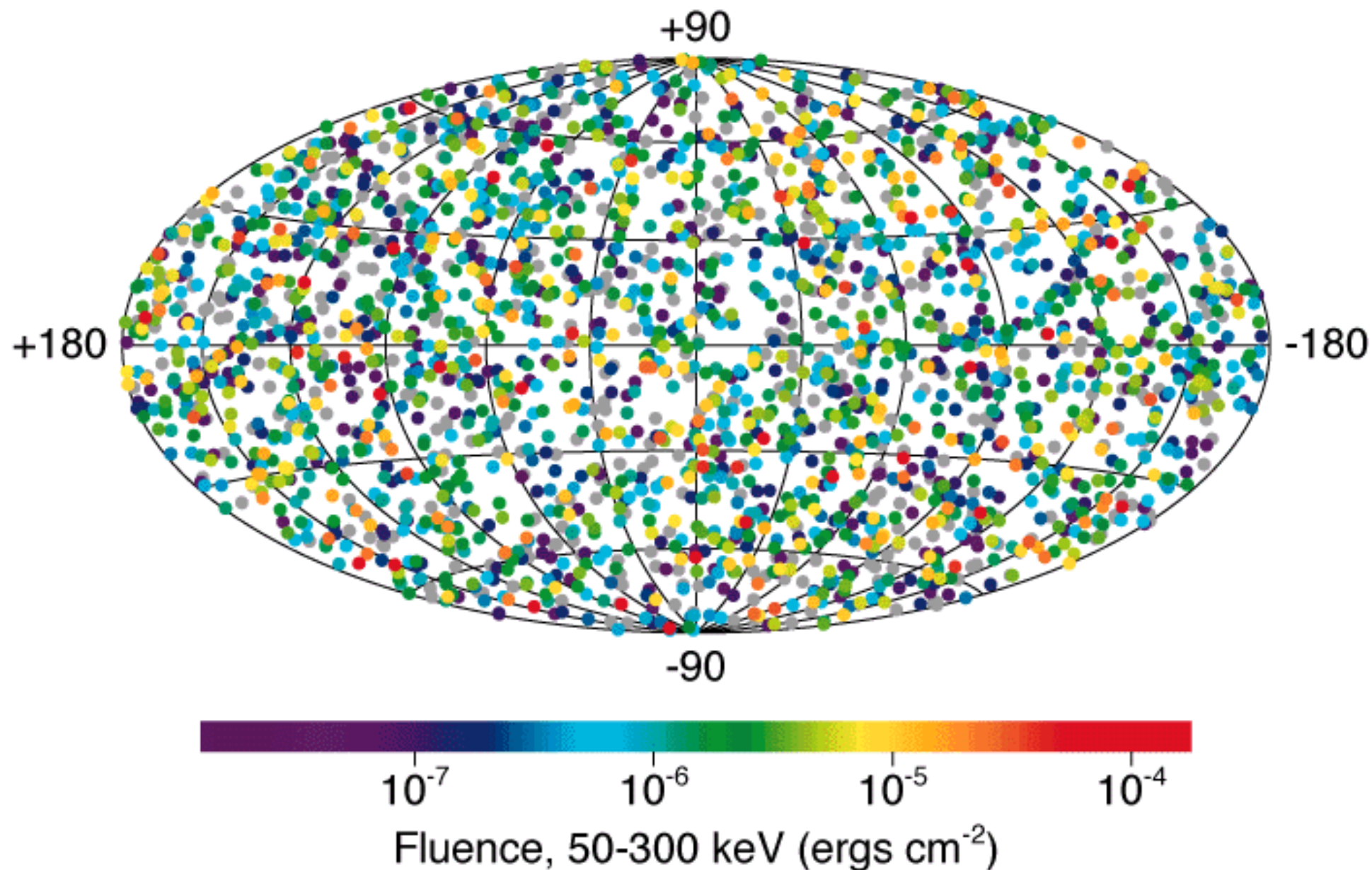
NASA's Fermi telescope reveals best-ever view of the gamma-ray sky



fermi
Gamma-ray
Space Telescope

Credit: NASA/DOE/Fermi LAT Collaboration

2512 BATSE Gamma-Ray Bursts



1996

Beppo SAX deve il suo nome a Giuseppe "Beppo" Occhialini

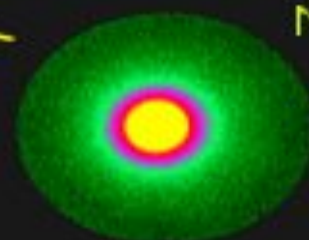
Beppo SAX

(Agenzia Spaziale Italiana con la partecipazione della Netherlands Agency for Aerospace Programs)

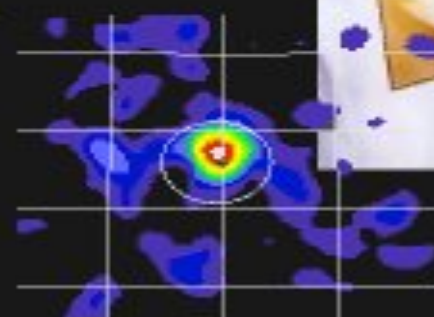
Energia:
0.1 - 300 keV

Beppo SAX studia anche

AGN...

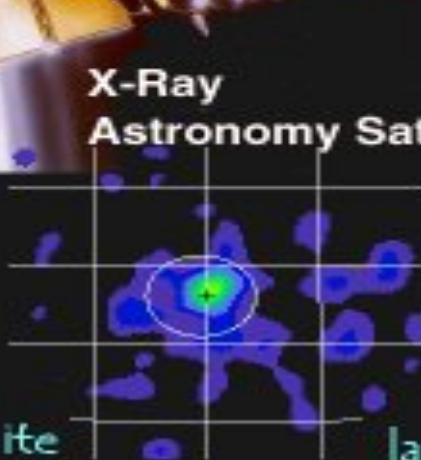


Nane bianche, stelle di neutroni e buchi neri



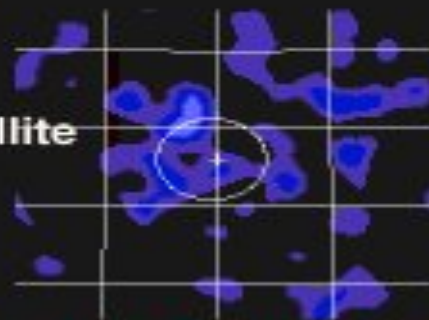
Beppo SAX

è il primo satellite



X-Ray Astronomy Satellite

in grado di indentificare



di un lampo gamma

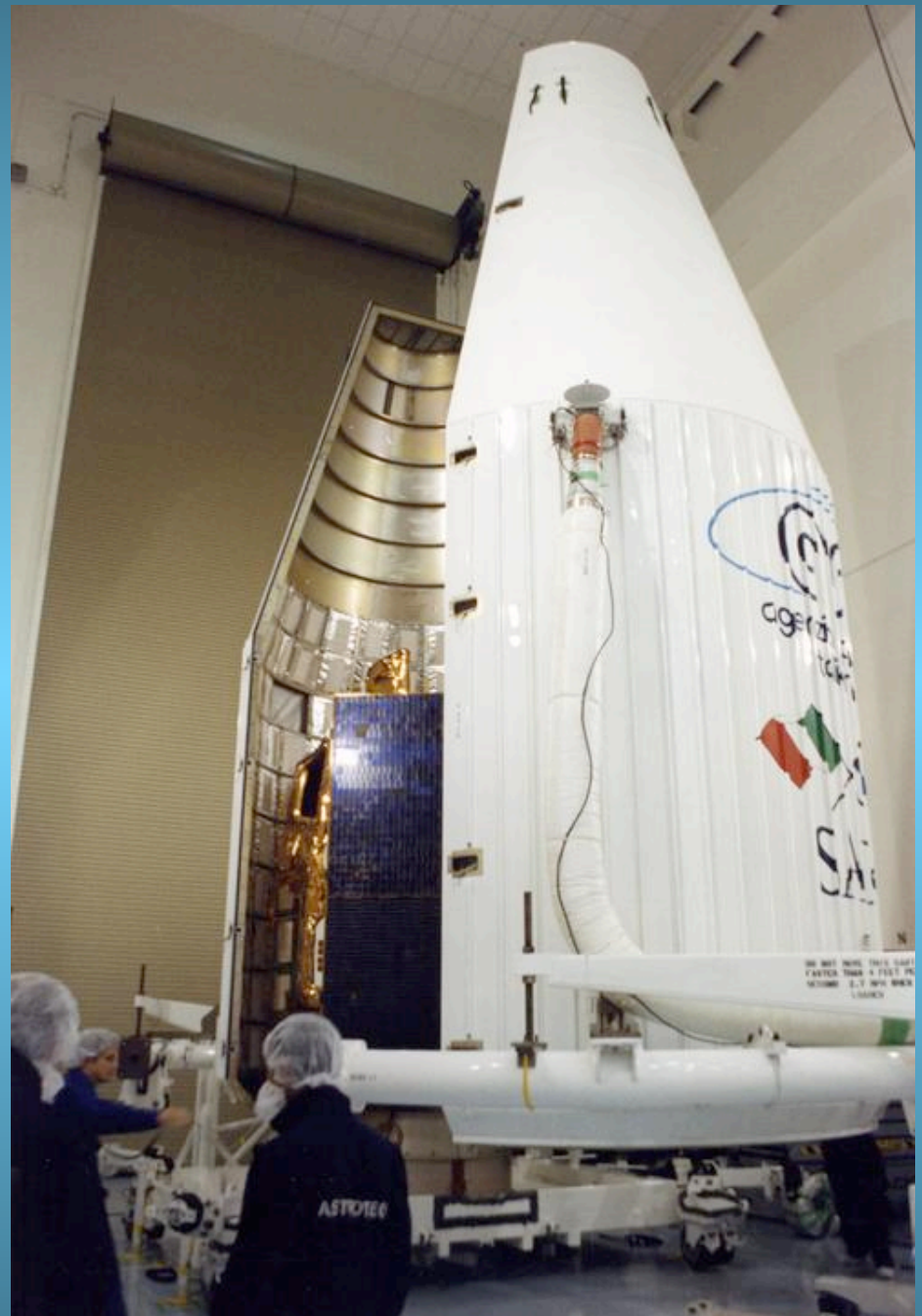
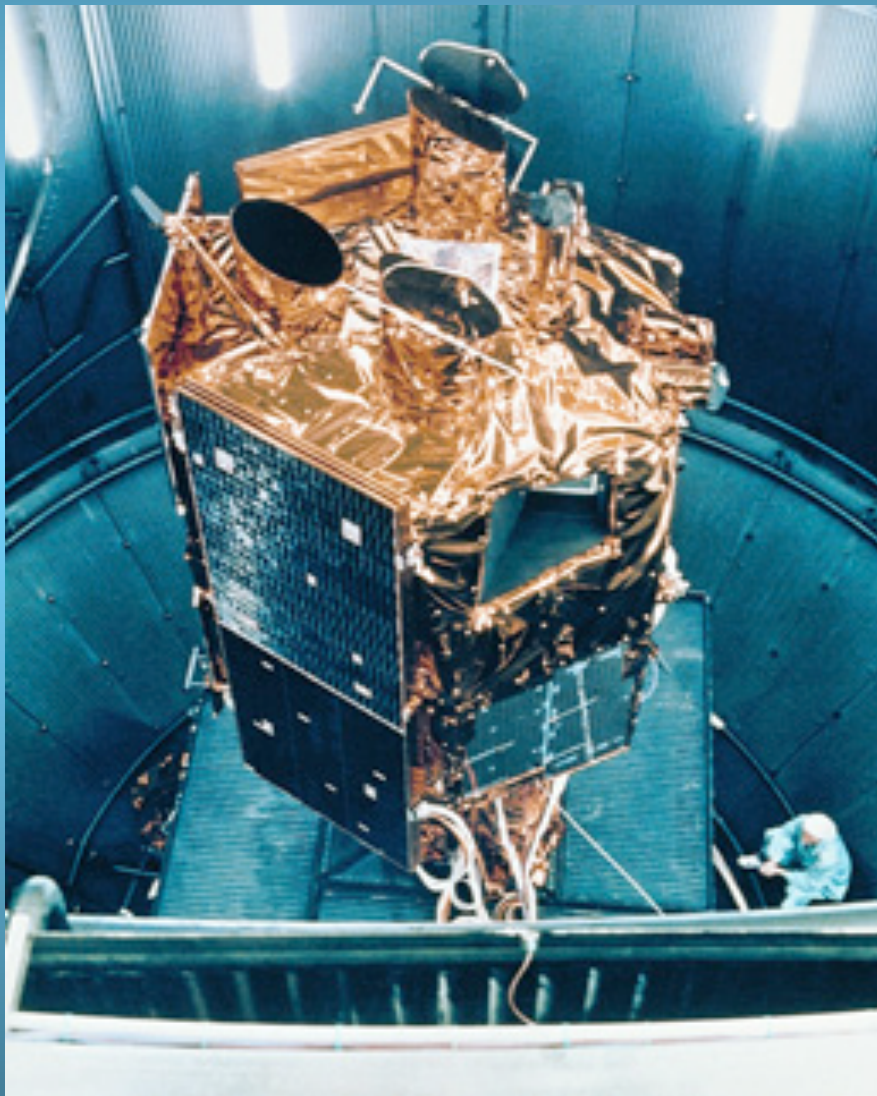
la controparte X

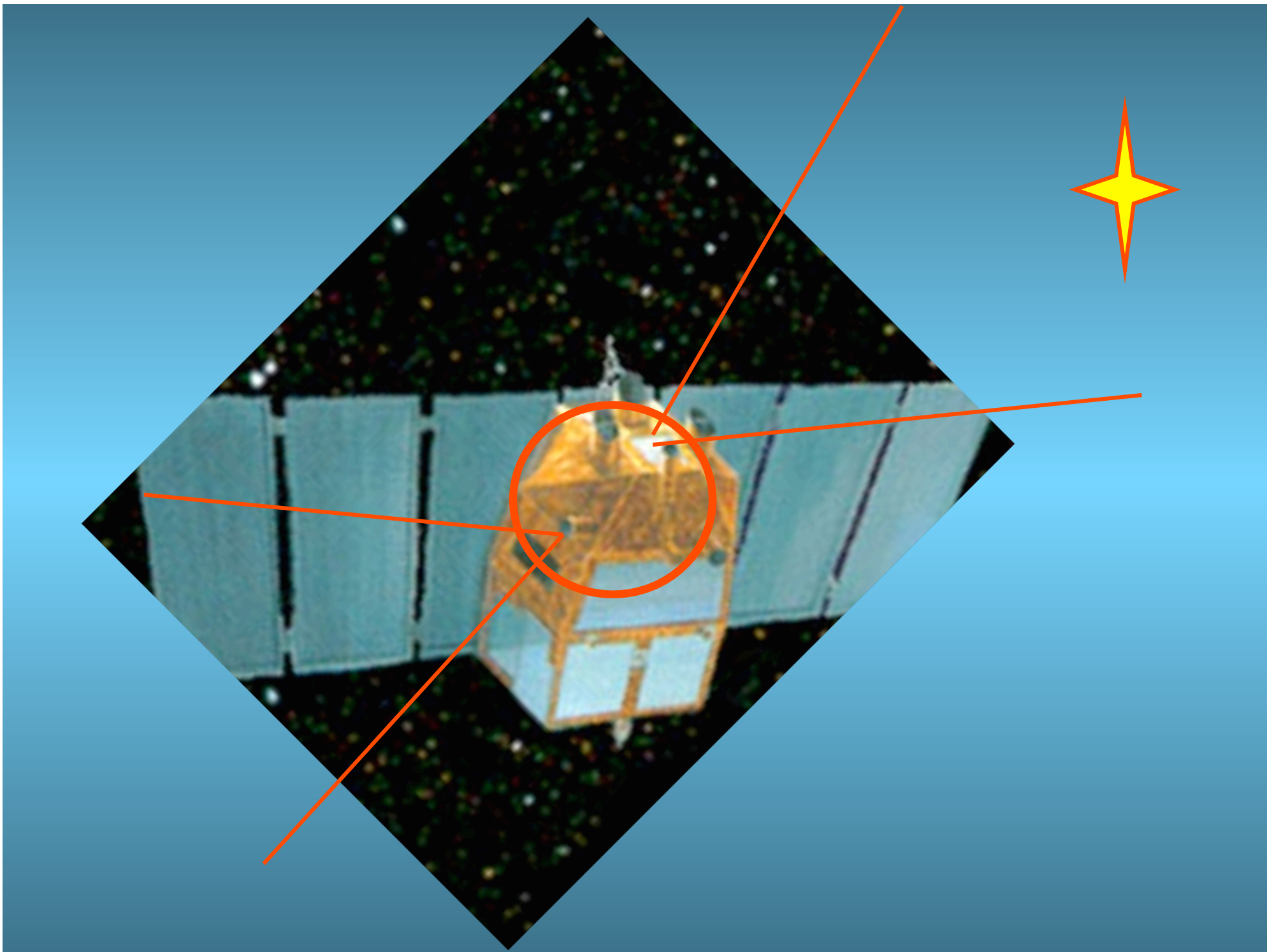
Ammassi di galassie ...

Residui di supernova ...

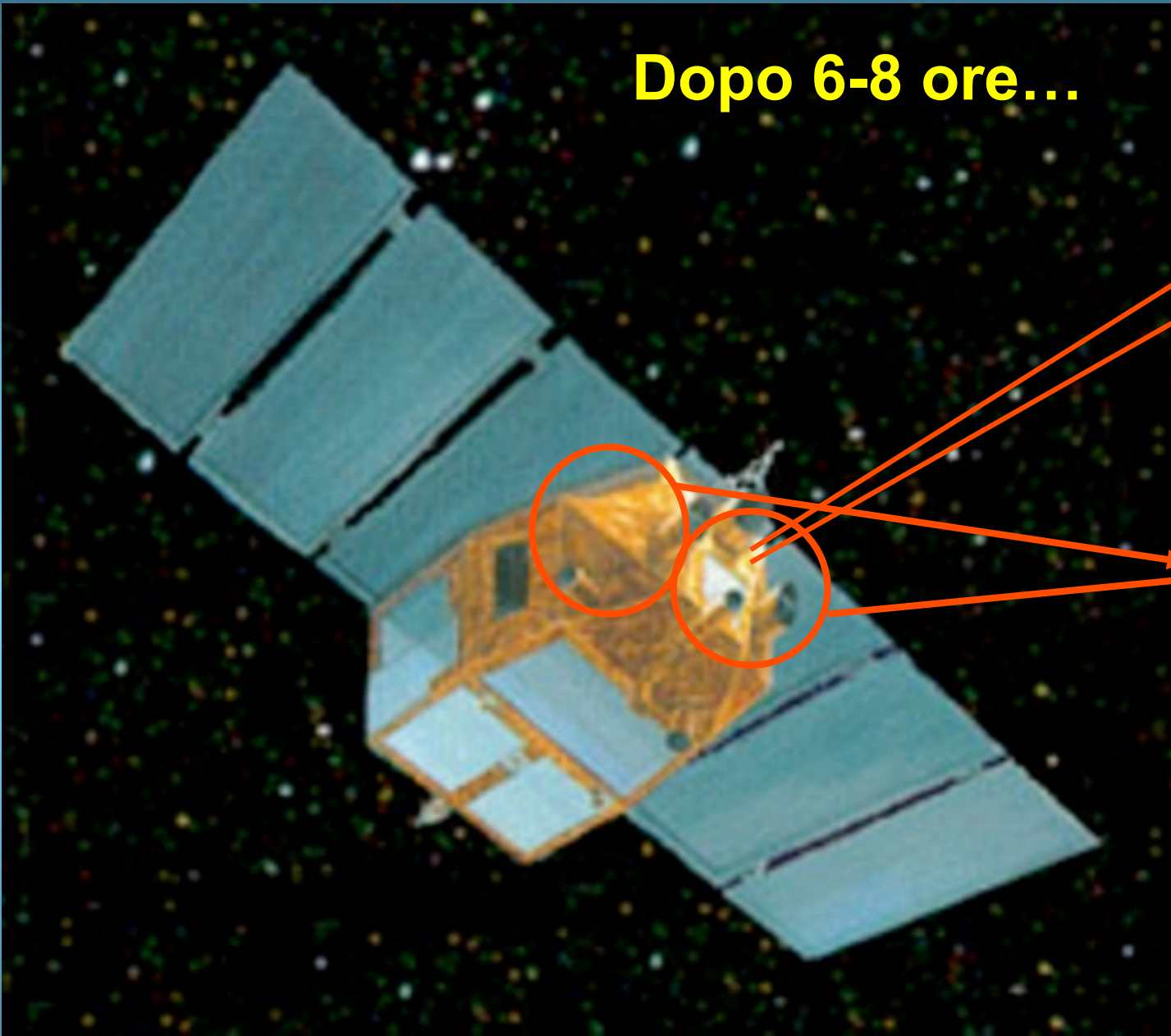
Galassie

BeppoSAX





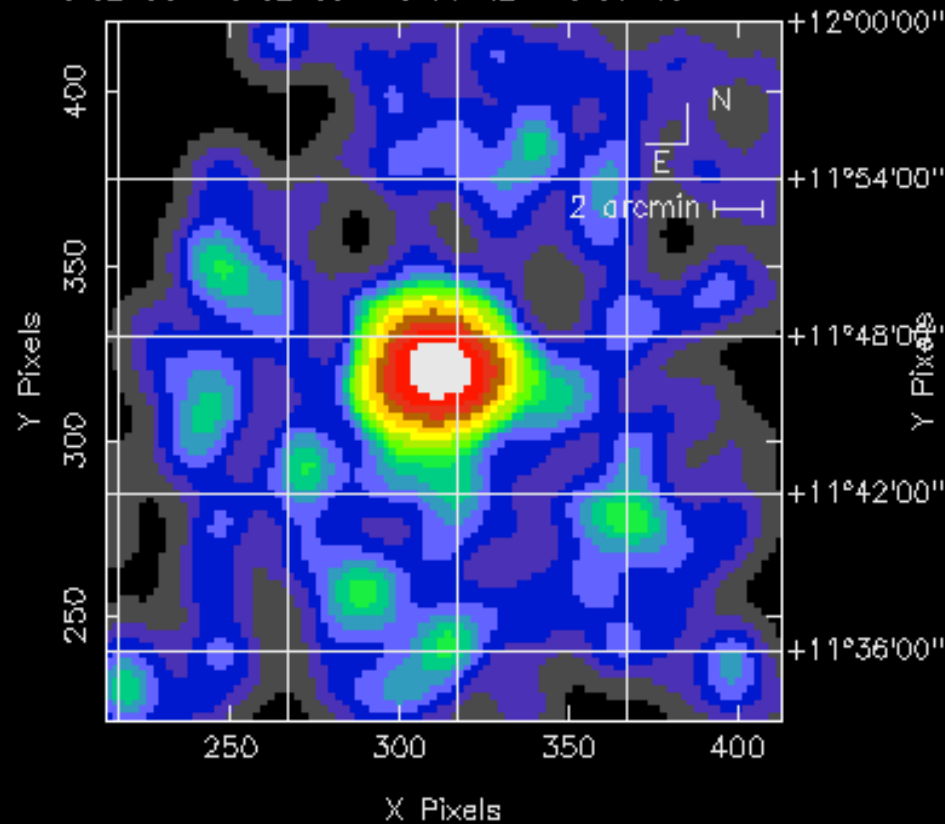
Dopo 6-8 ore...



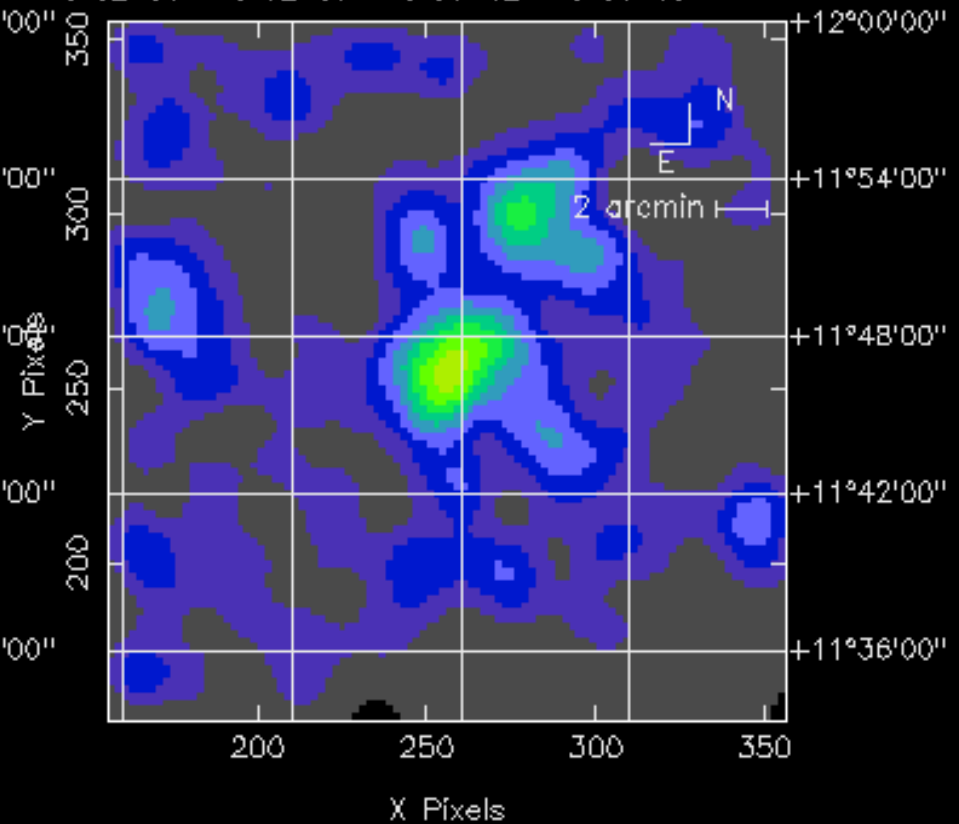
Telescopi X

AFTERGLOW !

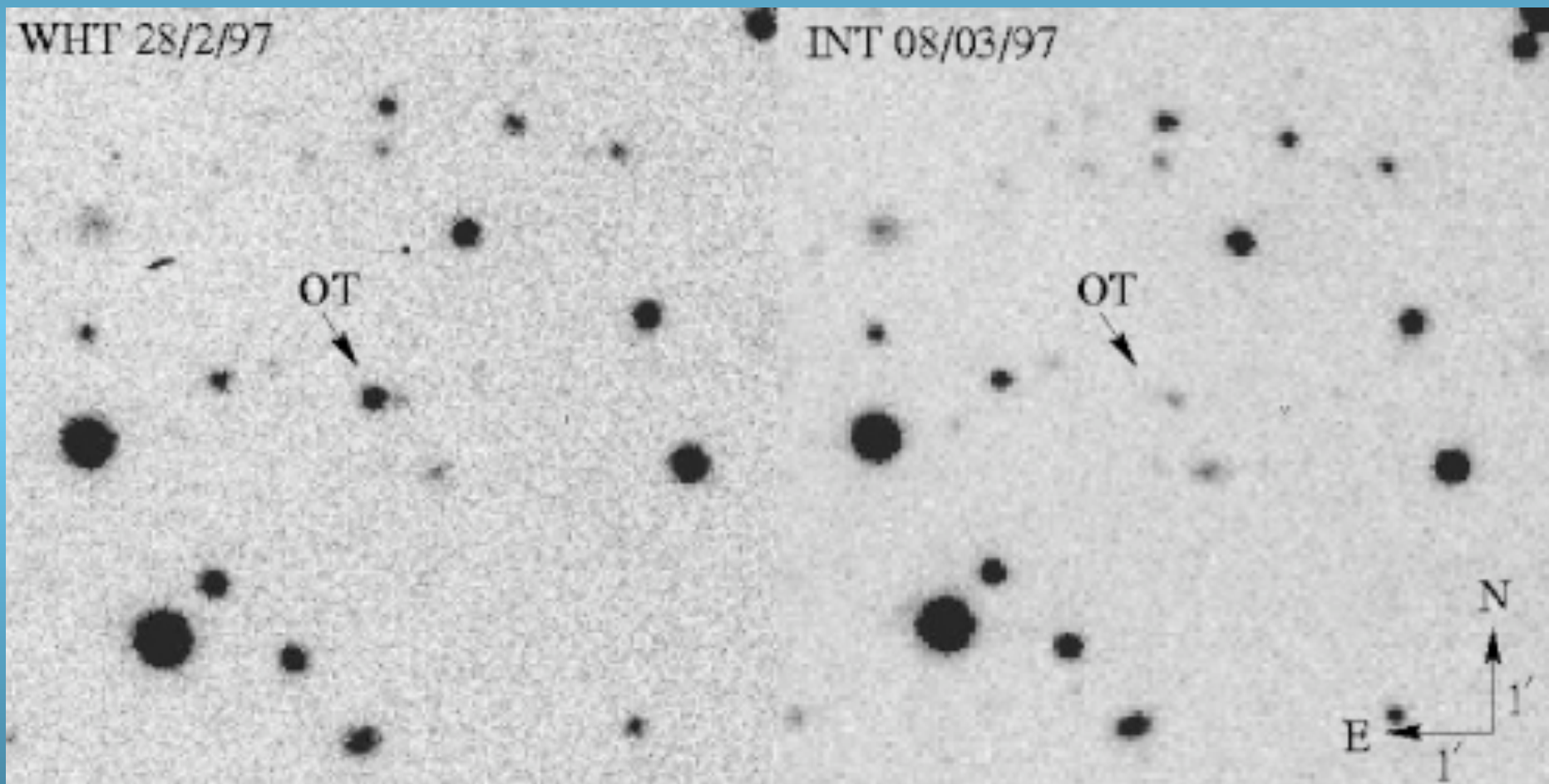
BeppoSAX observation of GRB970228 field
SAX MECS 1997 Feb 28 Exposure: 14334 s
5^h02^m36^s 5^h02^m09^s 5^h01^m42^s 5^h01^m15^s

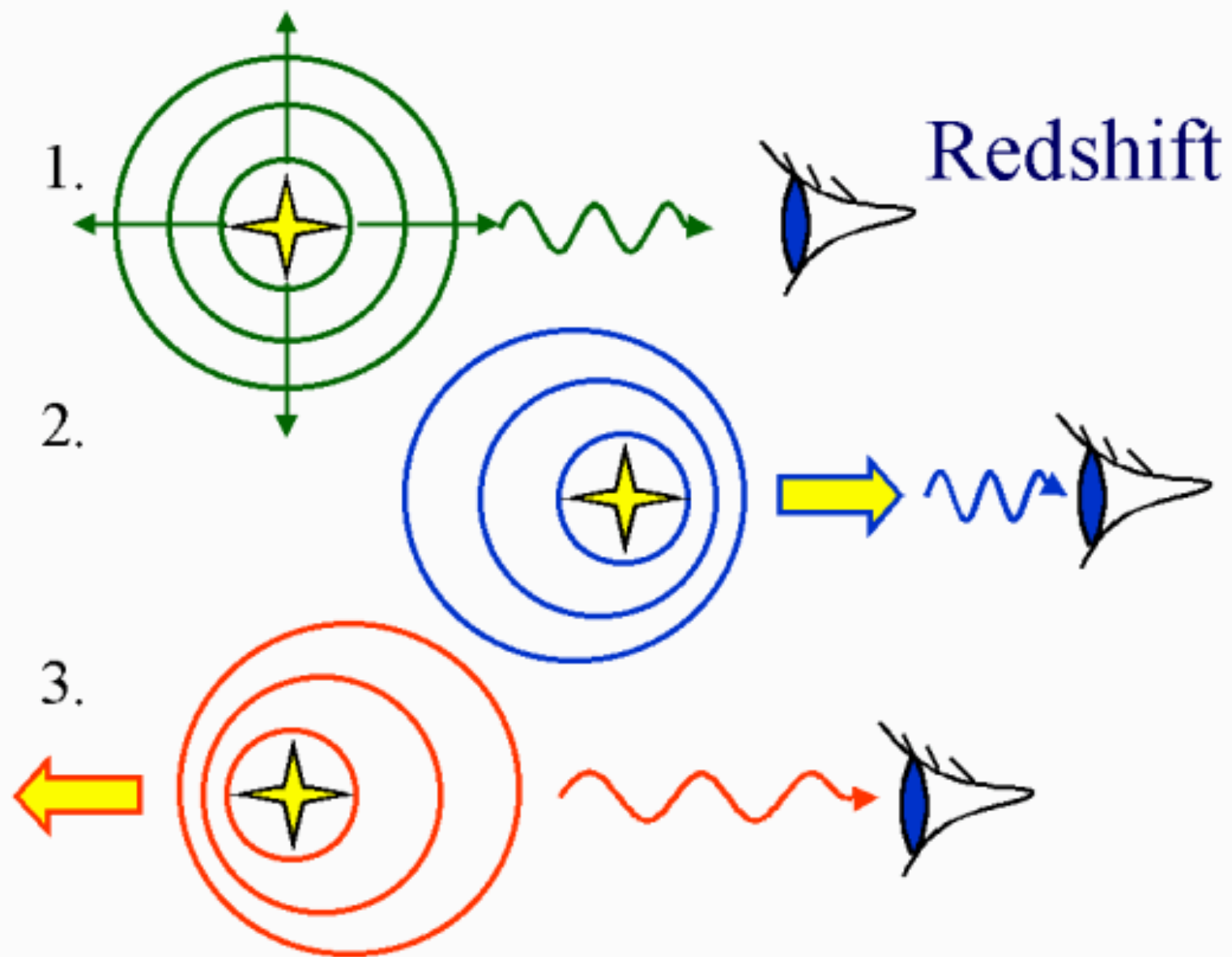


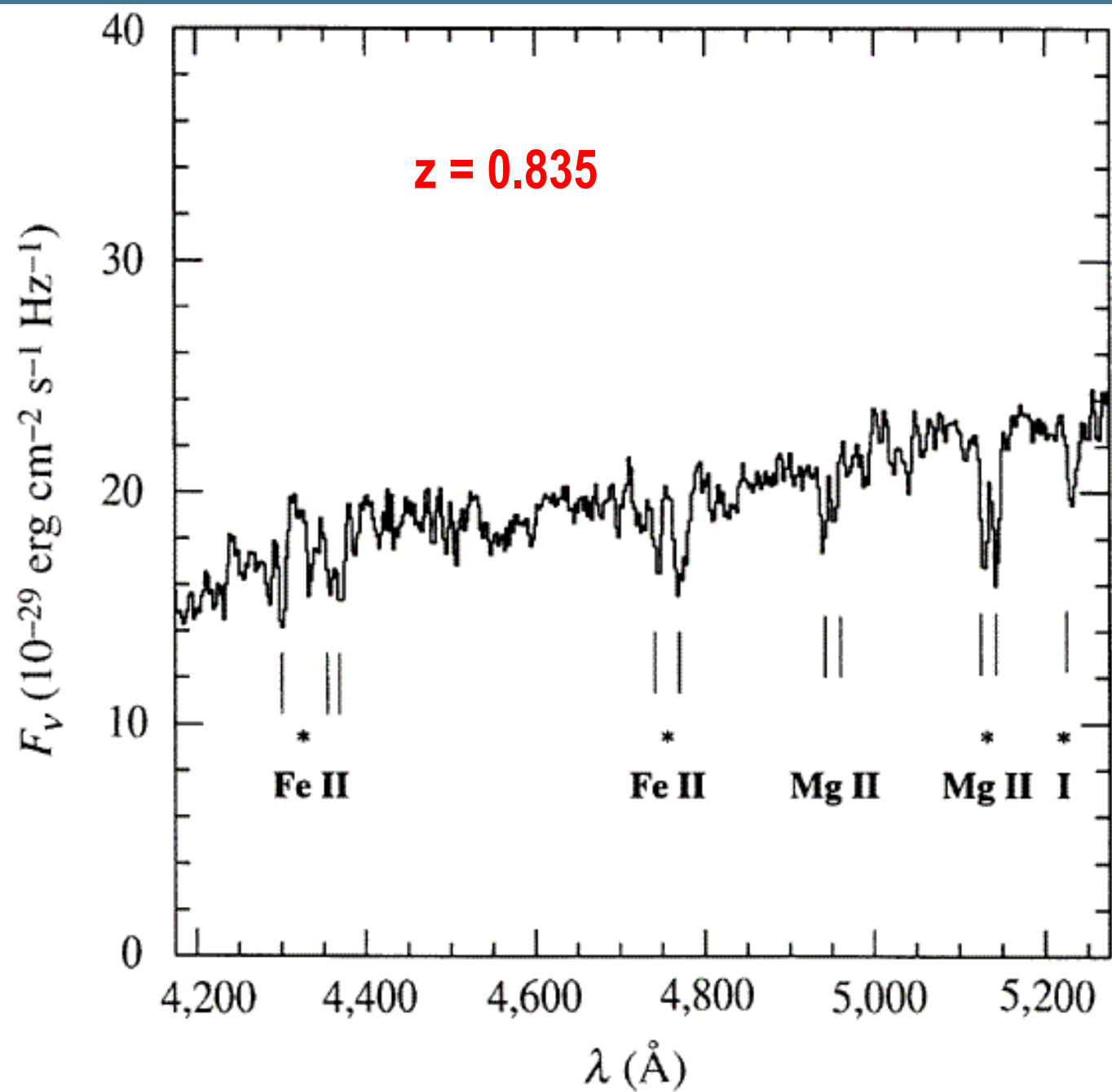
BeppoSAX observation of GRB970228 field
SAX MECS 1997 Mar 3 Exposure: 16272 s
5^h02^m36^s 5^h02^m09^s 5^h01^m42^s 5^h01^m15^s



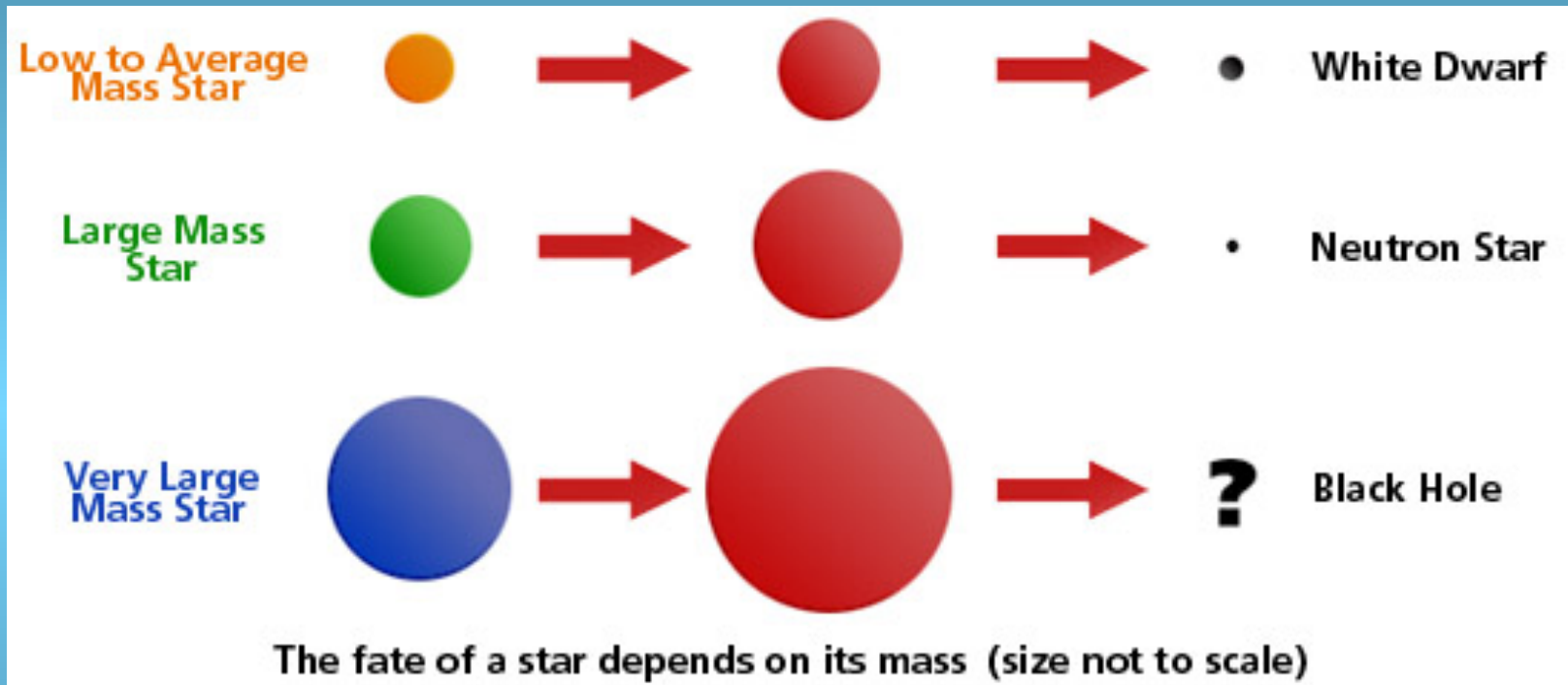
E da terra...







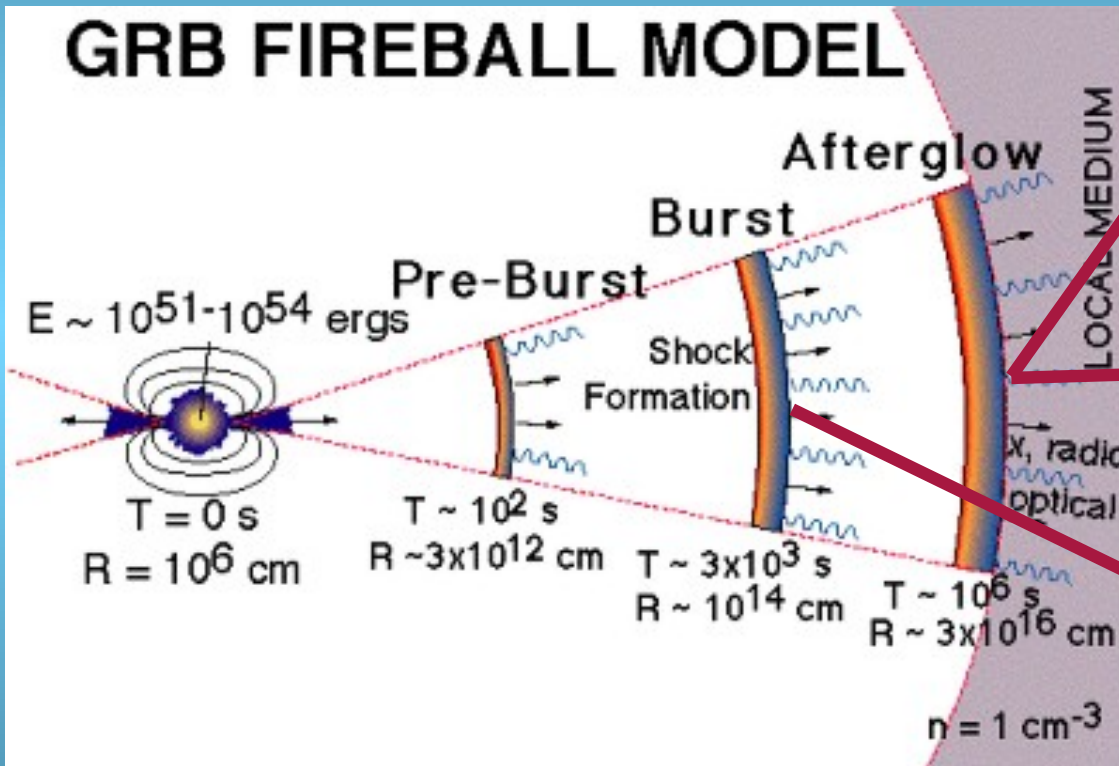
Un breve ripasso di evoluzione stellare...



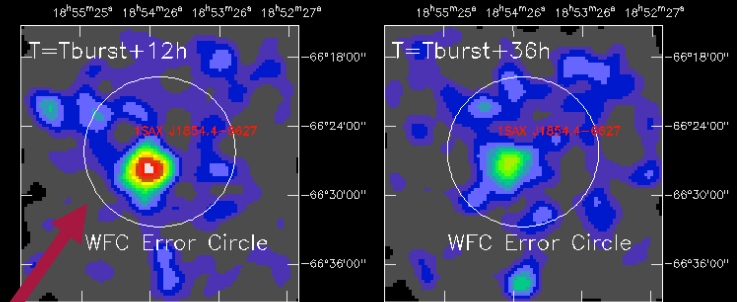
Essenzialmente, le stelle medio-piccole si spengono relativamente dolcemente, le stelle massicce esplodono!

Il modello a fireball

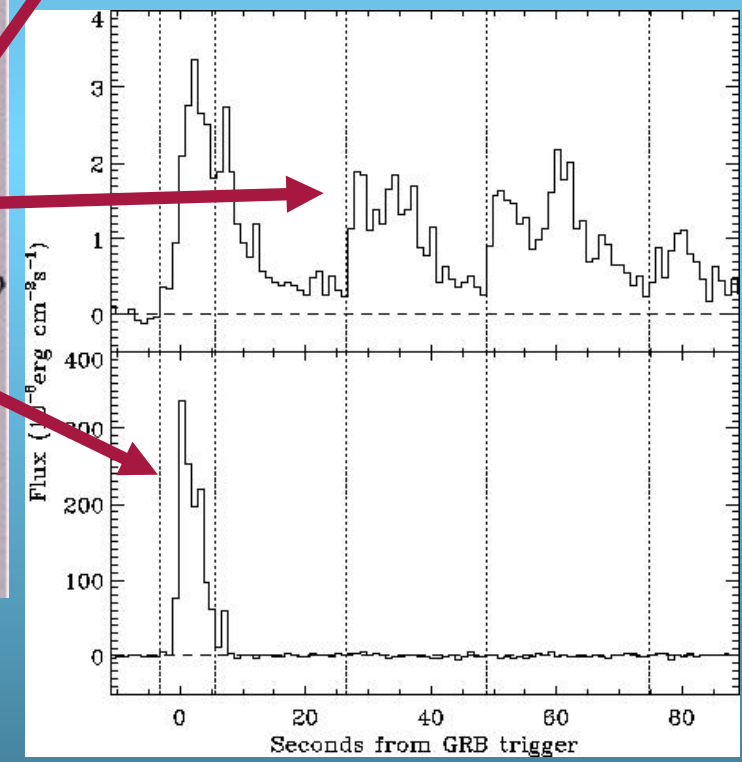
GRB FIREBALL MODEL



GRB 000214 X-ray afterglow (BeppoSAX MECS)

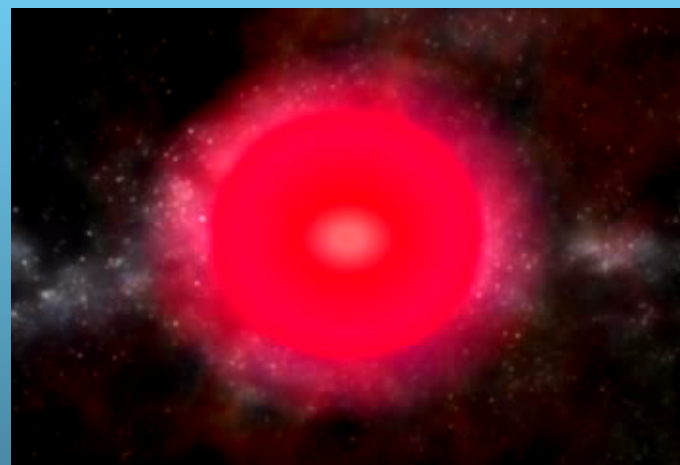


(Antonelli et al., 2000, Ap.J.Lett., in press)





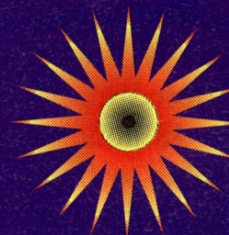
I progenitori dei GRB



Merging neutron stars



Binary neutron stars spiral into each other

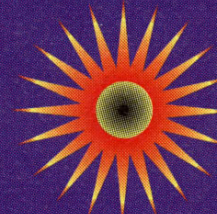


Neutron stars merge into a black hole, creating a gamma ray burst

Classical hypernova model



Core collapses into a black hole

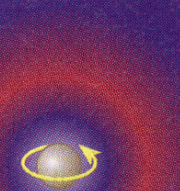


Star explodes; gamma ray burst ensues

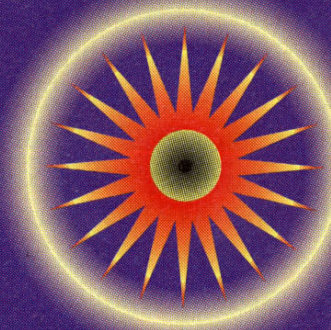
Supernova model of Vietri and Stella



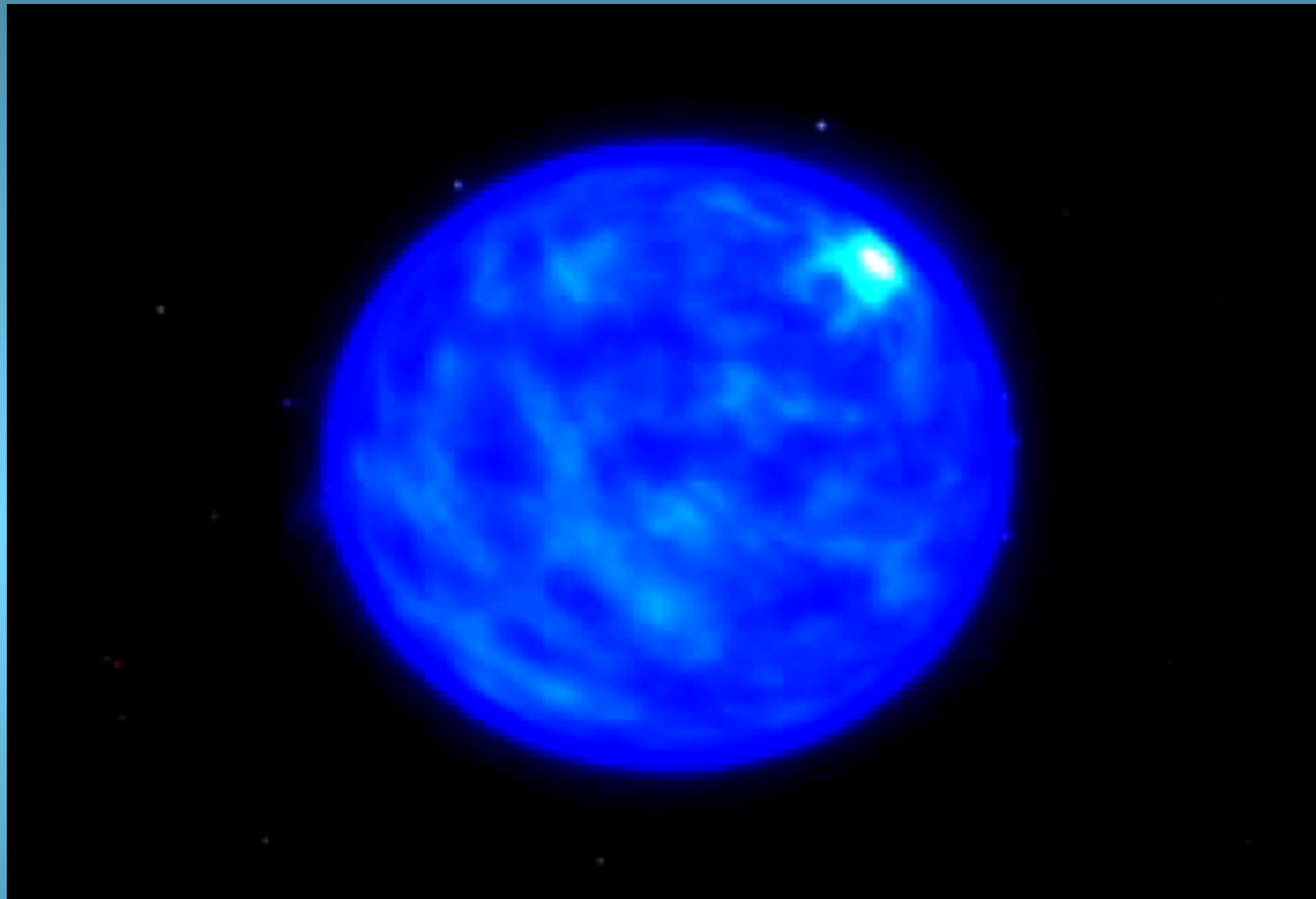
Very massive, rapidly spinning star



Star explodes as supernova, leaving behind a rapidly spinning neutron star

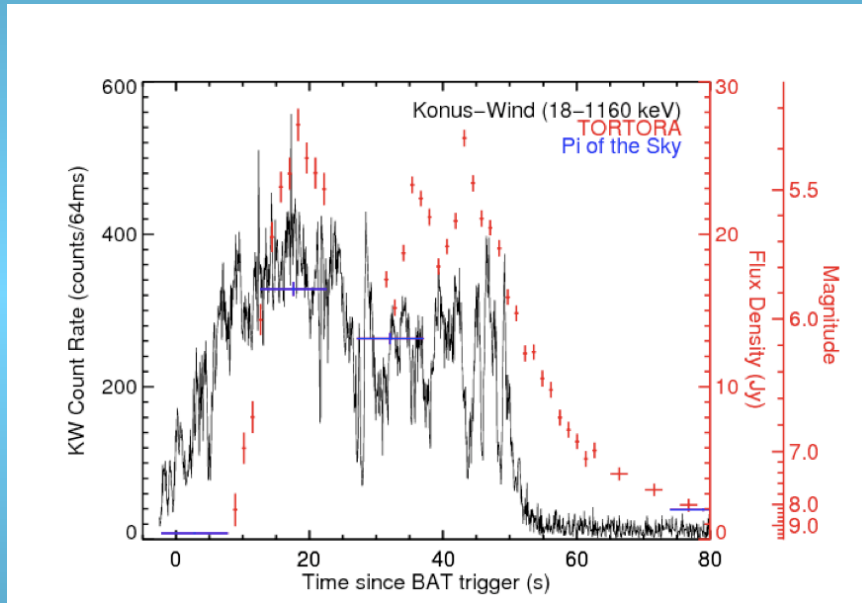


Neutron star collapses into a black hole, creating a gamma ray burst that lights up the older supernova shell

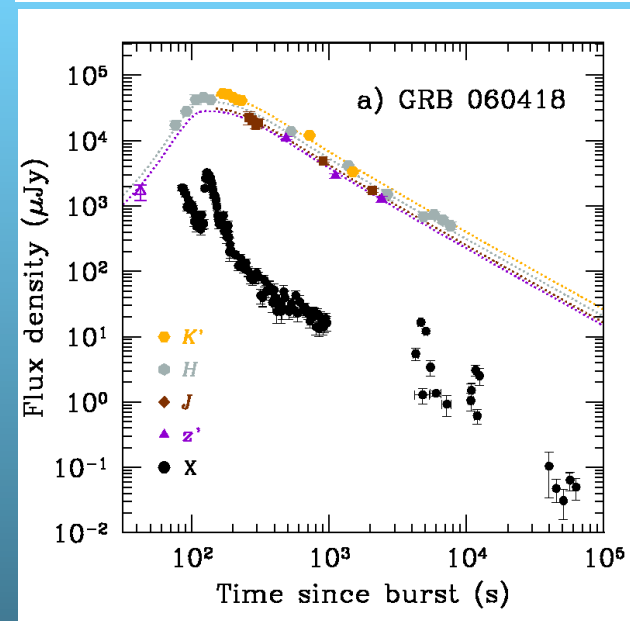
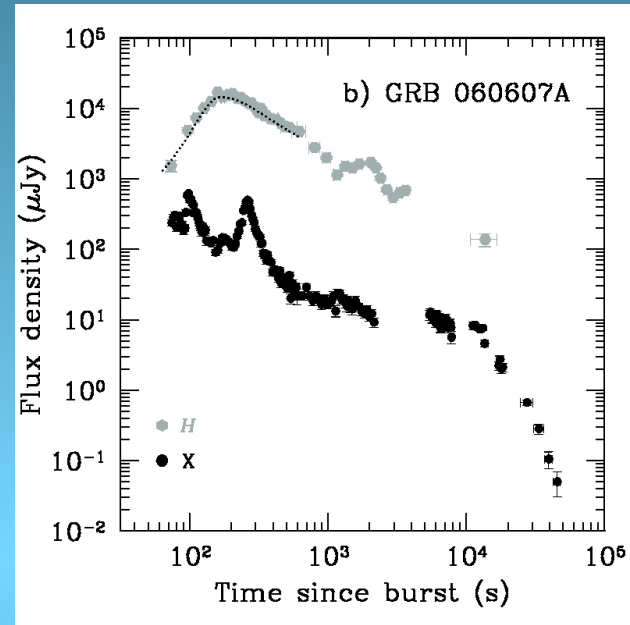


Una possibile descrizione di un GRB

I GRB sono fenomeni rapidi...

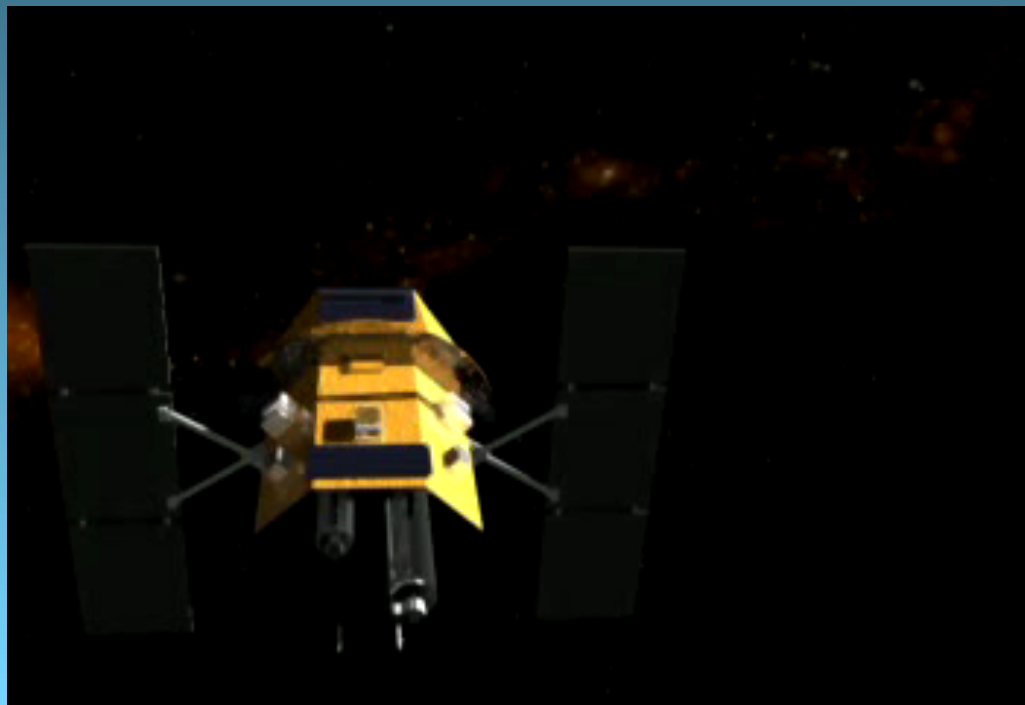


GRB080319B



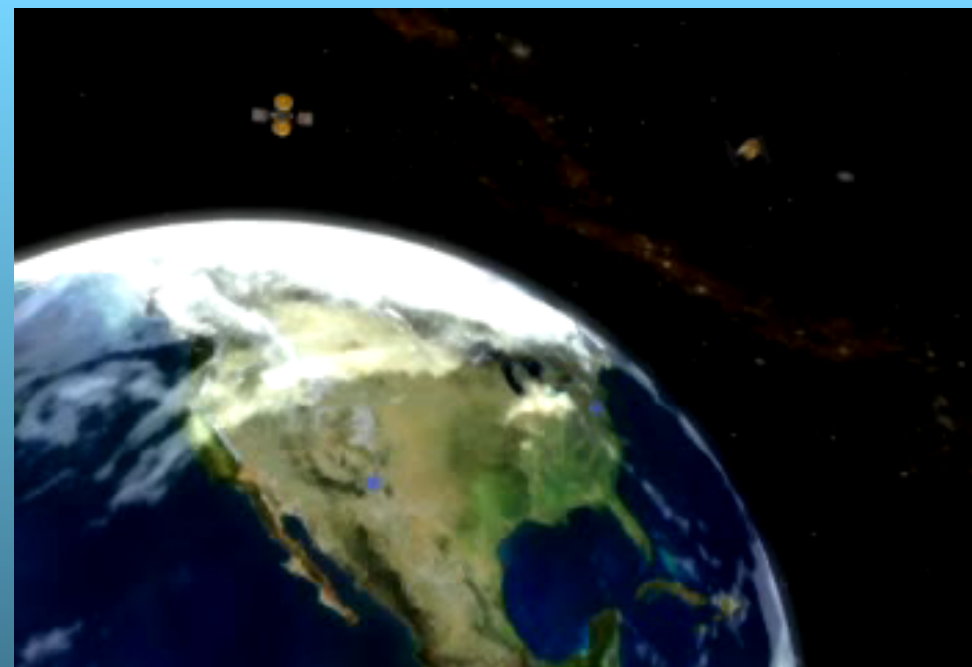
Swift





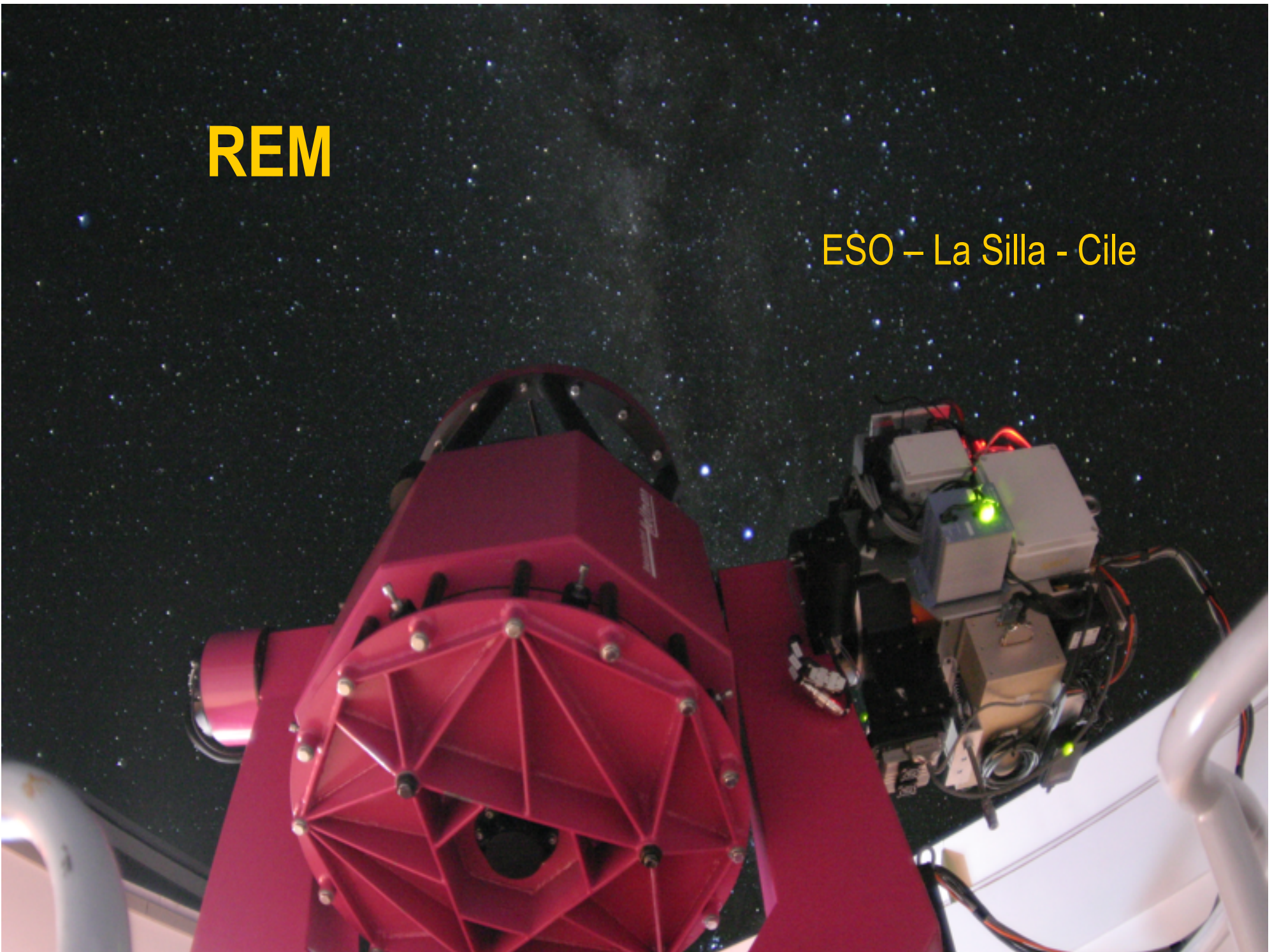
Cosa fa Swift?

E cosa fa fare...?



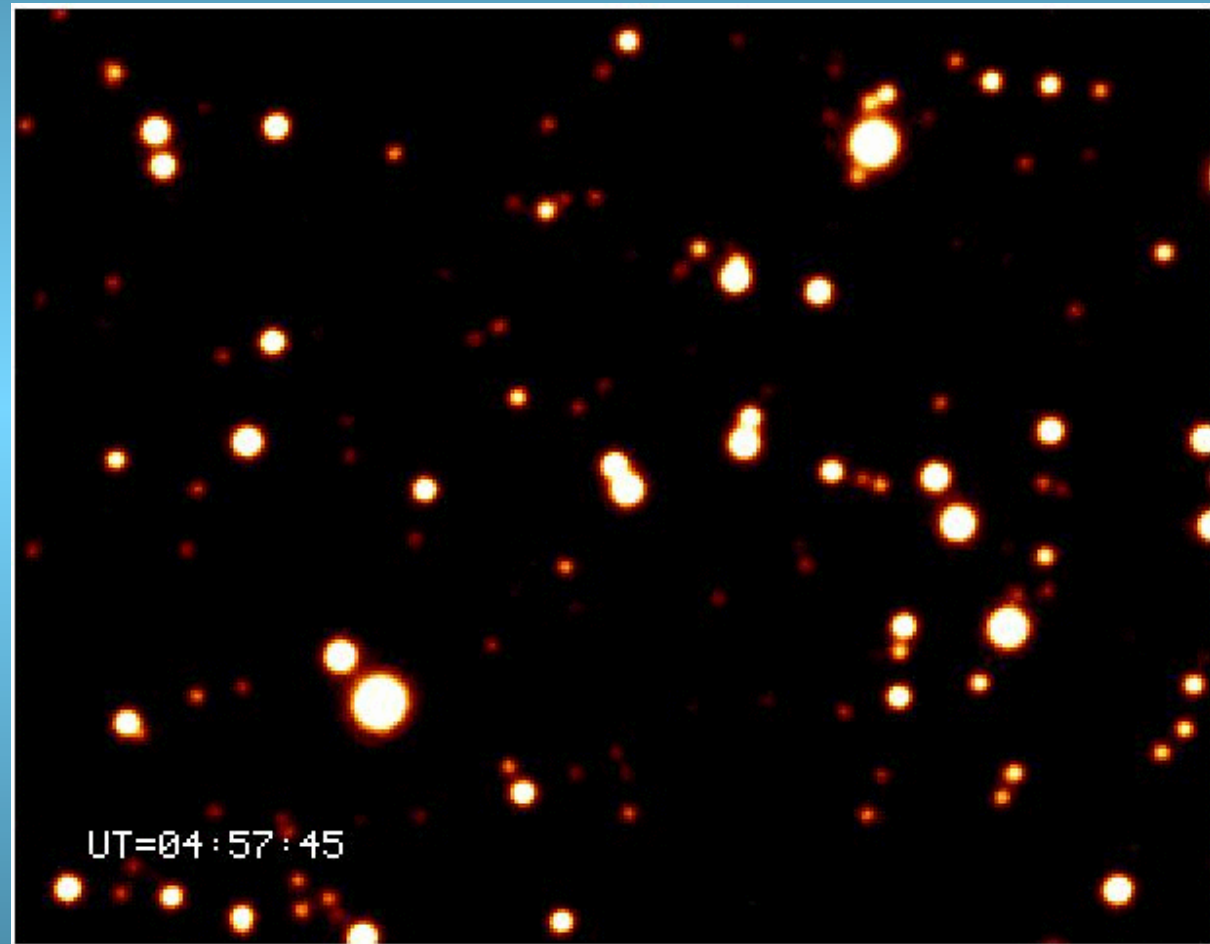
REM

ESO – La Silla - Chile

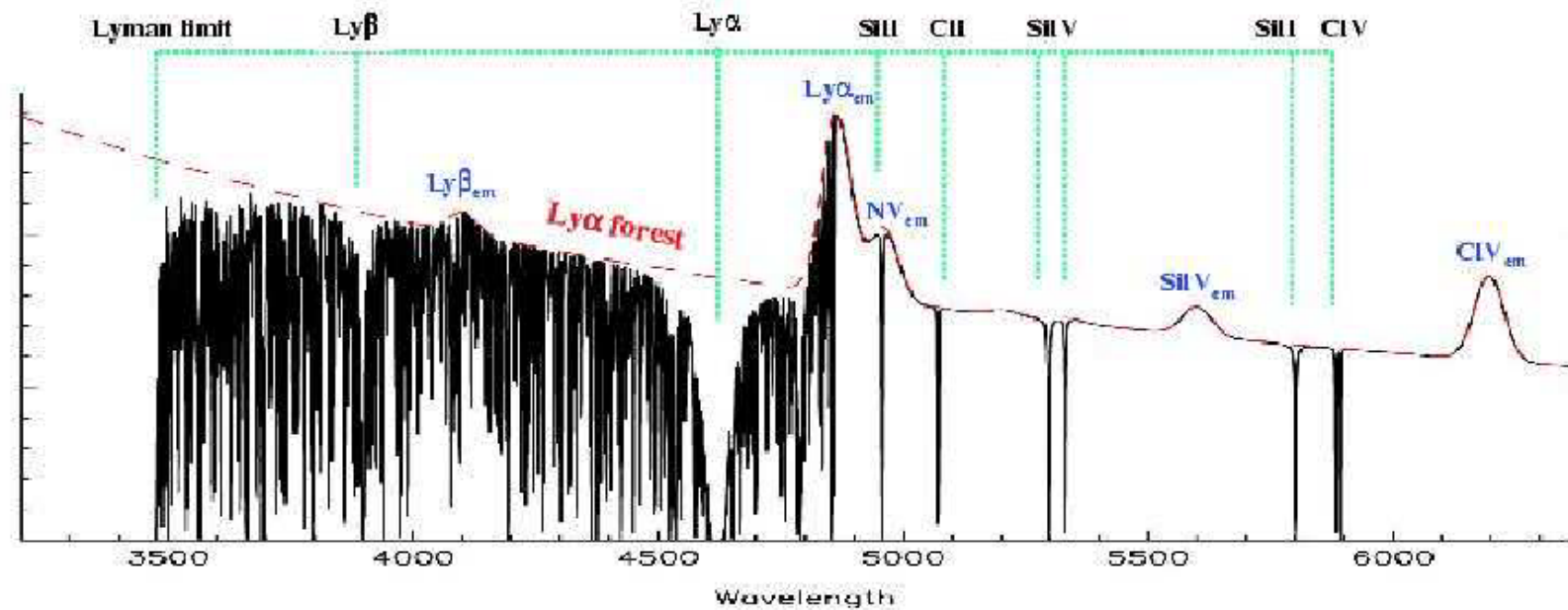
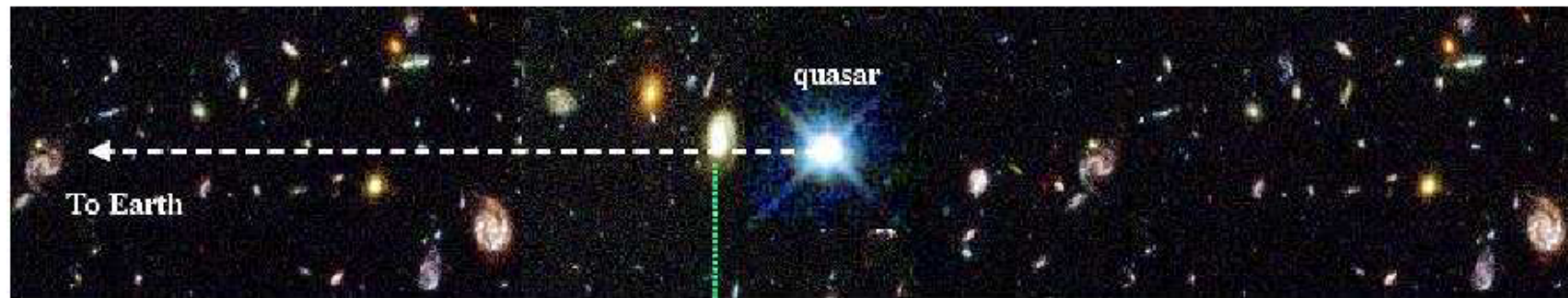


GRB 050721

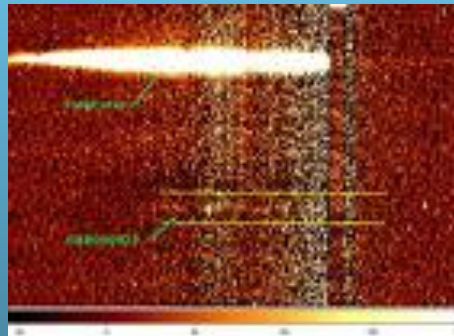
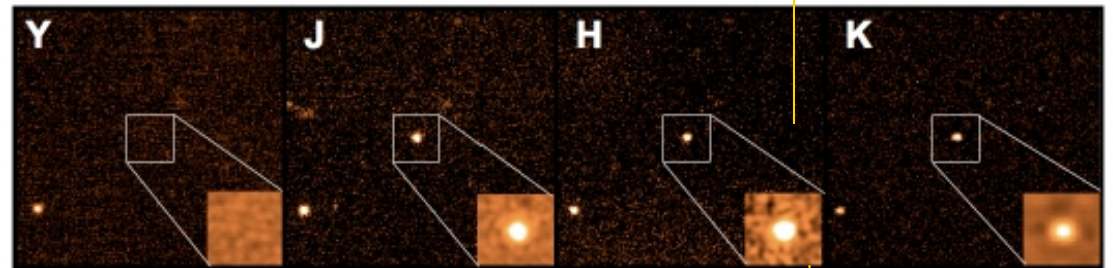
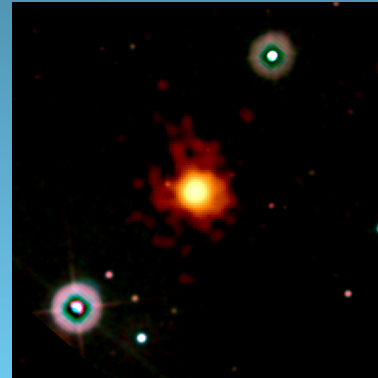
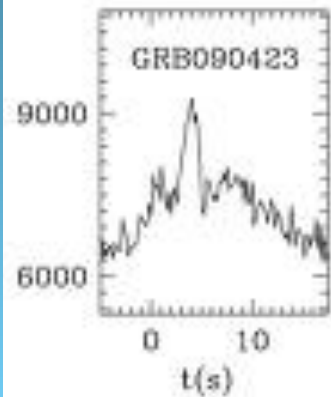
Filmato di D. Fugazza



GRB => una tomografia dell'Universo



GRB 090423



Telescopio
Nazionale
Galileo

Z ~ 8.2!

