Wind-Type Atmosphere Models for Novae in the SSS Phase

Daniel R. van Rossum

University of Chicago, Flash Center

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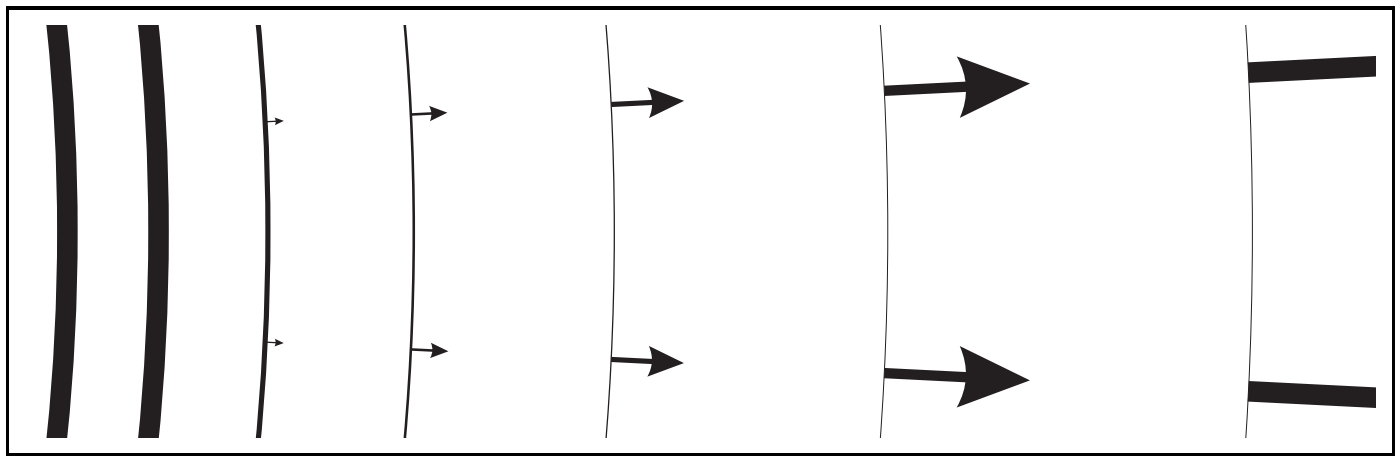
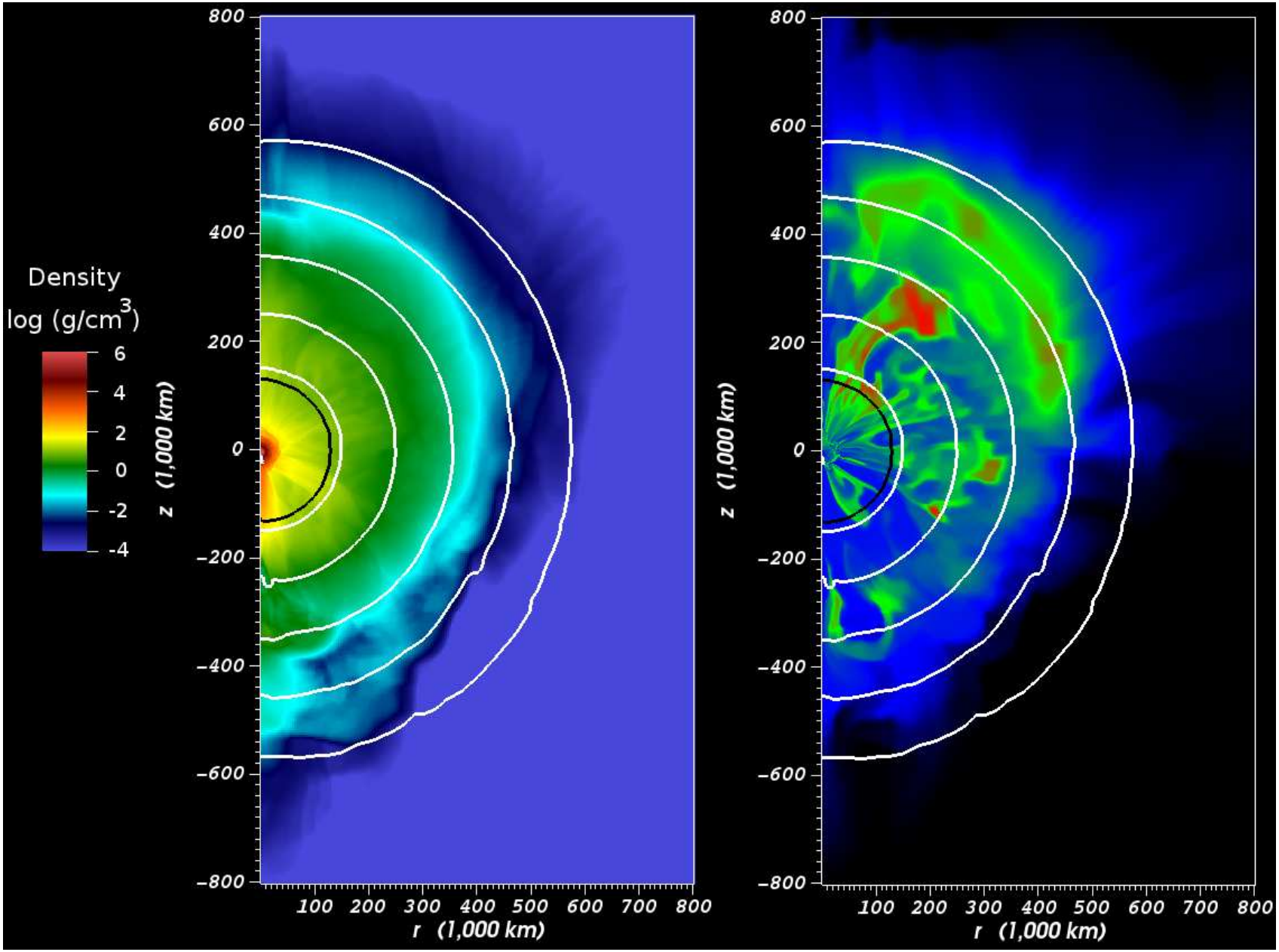
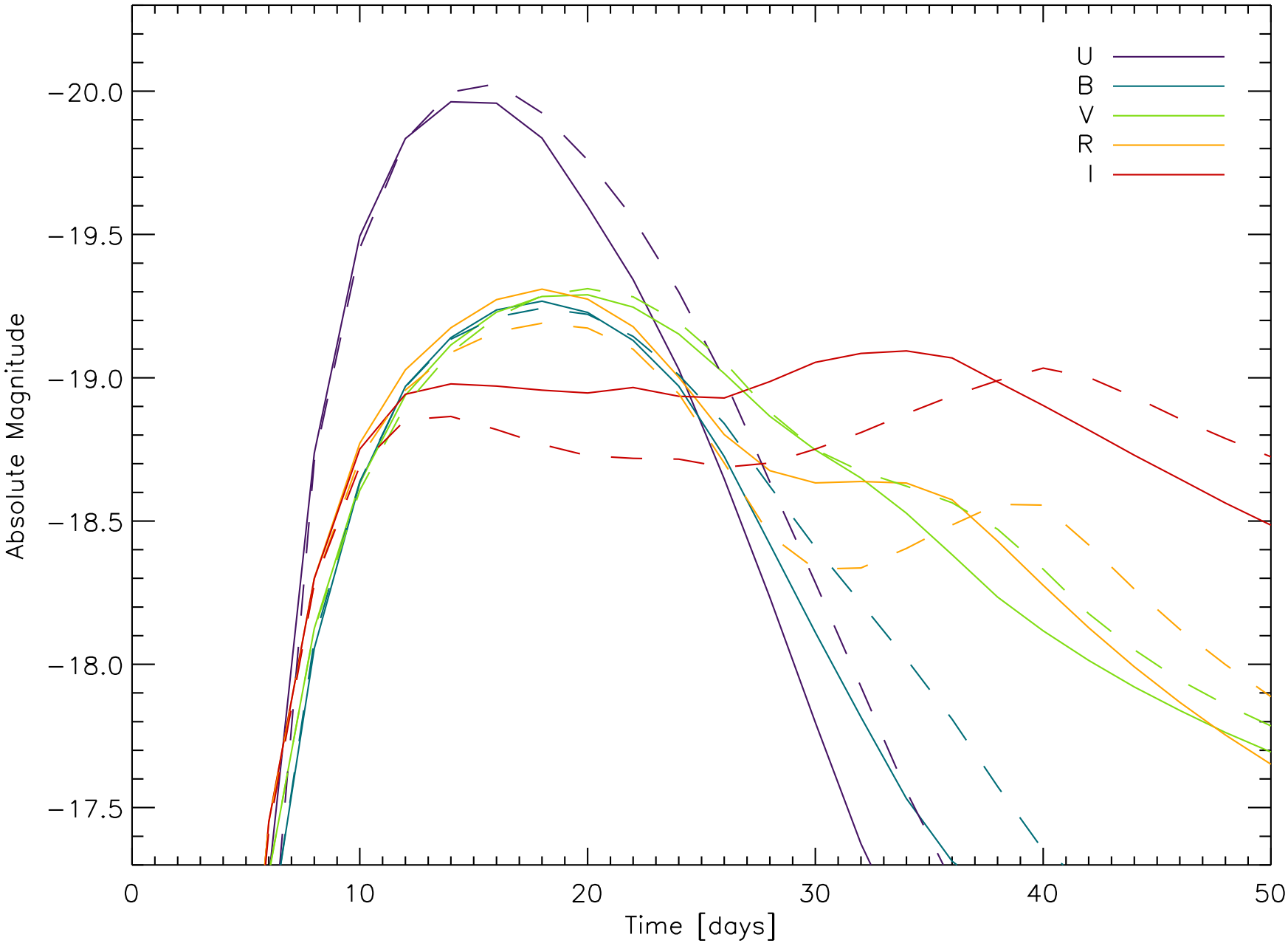


Outline

FLASH - SN Ia Explosion modeling



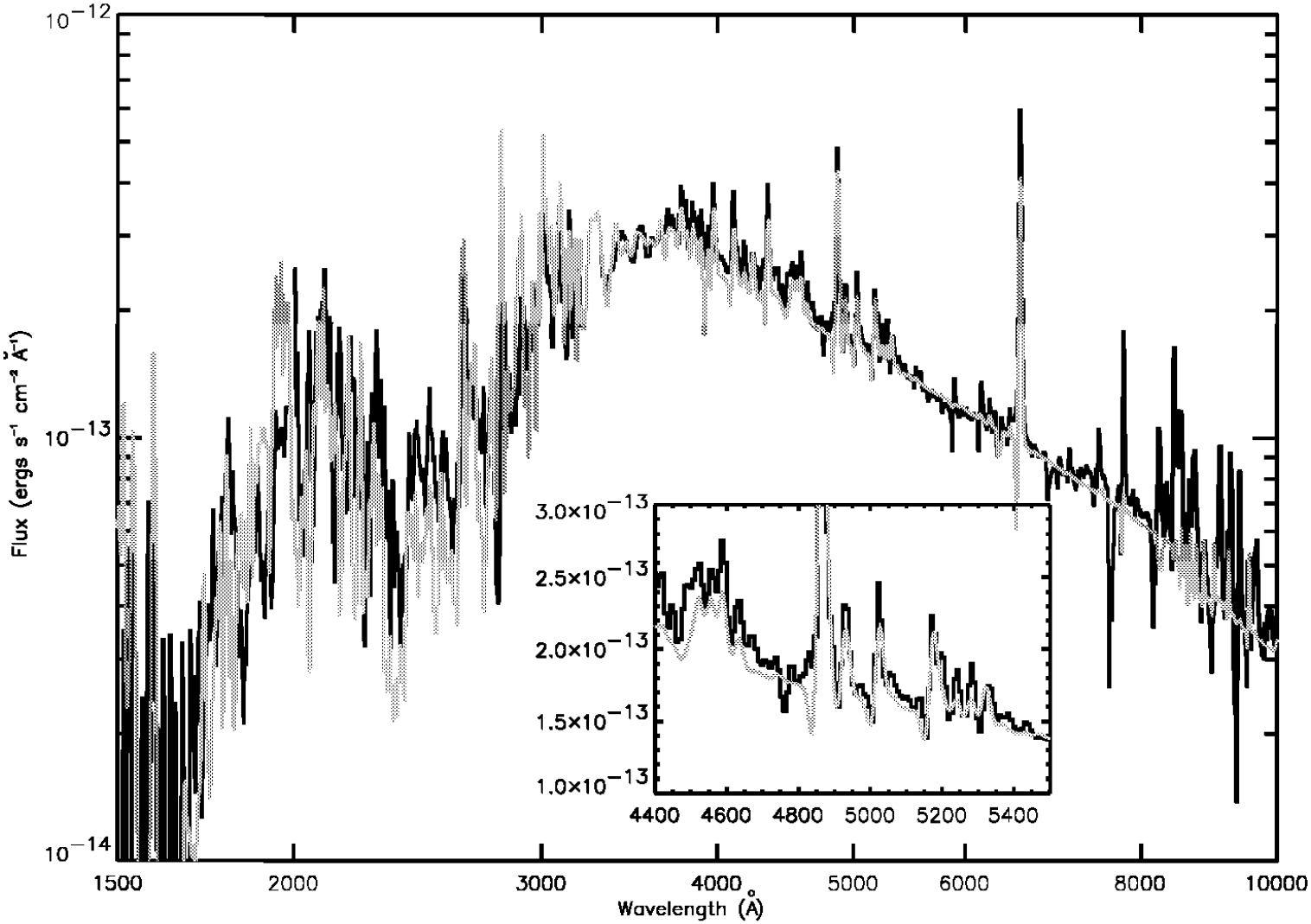
SN Ia Light Curves - NLTE vs LTE



Main collaborators

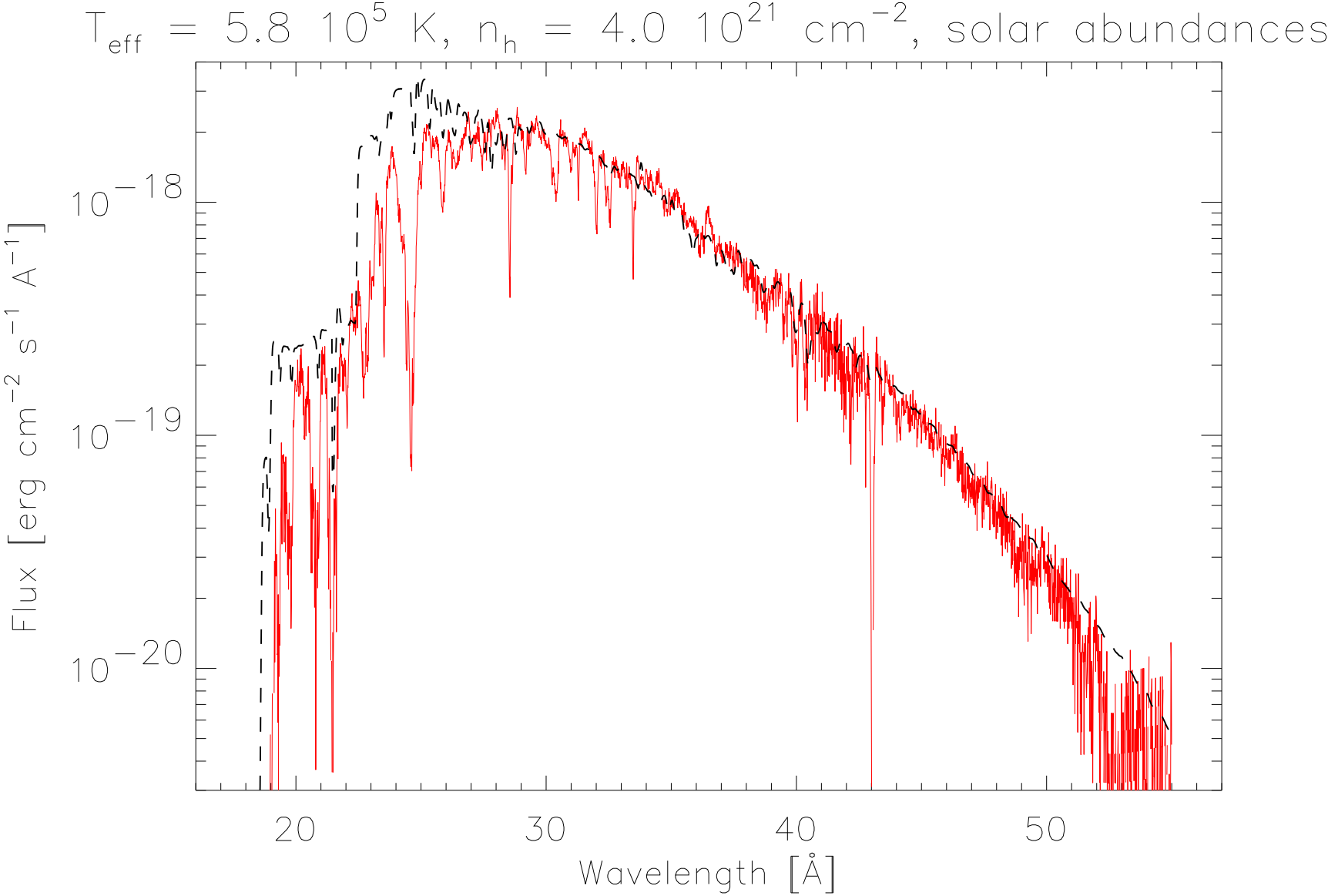
- Don Lamb (advisor)
- FLASH-group
- Sumner Starrfield
- Jan-Uwe Ness
- Eddie Baron
- Peter Hauschildt

Phoenix legacy



Excellent agreement (Schwarz et al. 1998)

Phoenix - SSS first steps



V4743 (Petz et al. 2005)

Phoenix - SSS improvements

- new NLTE rates and opacities
- new statistical equations (NLTE) solver
- new broad line profiles
- pure NLTE (no LTE opacities)
- new temperature correction method
- new global iteration scheme
- hybrid-type atmosphere (hydrostatic - wind)

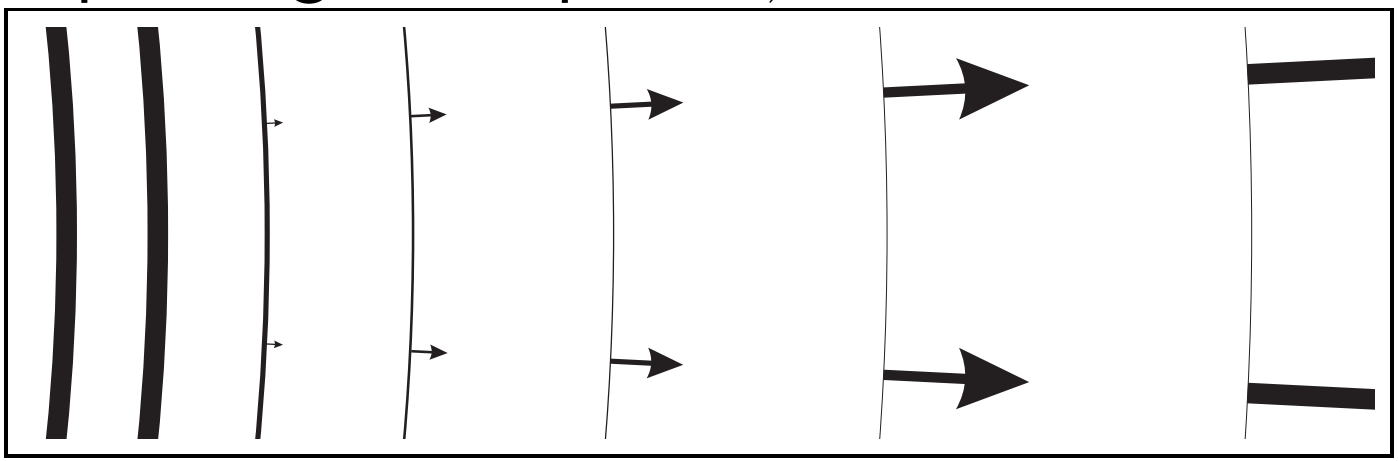
Summary:

- Better physics
- Faster code

Outline

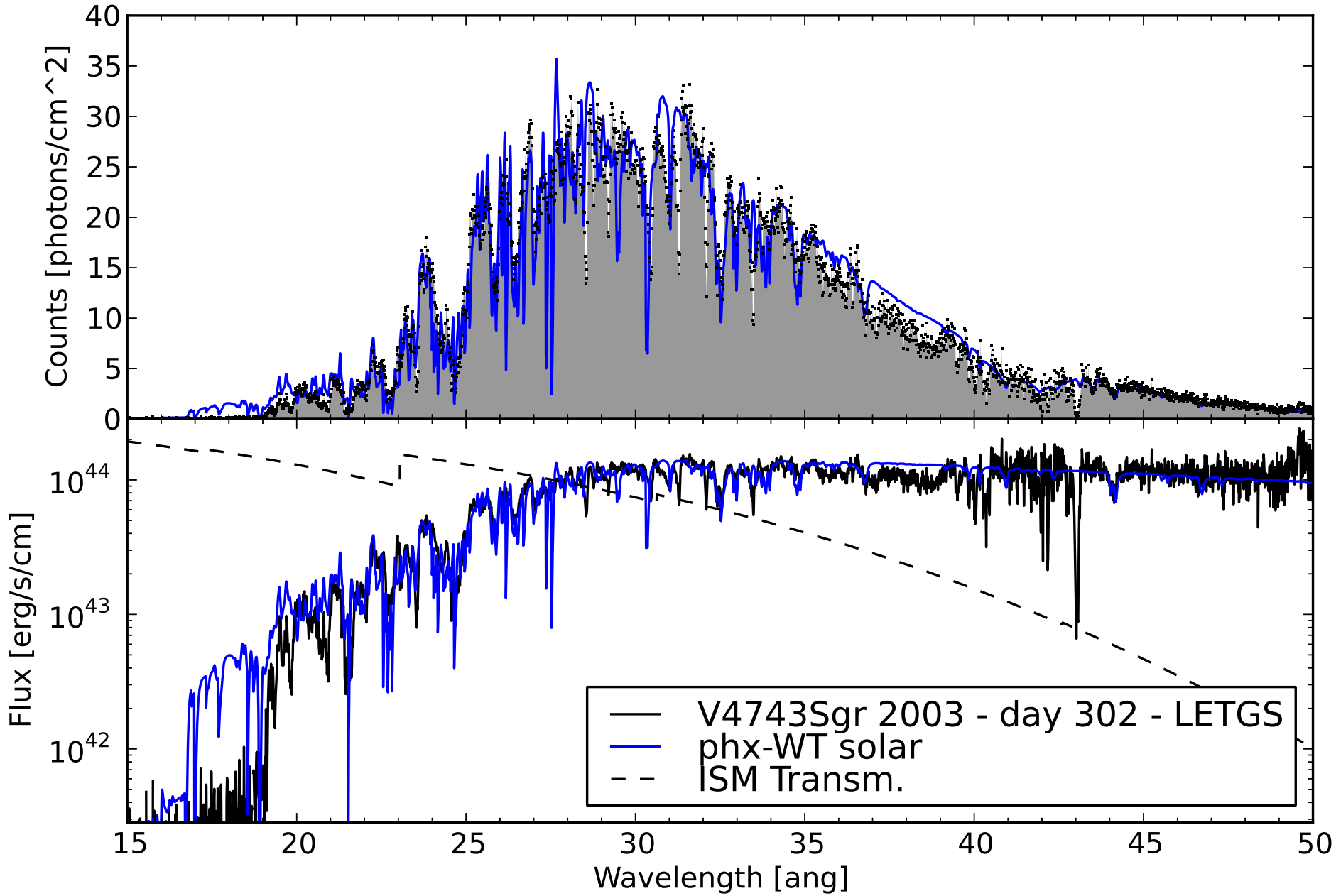
WT models

- hydrostatic core: $T_{\rm eff}, \log g$
- expanding envelope: $\dot{M}, v_\infty$



- solar abundances:
  H He CNO Ne Na Al Mg Si S Ar Ca Fe
- Nr. independent levels: $\sim$7500
- Nr. independent lines: $\sim$150,000

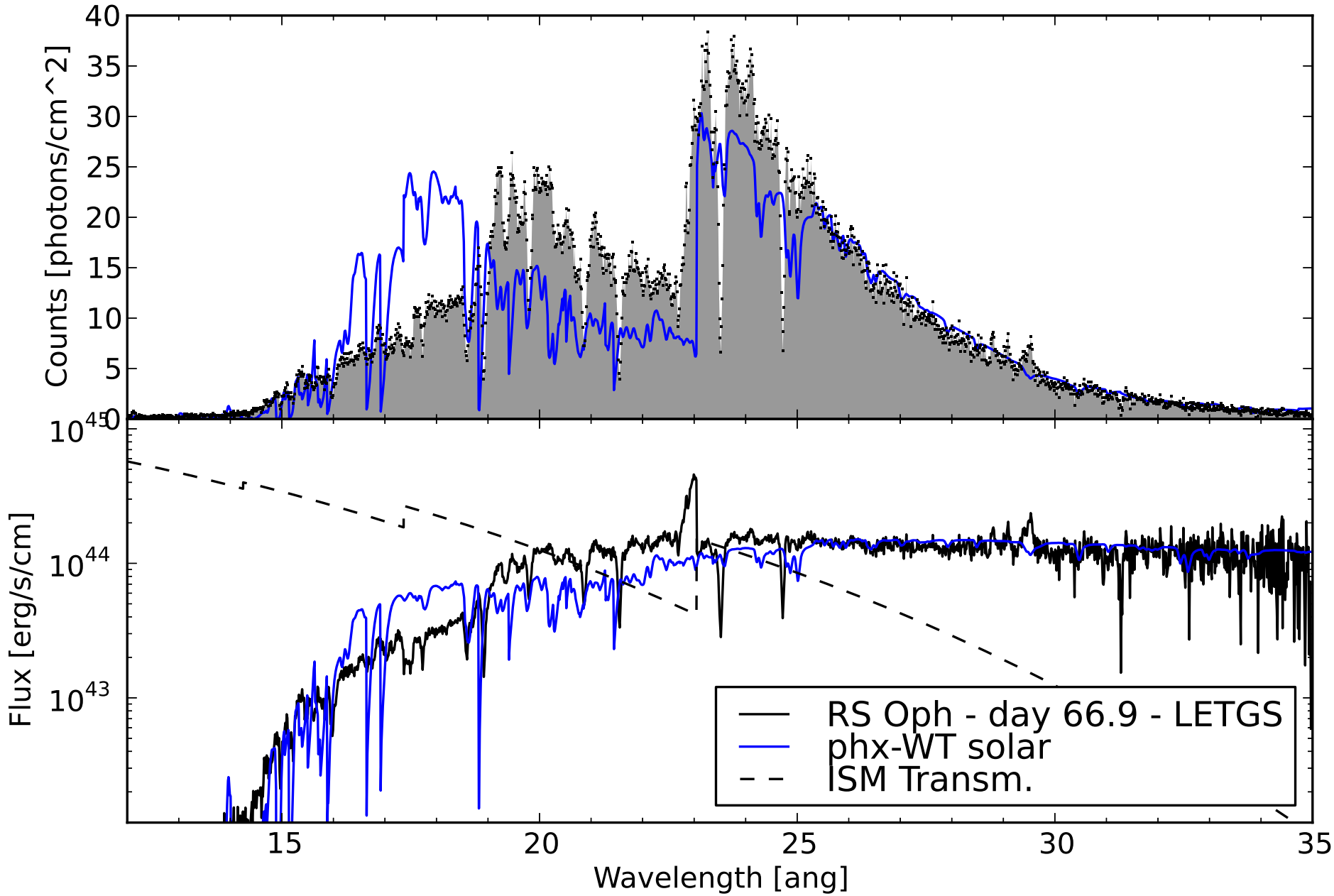
Example - Solar model - V4743 Sgr



WT models - Solar

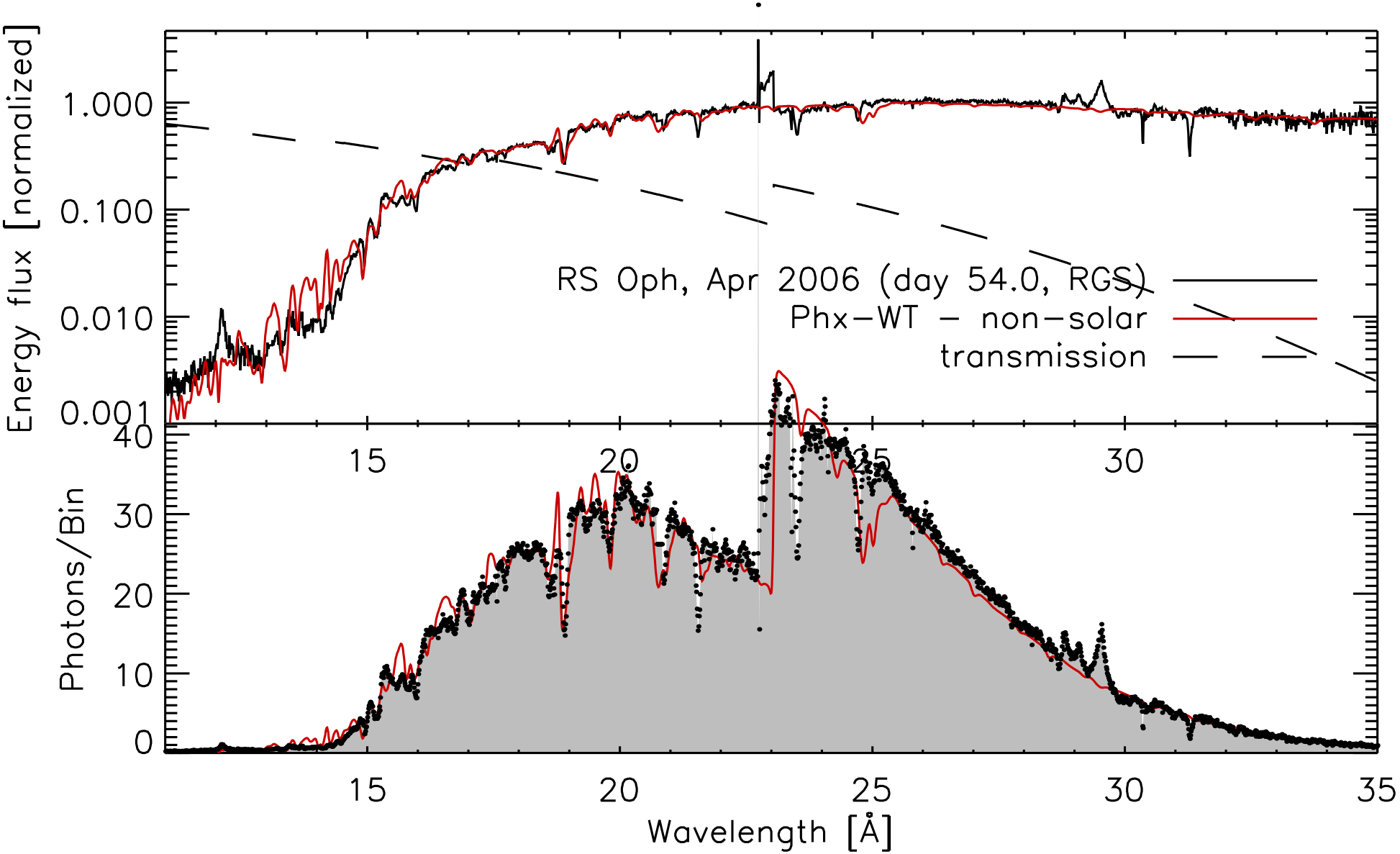
Work quite well for some novae, like V4743
But not very well others, like RS Oph

Example - Solar model - RS Oph 2006

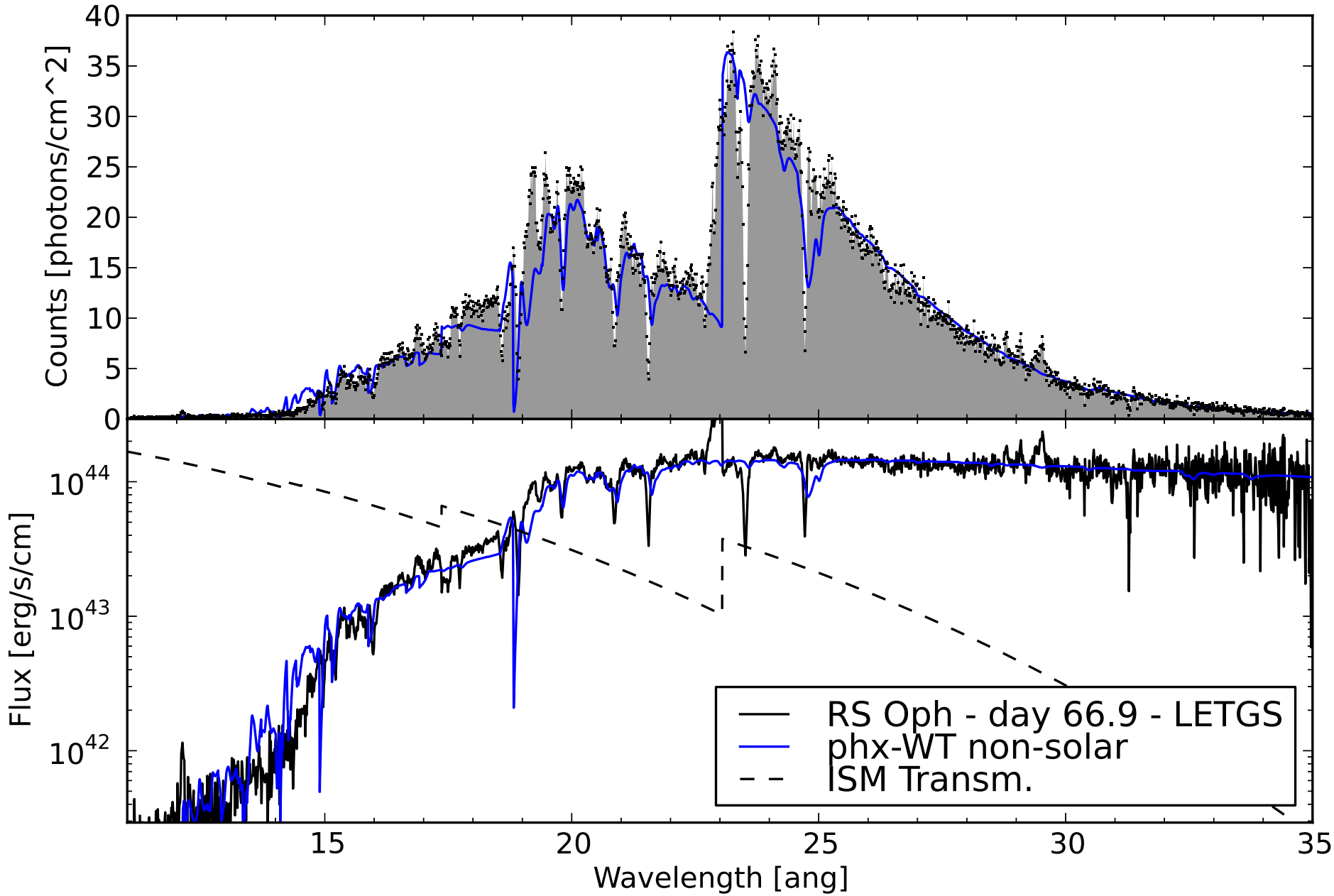


Outline

RS Oph 2006 - non-Solar model



RS Oph 2006 - non-Solar model



RS Oph 2006 - non-Solar model fit

SSS metal abundances (preliminary fit results)

	C	N	O	Z>8
solar	18	5	44	33
RS Oph - day 54.0	15	35	45	5
RS Oph - day 66.9	2	40	55	1

Outline

What can we learn

SSS Atmosphere conditions:

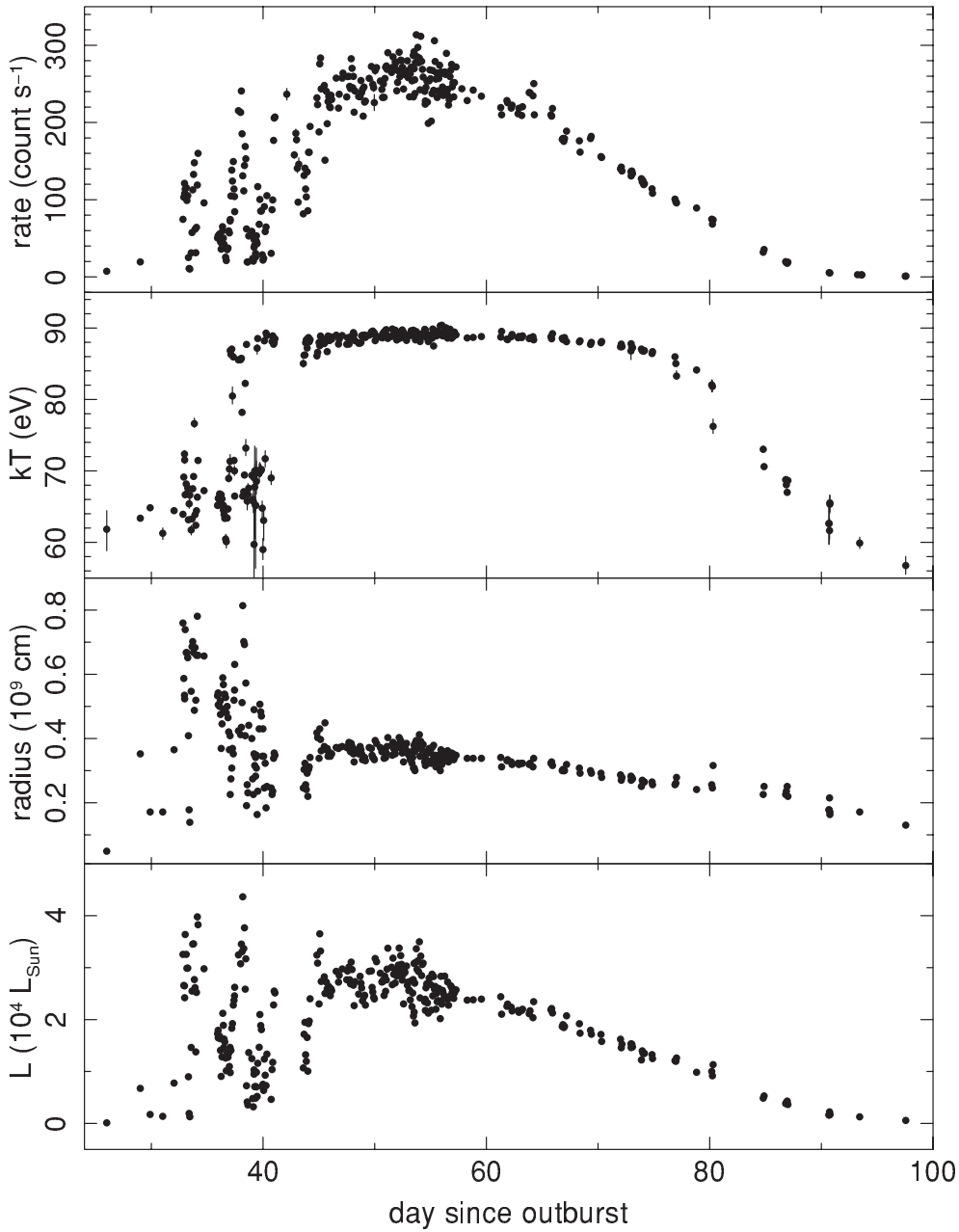
- $L_{\rm bol}$
- $R_{\rm WD}$
- $\dot{M}$
- Chemical composition (of SSS atmosphere!)

But above all:

- $N_{\rm H}$

Outline

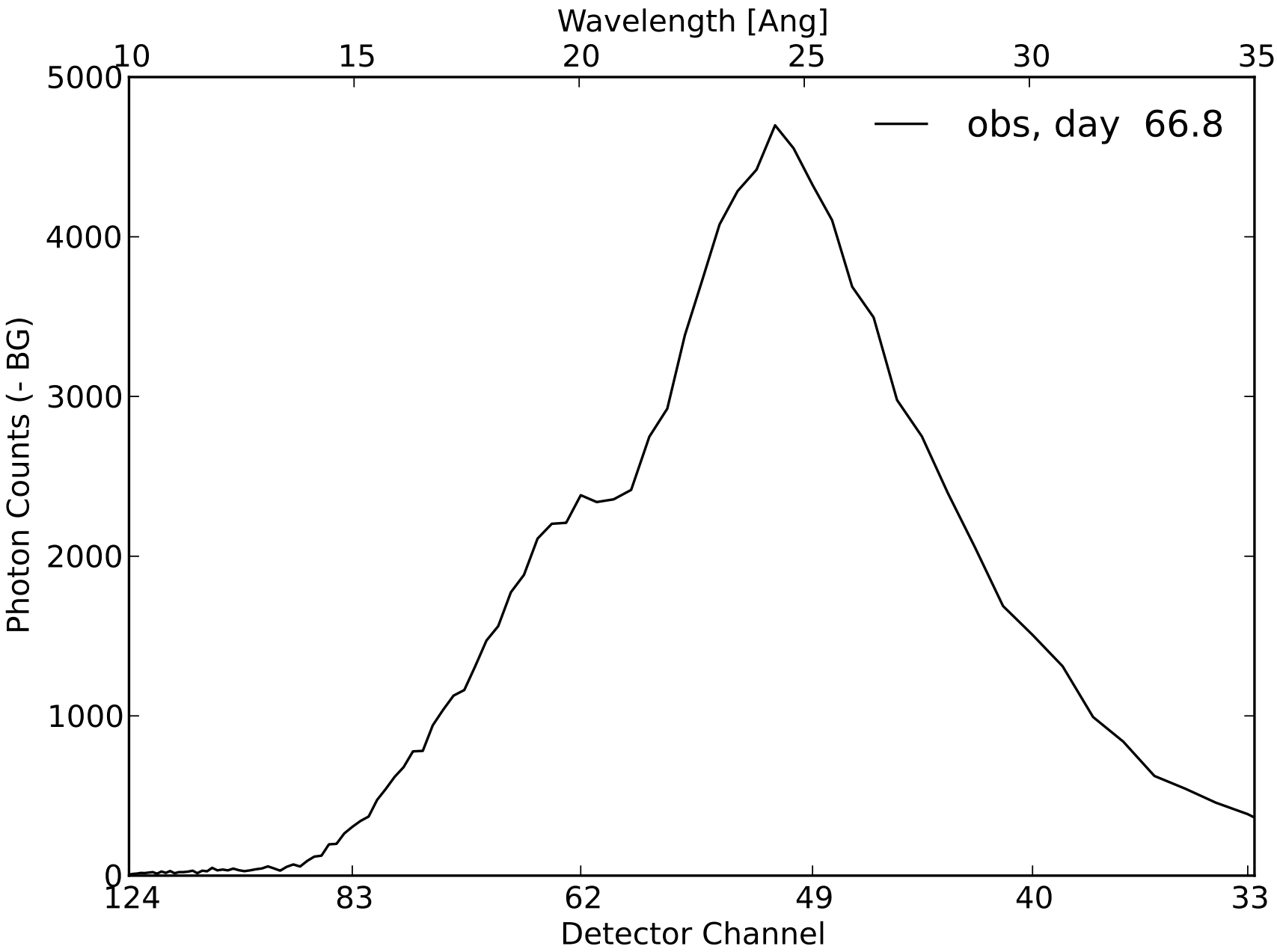
Swift - RS Oph



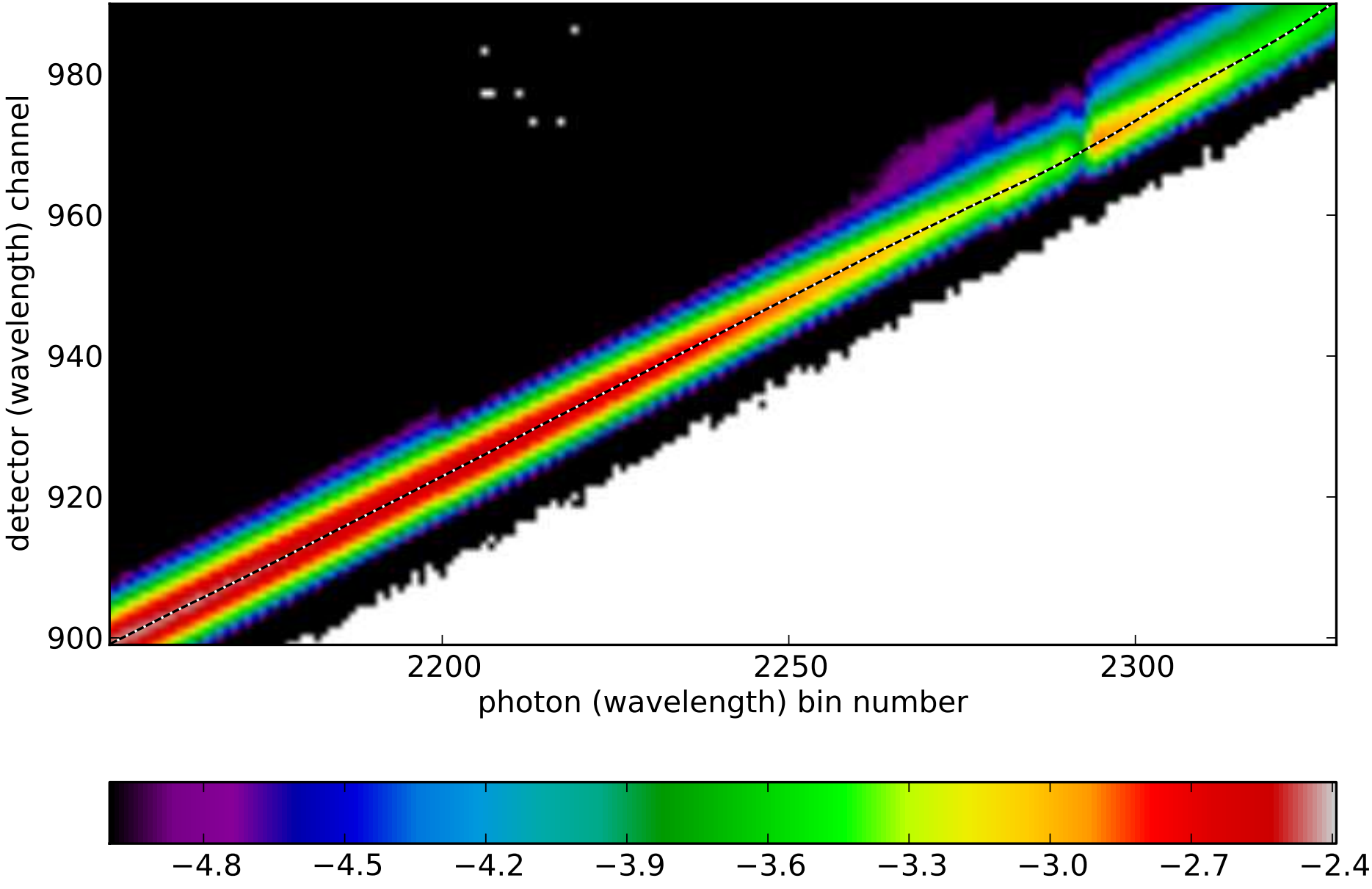
(Osborne et al. 2011)

See also:
Poster by Kim Page

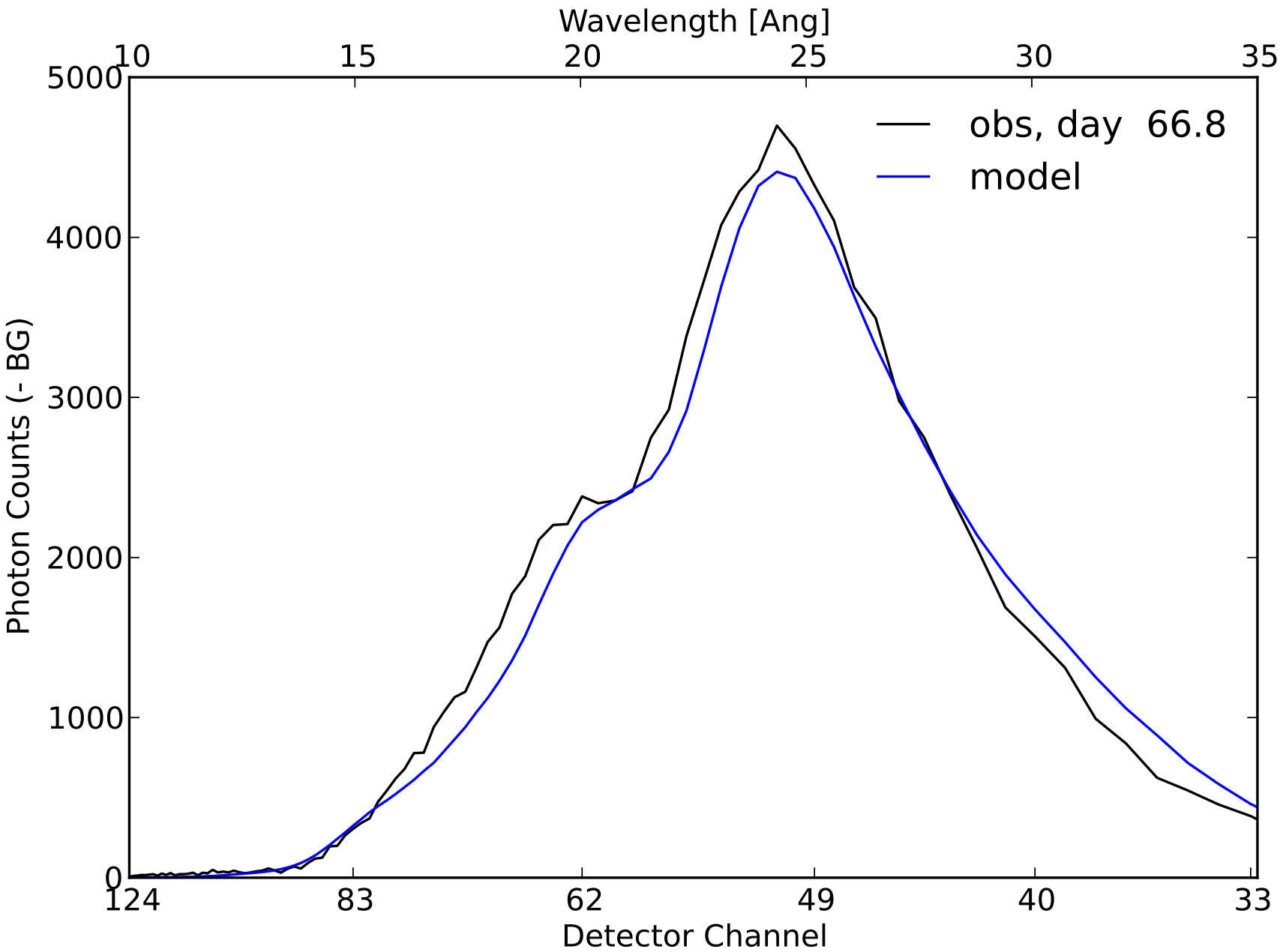
Swift - RS Oph


Wavelength [Ang]
10
15
20
25
30
35
5000
4000
3000
2000
1000
0
Photon Counts (- BG)
obs, day 66.8
124
83
62
49
40
33
Detector Channel

Swift - Instrument Response Matrix



Swift - RS Oph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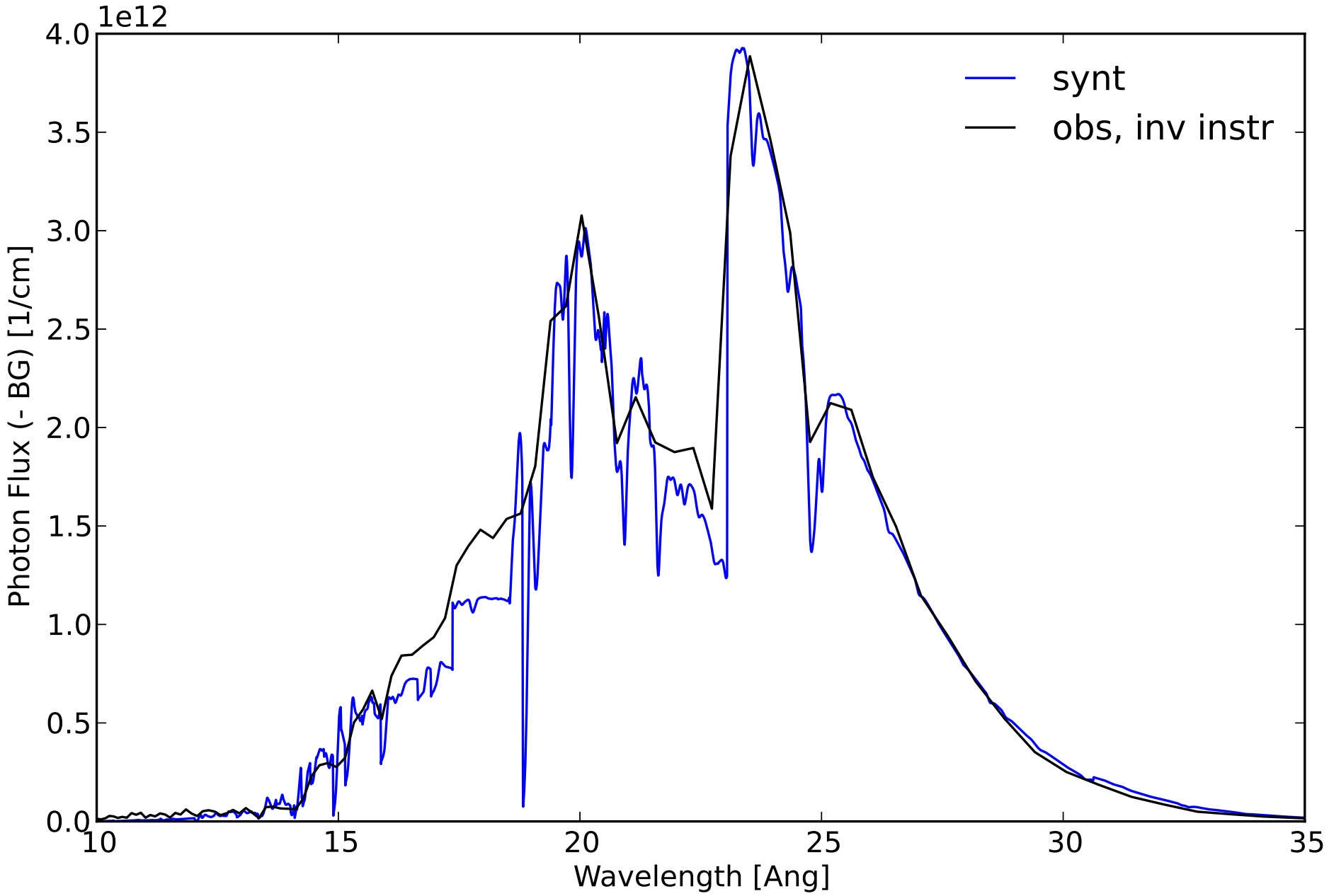
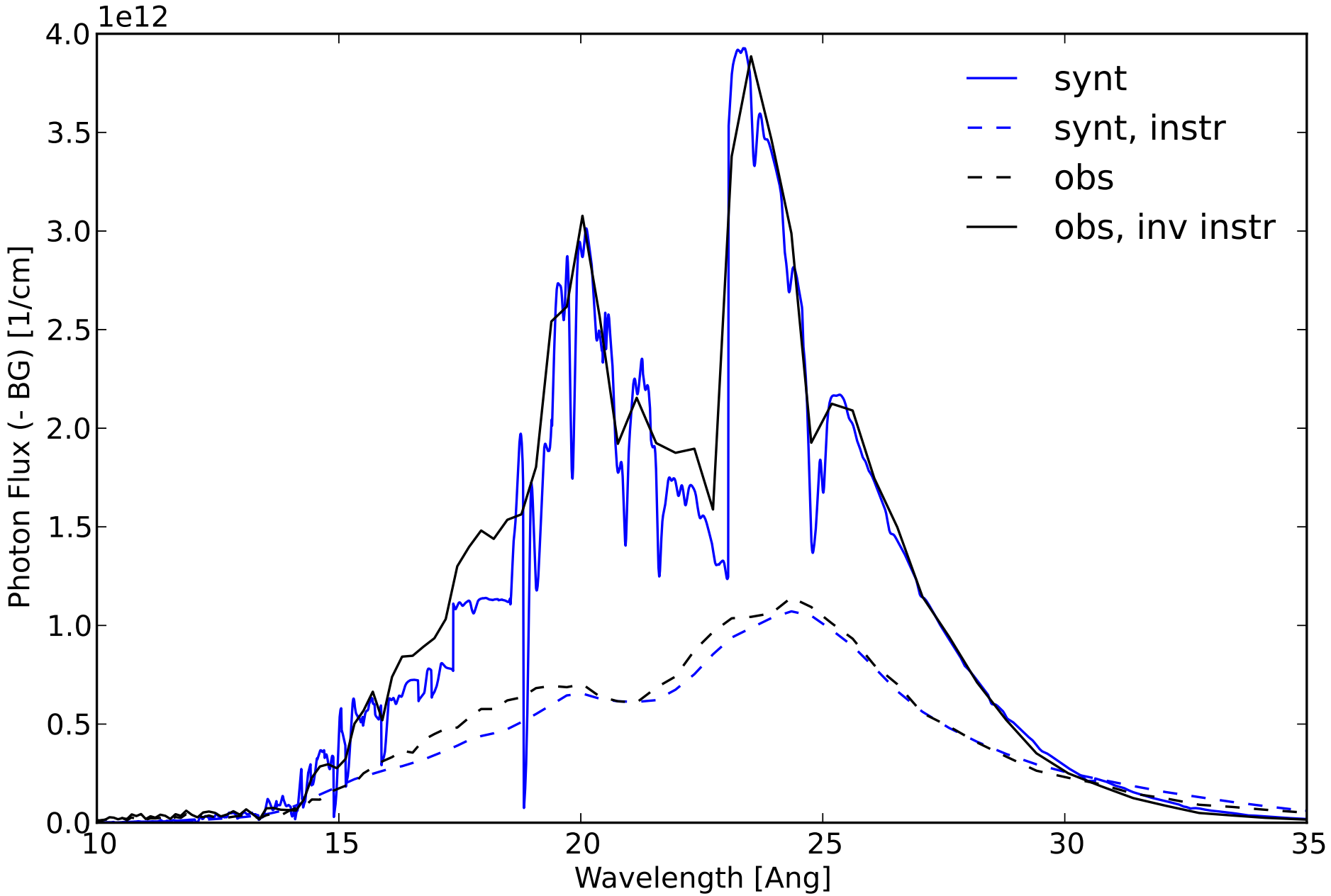
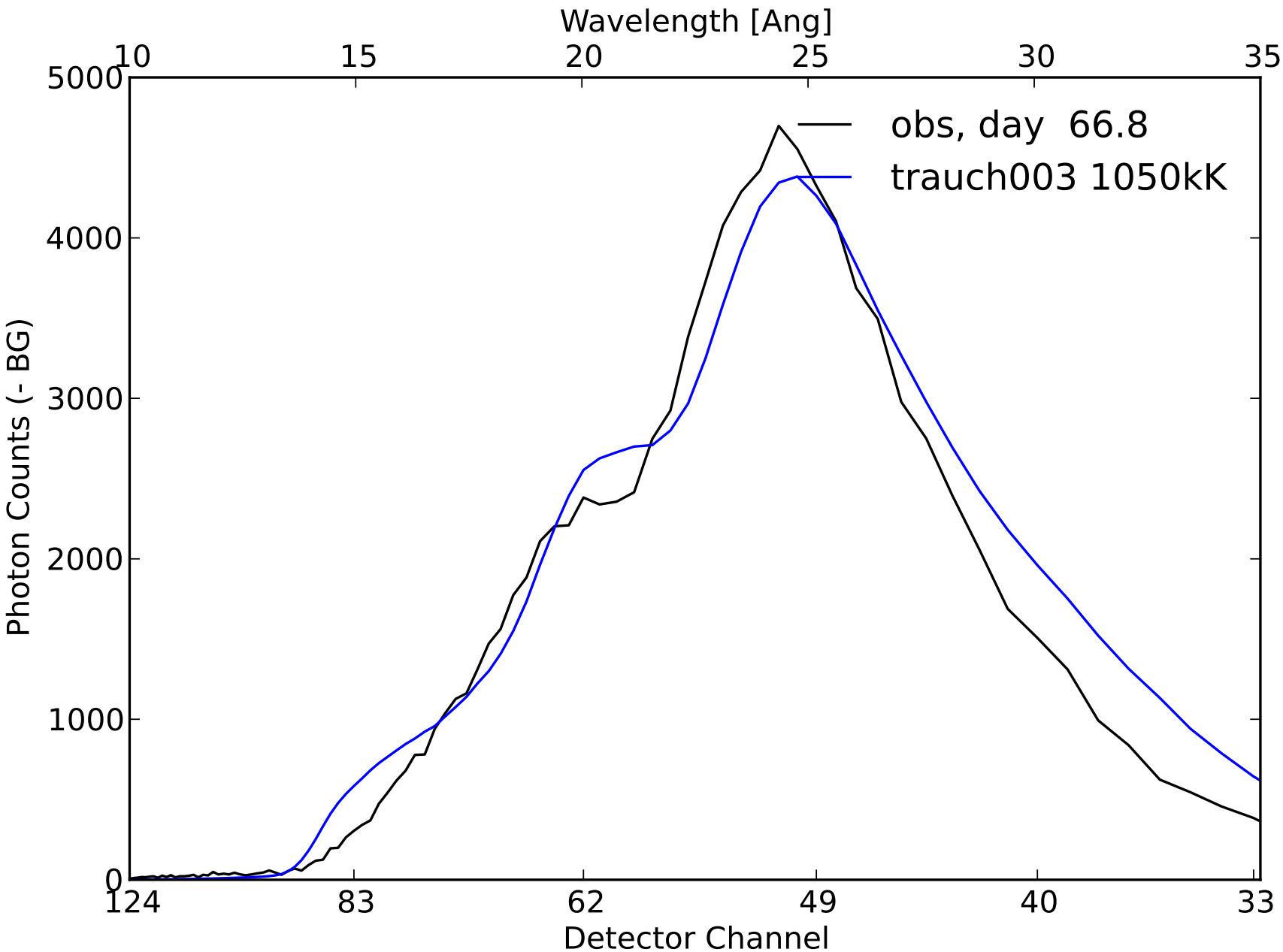
Swift - RS Oph - flux



Swift - RS Oph - flux



Swift - RS Oph - bad NH



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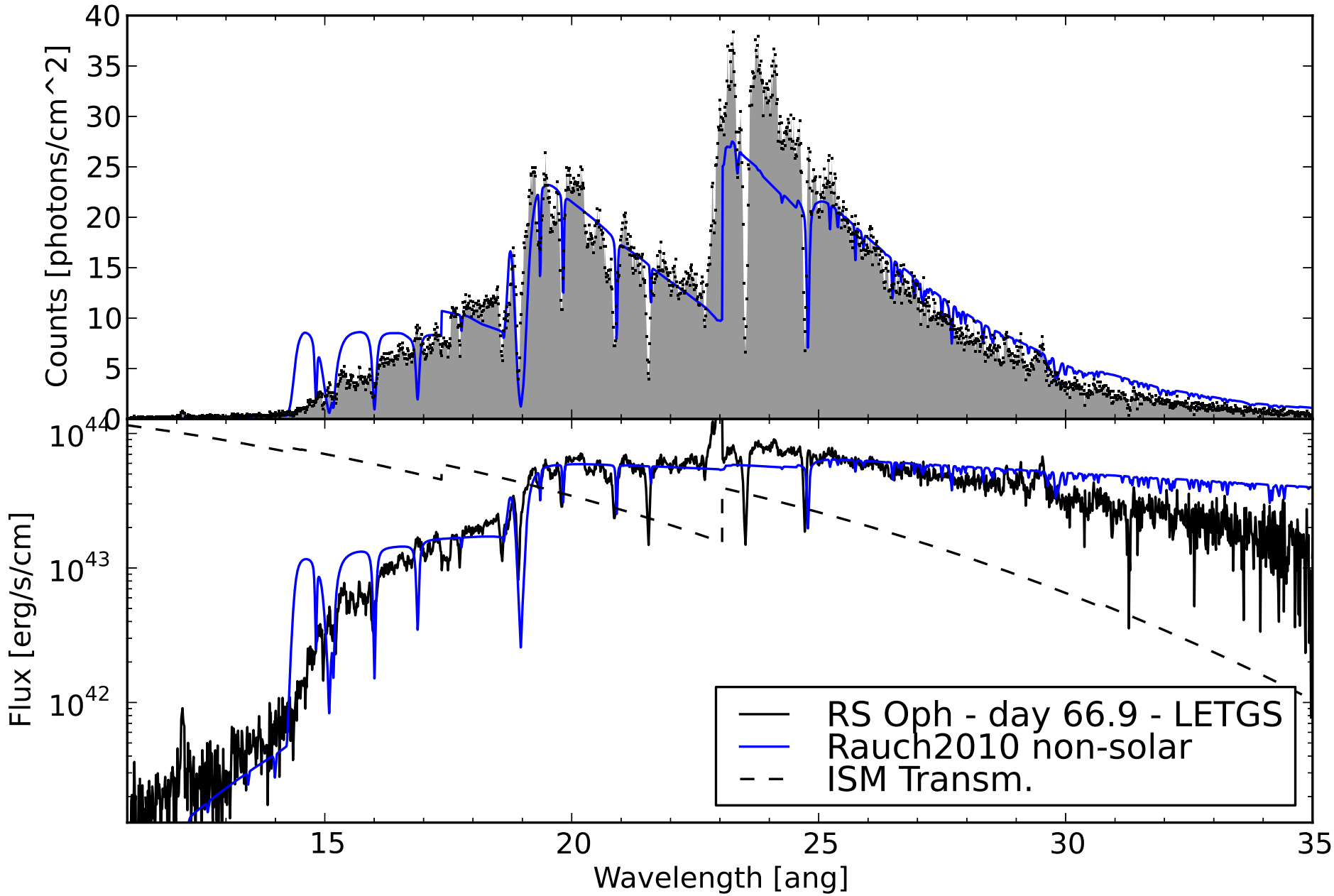

Swift + Grating combo

Without priors (eg. NH) Swift spectra are washed out enough to fit any model.
Constrain NH and model parameters from Grating spectra.
With those constraints, Swift data can yield accurate evolution parameters.