AtomDB Overview

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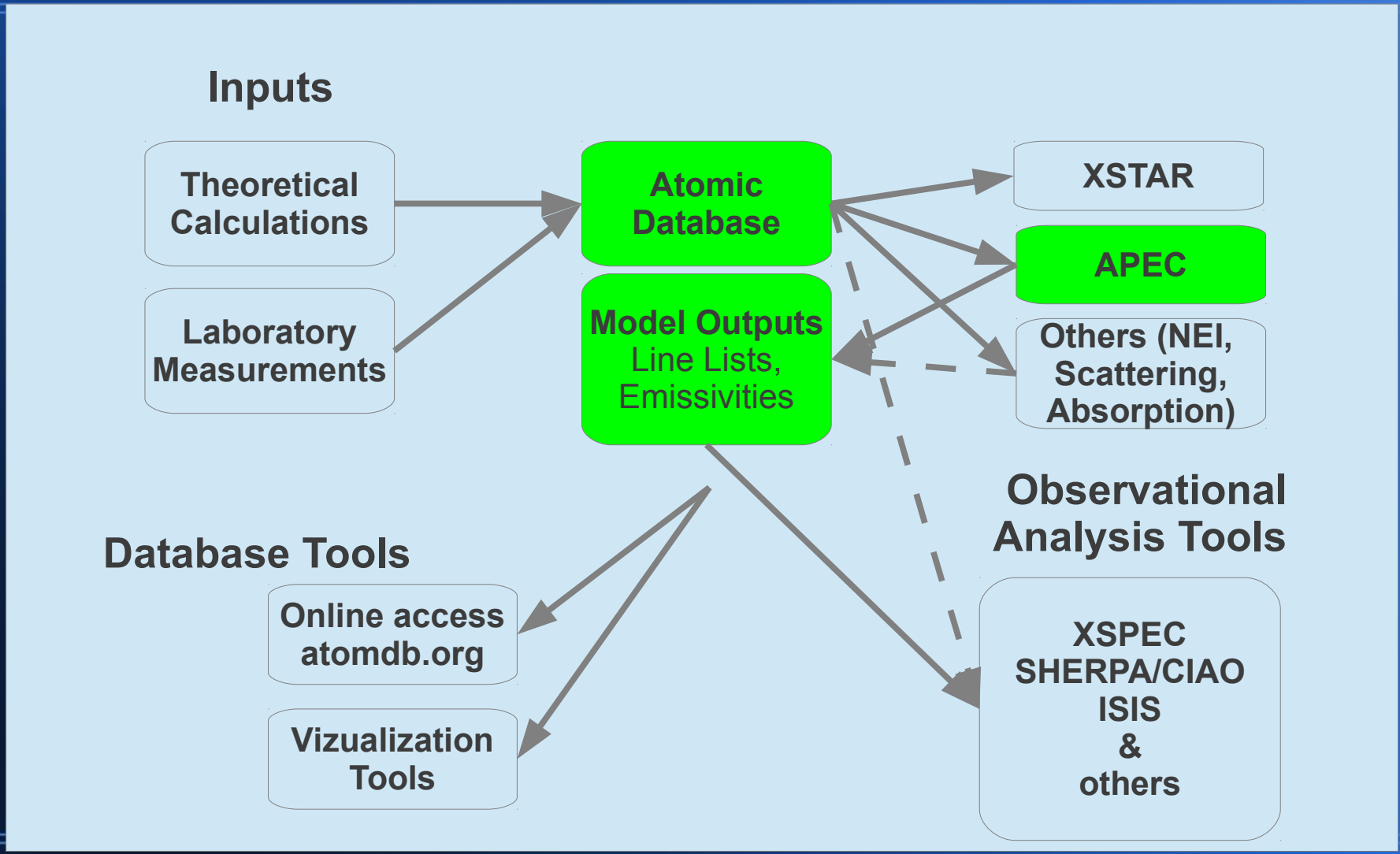
Brief Outline of AtomDB



What is AtomDB

APE**D** – Database

APE**C** – Code

Database: 416Mb (and counting) of fundamental atomic data.

Code: C code for calculating collisional plasma emission

Useful Outputs

- Collisional plasma model results (CIE)
  - apec_<label>_line.fits
  - apec_<label>_coco.fits
- Optional Extras:
  - apec_<label>_cont.fits
  - apec_<label>_comp.fits
  - apec_<label>_ionb.fits

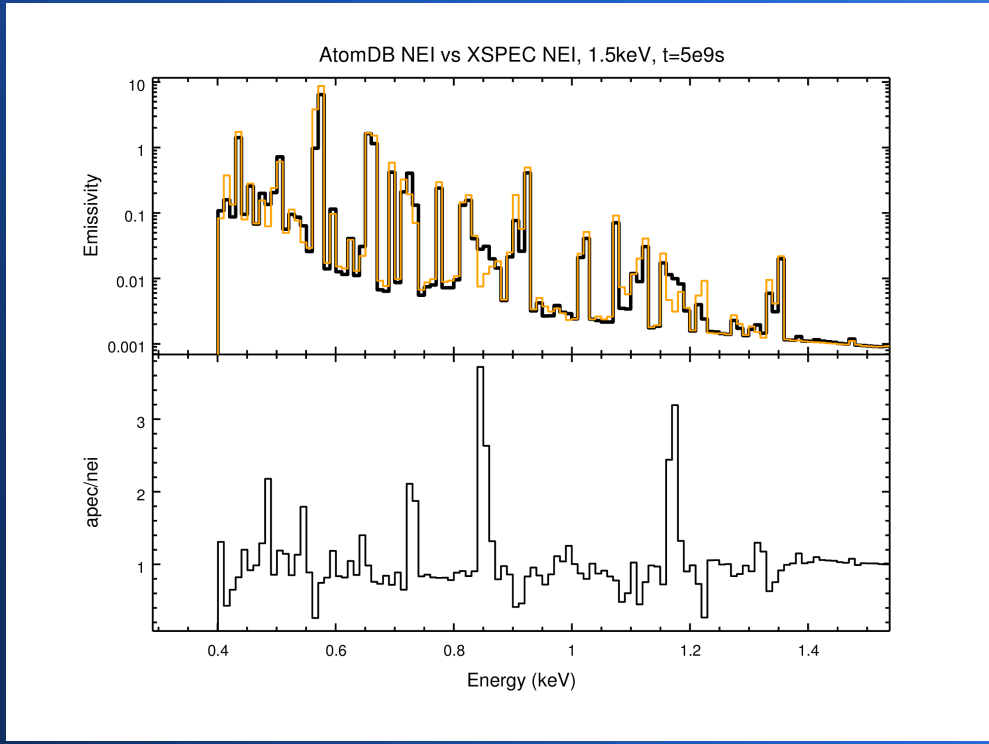
Users of AtomDB

- CIE models extensively used in X-ray modeling codes (*apec, vapec, vvapec* etc)
- Also some older data (version 1.2) used in some of the NEI models (*nei, vnei)*

The NEI Issue

APEC is entirely capable of modeling NEI plasma conditions

Updating NEI models in XSPEC requires bespoke approach for every update



New NEI models required

NEI Method

- Separate each line or continuum process by the ion population driving it
- For a transition in ion A^{+} population of upper level is due to:
  - excitation from A^{+}
  - recombination from A^{2+}
  - ionization from A
- Store these separately for a range of temperatures

NEI Method (2)

- In XSPEC model:
  - Perform ionization balance calculation
  - Multiply emissivities by driving populations
  - Sum to obtain spectrum
  - ~~Receive Nobel~~

Current Progress

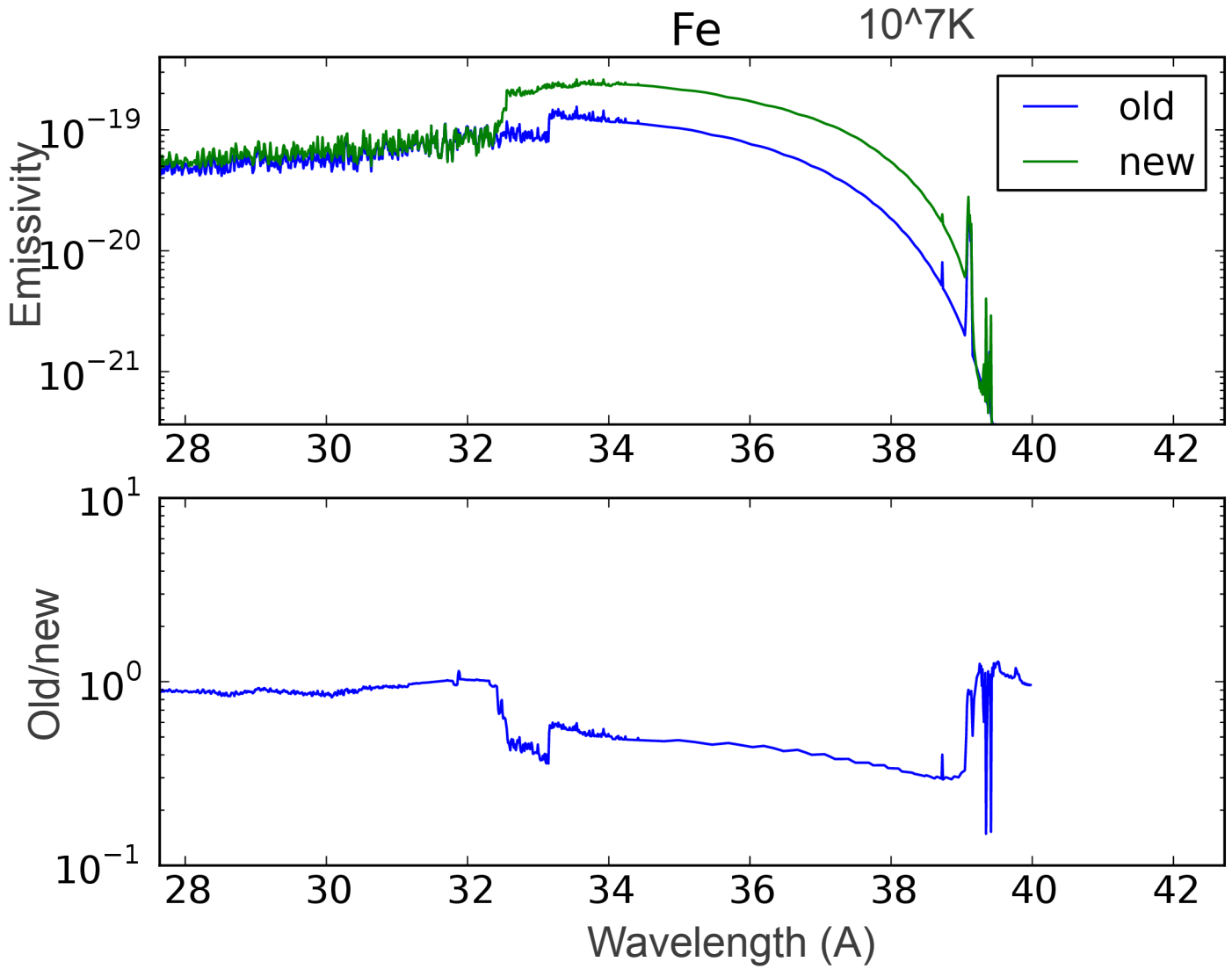
- Definition of new data formats ("AI", autoionization data) ✔
- Code rewrite to handle splitting ✔-ish

  Li-like and Na-like inner shell data ✔
- Fluorescence Yields Data ✗
  - Gorczycga, Hasoglu, Palmeri, Quinet + more
- Excitation to fluorescing levels ✗

Finishing this is our #1 priority

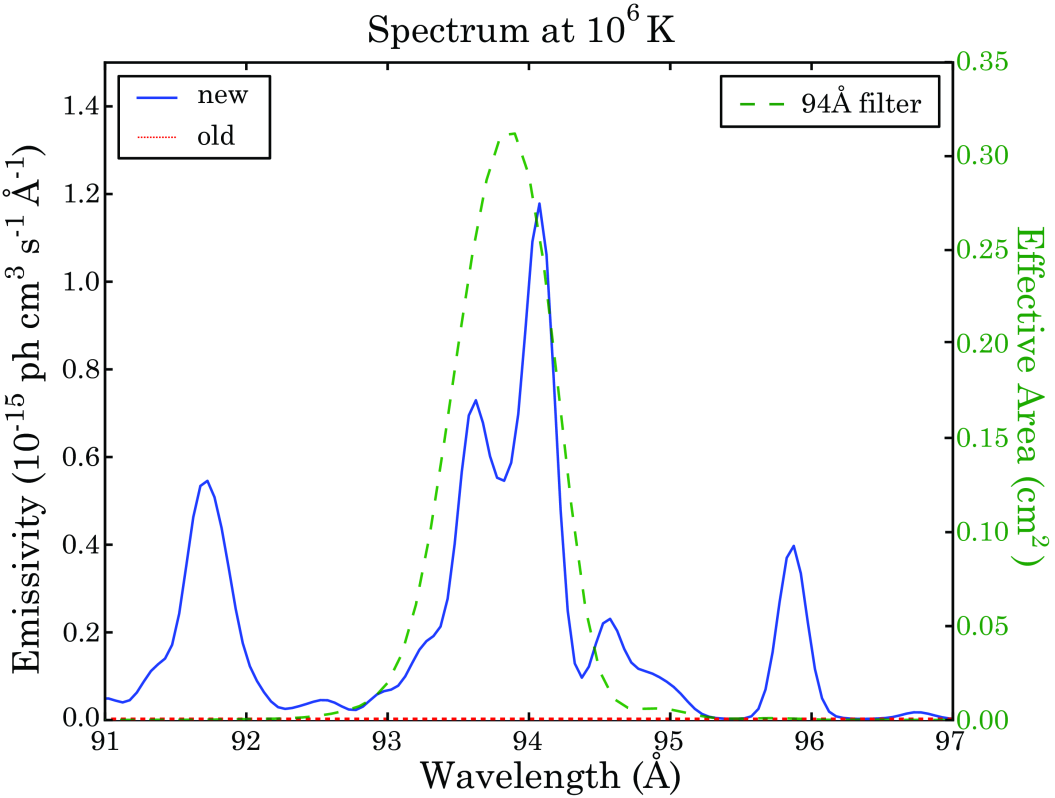
Other Progress

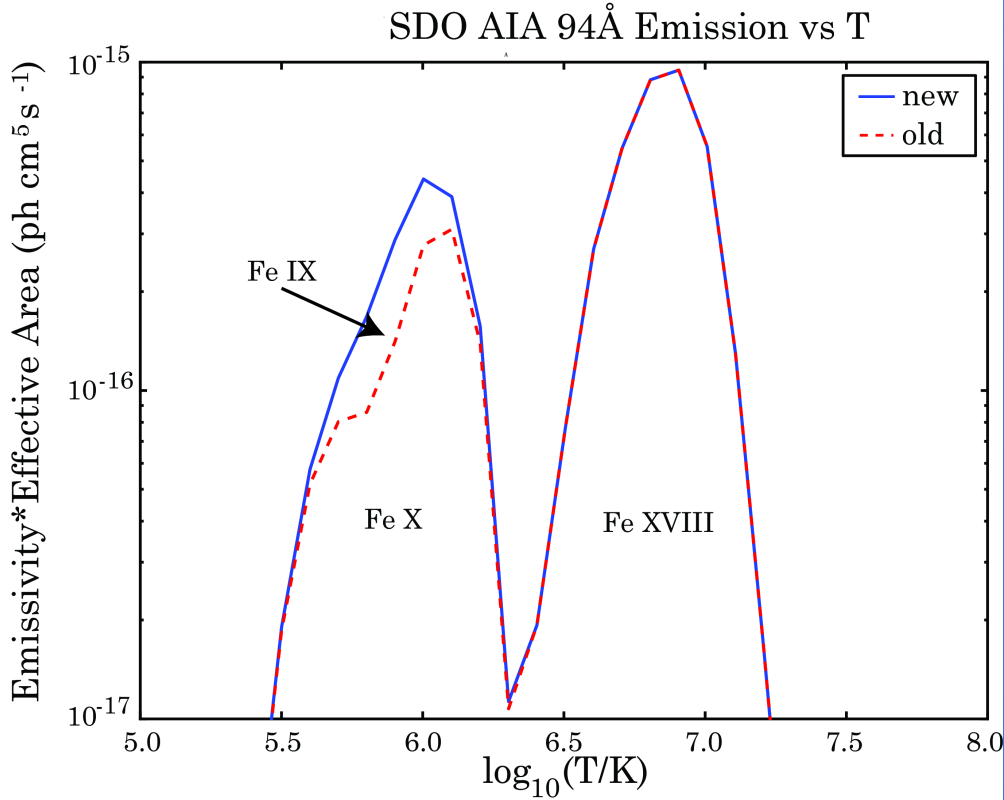
- Incorporated XSTAR database into AtomDB
- Levels and photo-ionization X-sections only
- New “PI” data format


Fe
10^7K
old
new
Emissivity
10^{-19}
10^{-20}
10^{-21}
28
30
32
34
36
38
40
42
Old/new
10^{1}
10^{0}
10^{-1}
Wavelength (A)

Fe IX data

- Lines of Fe IX observed in 94A bandpass SDO AIA (Lepson+2002)
- Not included in databases (5f-3d)
- Led to large discrepancy in flux in this band





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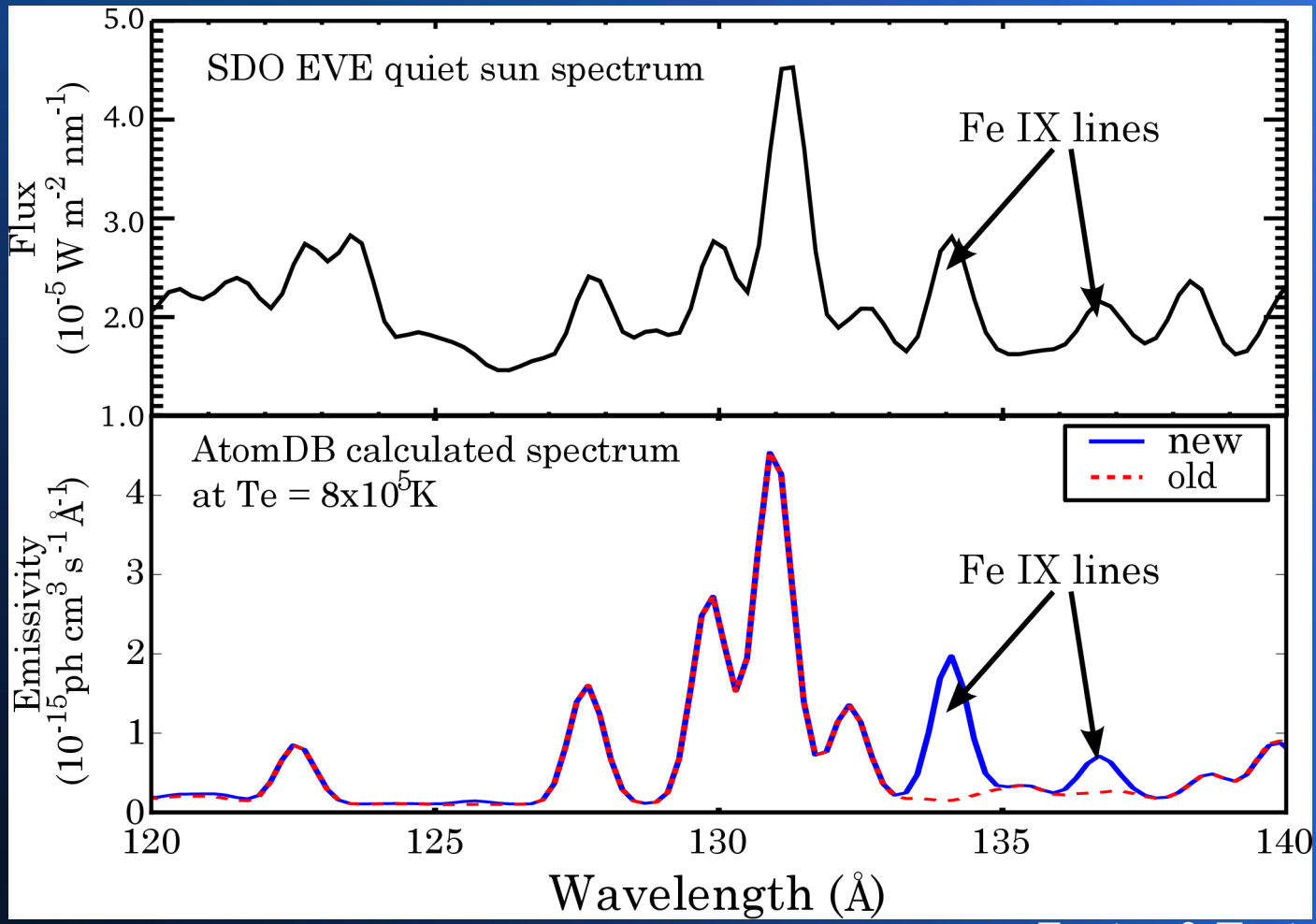

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Online Access

ATOMDB Atomic Data for Astrophysicists

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Searching for lines between 7.3 and 7.7 Å

9 lines found.

Ion	Wavelength Å	Upper Level	Lower Level	Emissivity ph $cm^3 s^{-1}$	Te peak K	Relative Intensity
Mg XI	7.310	37	1	2.205e-18	6.310e+6	0.34
Fe XXIV	7.370	19	2	2.415e-18	1.995e+7	0.37
Fe XXIV	7.437	20	3	4.432e-18	1.995e+7	0.68
Fe XXIV	7.457	16	3	1.757e-18	1.995e+7	0.27
Fe XXIII	7.472	176	5	2.442e-18	1.585e+7	0.37
Mg XI	7.473	23	1	4.611e-18	6.310e+6	0.70
Fe XXIII	7.478	104	1	6.550e-18	1.585e+7	1.00
Fe XXIII	7.498	168	5	1.496e-18	1.585e+7	0.23
Fe XXII	7.681	233	1	3.472e-18	1.259e+7	0.53

Statistics

- 3100 downloads since August 1st 2011
- 6332 online database queries since Jan 1st.
- 139 registered users on website