Outline

Intermediate Mass T-Tauri stars (IMTTS):

> characteristics

> relevance for the study of fossil fields origin

> IMTTS sample

Observations

> CRIRES @VLT data

Spectrum synthesis methods:

> VALD/MARCS/SYNMAST

> Improvement of oscillator strengths

> Determination of vsini

Magnetic field strength constraints

Conclusion

Intermediate Mass T-Tauri Stars

in stellar evolution context

T-Tauri stars:

> **pre-main sequence stars**

> roughly between 0.5 and 3.5 solar masses

> accreting material from surrounding protoplanetary disc

> fueled by gravitational energy from star's contraction

Intermediate Mass T-Tauri Stars:

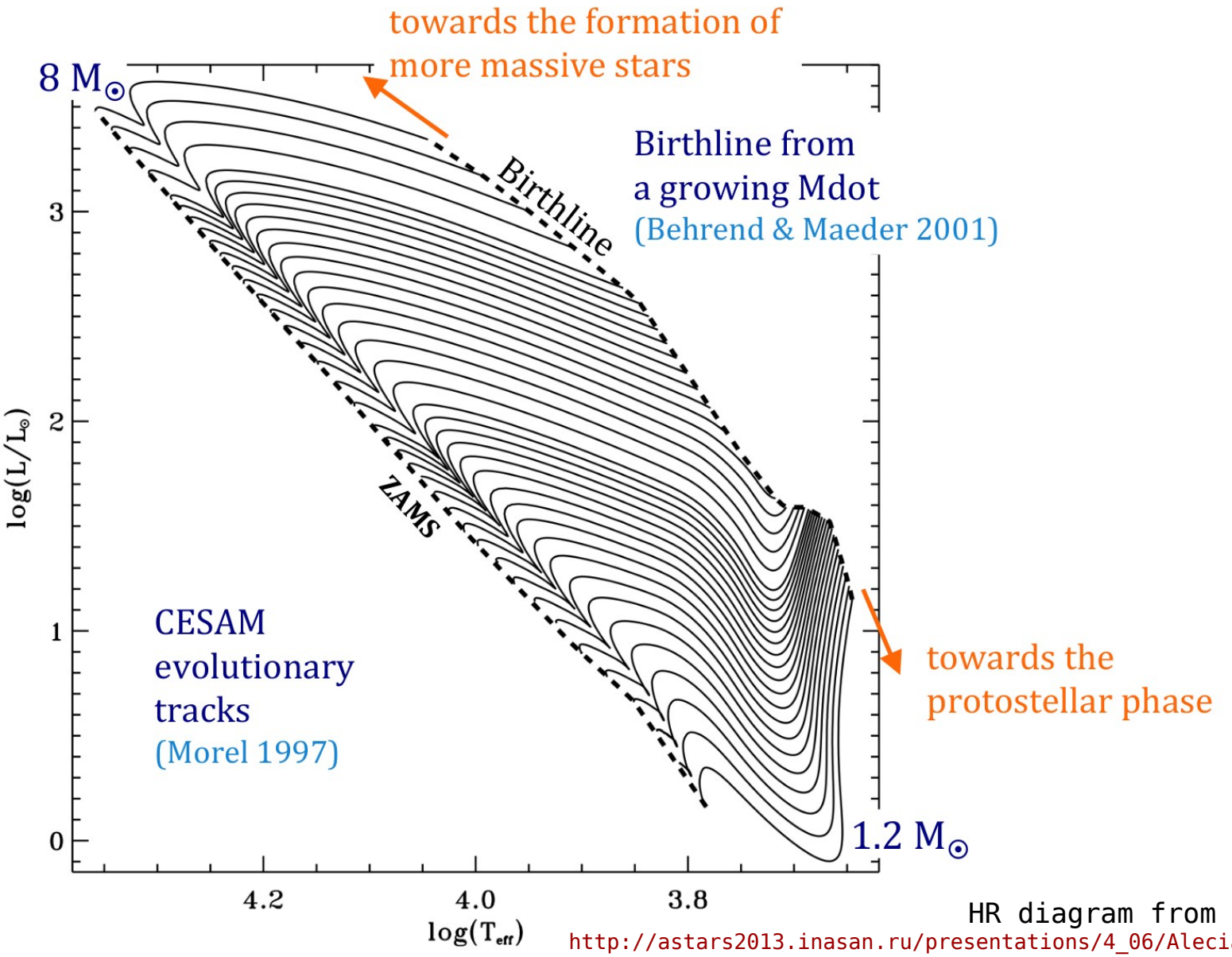
> around 2 solar masses

> precursors of Herbig Ae/Be stars and ultimately A/B type stars

Intermediate Mass T-Tauri Stars

in stellar evolution context

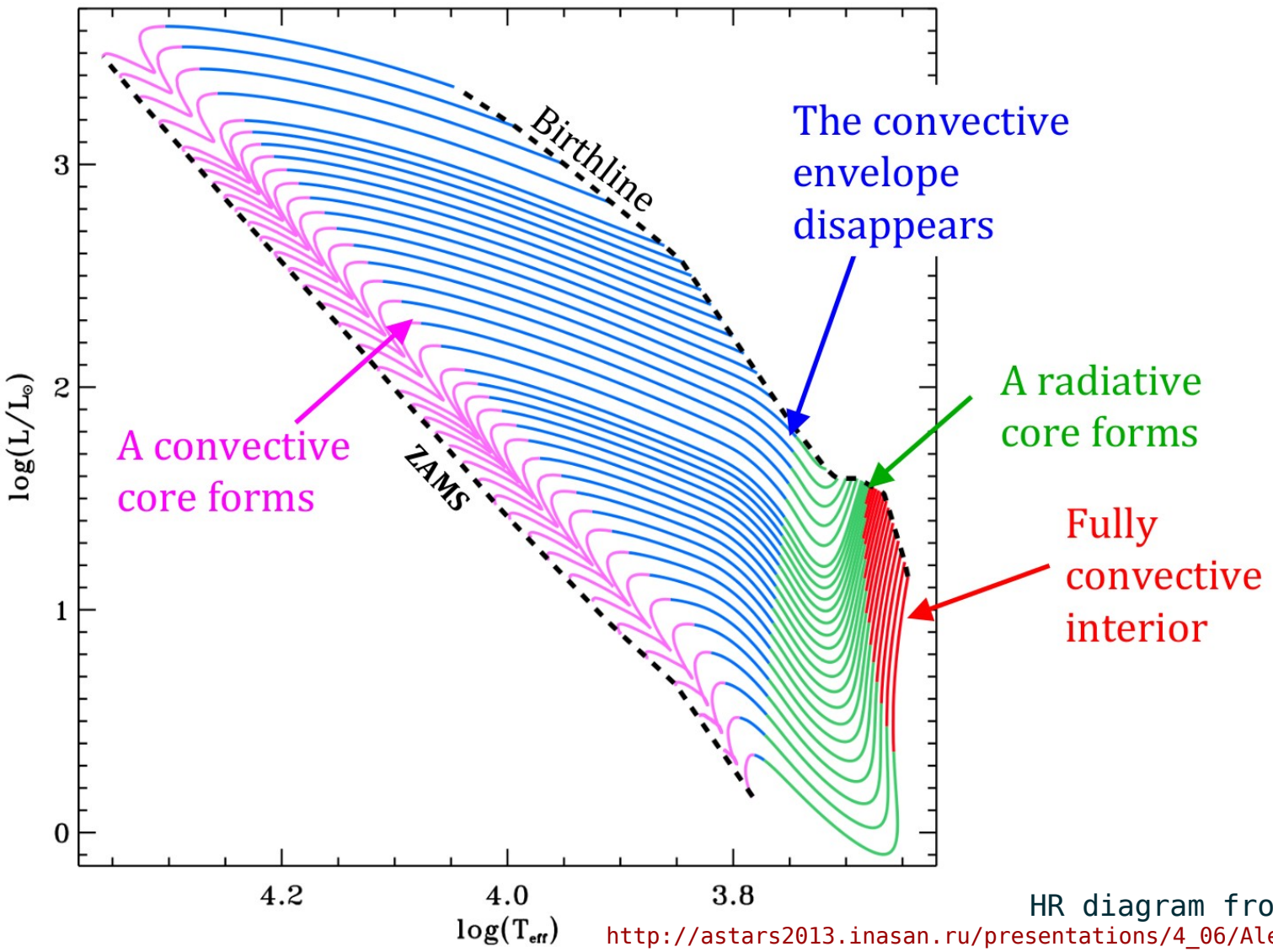
The PMS Evolution



HR diagram from **Evelyne Alecian**
http://astars2013.inasan.ru/presentations/4_06/Alecian/Alecian_Moscou.pdf

Intermediate Mass T-Tauri Stars

in stellar evolution context



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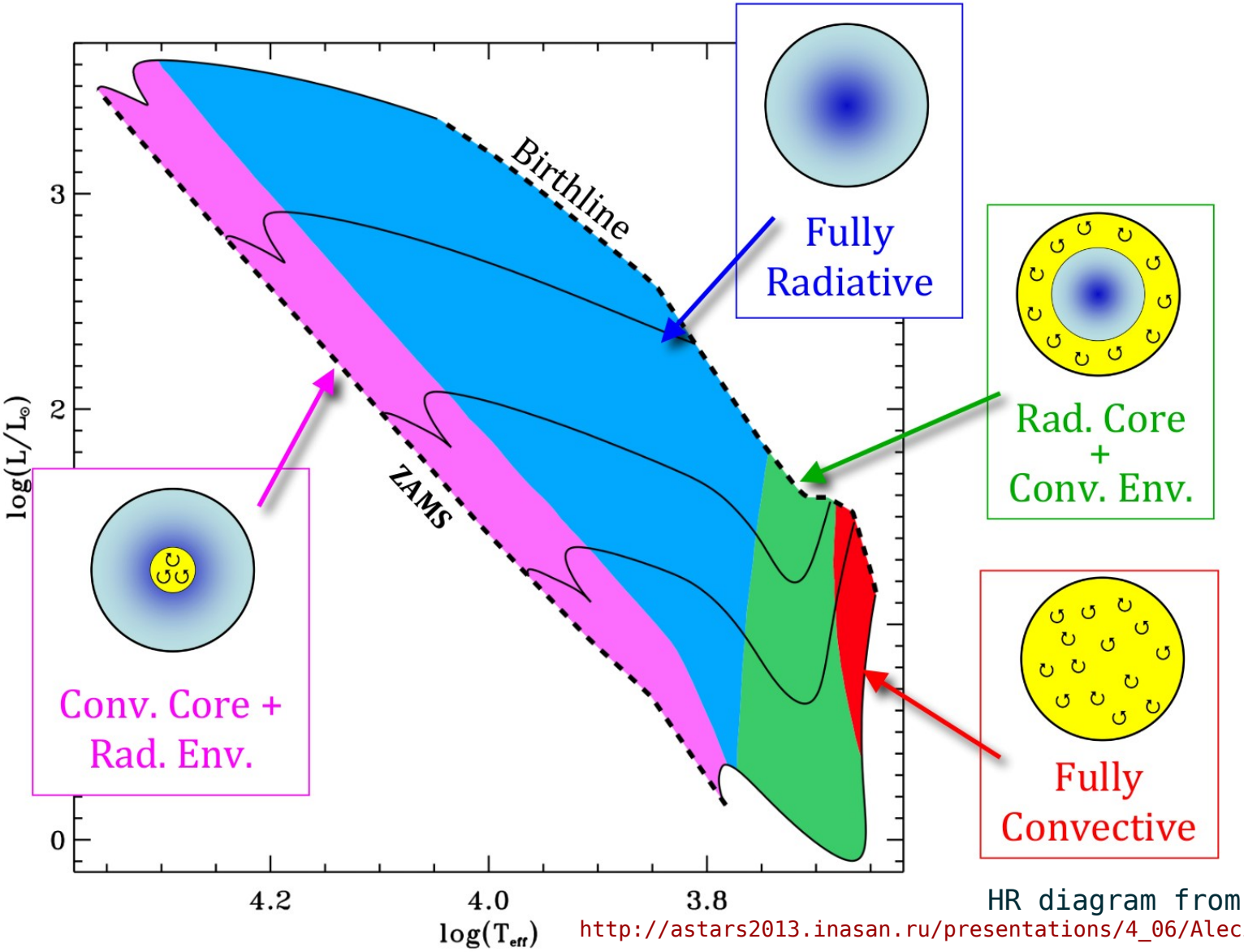
Intermediate Mass T-Tauri Stars

in stellar evolution context



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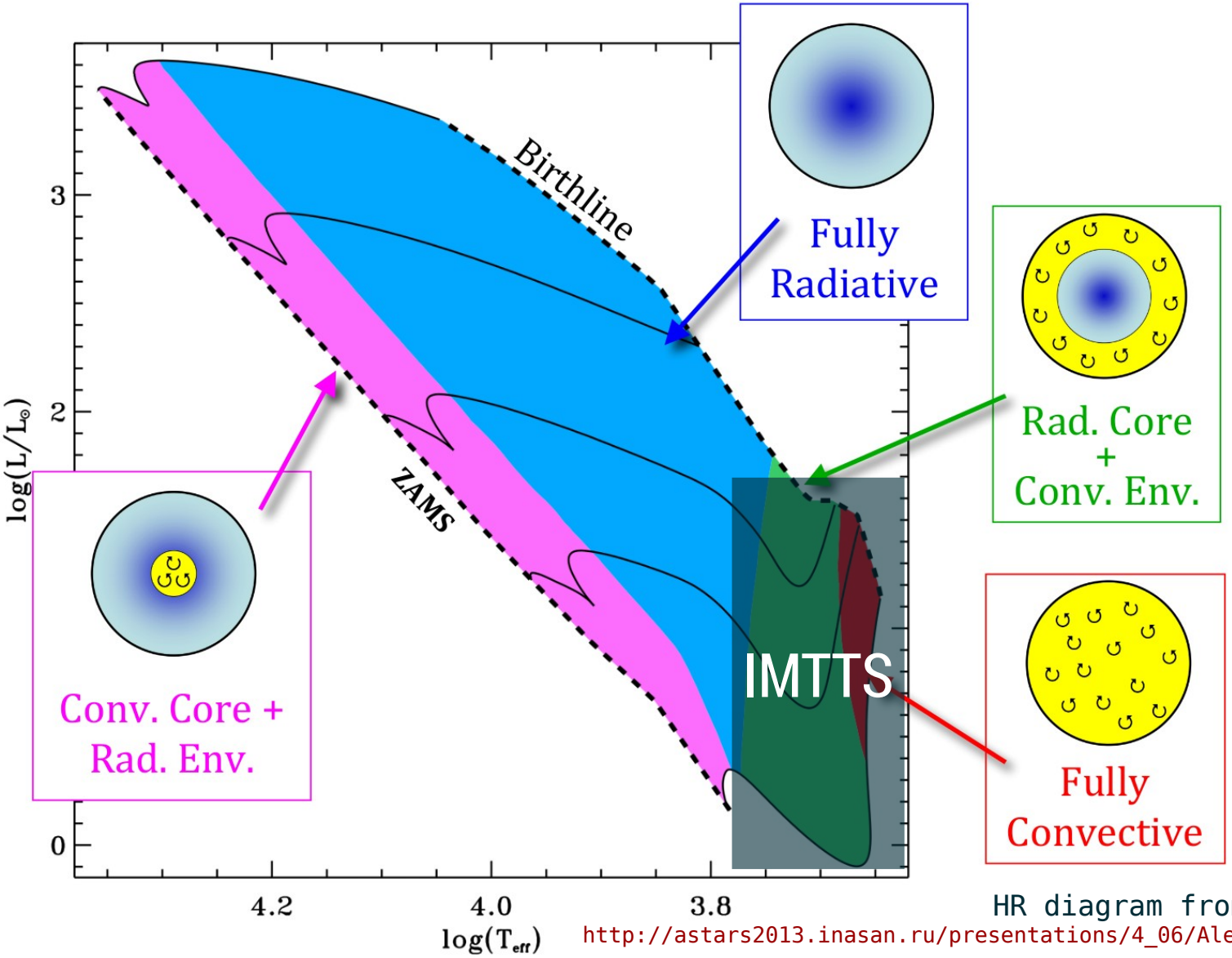
Intermediate Mass T-Tauri Stars

in stellar evolution context



HR diagram from **Evelyne Alecian**
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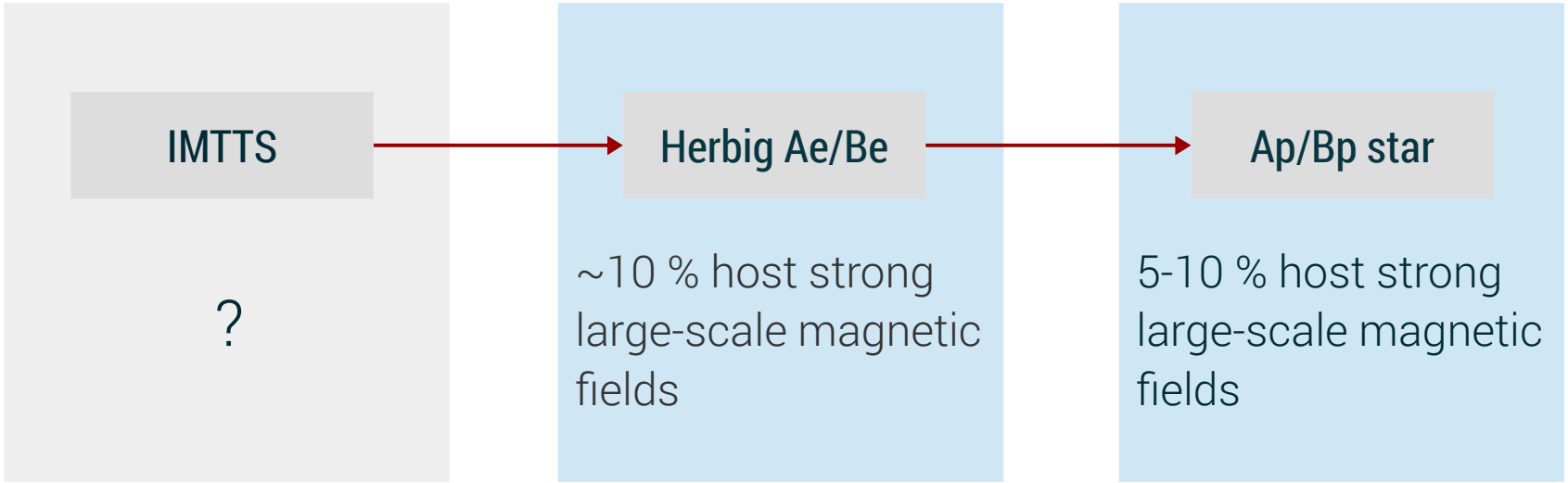
Intermediate Mass T-Tauri Stars

and their magnetic field



Low-Mass T-Tauri Stars

both large scale and complex magnetic fields

Science case:

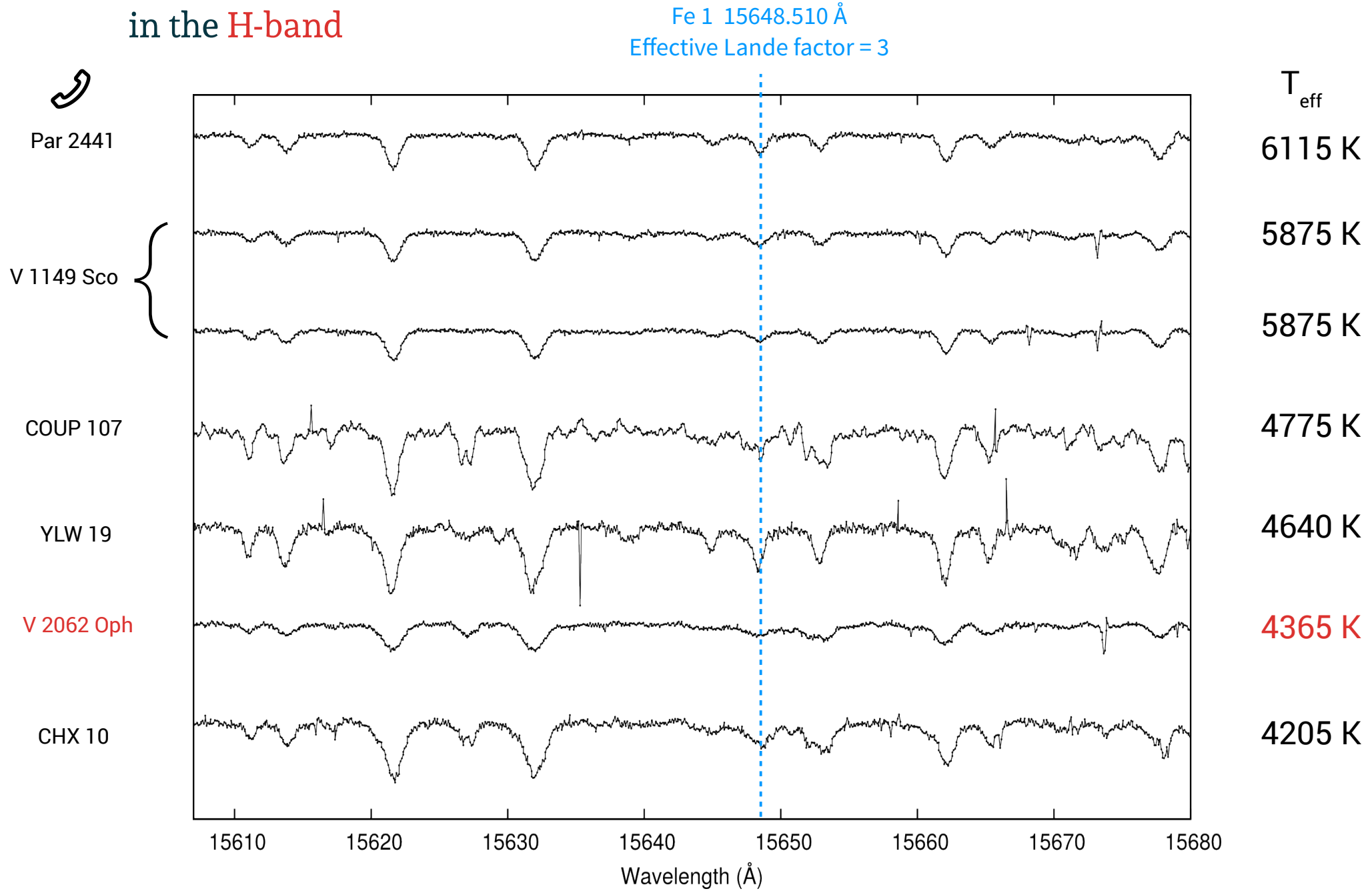
Studying the topologies of magnetic fields in IMTTS to discriminate between two scenarios:

> fossil fields are leftovers from dynamo processes

> fossil fields are remnants of the galactic magnetic field captured during stellar formation

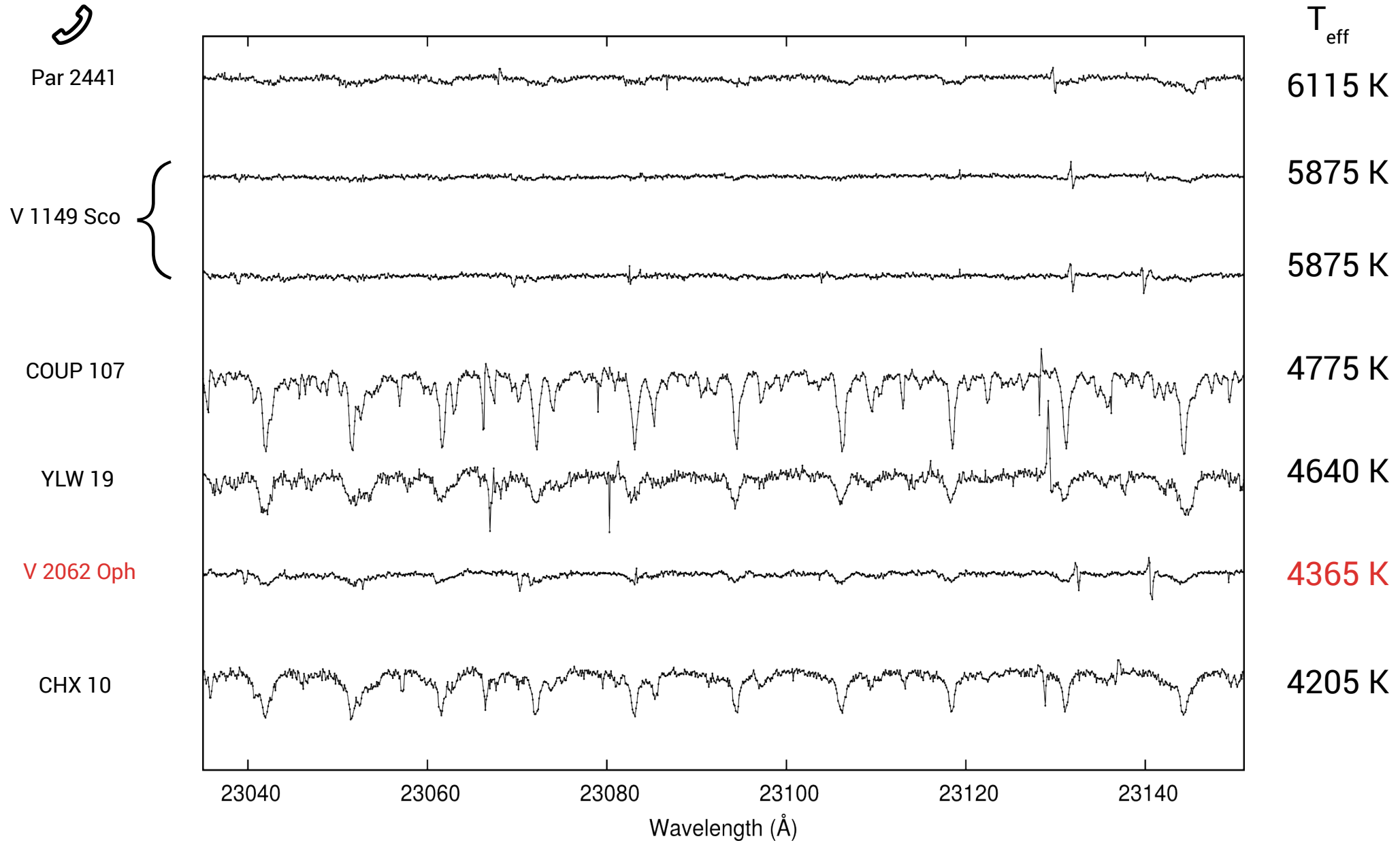
CRIRES observations

in the H-band



CRIRES observations

in the K-band



Spectrum synthesis

method and assumptions

Vienna Atomic Line Database
VALD

Atomic data

SYNMAST

Magnetic spectrum synthesis code

Homogeneous field characterized by 3 vectors

synthetic spectrum

MARCS

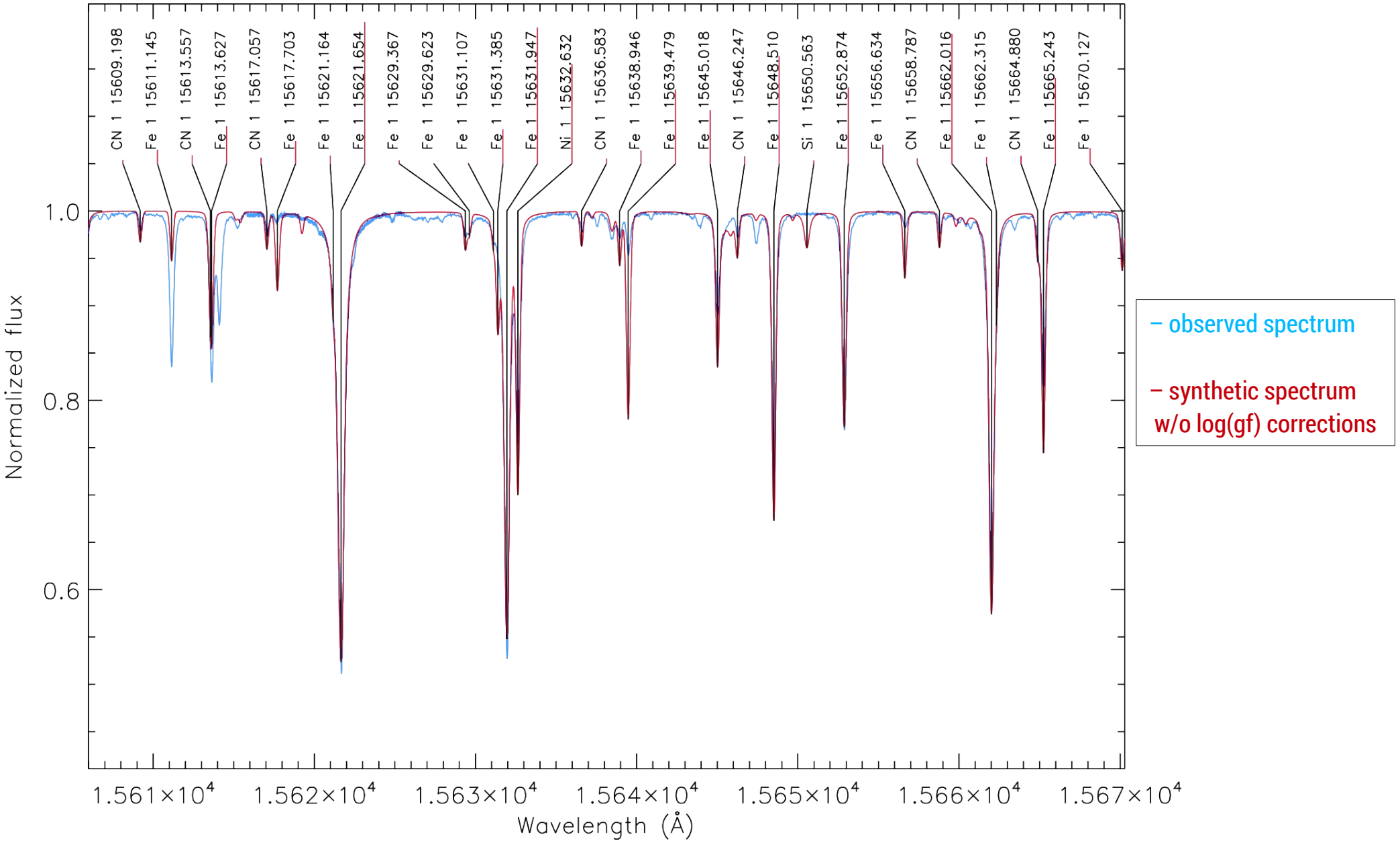
Model atmosphere

Static, plane-parallel, 1-D model atmosphere

→ T_{eff} from the litterature
→ **log*g*** fixed to 3.5
→ **Solar** metallicity is assumed
→ Adjust **veiling**

Improving oscillator strengths

with the Sun as a benchmark



Improving oscillator strengths

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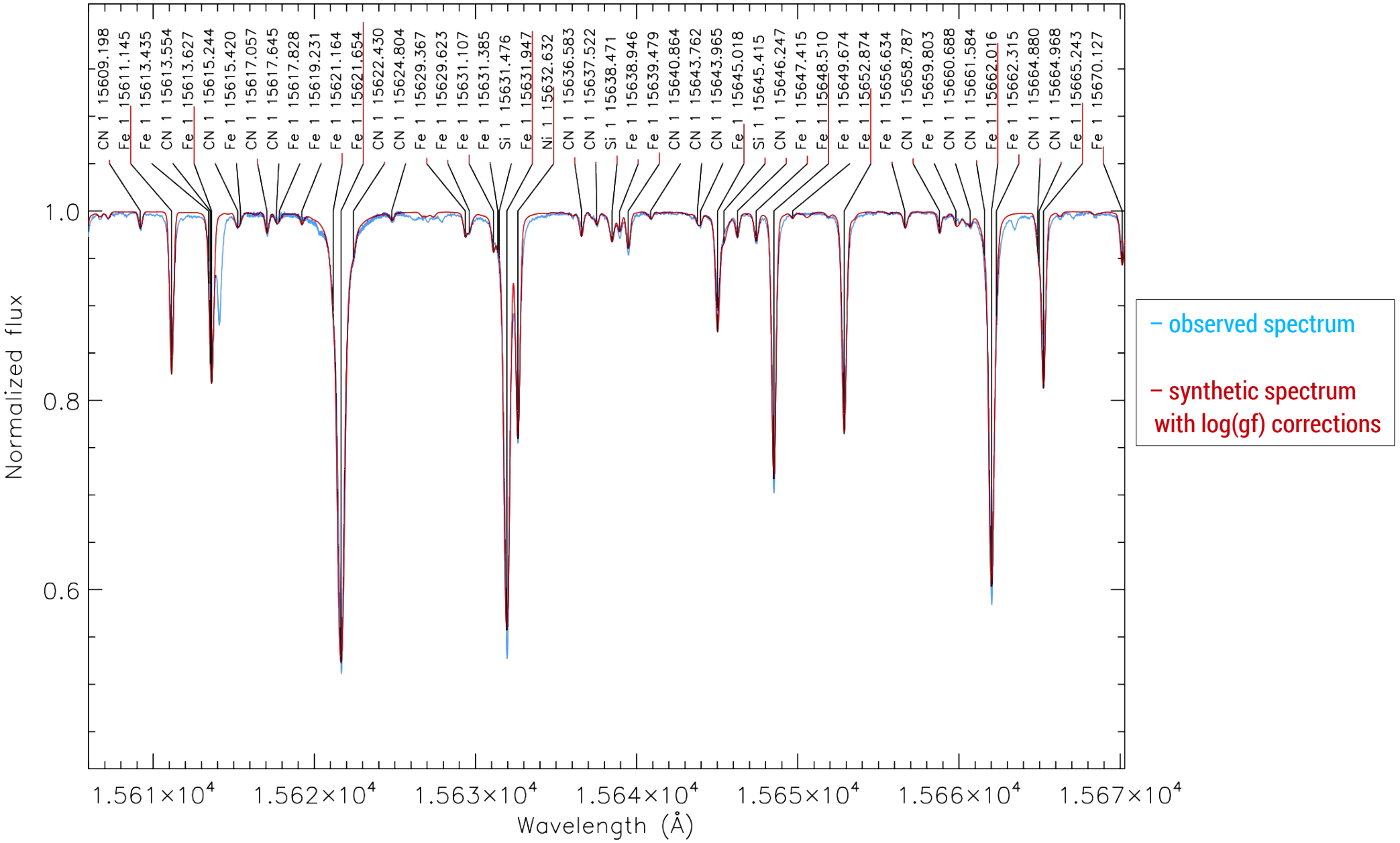
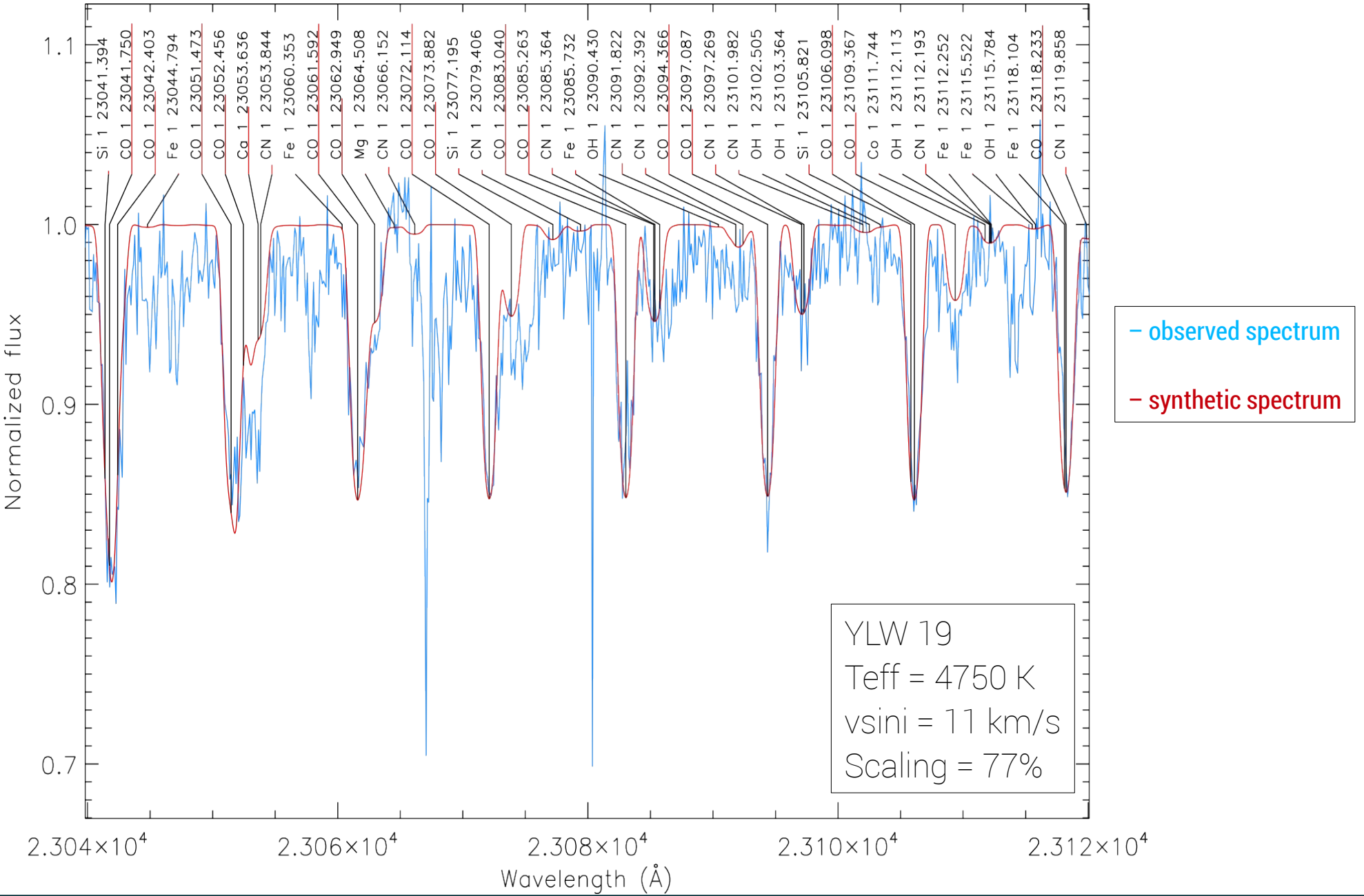


*v*sin*i* determination

using CO lines in the K-band



*v*sin*i* determination

using CO lines in the K-band

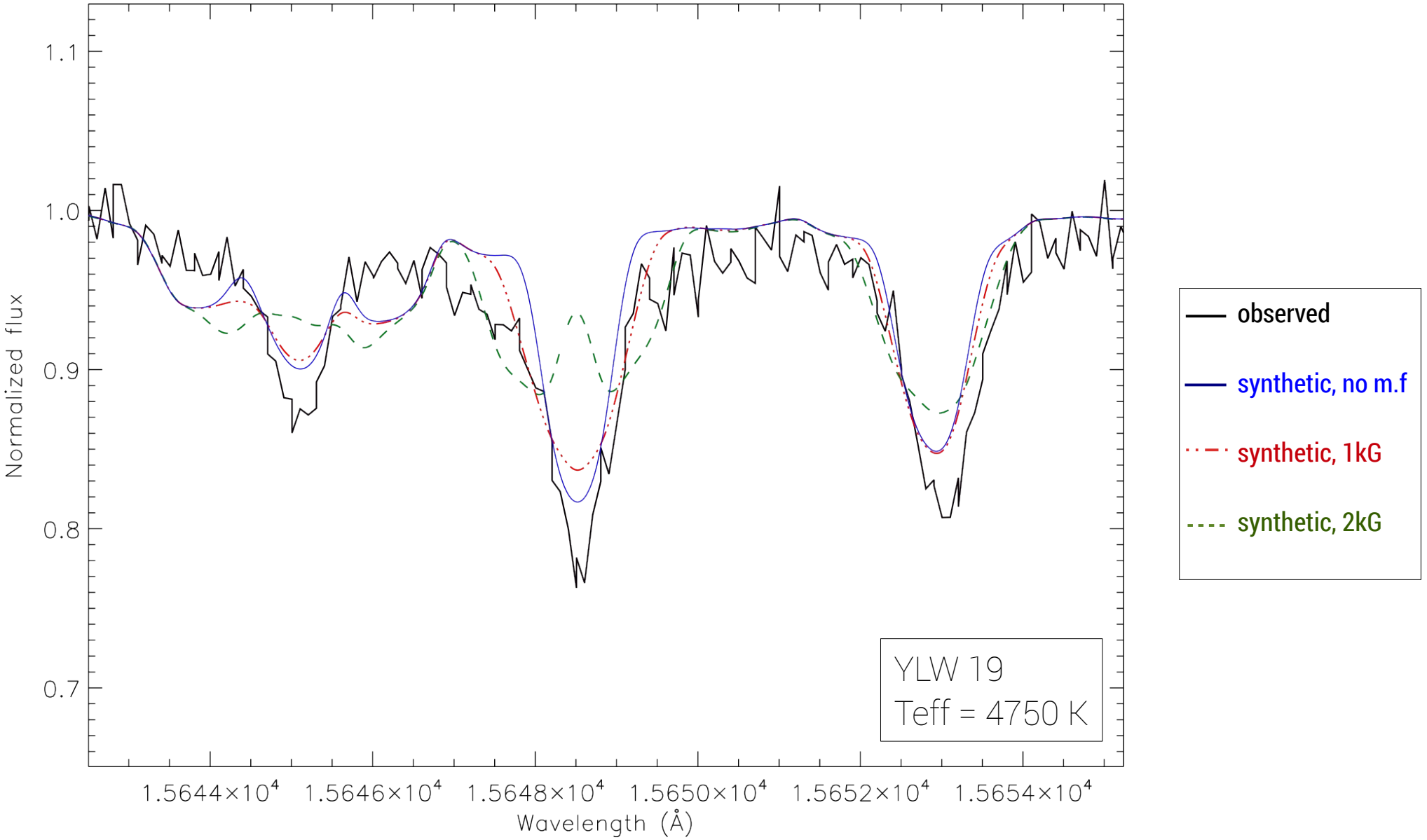
Star	Vsini (km/s)
CHX 10	8.3
COUP 107	6.5
V 2062 Oph	15.9
YLW 19	11.0

→ *v*sin*i* determined for the 4 stars with enough signal in the K-band

→ *v*sin*i* from the litterature available for the other stars

magnetic field strength constraint

using Fe 1 15648.510 in the H-band



Conclusion

Done

> Learned how to use spectrum synthesis tools

> Correction of oscillator strengths

> Better determination of *v*sin*i* for 4 stars

Work in progress

> Put constraints on magnetic field strengths

Thanks for your attention