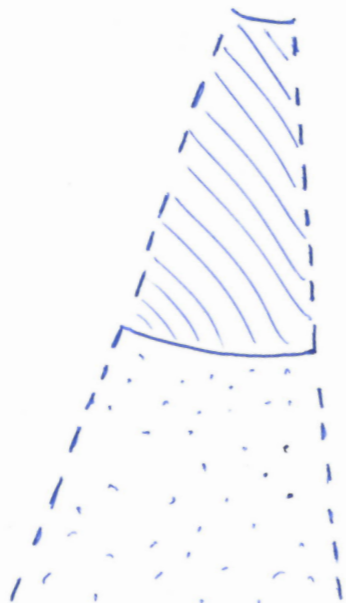


B.L. de Vries
J. A. D. L. Blommaert
L. B. F. M. Waters
C. Waelkens
M. Min
R. Lombaert
H. Van Winckel



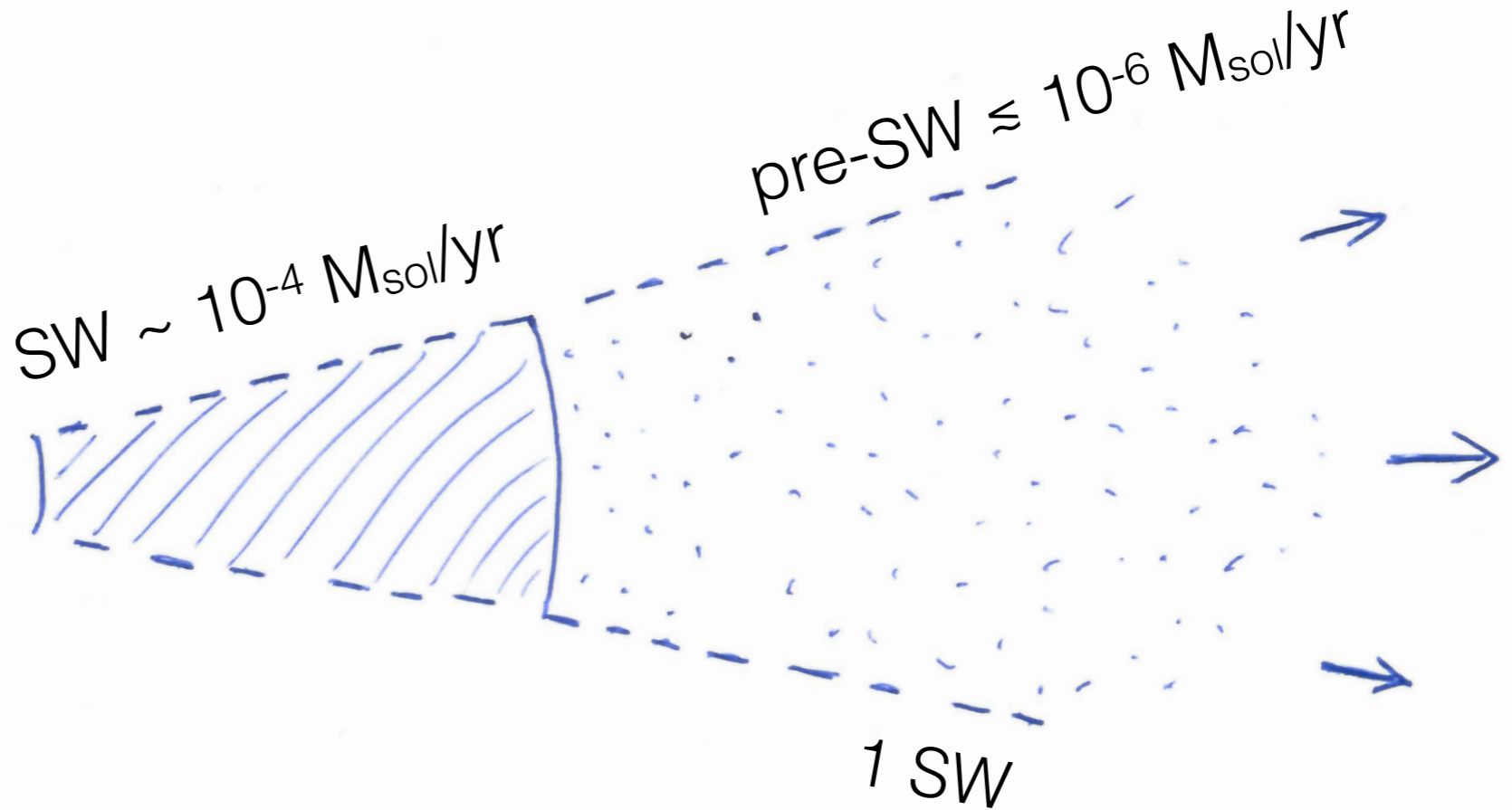
OH/IR stars and their dusty superwind, forsterite bands, and unclear evolution

AlbaNova University Centre, Stockholm University
Stockholm University Astrobiology Centre
Instituut voor Sterrenkunde, K.U. Leuven

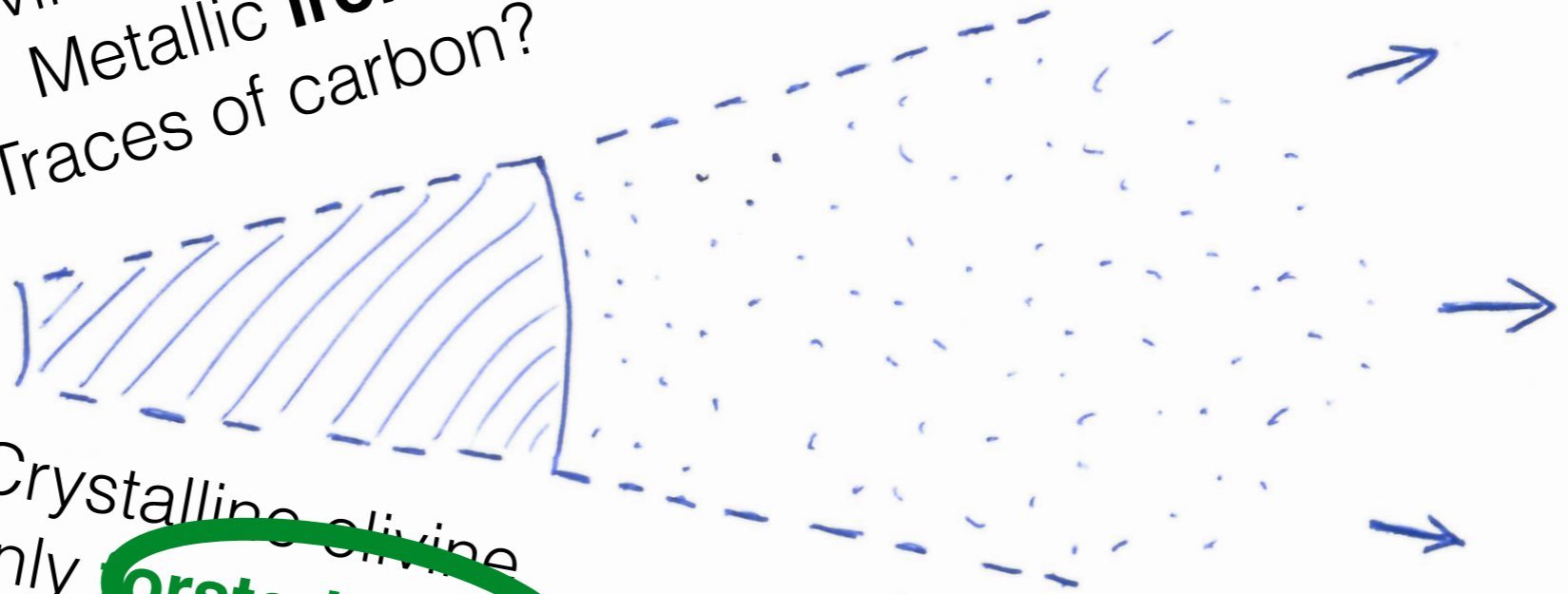
MS mass $\approx 5 M_{\text{sol}}$



O \rightarrow C, molecules,
dust and
wind driving



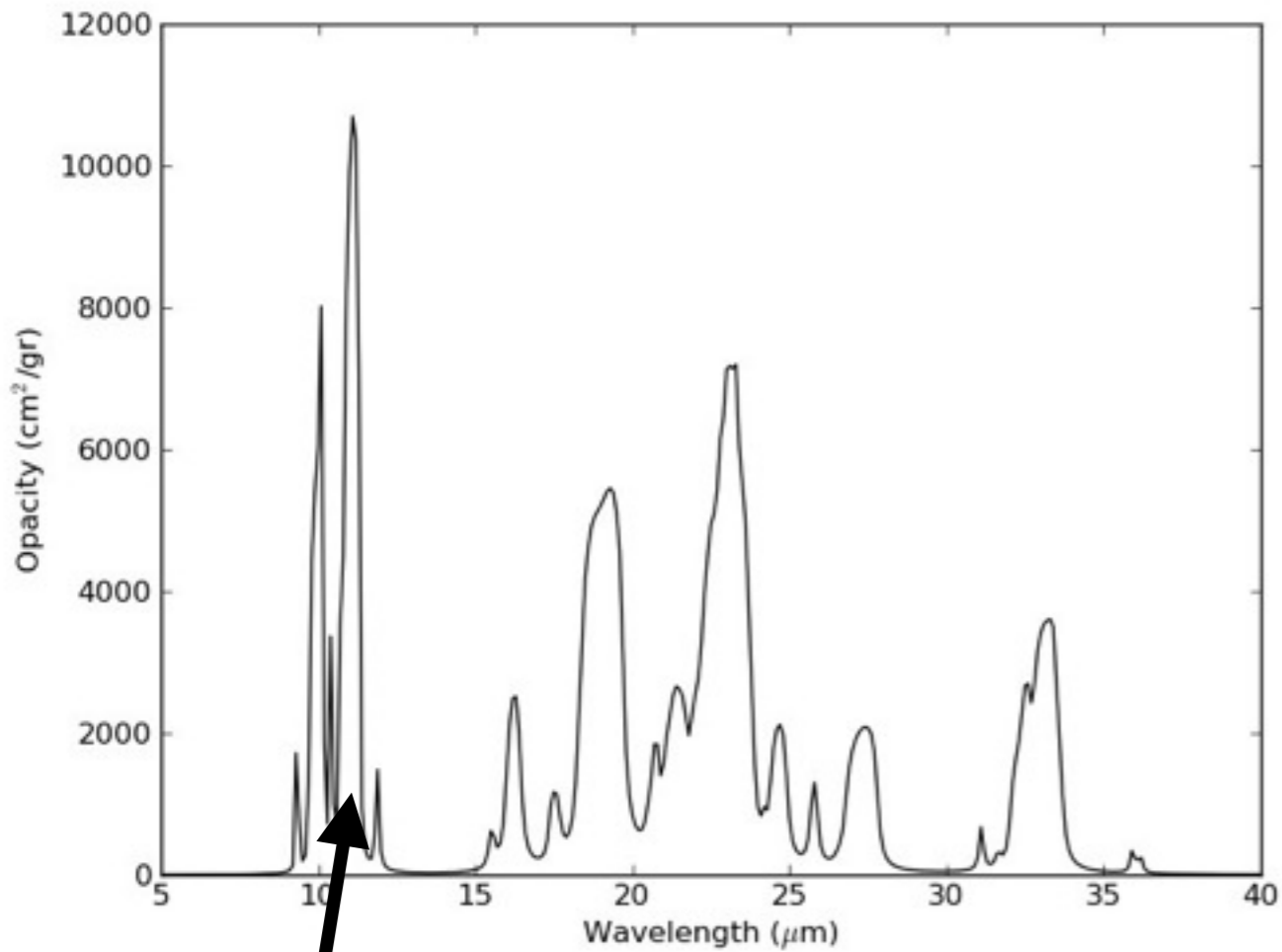
Amorphous **silicates**
(olivines, pyroxenes)
Metallic **iron**?
Traces of carbon?



Crystalline olivine
mainly **forsterite** ($x=0$)
 $Mg_{(2-2x)}Fe_{(2x)}SiO_4$

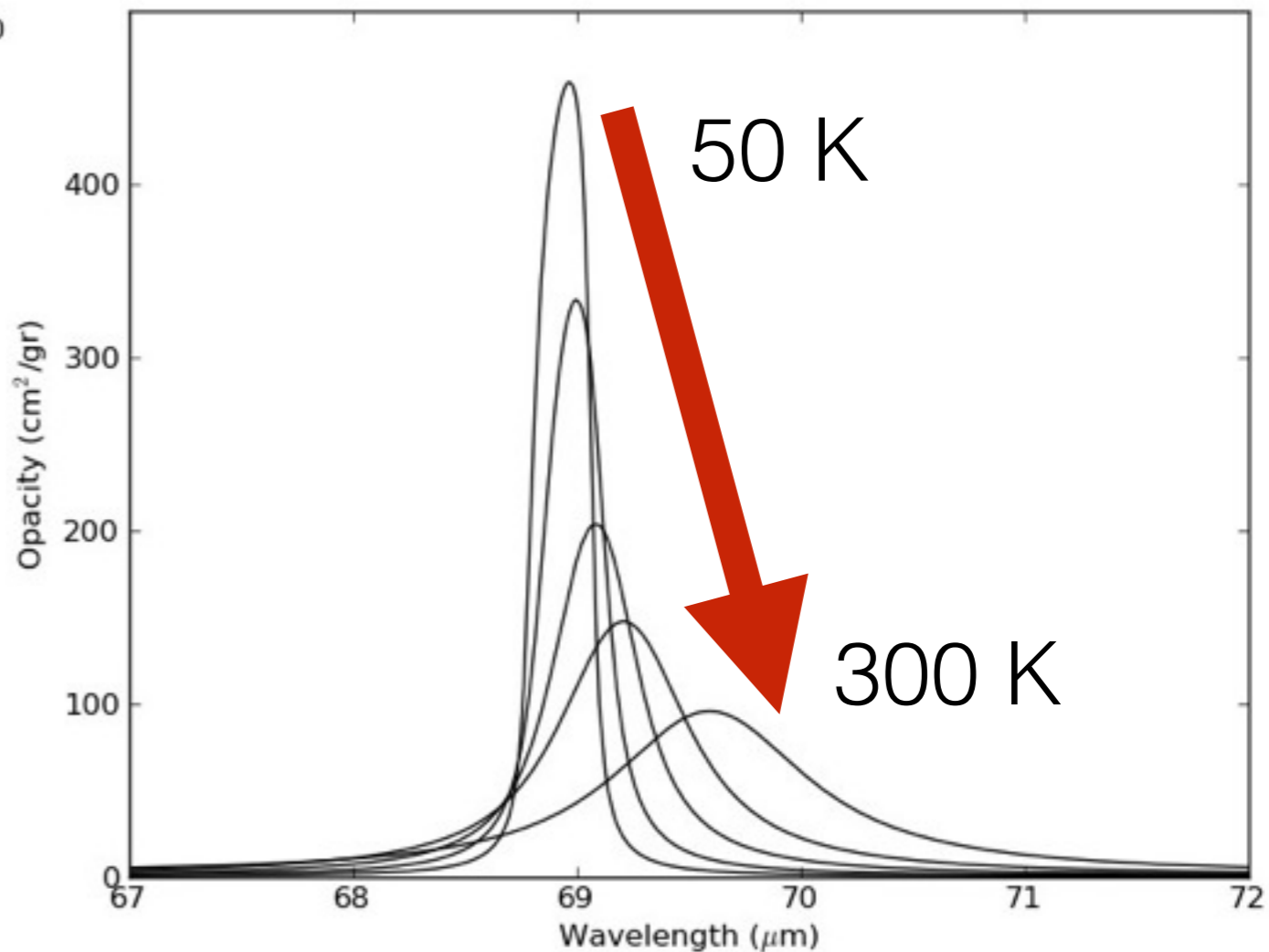
Sharp and interesting **bands**:
11.3, 33.6, **69.0** micrometer

Forsterite: $\text{Mg}_{(2-2x)}\text{Fe}_{(2x)}\text{SiO}_4$



11.3 micrometer band
Abundance probe in line of sight
(de Vries+ 2010)

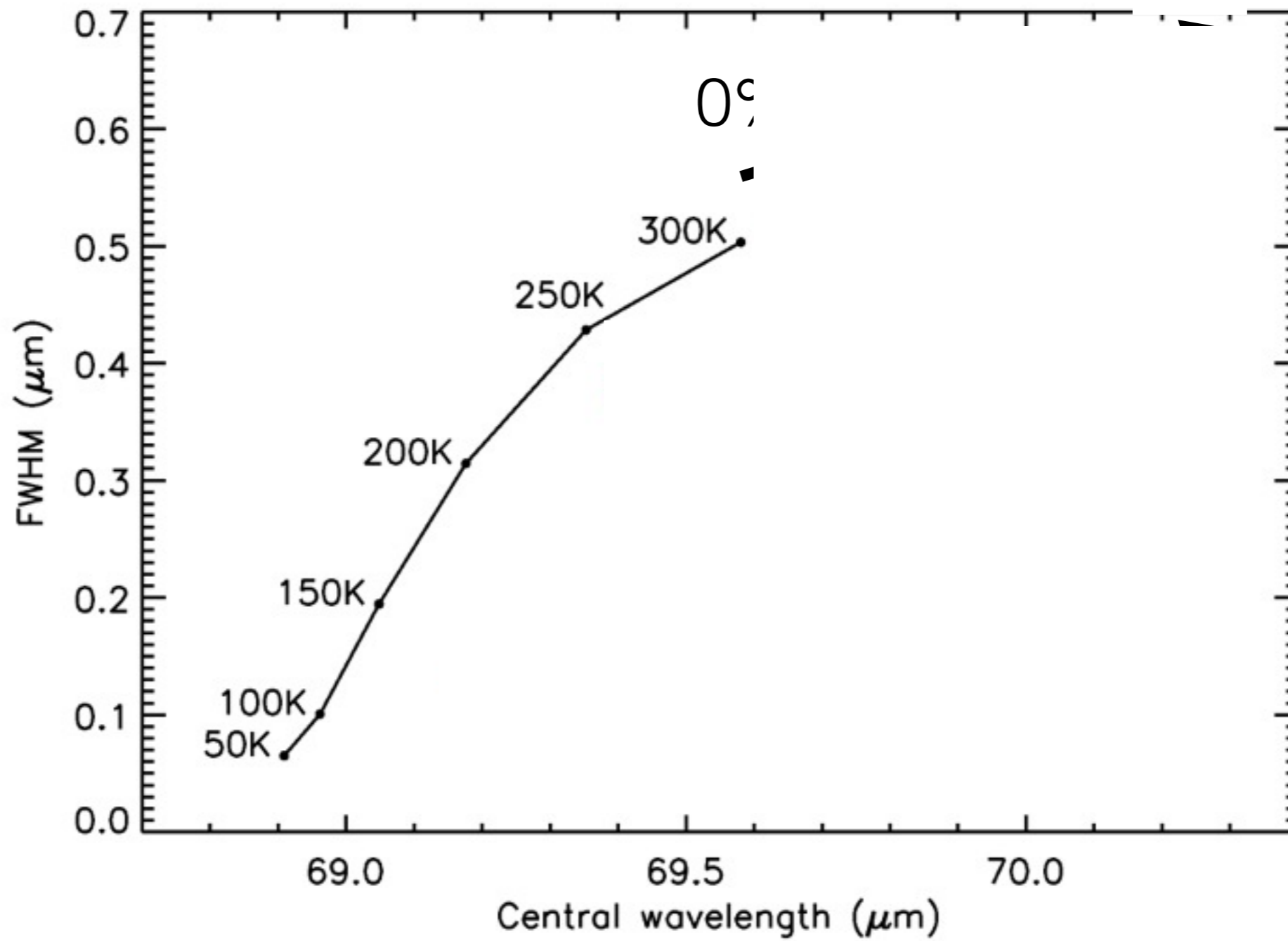
69 micrometer band
T and iron probe
(Suto+06, Koike+03)

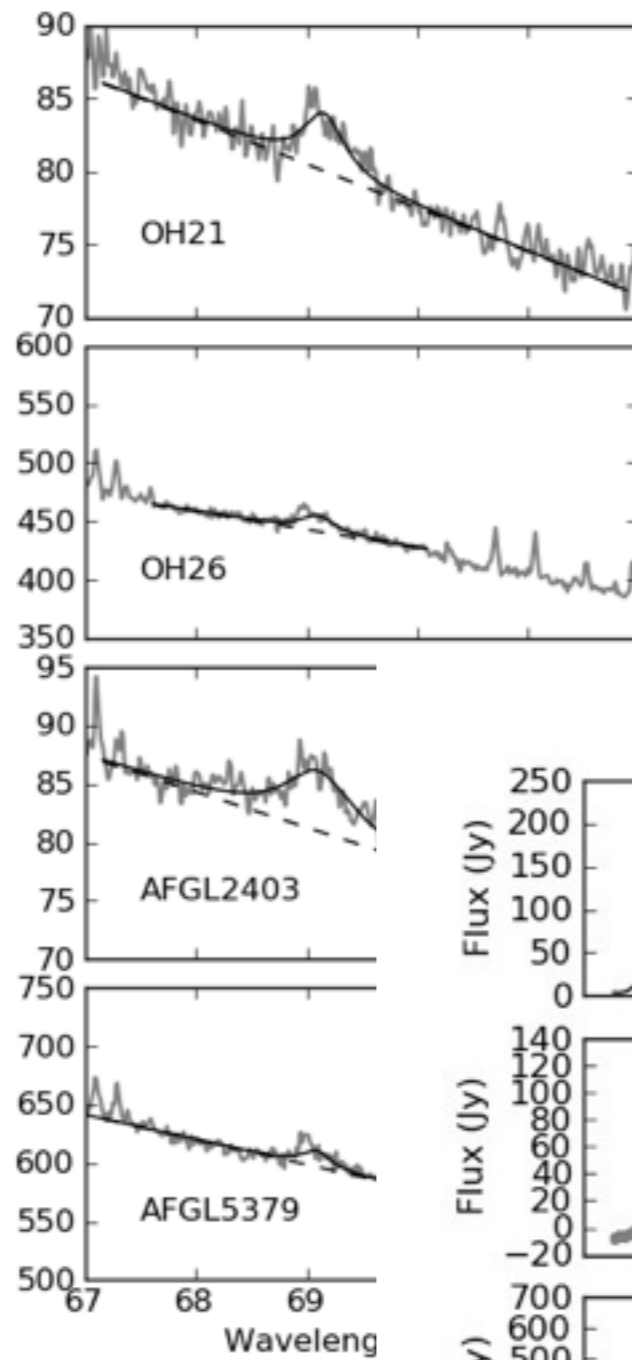
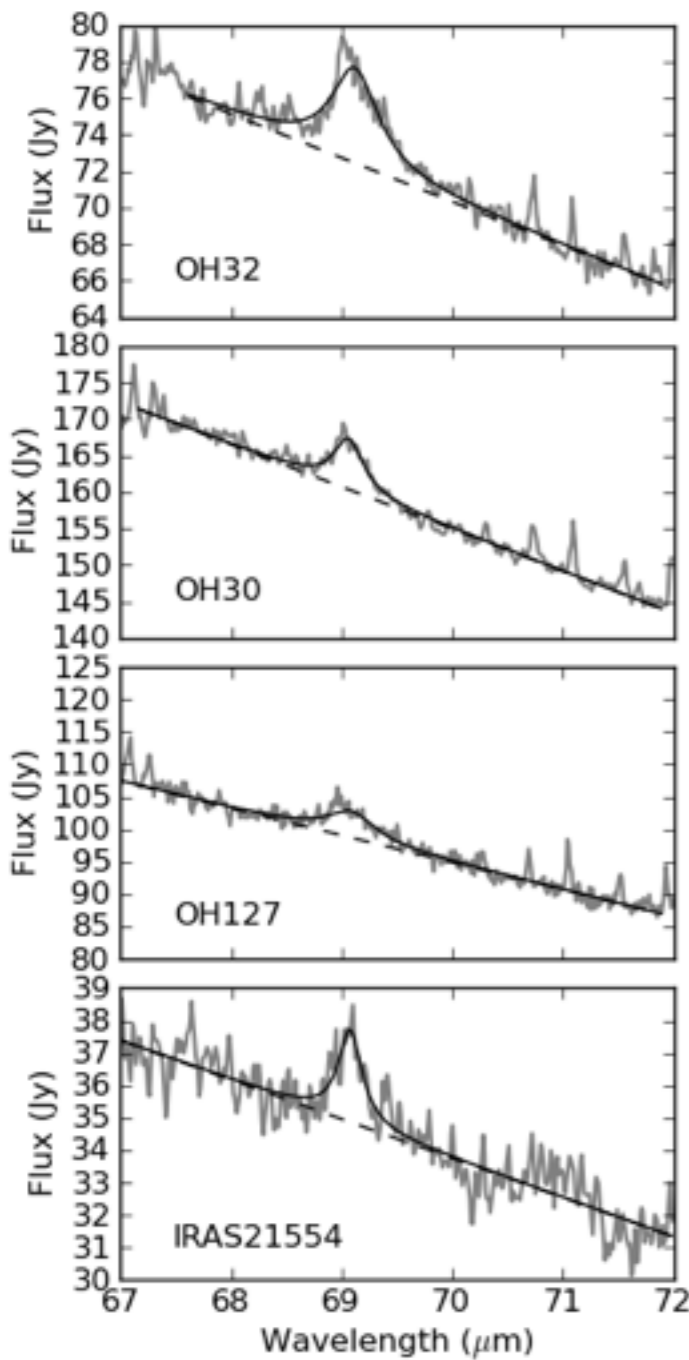


Forsterite: $\text{Mg}_{(2-2x)}\text{Fe}_{(2x)}\text{SiO}_4$

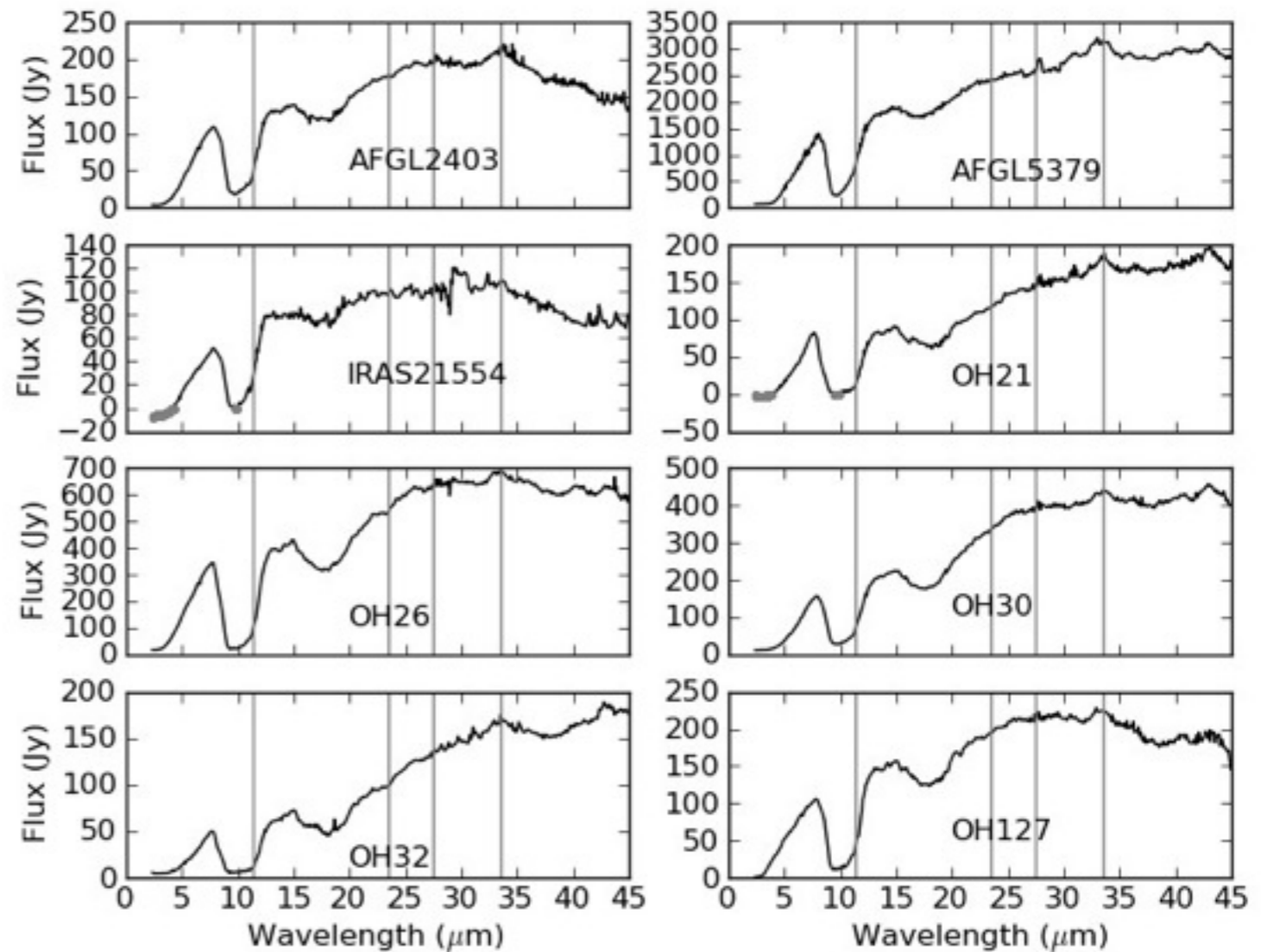
2%

The 69 micron band





14 sources
 Herschel/PACS: 69mic scans
 ISO-SWS: mid infrared



MODELS

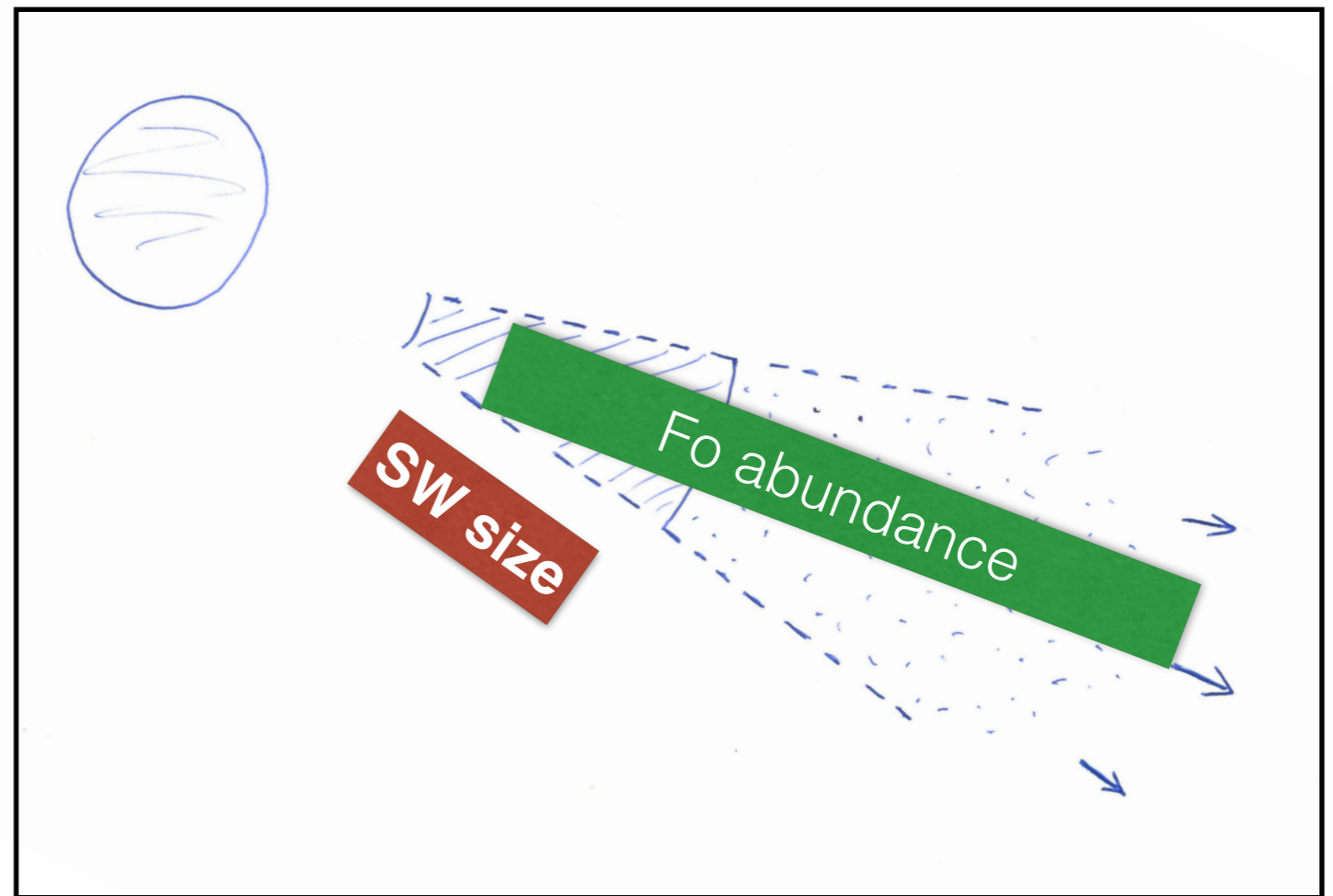
mass-loss
forsterite abundance
other abundances
superwind size
superwind strength
location forsterite
+++

11.3: fo. abundance
69.0: SW size & fo. abundance

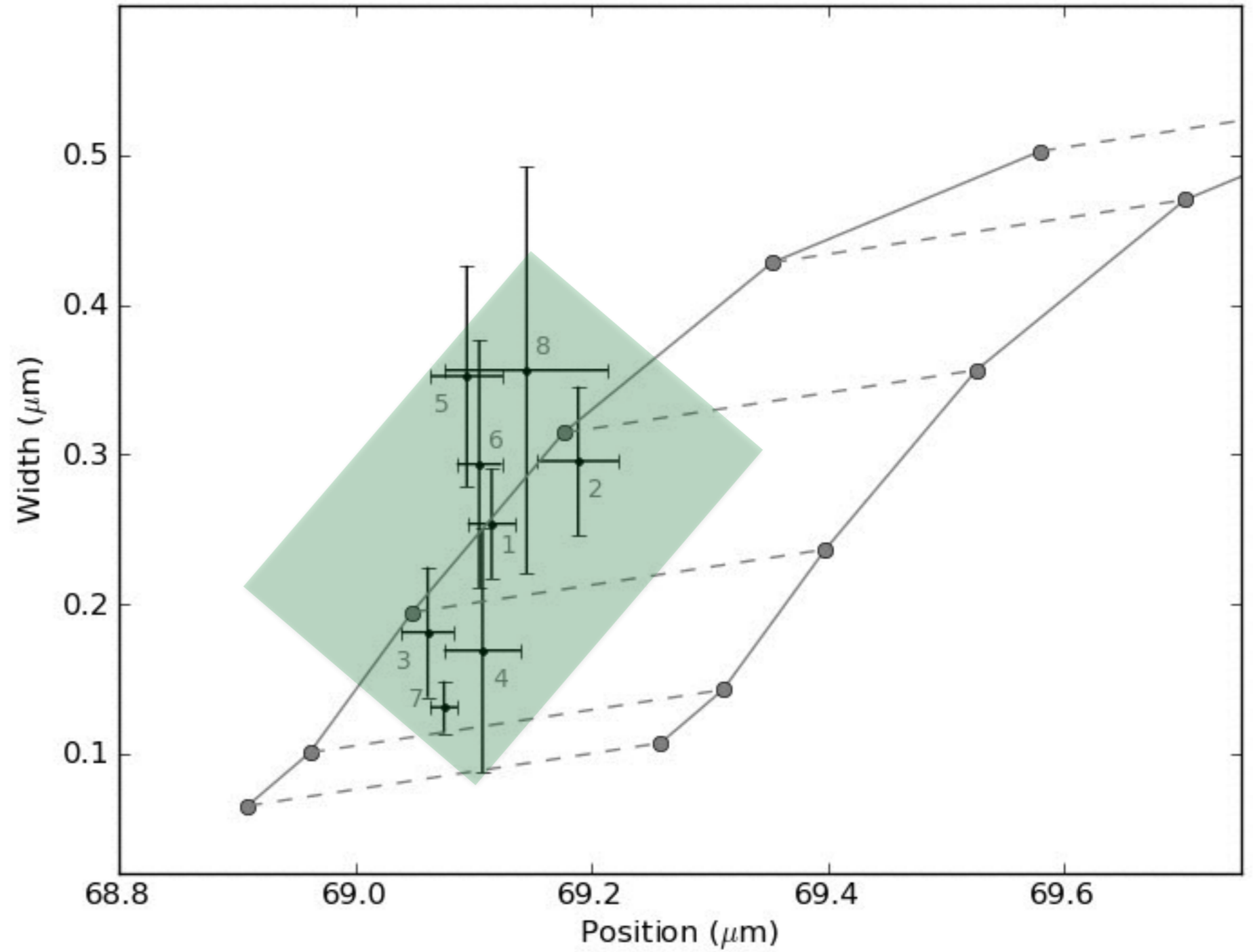
strength 11.3
shape 69 bands

OBSERVATIONS

14 total
8 detections at 69 micron
5 detections at 11.3 micron



Crystalline olivine
0-0.5% iron



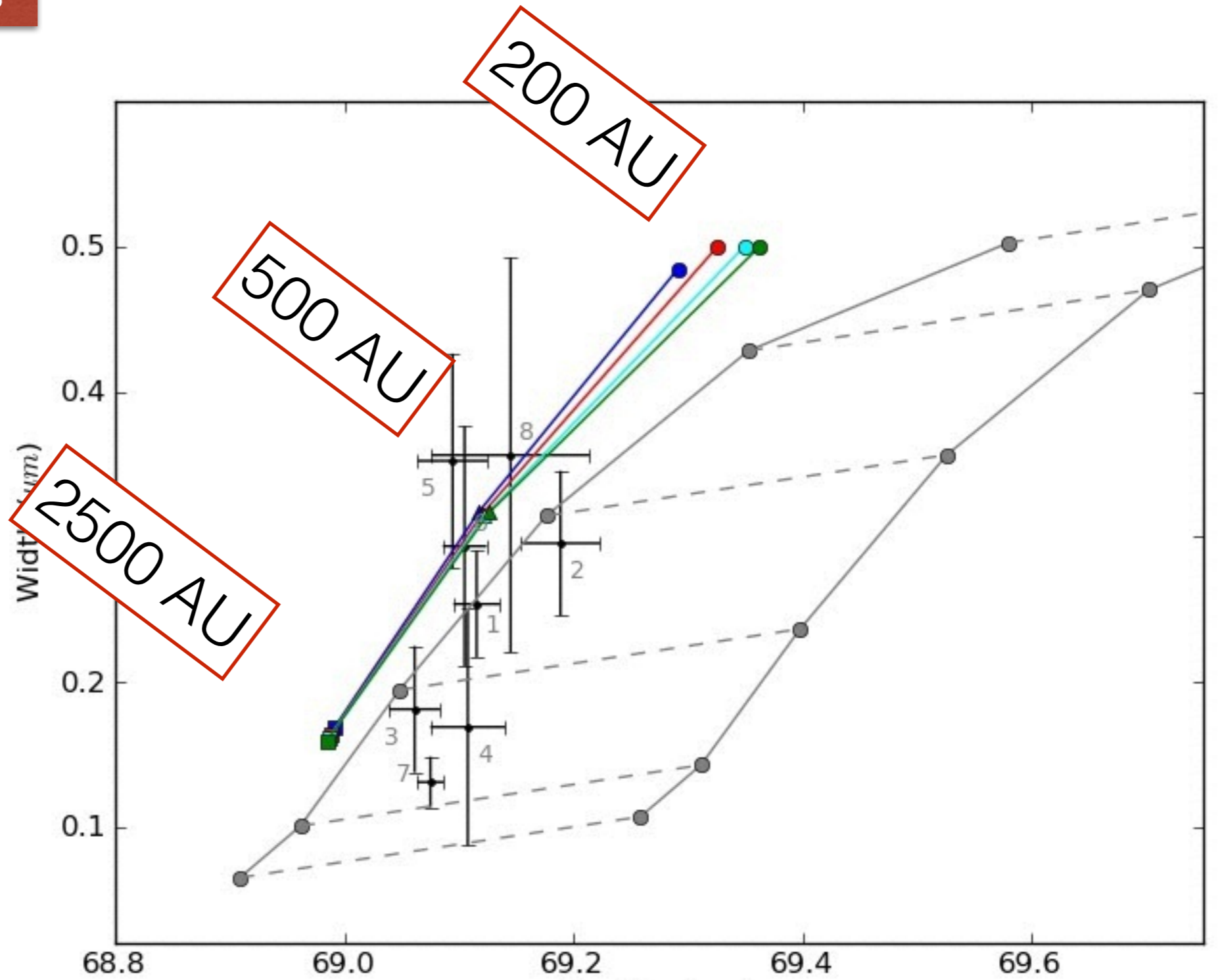


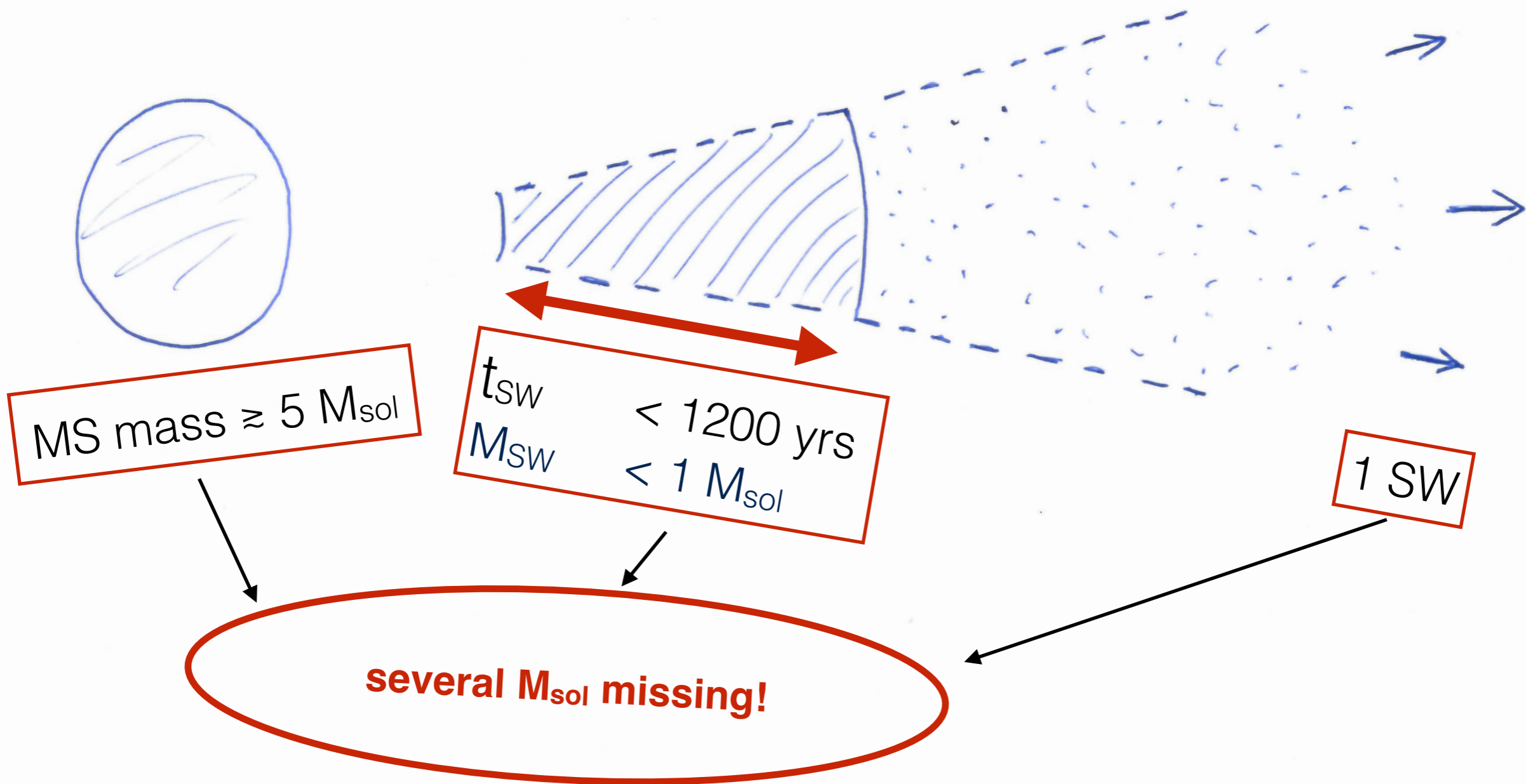
1-10% forsterite

~~Forsterite~~

Features indicate
spherical distribution
of forsterite.
No disk

SW \approx 2500 AU
1400 R_{star}
1200 yrs





several M_{sol} missing!

Before SW?

Not seen so far

destruction/dilution ?

After SW?

super-luper wind?

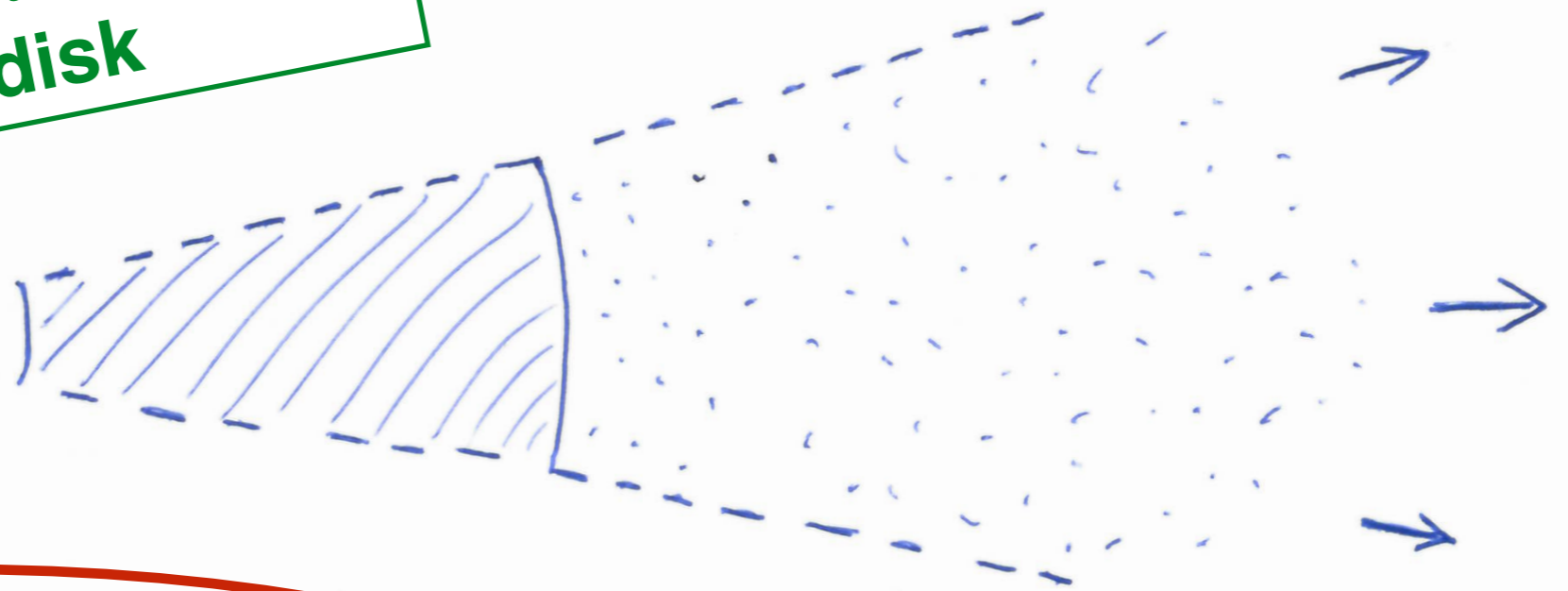
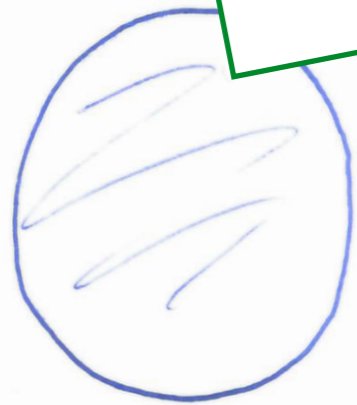
$\approx 10^{-3} M_{\text{sol}}/\text{yr}$

Not observed?

Incorrectly classified objects? (YSO like?)

Like the proto-PN IRAS 16342–3814?

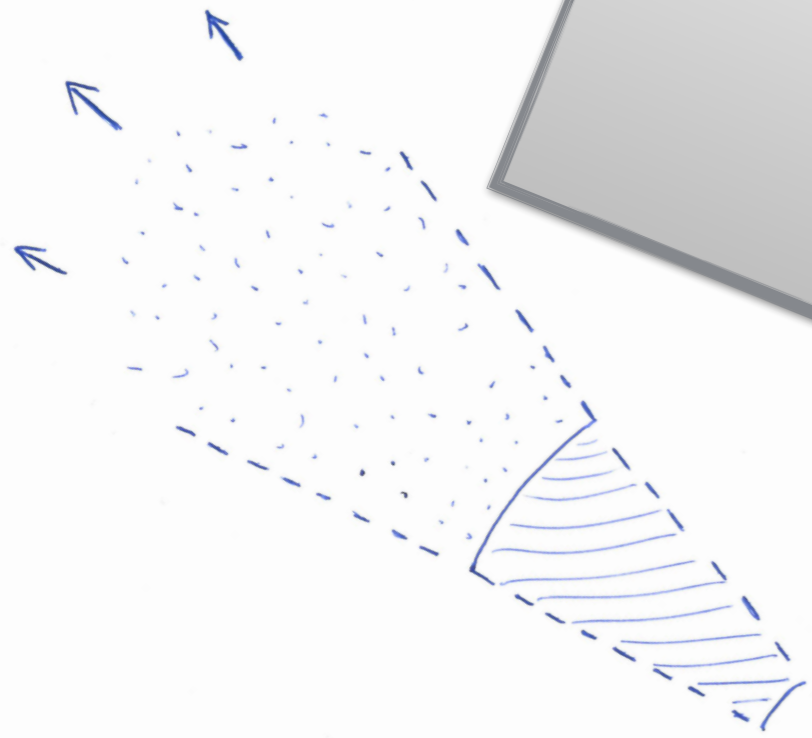
Features indicate
spherical distribution
of forsterite.
No disk



several M_{sol} missing!

Shown in gas and dust
analysis!
Justanont+13

**All diagrams and the error
analysis are in the paper!**



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Thank you.
B.L. de Vries et al. 2014
(A&A, 561, A75)

Questions?
OH/IR stars
dusty **super**
forsterite bands,
and **unclear** evolution

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Features indicate
spherical distribution
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No disk

several M_{sol} missing!