

Time-frequency analysis of stellar oscillations : from the Sun to Stars

Frédéric Baudin

At the beginning...

There was IPHIR data (~150 days)

Alan:

«On doit pouvoir mieux faire que la
Fourier Transformée...»

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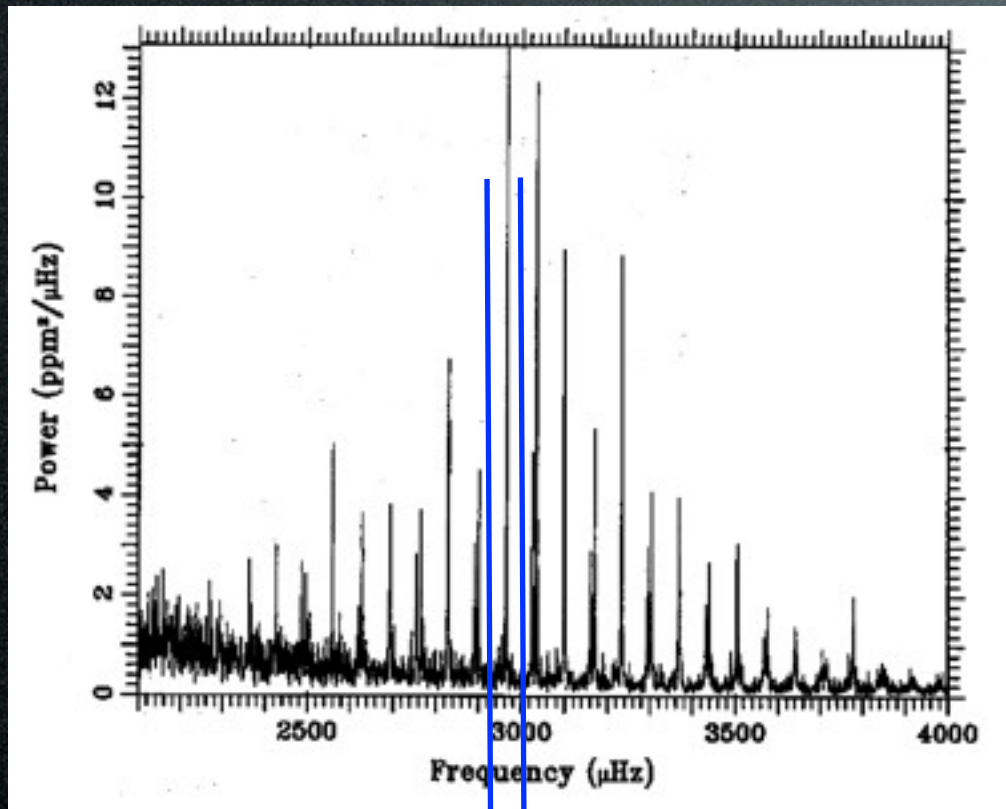
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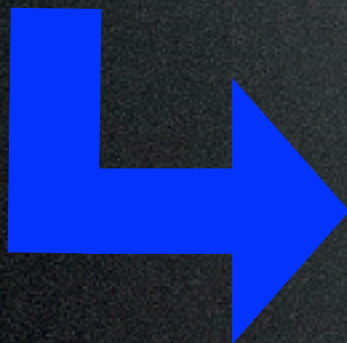
Frédéric:

«Yes! ze analyse time-frrrréquency»

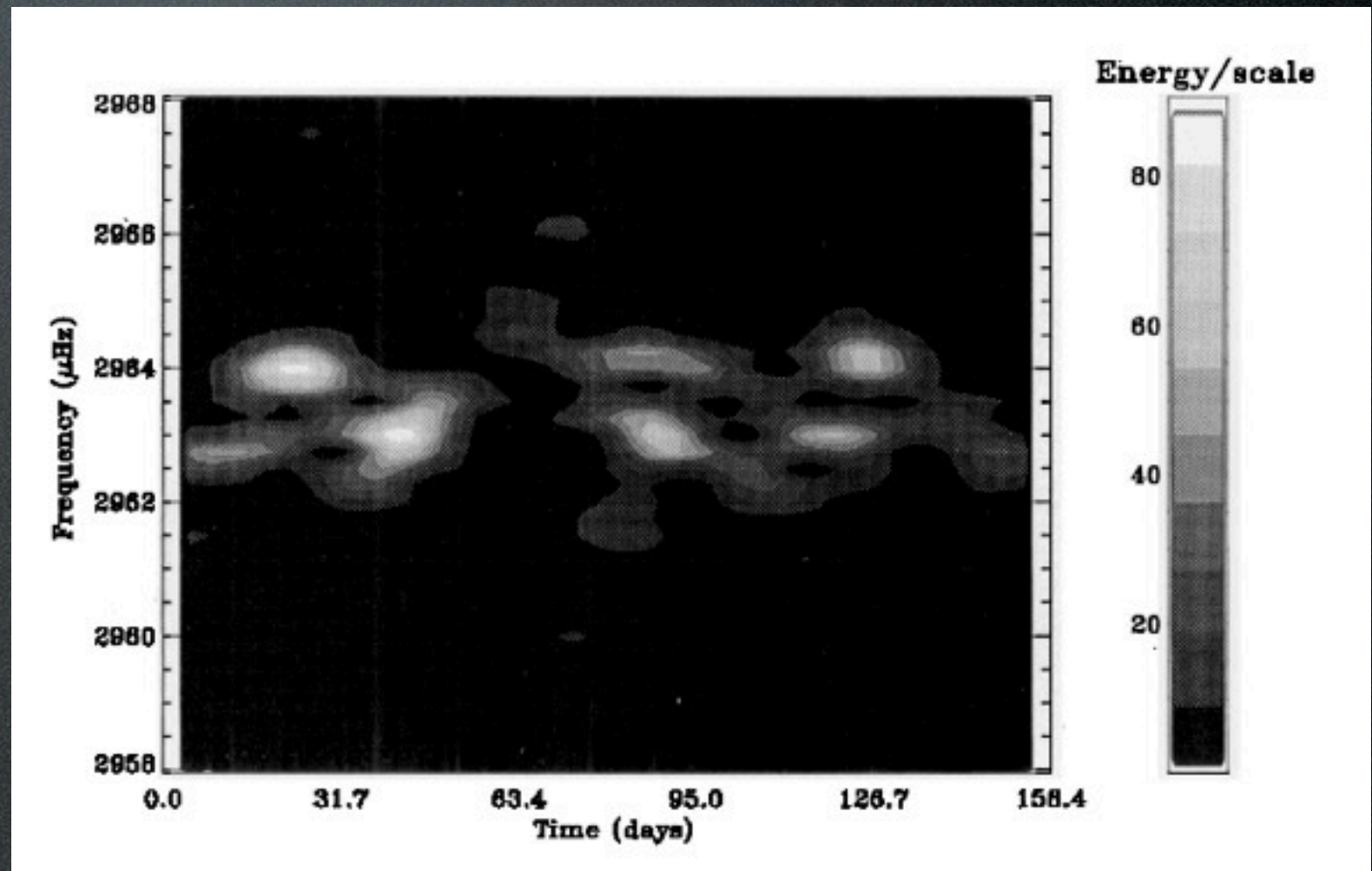
Time varying solar modes



Toutain et al. 1992



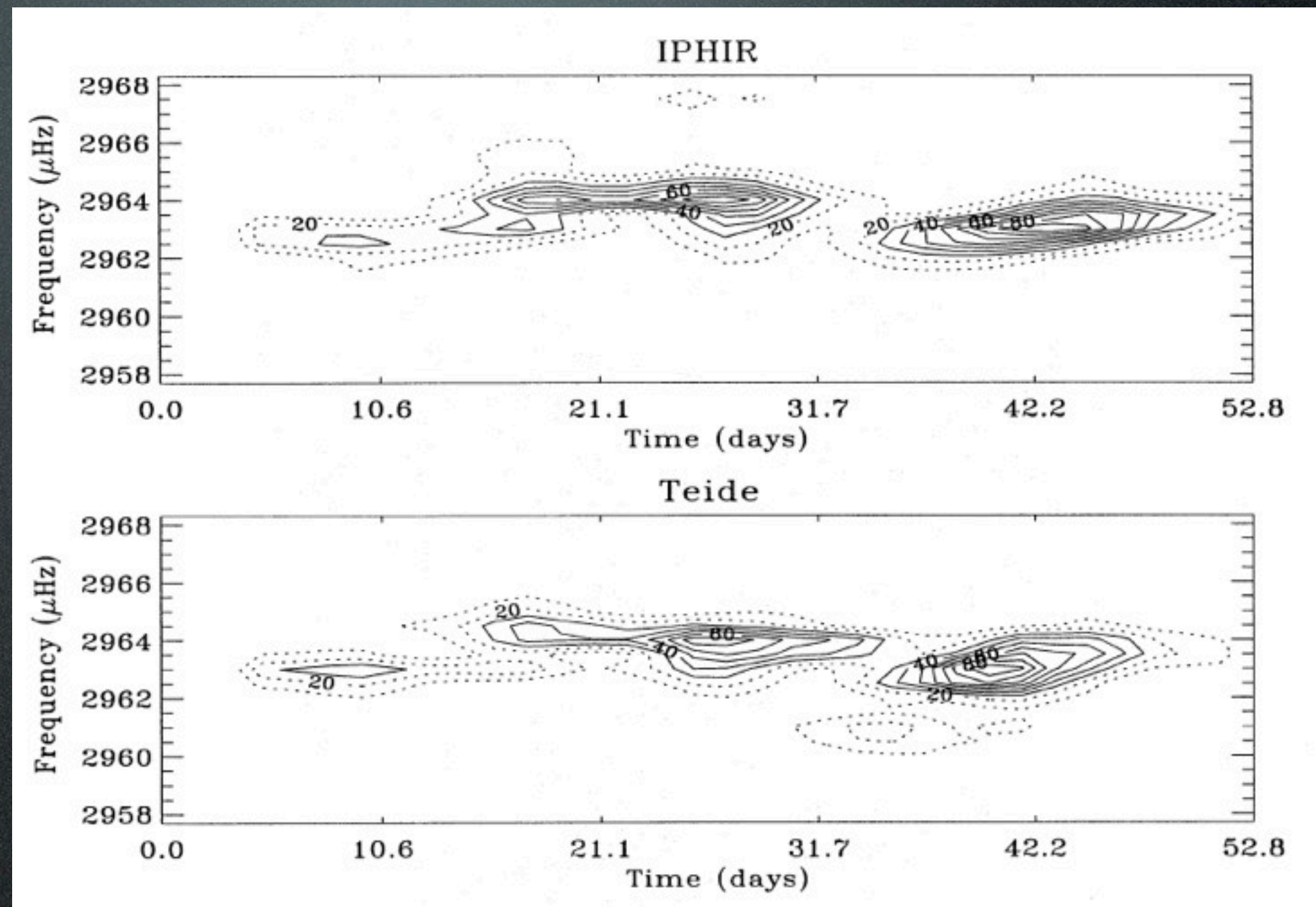
Baudin et al. 1994



Time varying solar modes

Space-borne
photometry

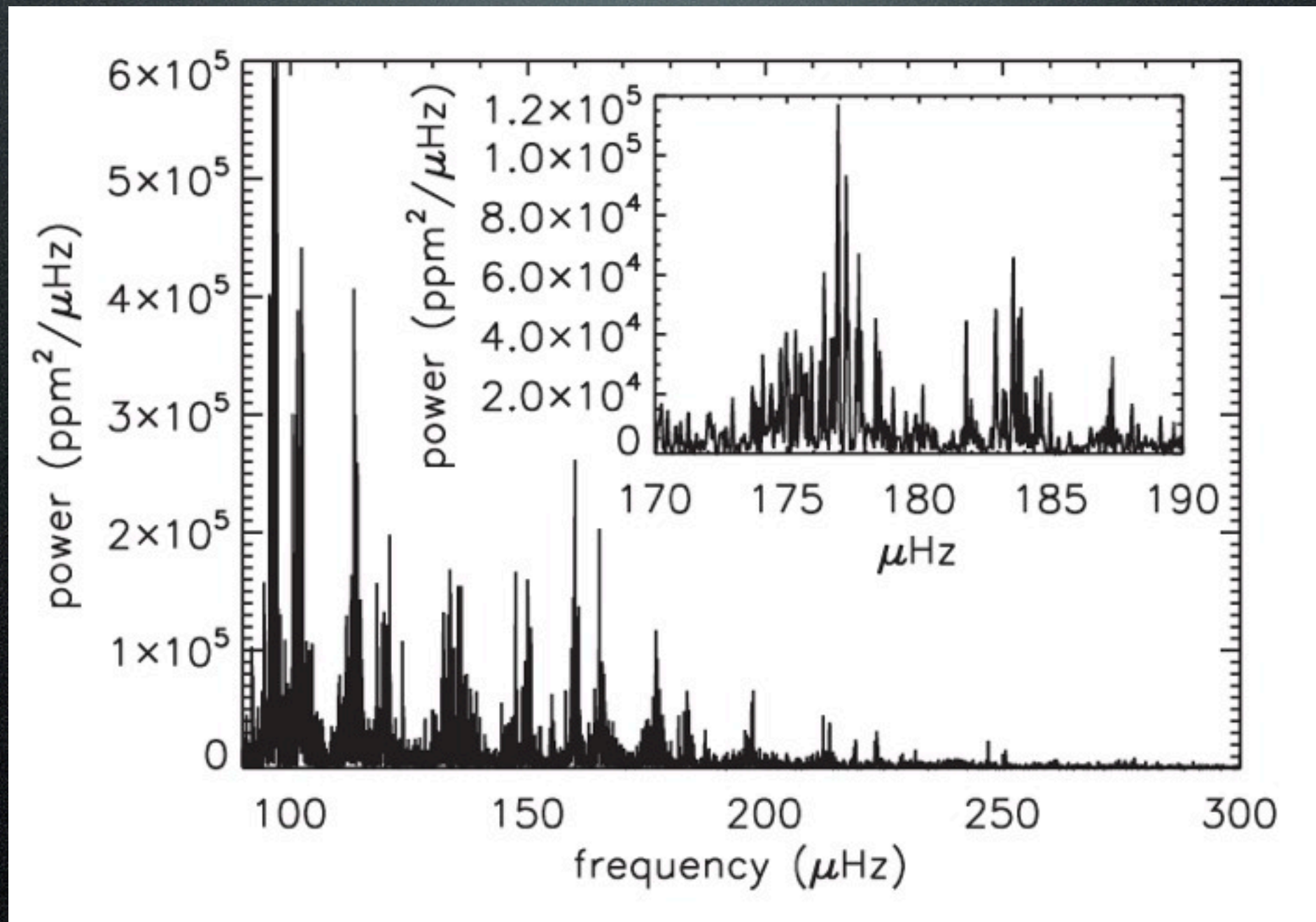
Ground-based
spectroscopy



Baudin et al. 1996

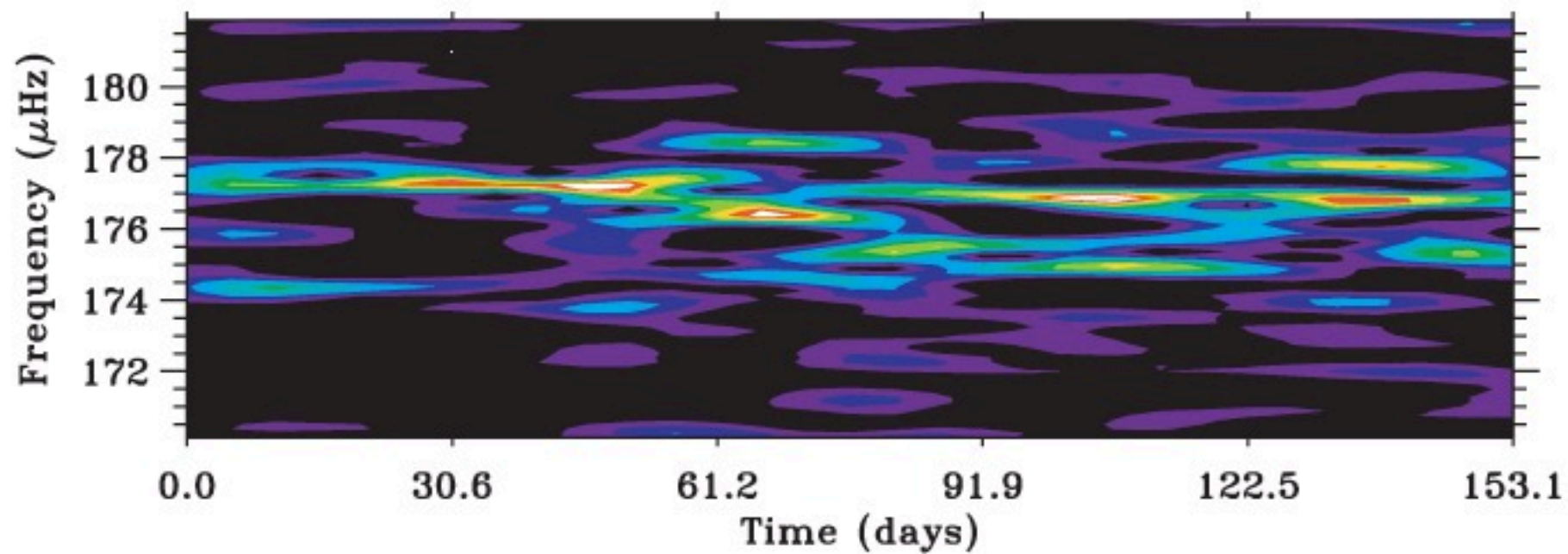
=> yes, solar modes are stochastically excited

Time varying modes in a β Cephei star

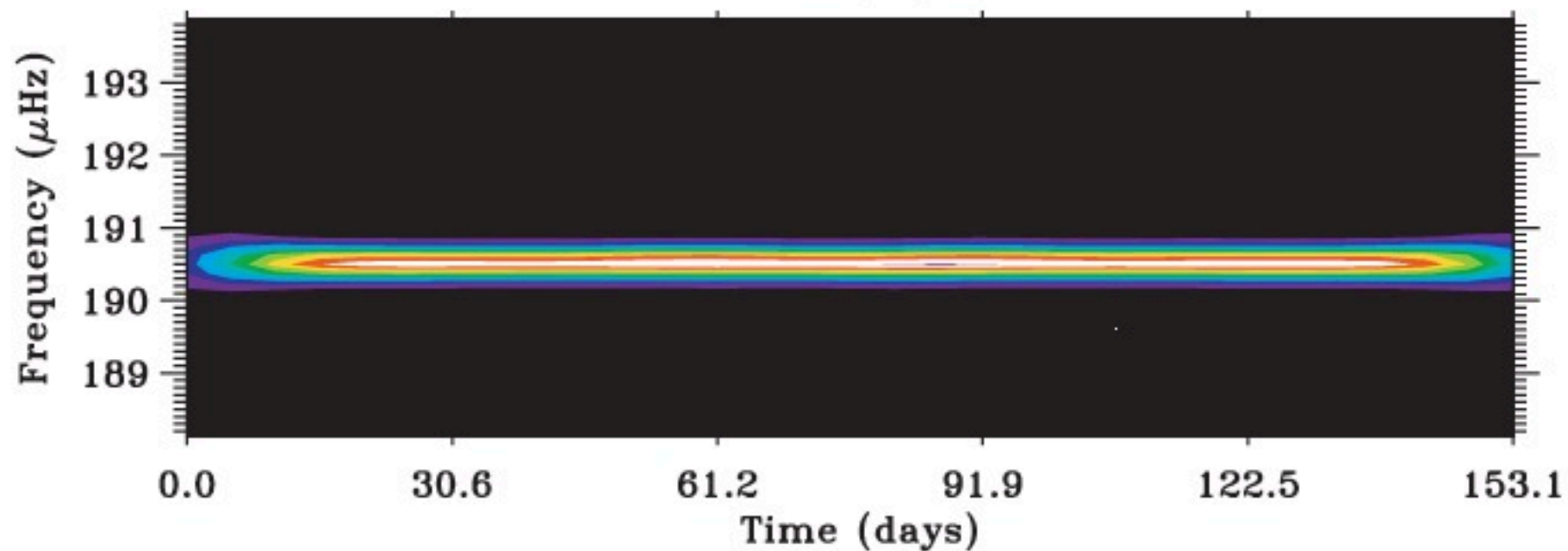


Belkacem et al. 2009

Time varying modes in a β Cephei star



stochastically
driven
(solar-like)

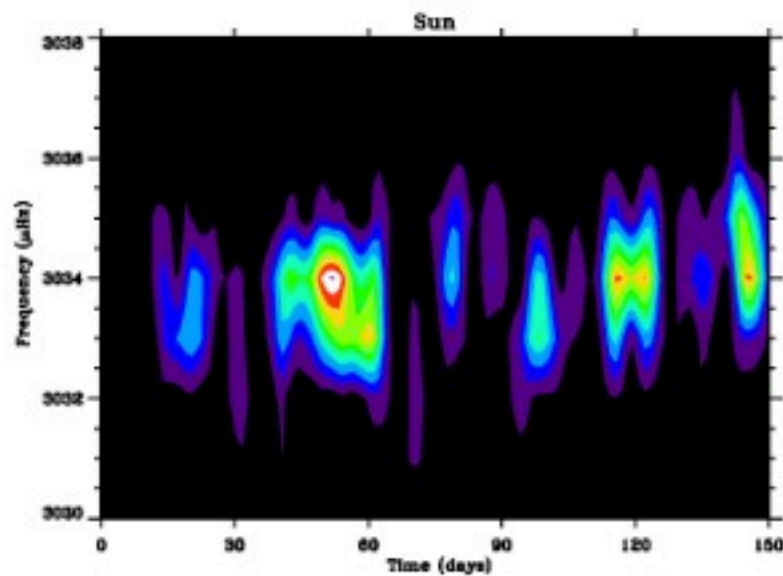


opacity
driven

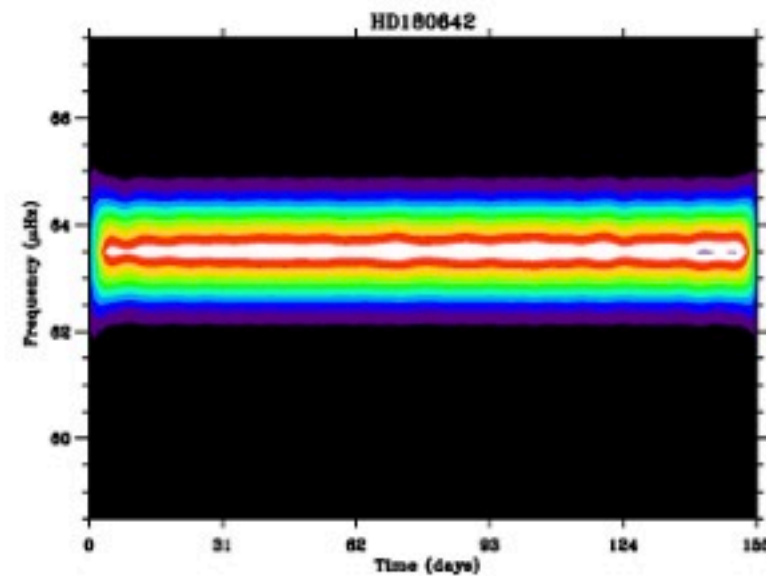
Belkacem et al. 2009

Time varying modes in a β Cephei star

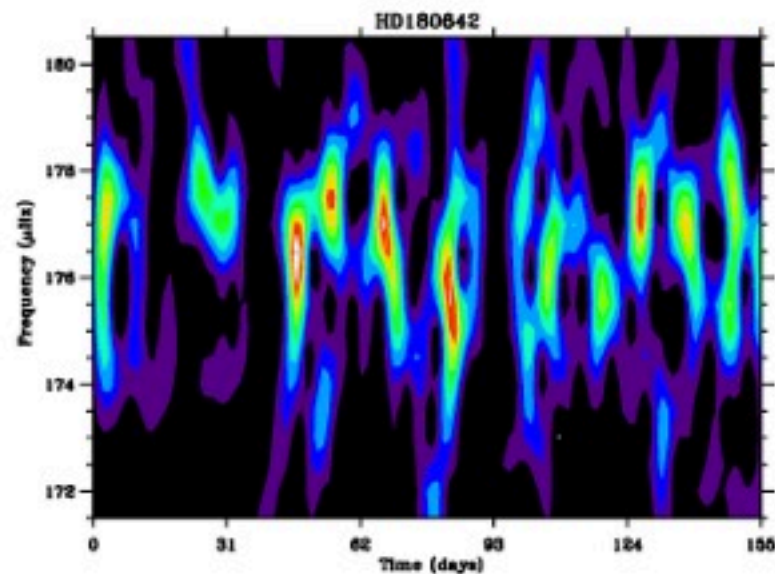
Sun



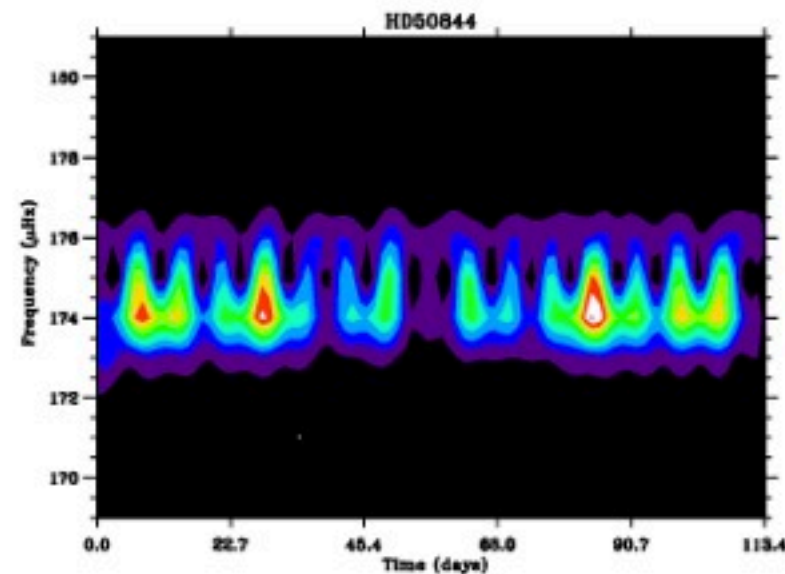
β Cep



β Cep

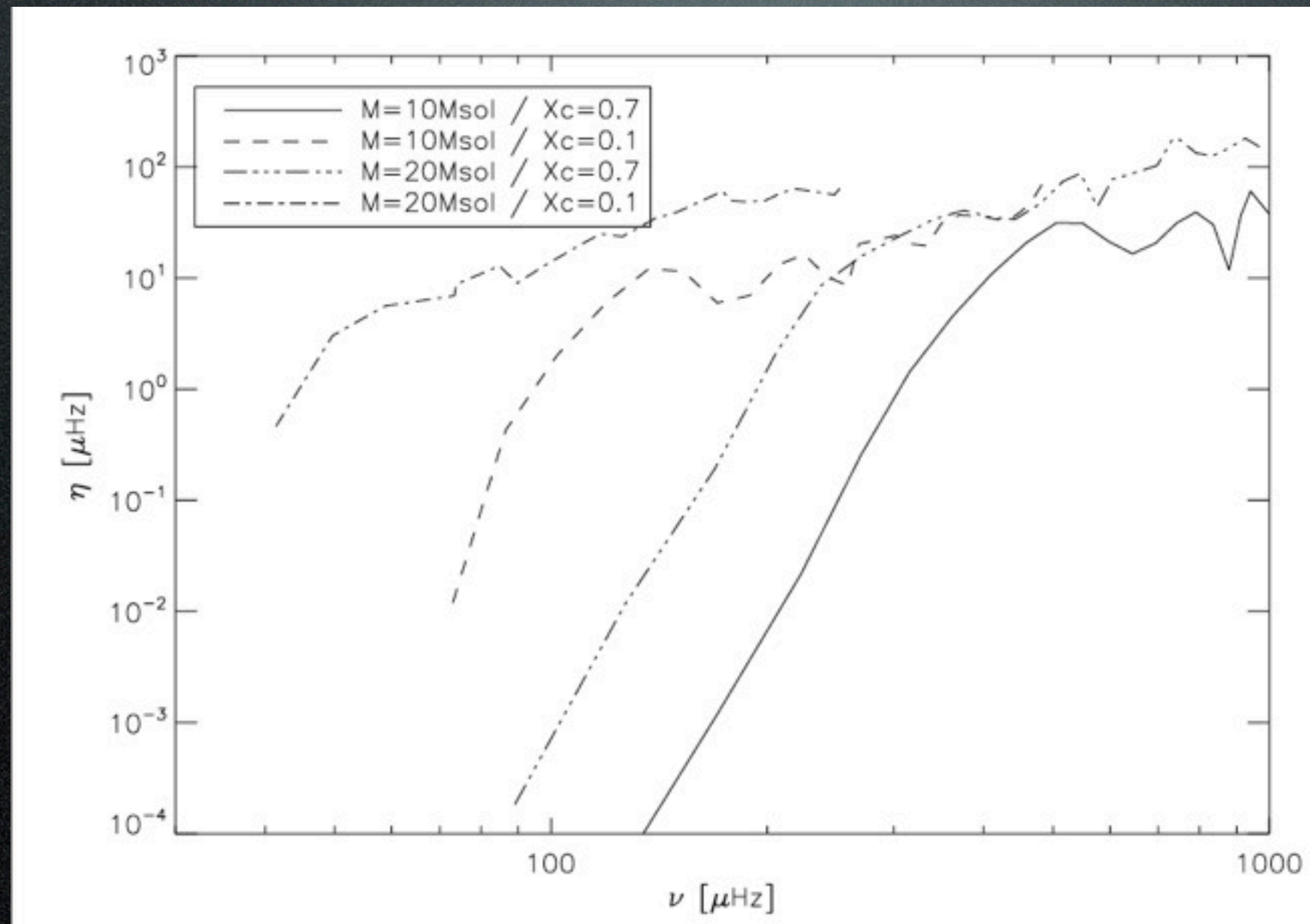


δ Scu



Baudin et al. 2012

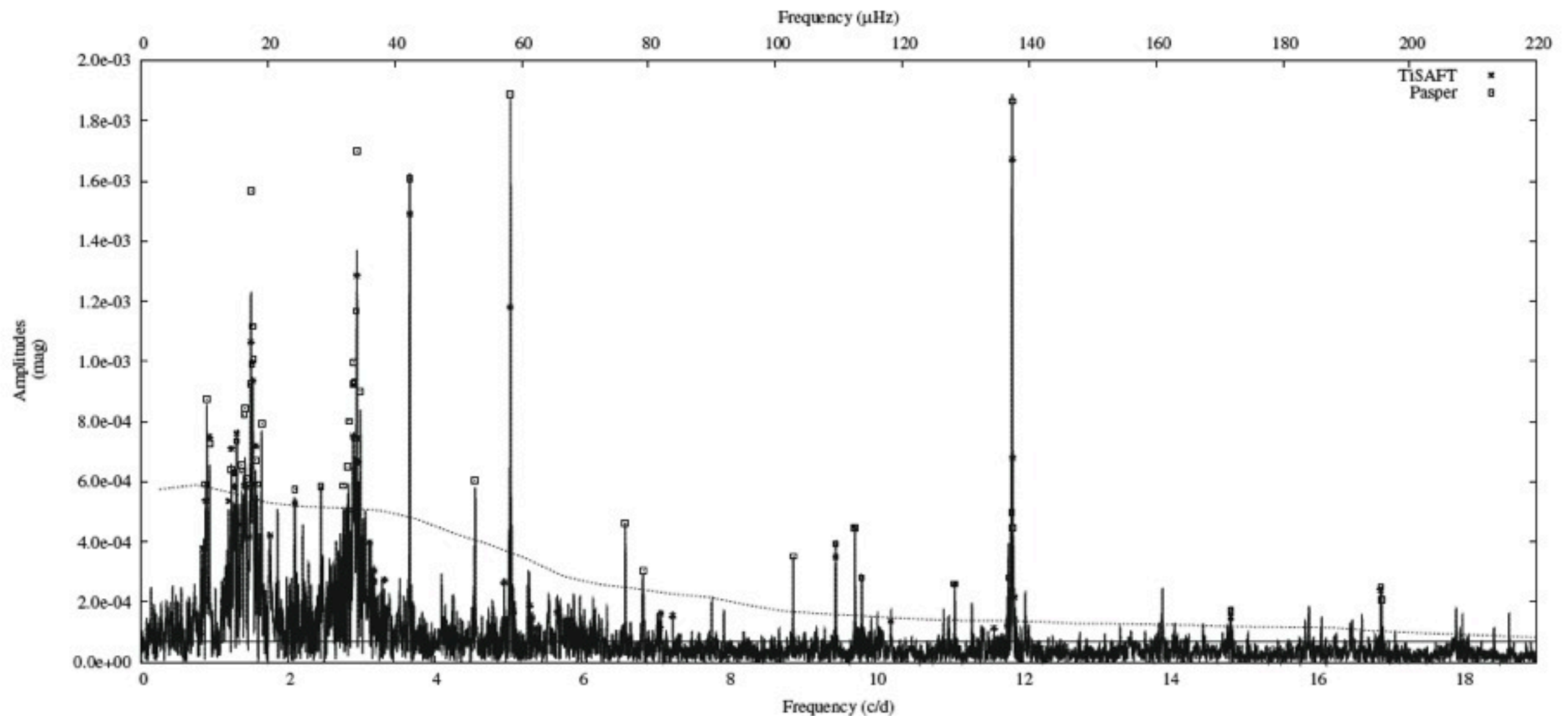
Time varying modes in a β Cephei star



Baudin et al. 2012

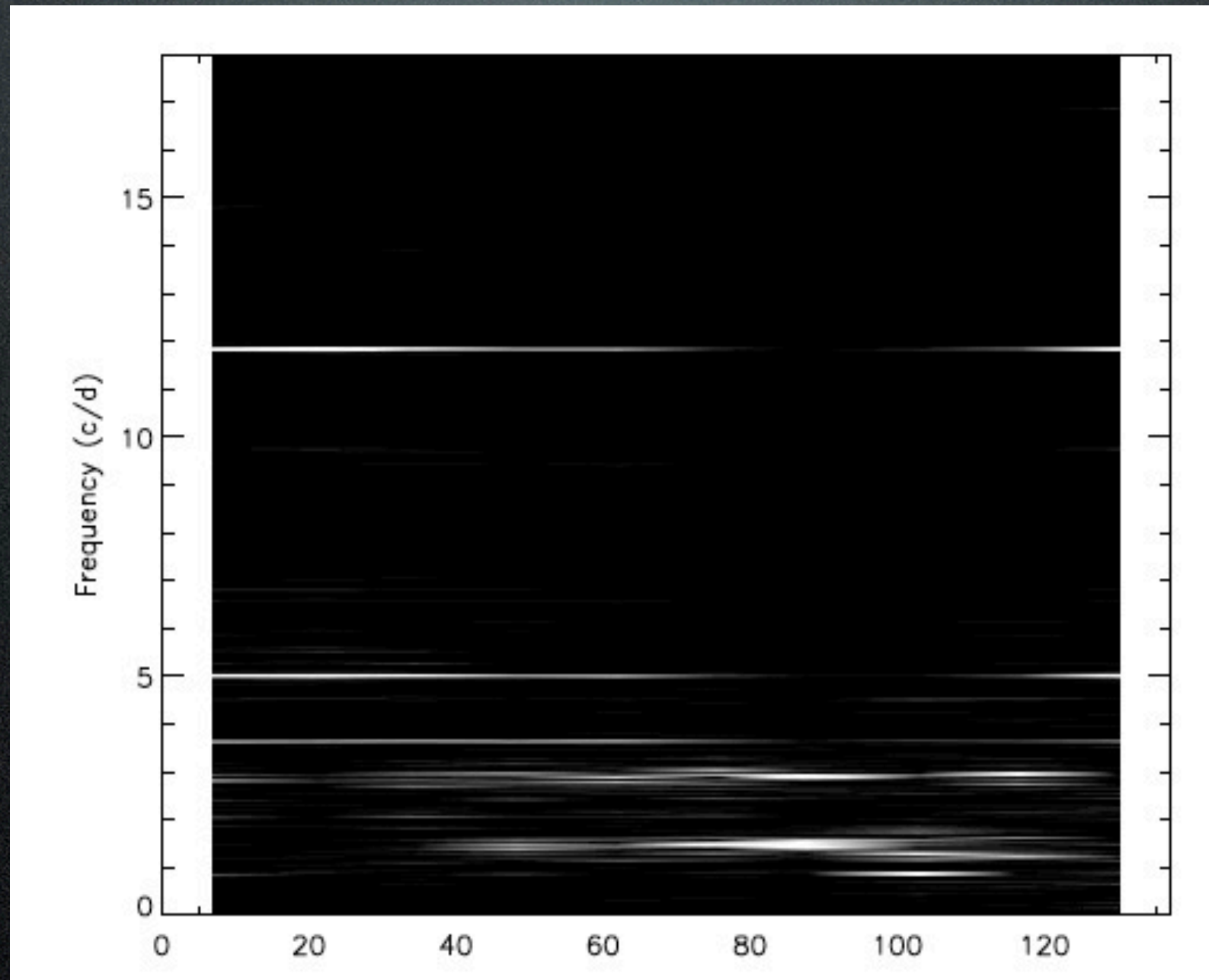
Damping time $\Rightarrow$ star's age

Time varying modes in a Be star



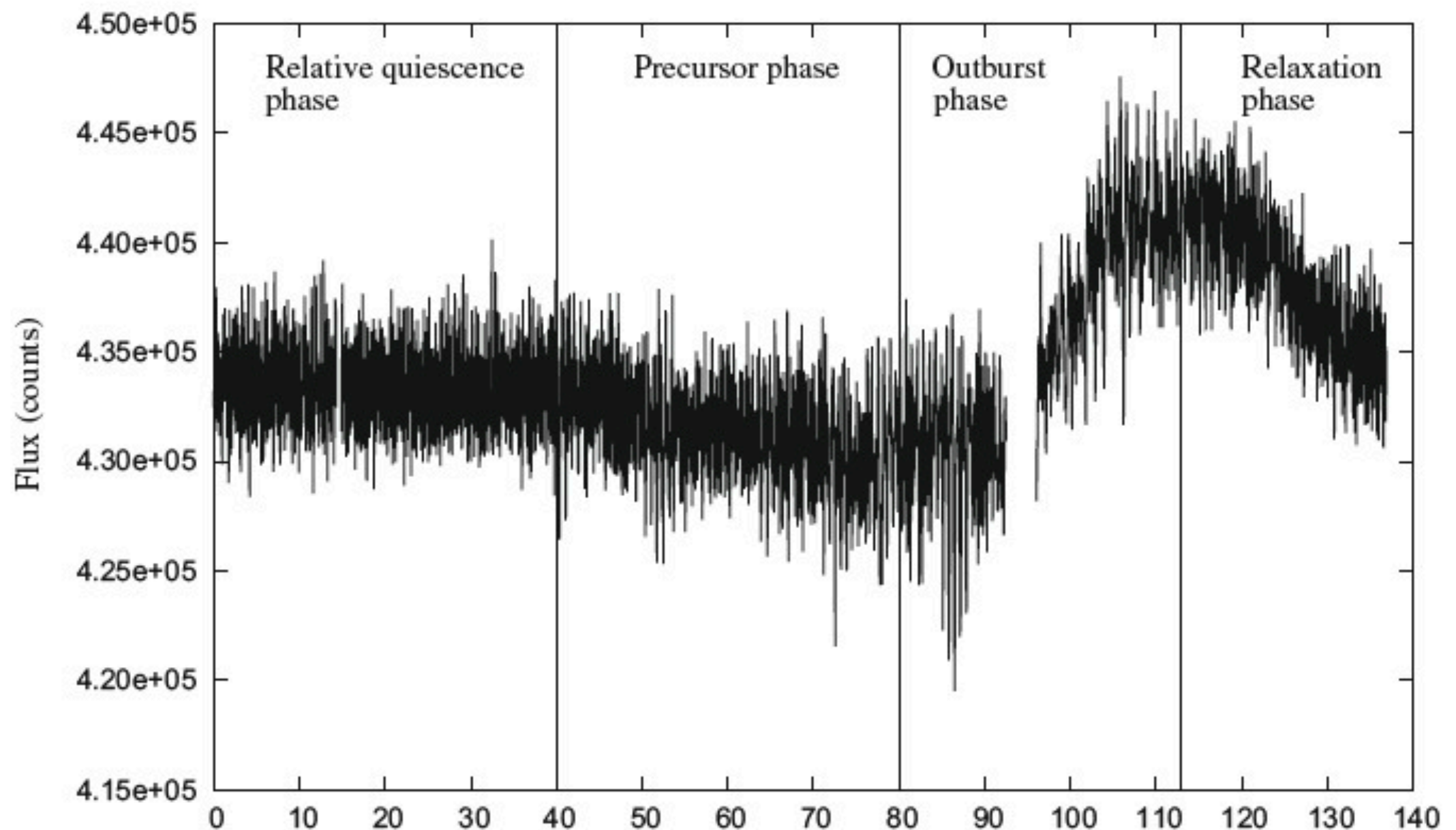
Huat et al. 2009

Time varying modes in a Be star



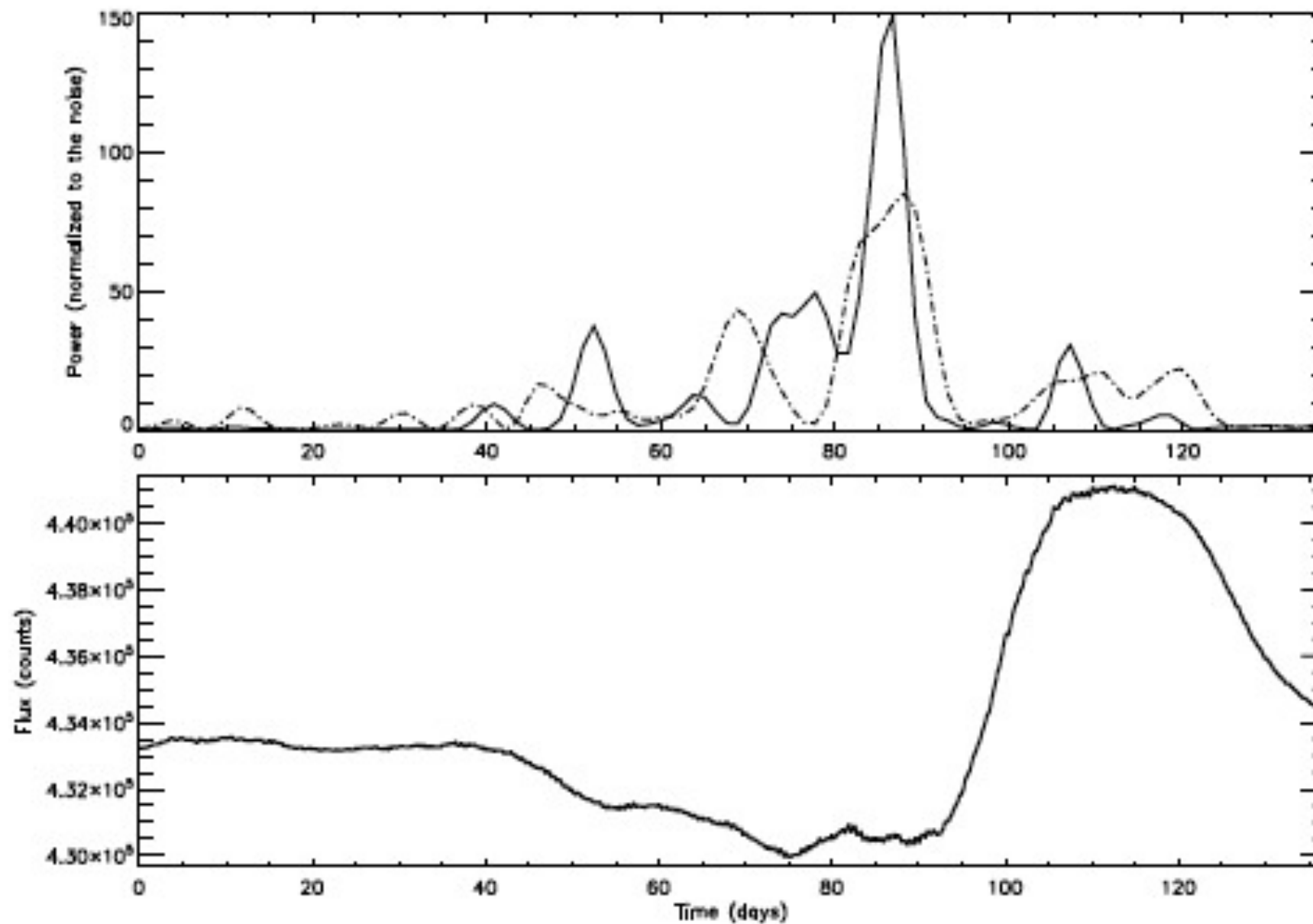
Huat et al. 2009

Time varying modes in a Be star



Huat et al. 2009

Time varying modes in a Be star



Huat et al. 2009

Conclusion

Alan has good ideas...

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...and they last a long time!