

1. Context

Damping process is commonly observed in coronal structures. Standing and propagating oscillations show amplitudes decaying in a few periods / wavelengths. Exponential profiles have normally assumed to adjust temporal and spatial decays, but recent studies point out to Gaussian ones as more adequate to explain observations, or a mix of both. We consider the resonant absorption of propagating waves to compute, through Bayesian techniques, the plausibility of exponential or Gaussian profiles in the two principal structures of the corona, coronal loops and prominence threads.

2. Model

Resonant absorption – Theoretical expressions of damping ratios:

Exponential $M_1: \frac{L_d}{\lambda} = \left(\frac{2}{\pi}\right)^2 \left(\frac{l}{R}\right)^{-1} \left(\frac{\zeta+1}{\zeta-1}\right)$

Gaussian $M_2: \frac{L_G}{\lambda} = \left(\frac{2}{\pi}\right) \left(\frac{l}{R}\right)^{-1/2} \left(\frac{\zeta+1}{\zeta-1}\right)$

L: damping length
 λ : wavelength
 l/R : thickness of the resonance layer
 $\zeta = \frac{\rho_i}{\rho_e}$: density contrast

3. Bayesian comparison techniques:

Marginal likelihood: $p(L/\lambda|M_i) = \int_{\theta} p(\theta_i|M_i)p(L/\lambda|\theta_i, M_i)d\theta_i ; i = 1,2$

Bayes' factors: $B_{12} = \frac{p(L/\lambda|M_1)}{p(L/\lambda|M_2)}$

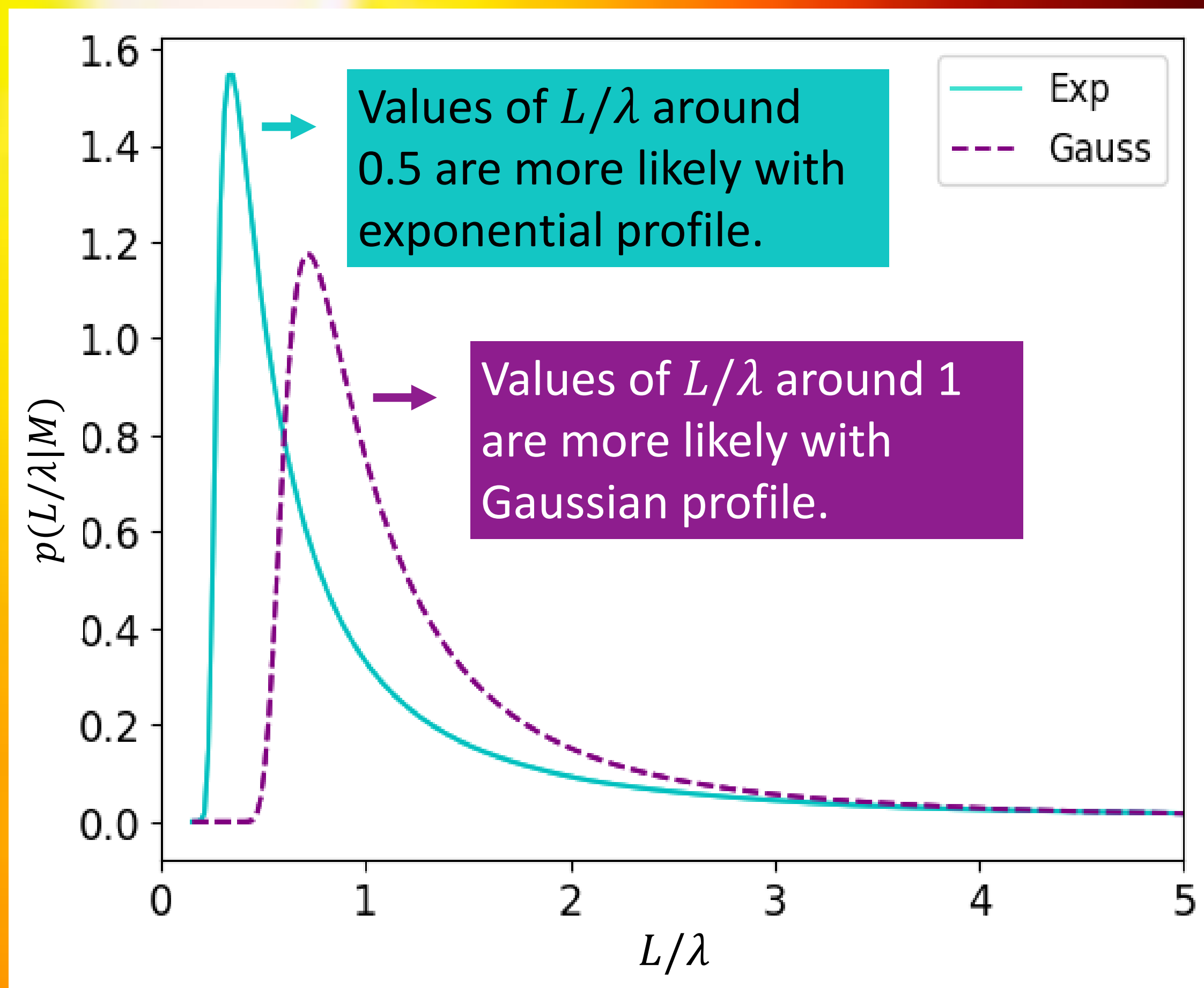
$2 \ln BF_{12}$	Evidence
0-2	Not Worth more than a bare Mention (NWM)
2-6	Positive Evidence (PE)
6-10	Strong Evidence (SE)
>10	Very Strong Evidence (VSE)

- Gaussian likelihoods
- Uniform priors

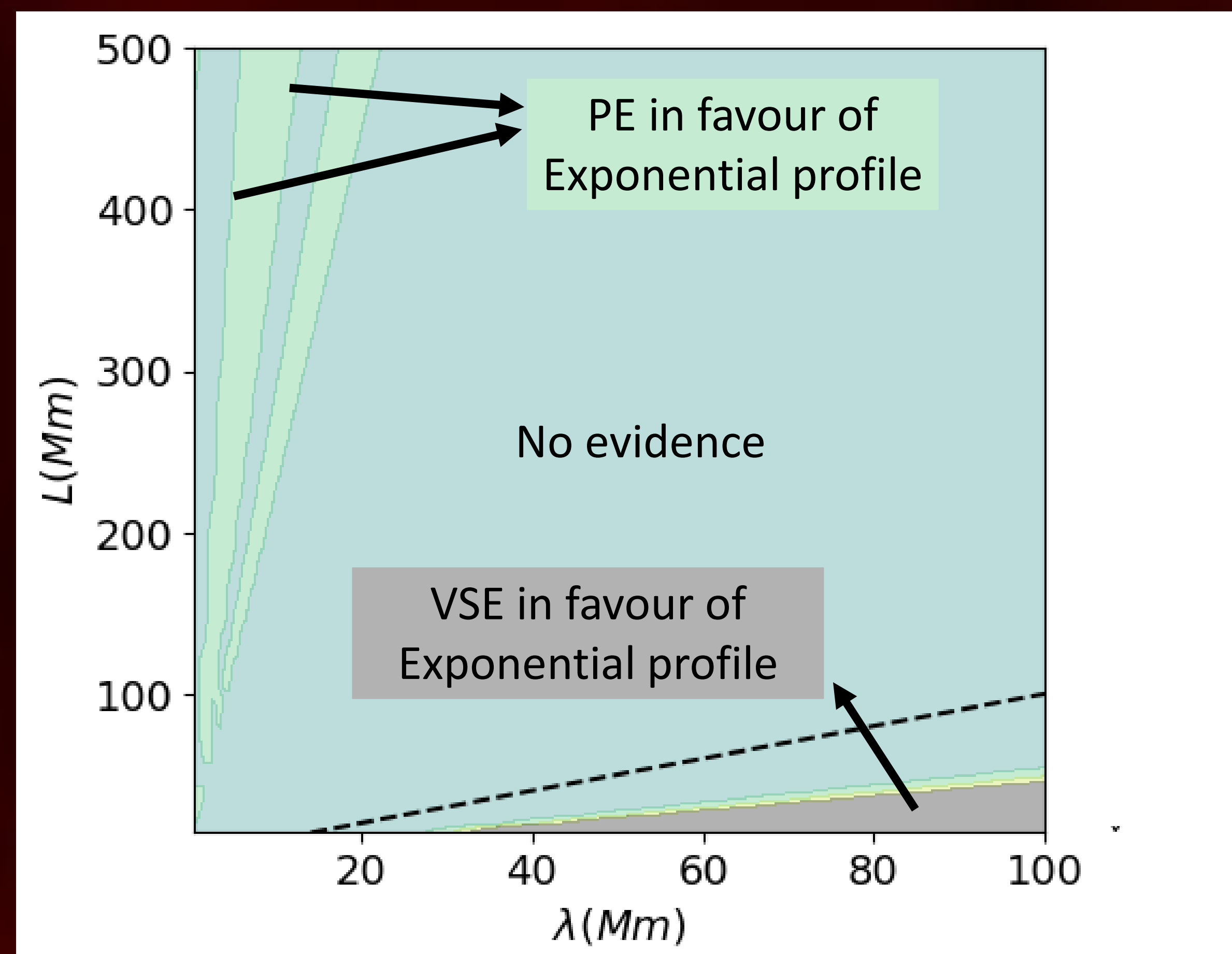
More information about techniques in the previous poster

4. Results

CORONAL LOOPS

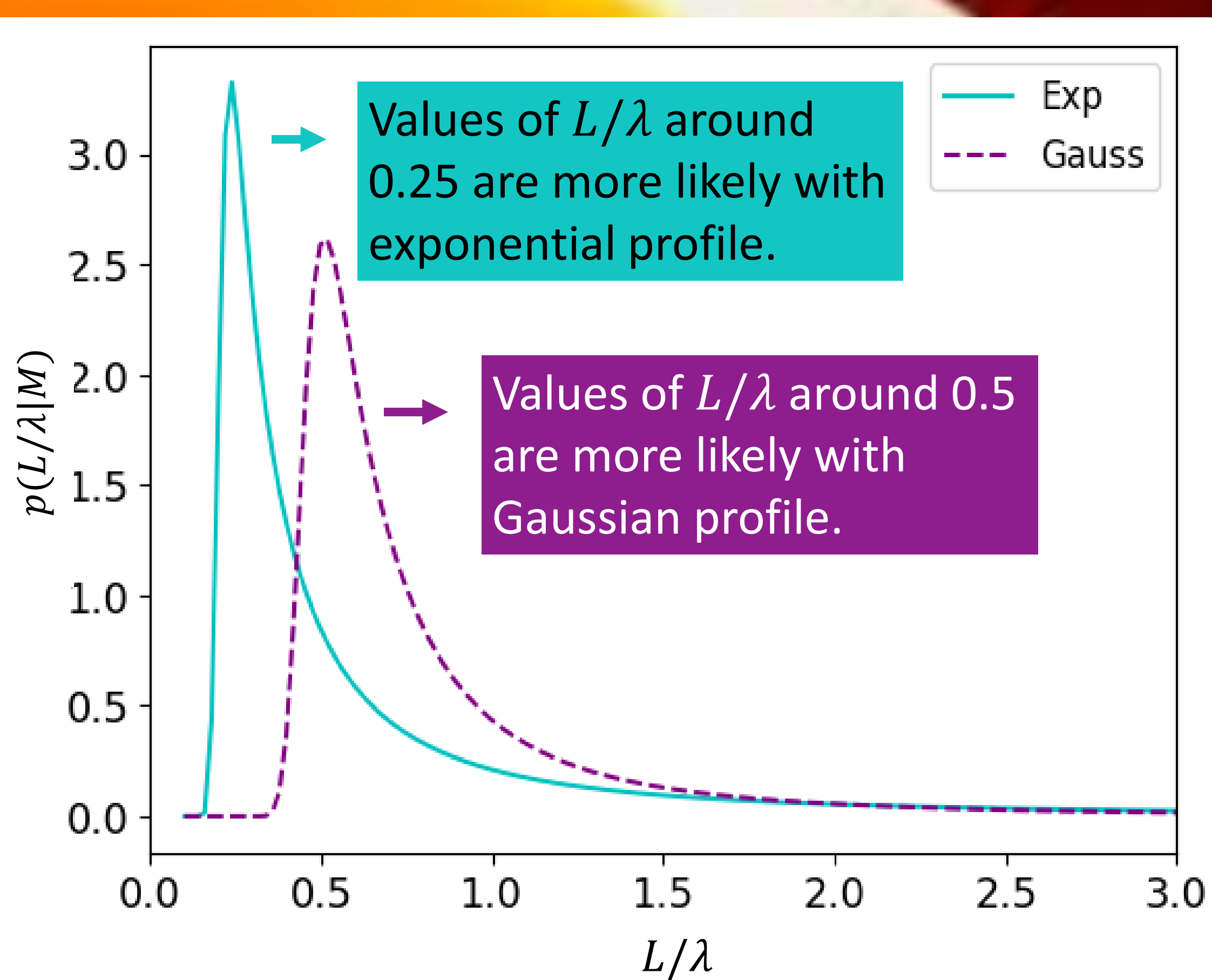


Marginal likelihoods corresponding to exponential (blue) and Gaussian damping profiles (pink) for coronal loop oscillations.

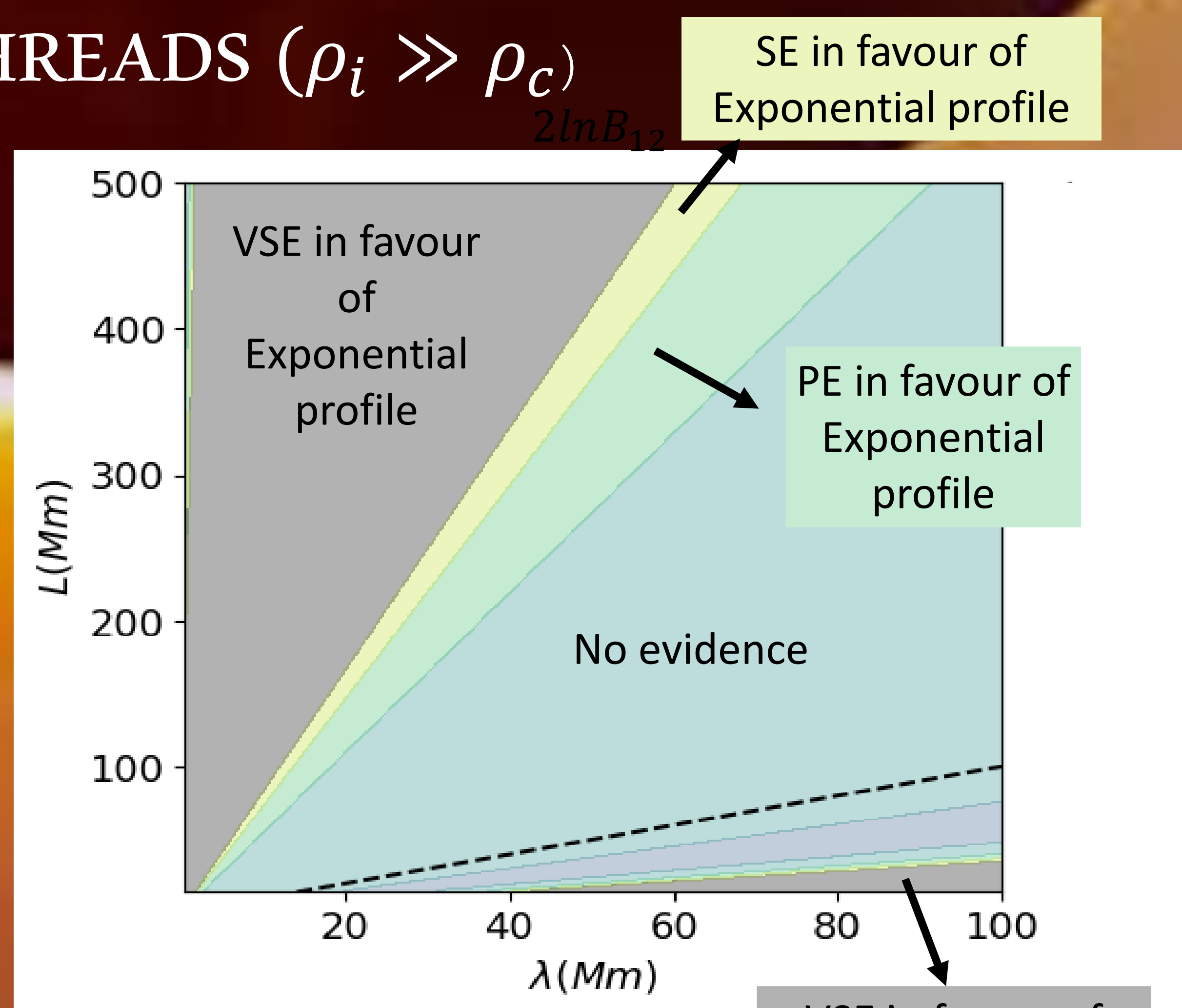


Bayes factors in the plane of the observables. Colours indicate different levels of evidence following the Kass & Raftery (1995) criteria and dashed line marks $L/\lambda=1$

PROMINENCE THREADS ($\rho_i \gg \rho_c$)



Marginal likelihoods corresponding to exponential (blue) and Gaussian damping profiles (pink) for thread oscillations.



Bayes factors in the plane of the observables. Colours indicate different levels of evidence following the Kass & Raftery (1995) criteria and dash line indicates $L/\lambda=1$

5. Conclusions

✘ **Coronal loops:** The smallest values of damping ratios are better explained by the exponential profile but the evidence does not support any particular profile for the rest of the considered values.

✘ **Threads:** The adequacy of exponential or Gaussian decay depends on the particular event.



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