

# Plato, WP 127

Seismic constraints from ageing stars

# WP 127 workshop: schedule

**Wednesday 25pm: PLATO/GAIA session**

**Thursday 26 am: "seismic constraints from ageing stars"**

- |       |   |             |
|-------|---|-------------|
| 9:30  | Length of the run and seismic performance   | B Mosser    |
| 10:00 | Seismic performance and scientific output   | A Miglio    |
| 10:30 | Constraints on main-sequence stars and link with WP 121   | J Montalban |
| 11:00 | Coffee break  |             |
| 11:30 | Discussion <ul style="list-style-type: none"><li>- next steps</li><li>- interactions within subgroups; interactions outside WP127</li><li>- identification of new potential collaborators</li><li>- actions</li></ul> |             |

# Performance simulator

- Much simpler tool than the solar-like light-curve simulator developed by Réza Samadi (Plato PSPSM WP 126100): no oscillation spectrum!
- Performance estimator based on the envelope autocorrelation function

$$\text{EACF} = \text{EACF}(mV, t_{\text{obs}})$$

Mosser & Appourchaux 2009

$$\text{EACF} \sim \text{HBR}^{1.5} v_{\text{max}}^{0.9} t_{\text{obs}}$$

at low  $v_{\text{max}}$

HBR  $\sim 3.6$ , dominated by stellar background

at high  $v_{\text{max}}$

HBR dominated by photon noise (mV)

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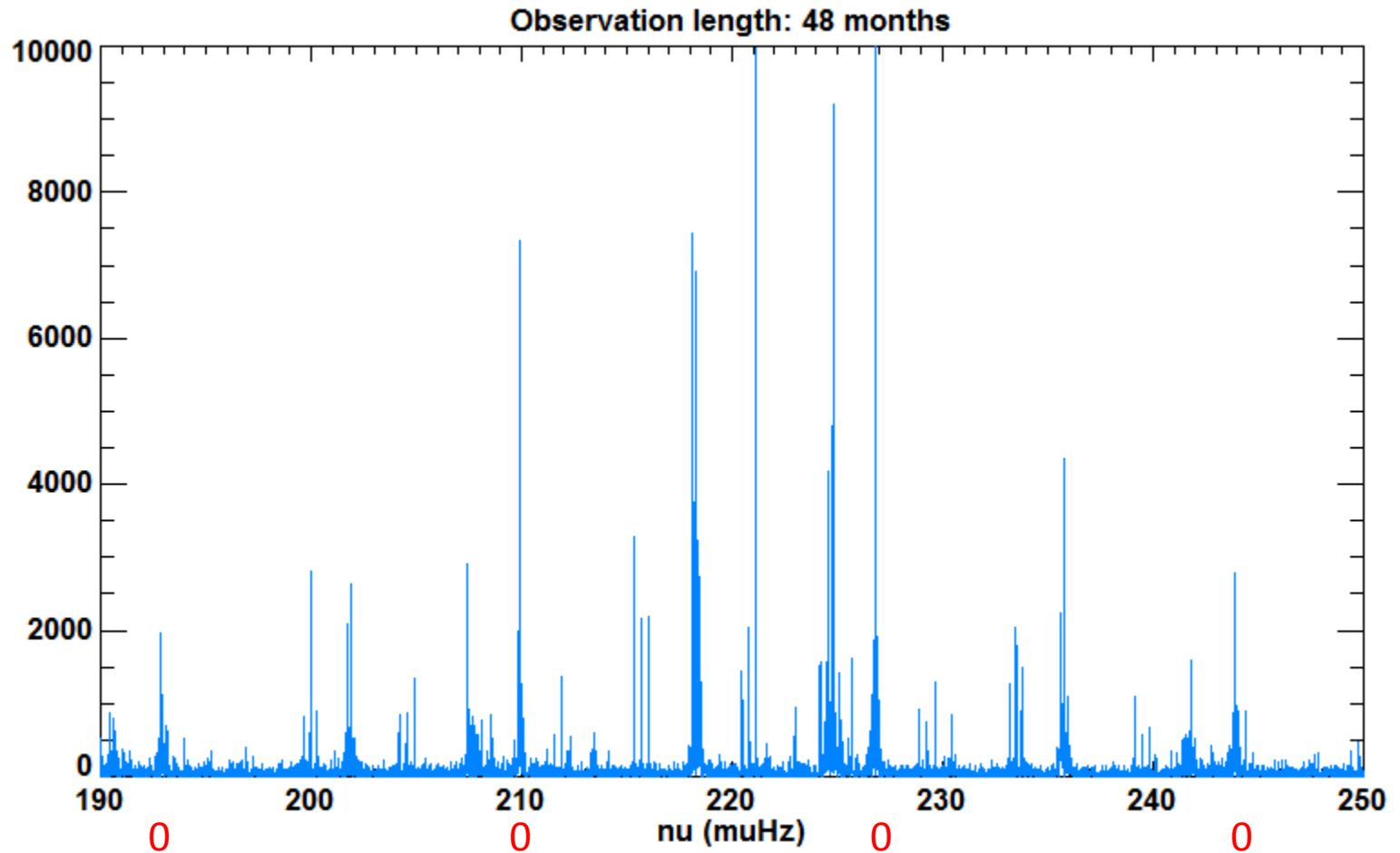
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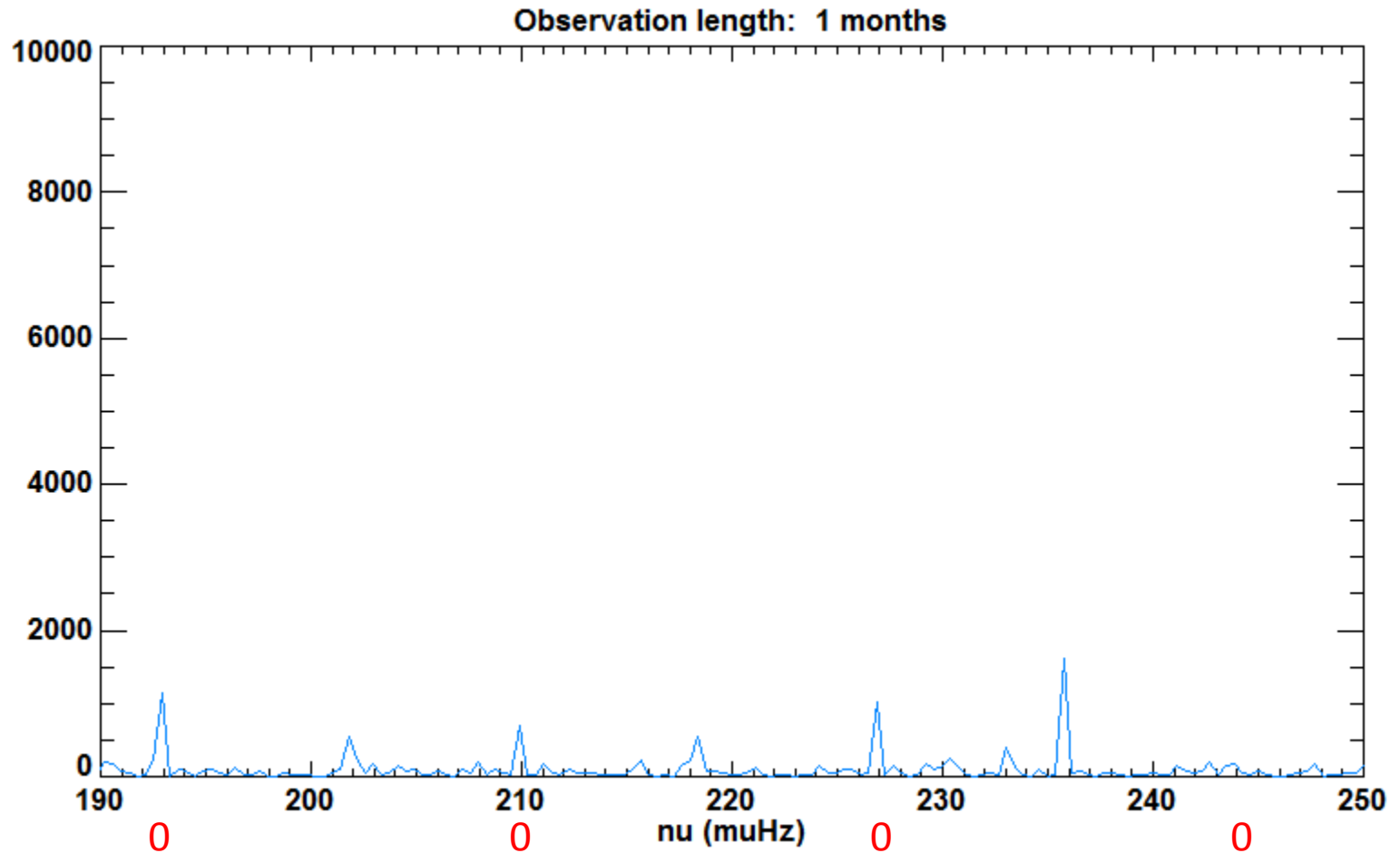
- Performance calibrated with CoRoT and *Kepler* stars

Action: improve calibration

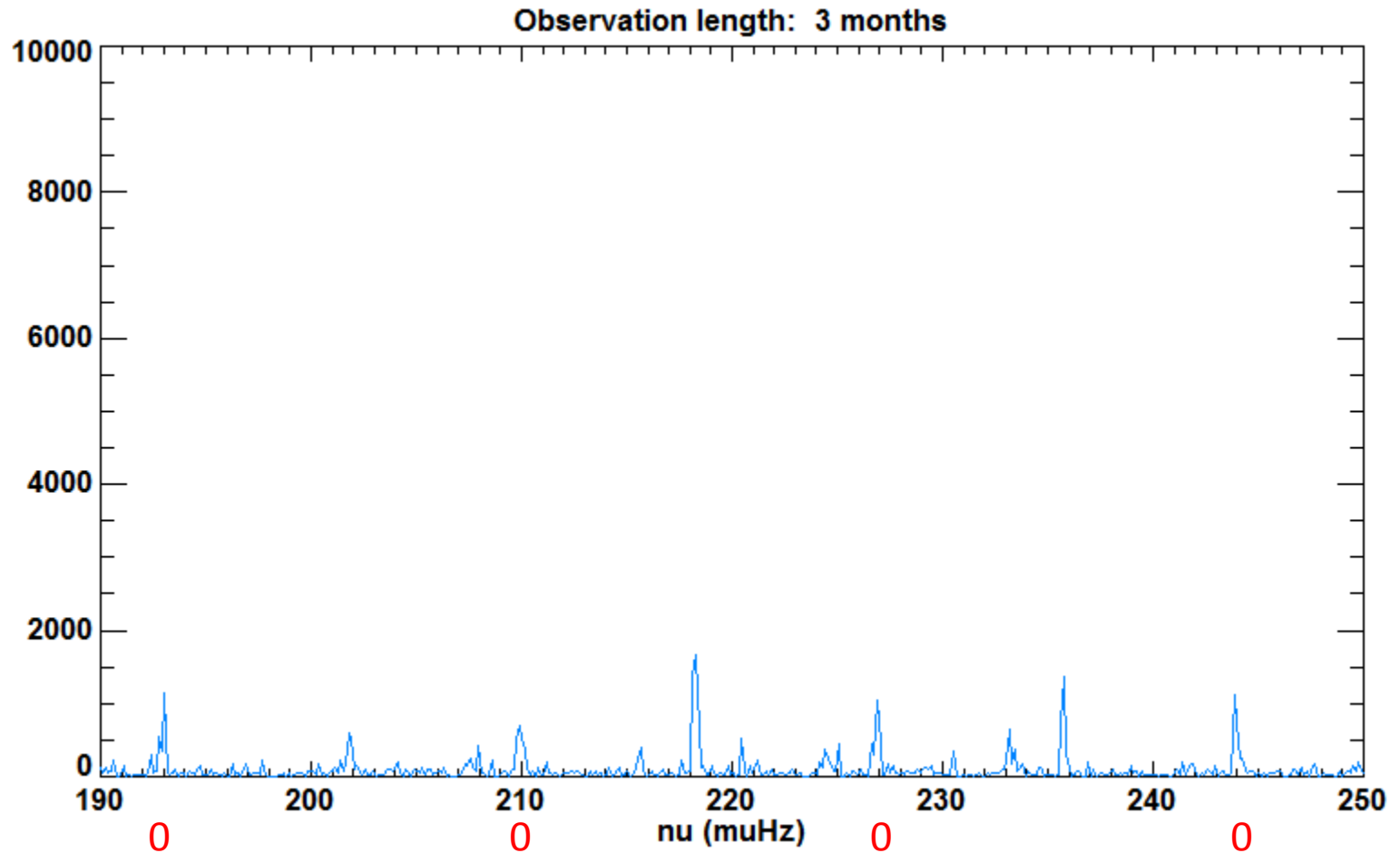
# Observation duration



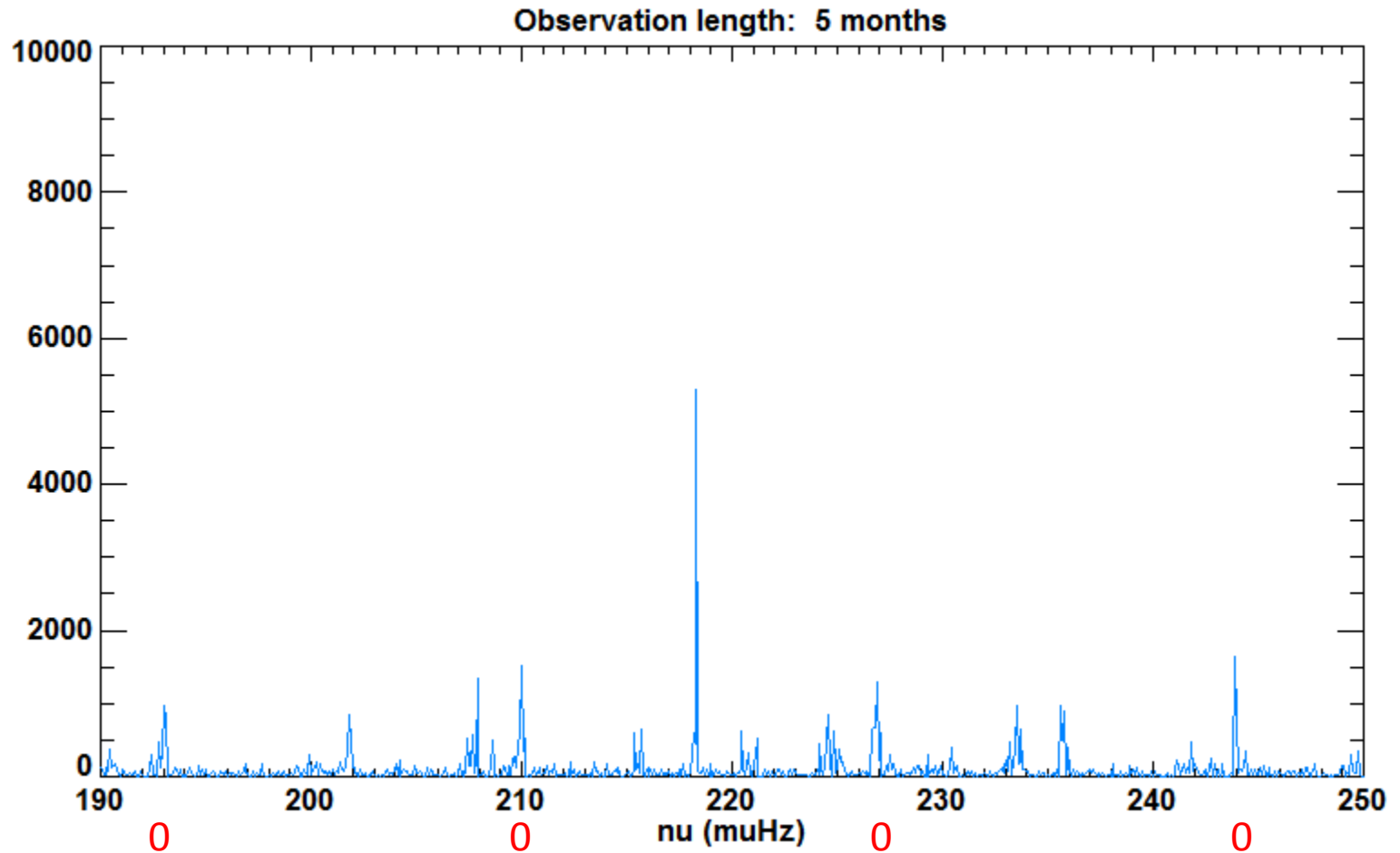
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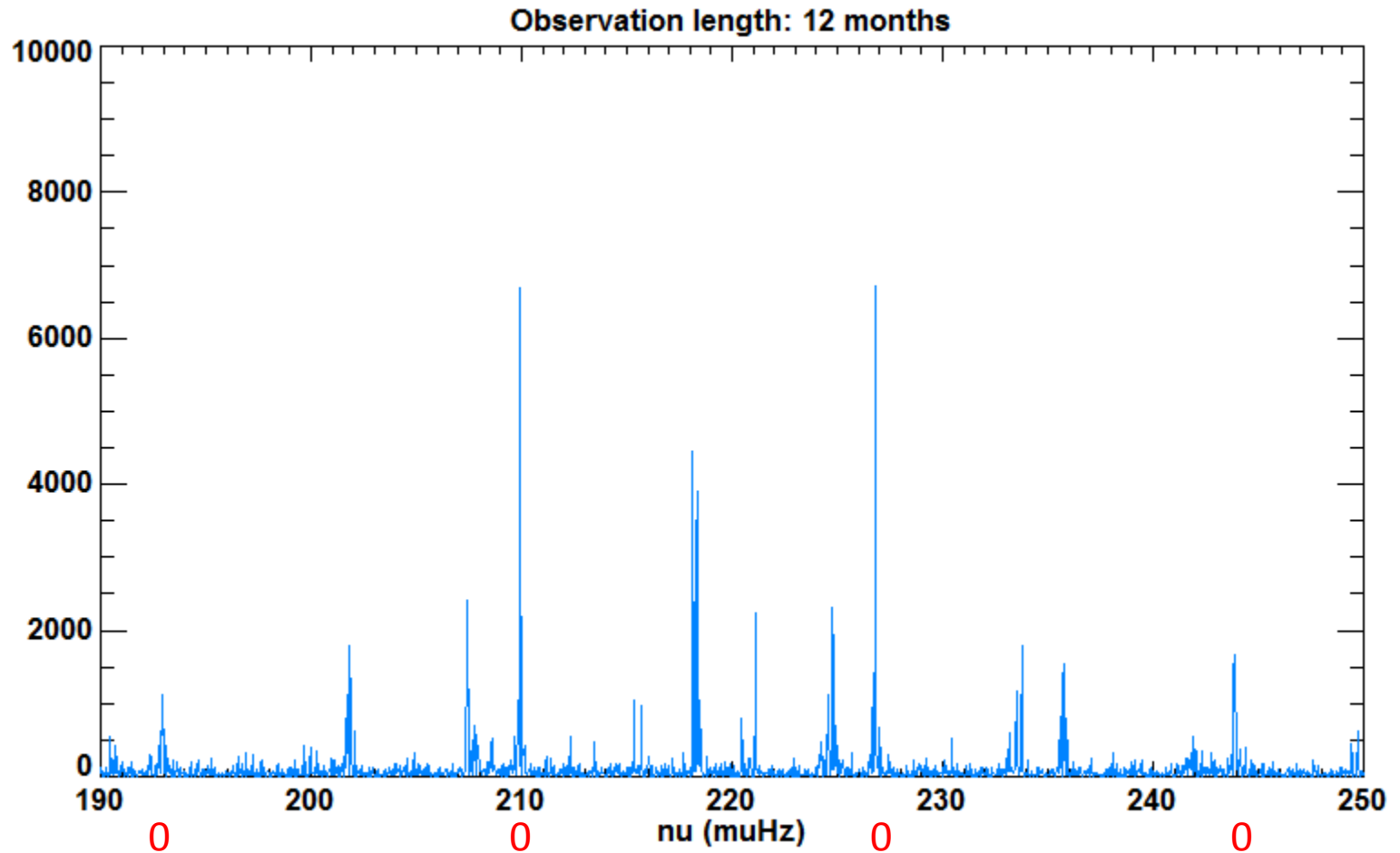


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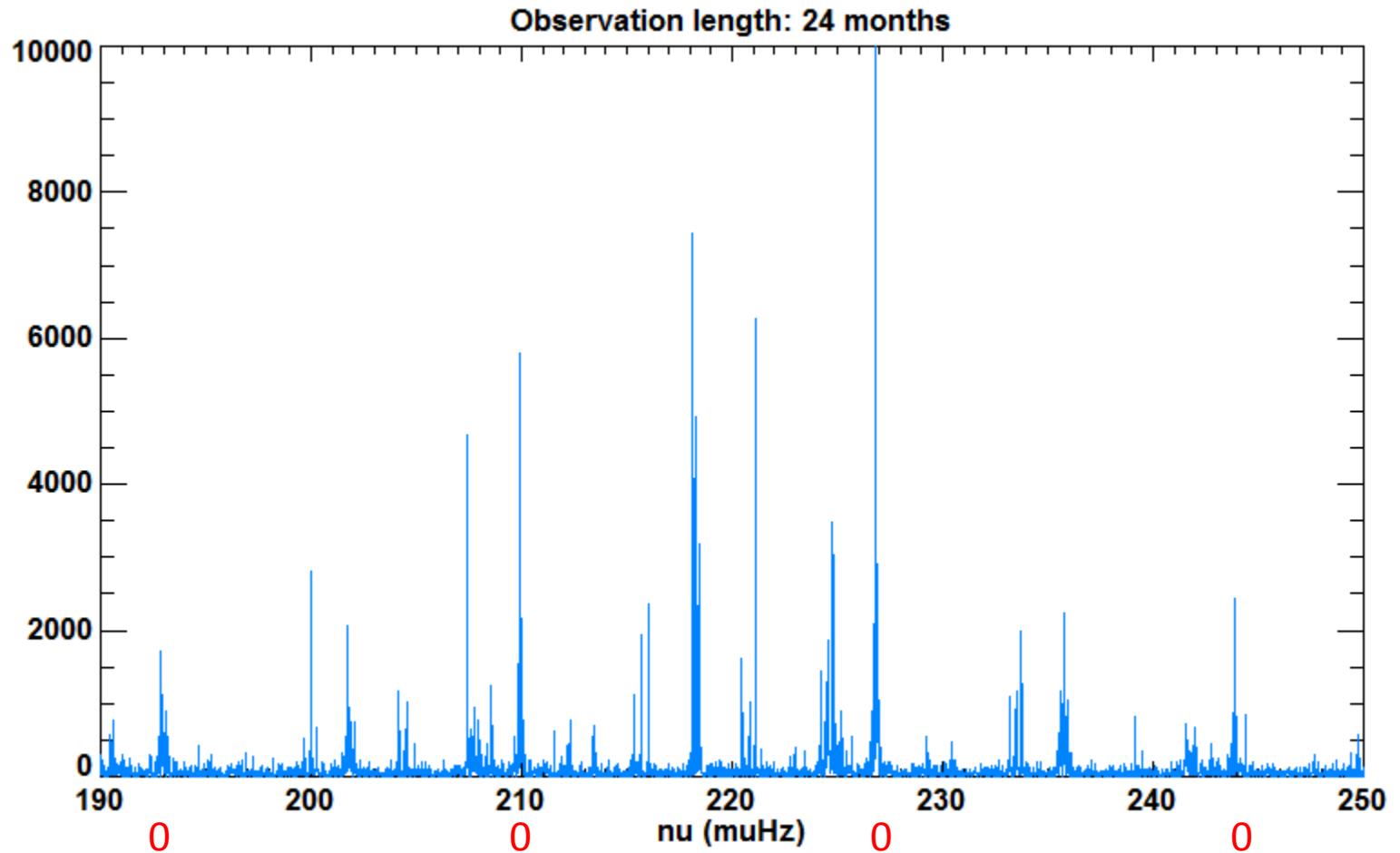




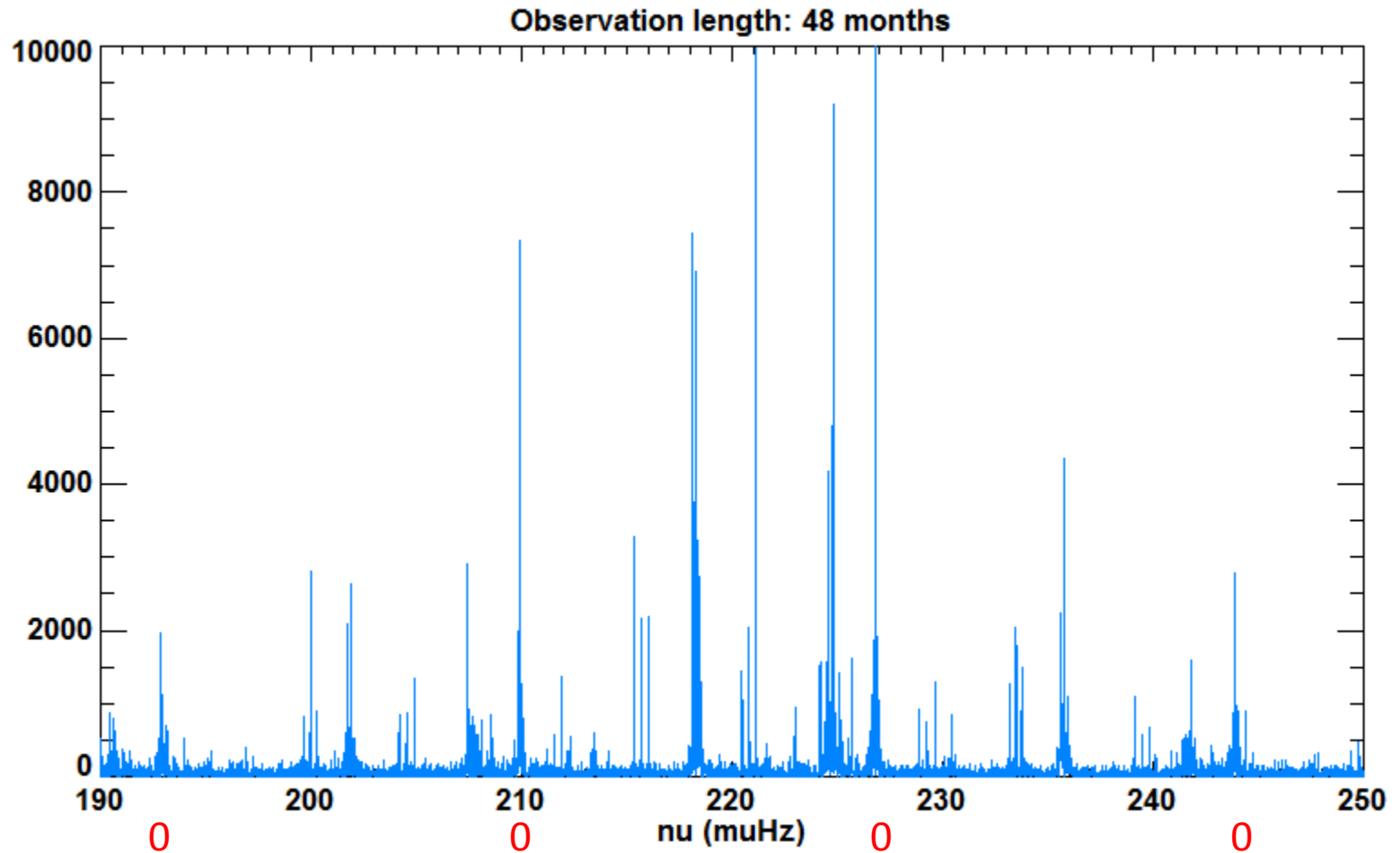
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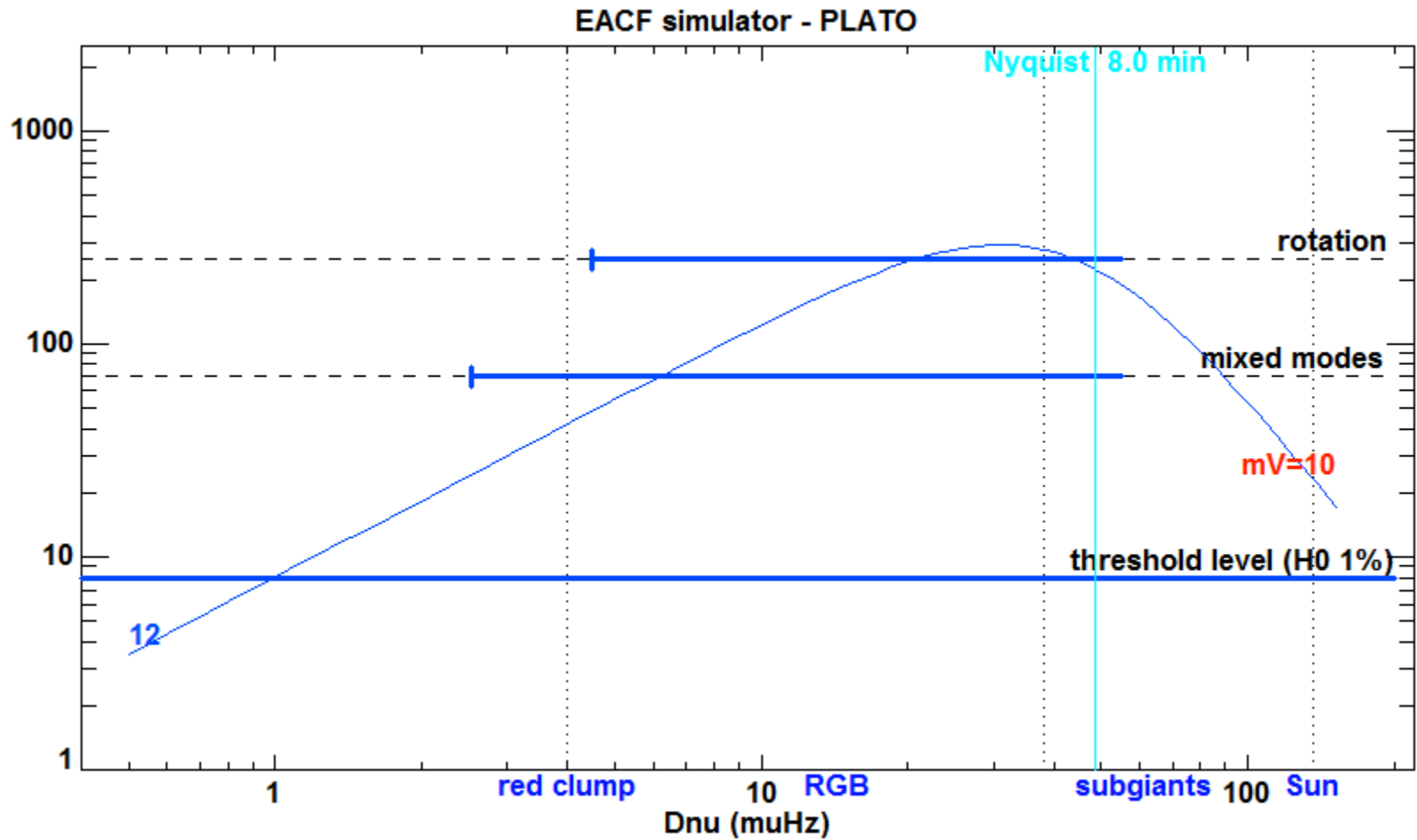
# Observation duration



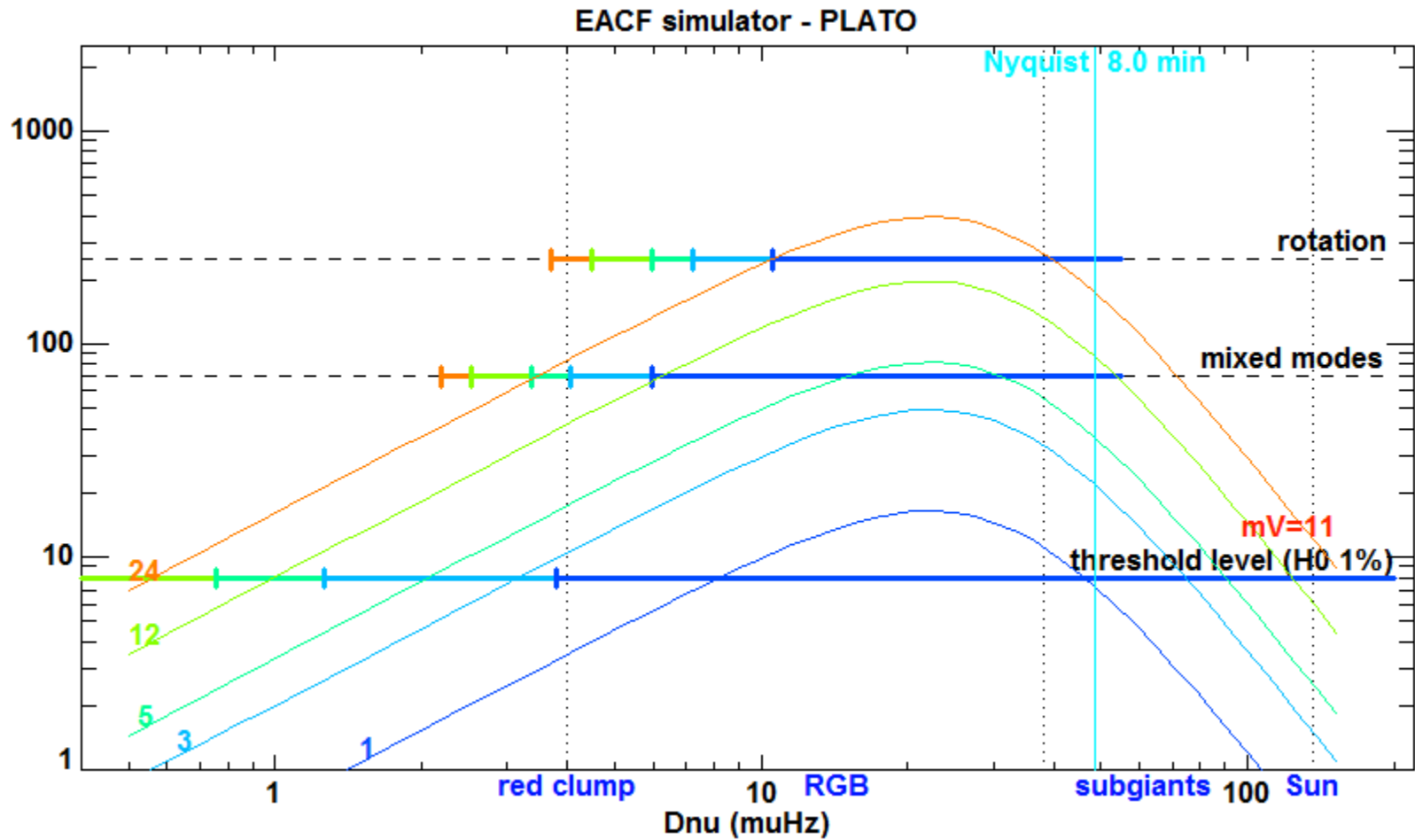
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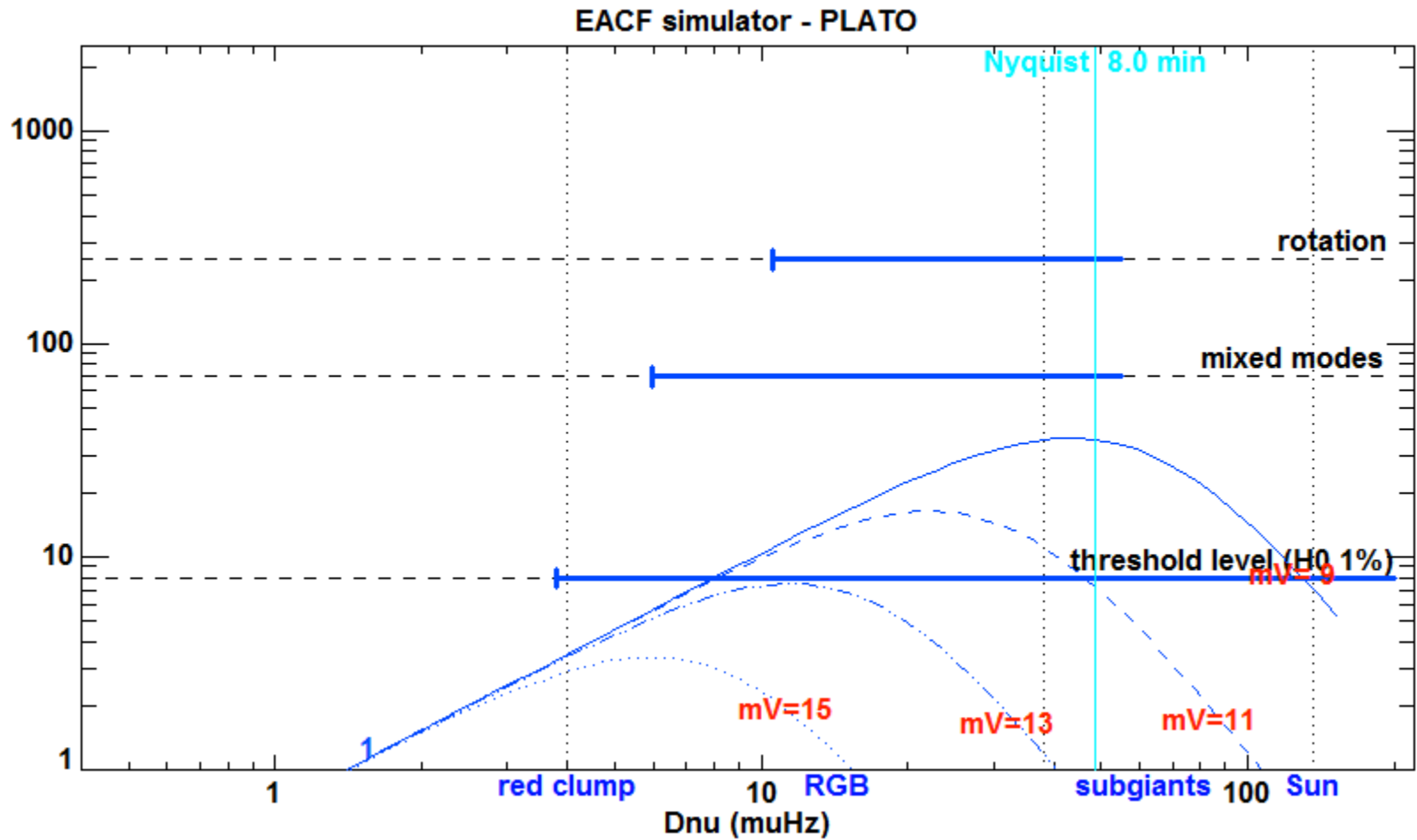
# Example



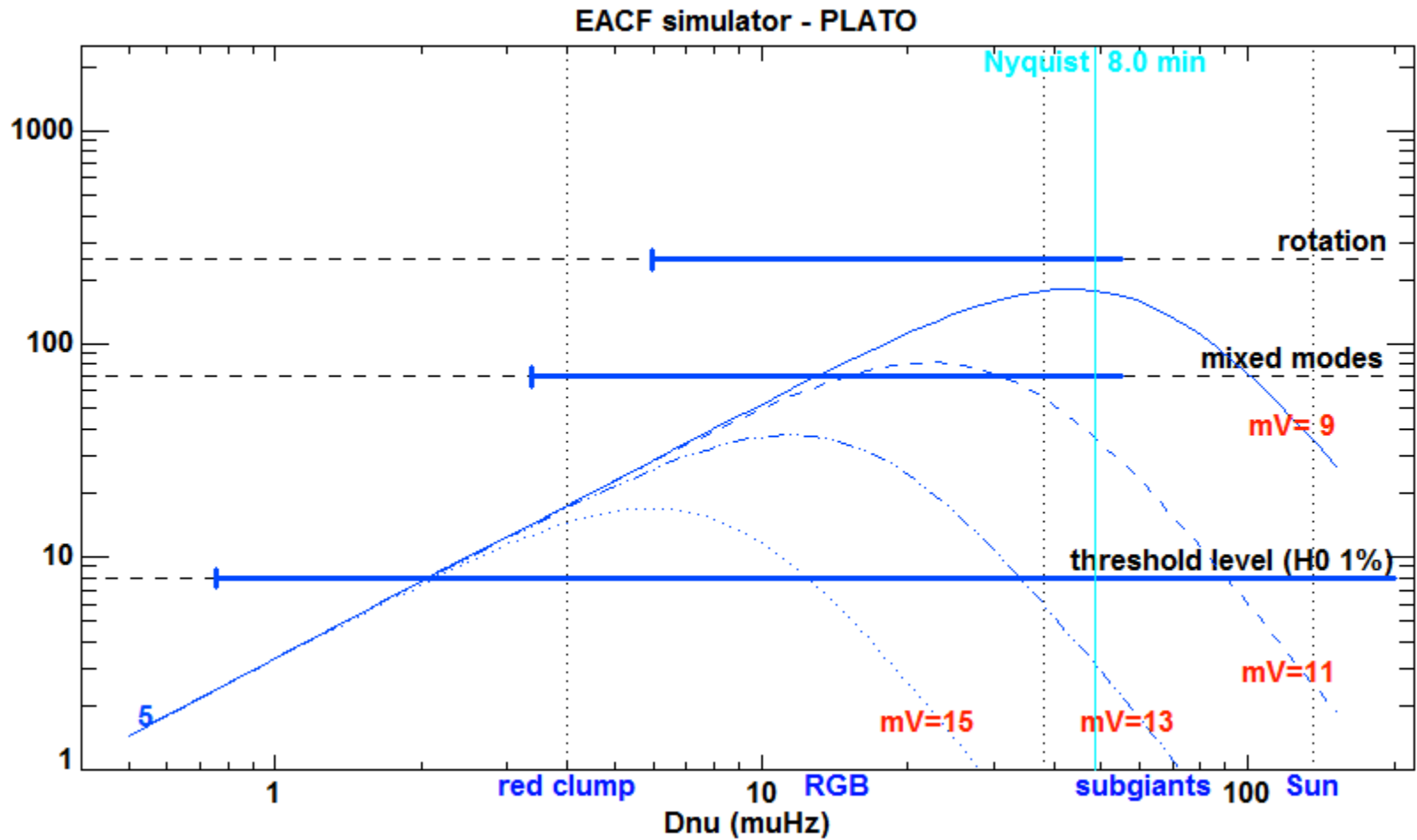
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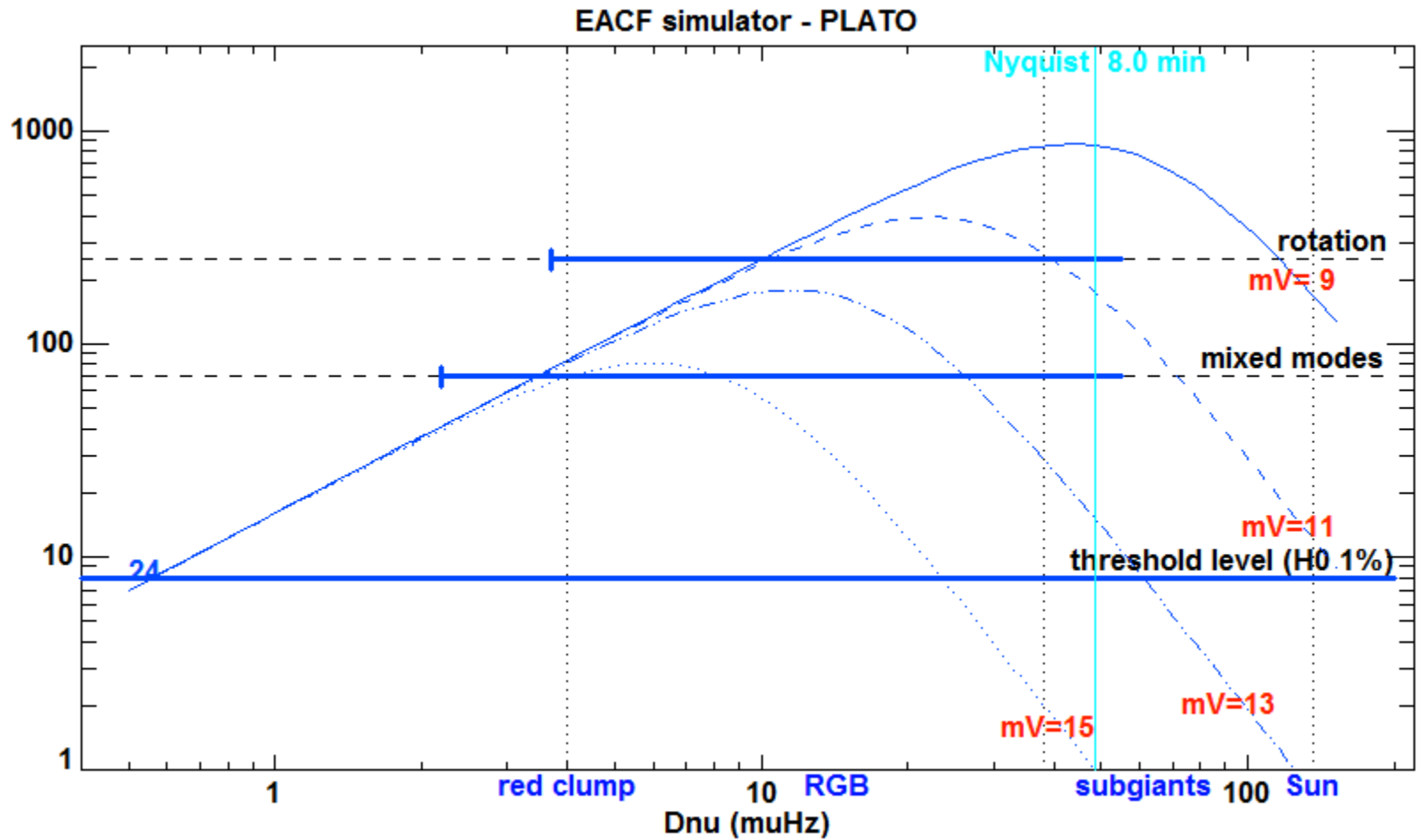
# Stellar magnitude



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$mV = 15$  for a red clump star at 12 kpc



# Can we deal with 500 000 red giants?

From CoRoT and *Kepler*, we have automated, calibrated, reliable pipelines for

## Radial modes

$\Delta\nu$  → M, R  
 $\nu_{\max}$  glitches  
Global seismic parameters

## Mixed modes

(DP) → Evolutionary stage  
 $\Delta\Pi_1$   
q new !

We are working hard for having an automated pipeline for the core rotation

$\delta\nu_{\text{rot}}$

# Next steps

Improvement of the pipeline; individual tests; quality insurance

















Use of the pipeline with other information

$\Delta v$  can be replaced by

- stellar type
- effective temperature

Coupling of the pipeline with other tools, e.g. for a quantitative estimate of the seismic output in a given field, depending, on  $T_{\text{eff}}$ ,  $mV$  and  $t_{\text{obs}}$

# From CoRoT to Plato 2.0

	CoRoT	Kepler	K2	Plato
RGB	$< 30 R_{\odot}$	$> 200 R_{\odot}$ ( $>$ tip)	$< 12 R_{\odot}$ ( $\sim$ clump)	$200 R_{\odot}$ tip
M, R				
Evolution				
Core structure	<b>X</b>		<b>X</b>	
Core rotation	<b>X</b>		<b>X</b>	
Hell				
Open clusters	<b>1</b>	<b>3</b>	<b><math>\sim 4</math></b>	<b><math>&gt; 10</math> (+MS)</b> <b><math>&gt; 100</math> (RGB)</b>

# From CoRoT to Plato 2.0

	CoRoT	Kepler	Tess	K2	Plato
Duration	5 months	4 years	1 month	3 months	2 years
Red giants			X		
Stars	10 000	15 000		120 000	> 500 000 (*)
					

# Plato 2.0 & red giants

- Stellar masses and radii
- Evolutionary stages
- Core rotation
- Open clusters with various ages
- Galactic archeology
- Synergy with GAIA

... from Kepler to Plato 2.0  
~ from Hipparcos to Gaia