

# SINGING COMET CHANGES ITS SONG



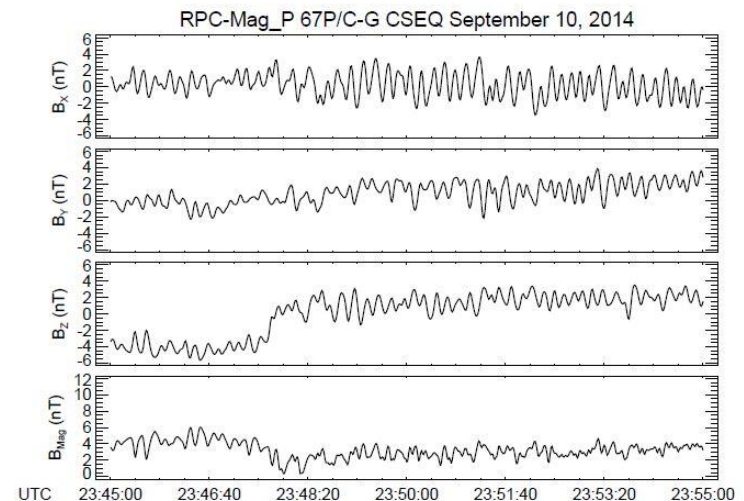
# THE SINGING COMET

Quasi-monochromatic waves  
observed in the magnetic field data

- Between 10 and 100 mHz
- Propagation direction perpendicular to  $B$
- Compressional waves
- Richter et al. (2015)

Weibel instability

- Newly picked-up ions
- Very large gyro radius
- Cross-field current
- Meier et al. (2016)



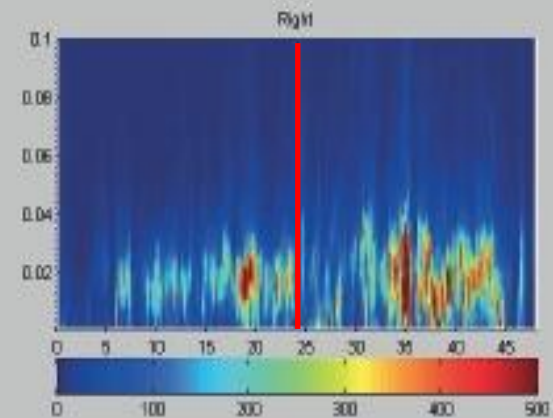
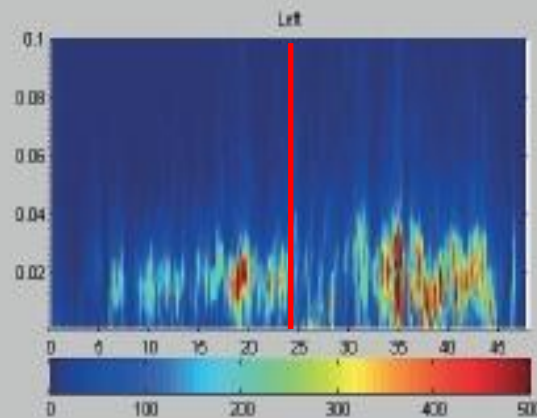
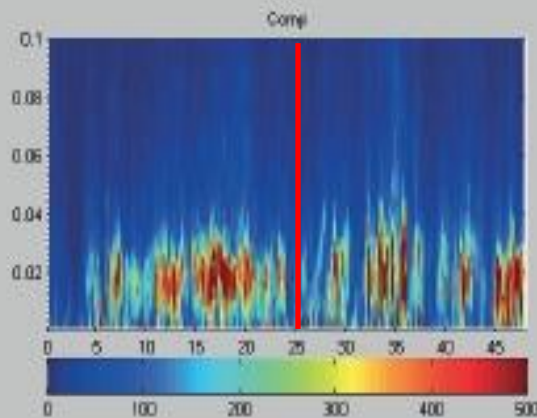
# RE-APPEARANCE NEAR END OF MISSION

At „high“ activity of 67P/CG signature was not seen:

- Instability does not occur
- Signal is drowned in „turbulent“ field around comet
- Glassmeier (2017)

Tail excursion

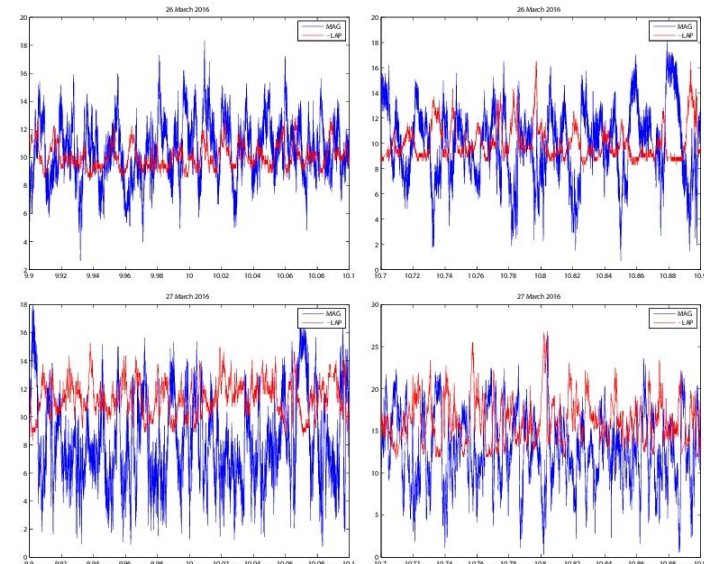
- Near end of mission
- 24 March until 10 April 2016
- Close to comet: singing comet
- However ... different



# CHARACTERISTICS OF WAVES

The waves are characterized by:

- ~20 mHz
- Phase changes with ion density
  - From in-phase (fast mode)
  - To anti-phase (slow mode)
- Compressional vs. Transverse changes
  - Compressional - left-hand
  - Transverse - linear



Date	Time	B	B	Min	Max	$\lambda_{int}/\lambda_{mi}$	$\lambda_{max}/\lambda_{int}$
26	9.9 – 10.1	(3.40, -9.24, -1.21)	9.9	(-0.42, 0.27, 0.87)	(0.85, -0.21, 0.47)	2	3
27	9.9 – 10.1	(-1.87, 3.75, 0.02)	4.2	(0.13, -0.36, 0.92)	(-0.99, -0.09, 0.11)	4	4
26	10.7 – 10.9	(5.35, -8.61, 4.36)	11.0	(-0.41, 0.39, 0.82)	(0.79, -0.29, 0.53)	2	3
27	10.7 – 10.9	(-2.20, -4.16, 5.97)	7.6	(0.10, -0.99, -0.10)	(-0.99, -0.10, 0.04)	2	5
Date	Time	$\mathcal{L}_{B,min}$	$\mathcal{L}_{B,max}$	L/R	C/T	$\mathcal{L}_{R,min}$	$\mathcal{L}_{B,R}$
26	9.9 – 10.1	115	115	3.0	2.0	132	92
27	9.9 – 10.1	105	122	1.2	0.5	103	89
26	10.7 – 10.9	99	32	3.7	2.1	121	124
27	10.7 – 10.9	63	68	1.2	0.5	76	78

# „SOLUTIONS“ TO THIS „PROBLEM“

Is it the magnetometer offset?

It can be shown that:

- If there is an unresolved magnetometer offset
- A fast-mode wave, with B and n in phase
- Can change into a slow-mode wave with B and n in anti-phase

In this case the error in the calculated offset should be more than 15 nT

This is unrealistic

Do waves behave differently in a two-ion plasma?

- Calculation of the mobility tensor for 2 ions
- Determination of phase B-n
- Determination of polarization of E

