Quasi-periodic ~20–30-s oscillations in Mercury's inner magnetosphere during steady southward IMF

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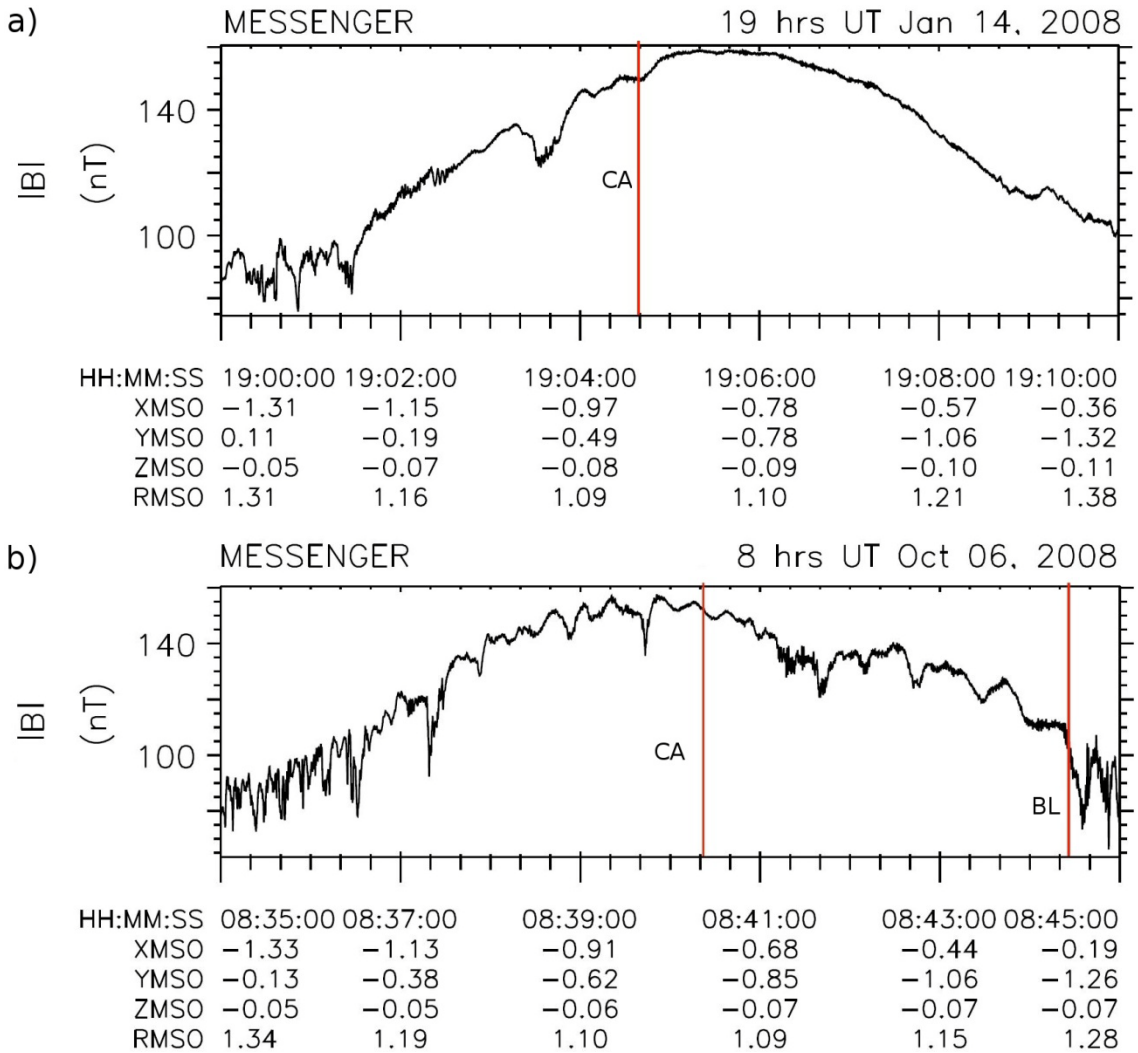
Comparison of M1&M2

- M1 IMF Bz>0
- Relatively smooth around CA

- M2 IMF Bz<0
- Multiple TCRs observed in tail
- FTEs on dawnside



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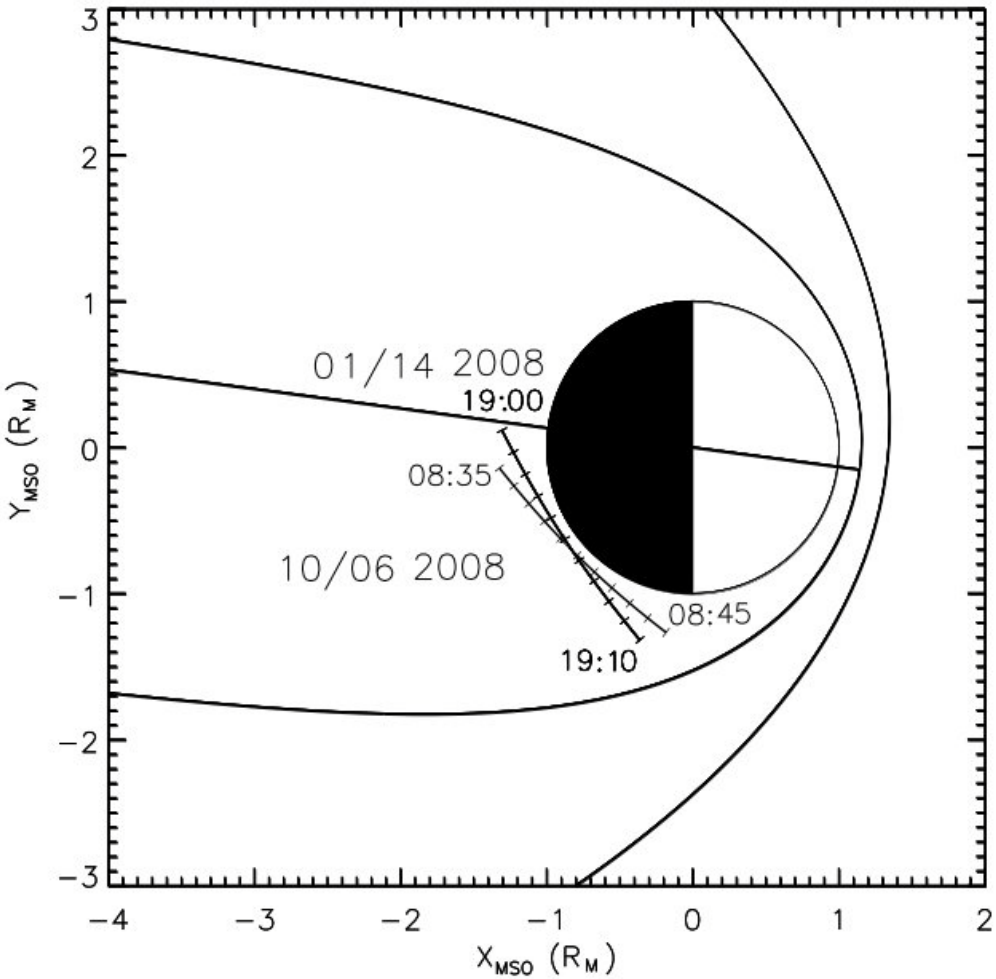
M1 & M2 trajectories

M1&M2 have similar trajectories



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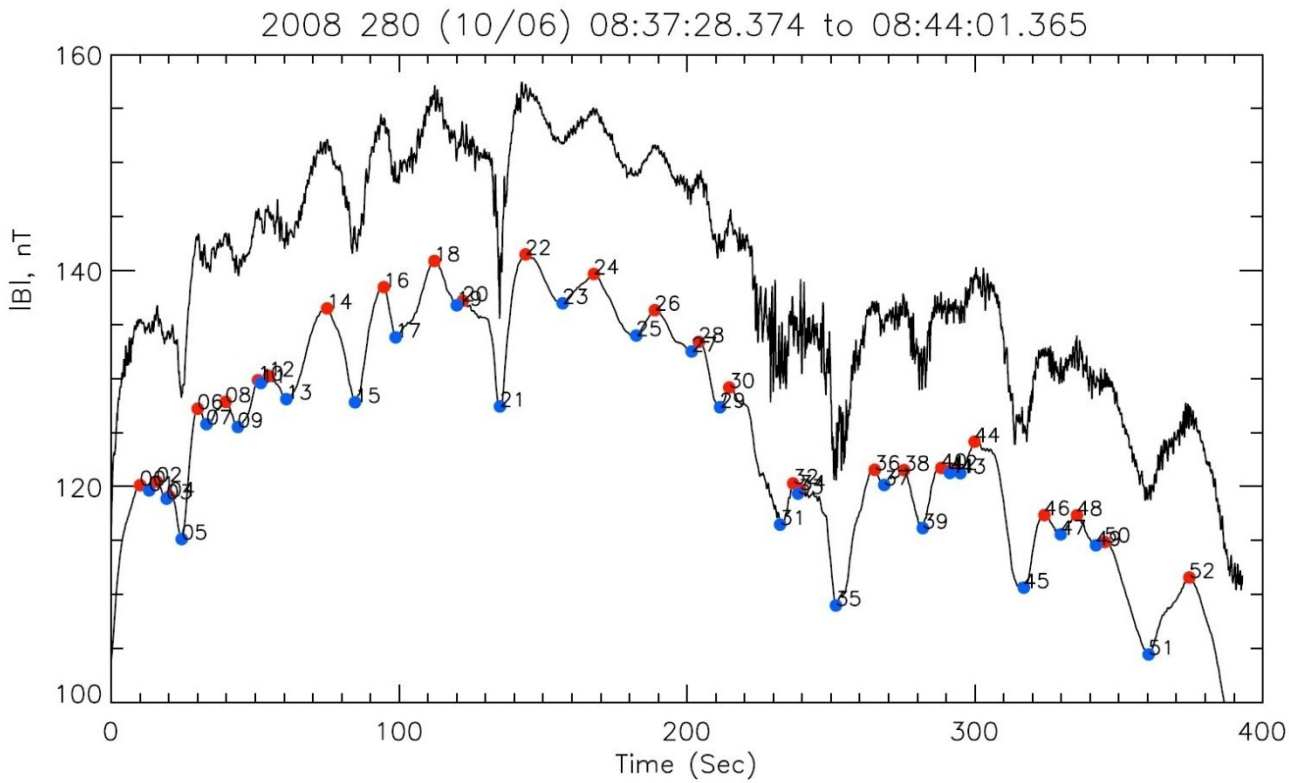
M2 Quasi-Periodic Oscillations around Closet Approach

Selected Extrema indicated by red (max) and blue (min) dots.



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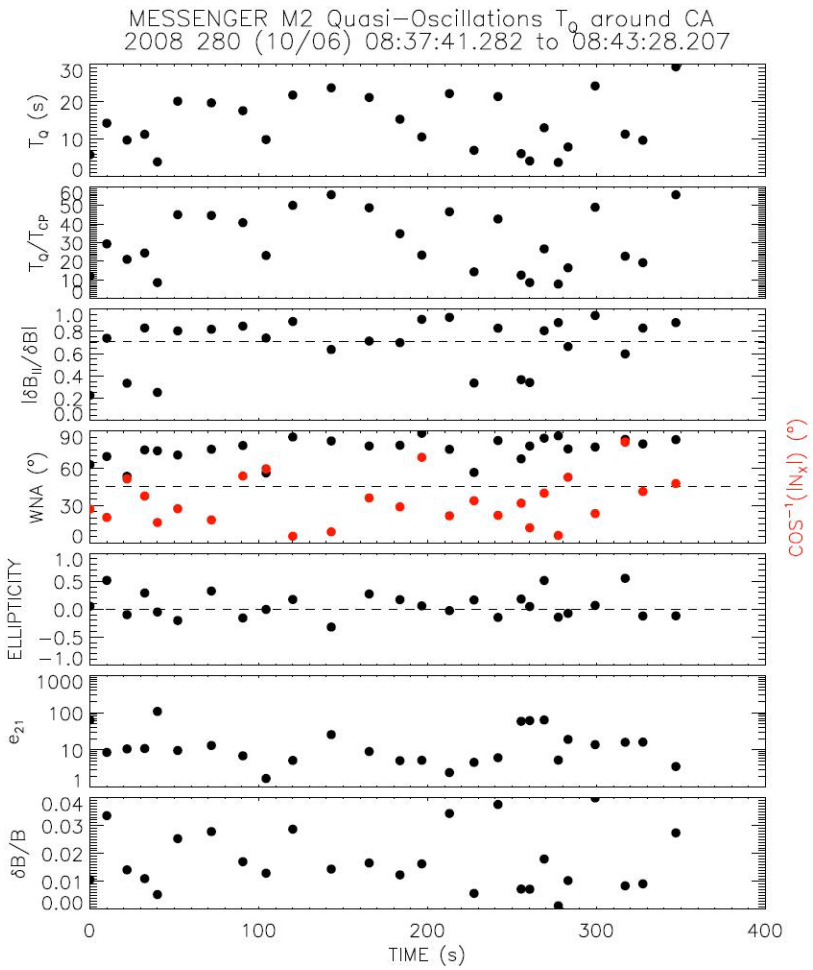
MVA of Extrema

MVA on neighboring Local Max and Min.

- T_Q~20s
- $T_Q > T_{cNa+}$
- WNA >45°
- ε~0°



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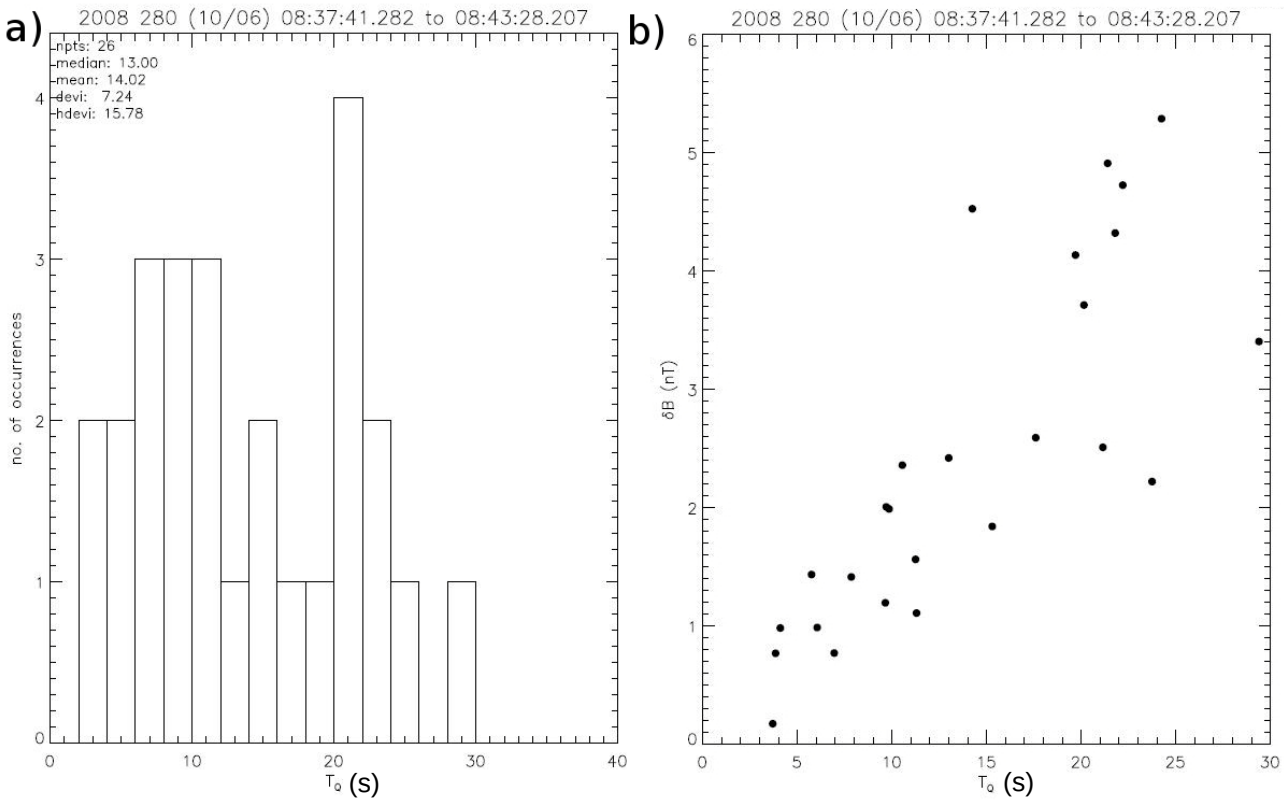
Quasi-Period

Histogram of Quasi-Period

Scatter plot of Quasi-Period Versus Amplitude



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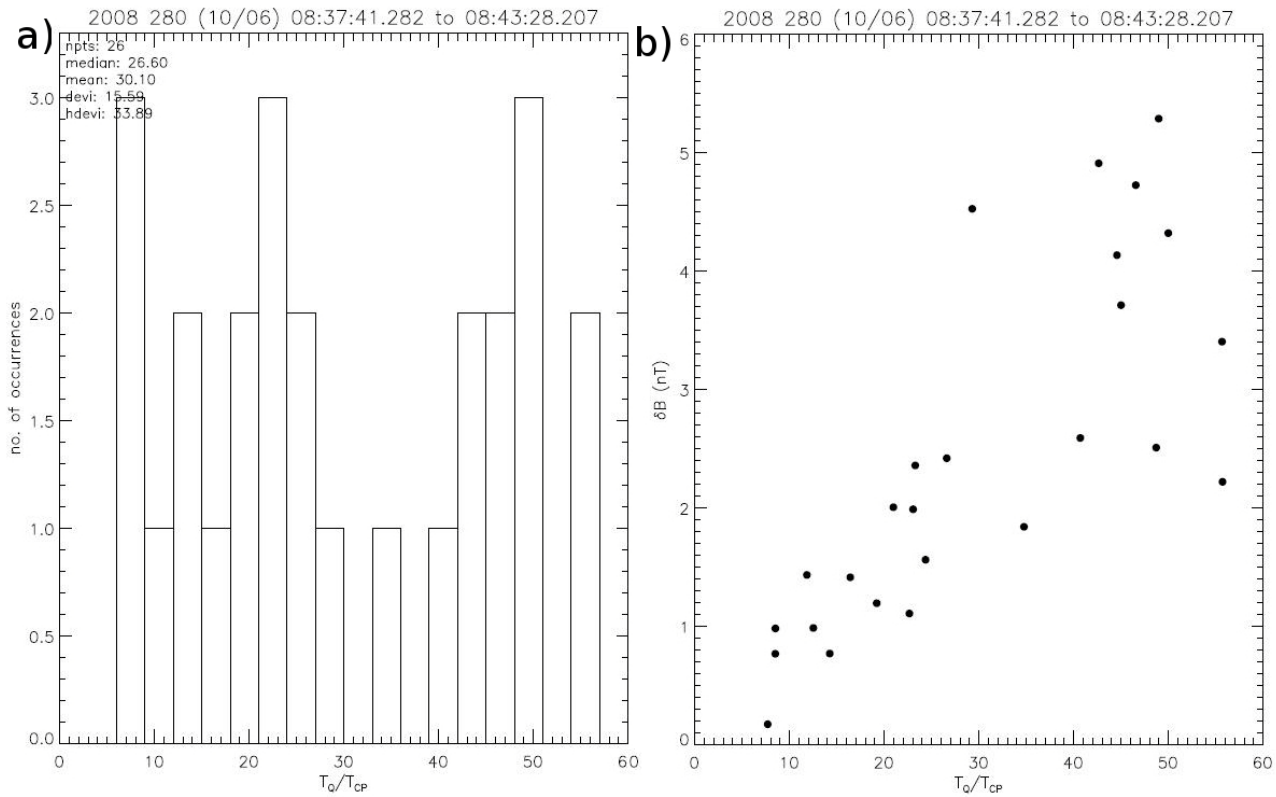
Quasi-Period/Proton Cyclotron Period

Histogram of T_Q/T_{cP}

Scatter plot of T_Q/T_{cP} Versus Amplitude



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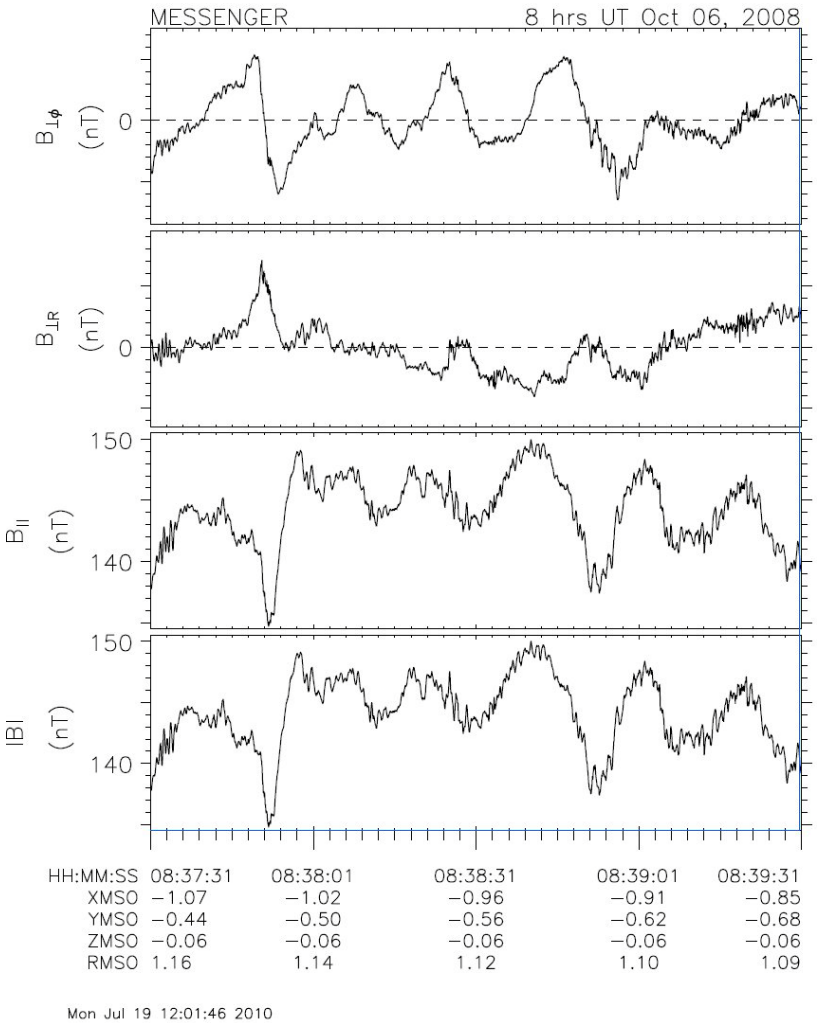
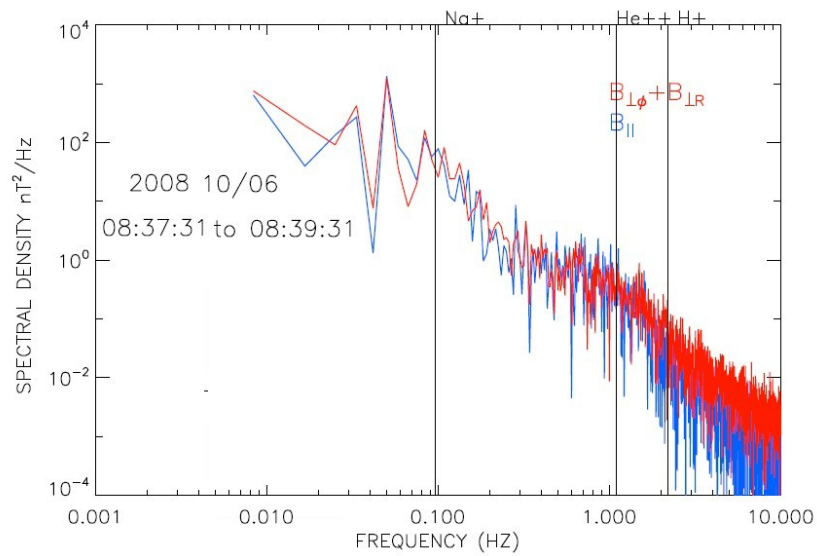
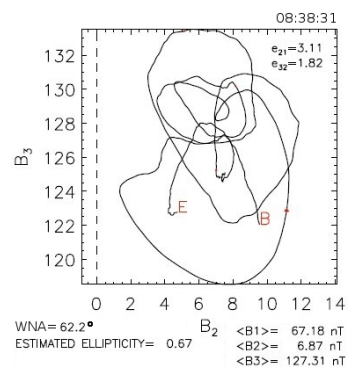
Example 1







T~20s
ψ~62º
ε~0.67

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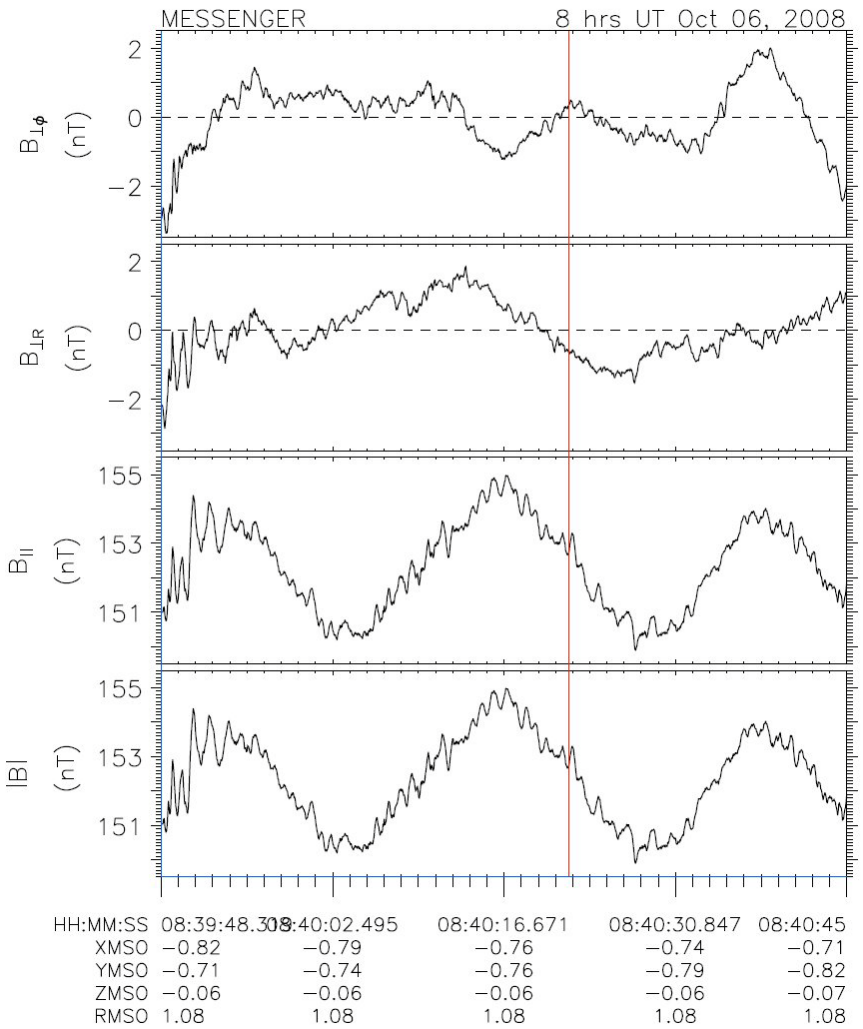
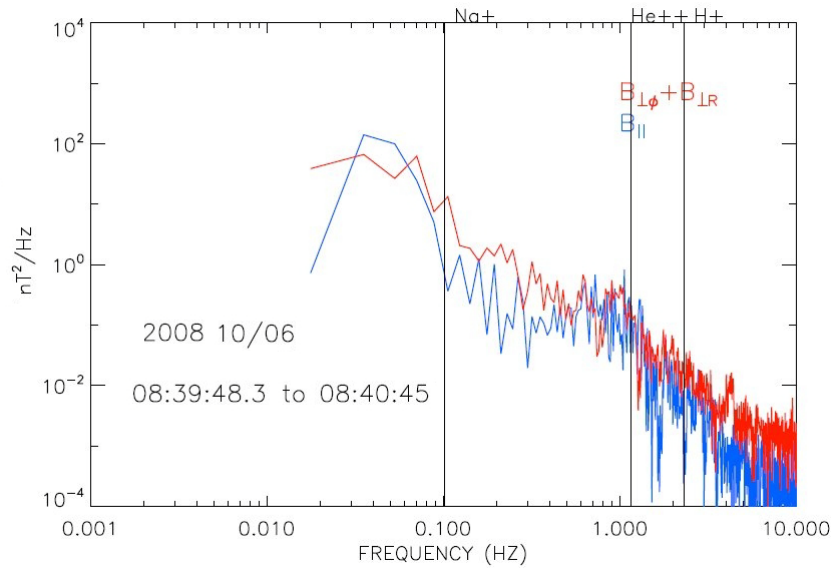
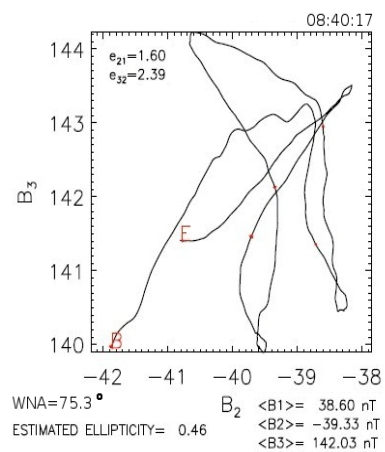
Example 2







T~19s

ψ~75°

ε~0.46

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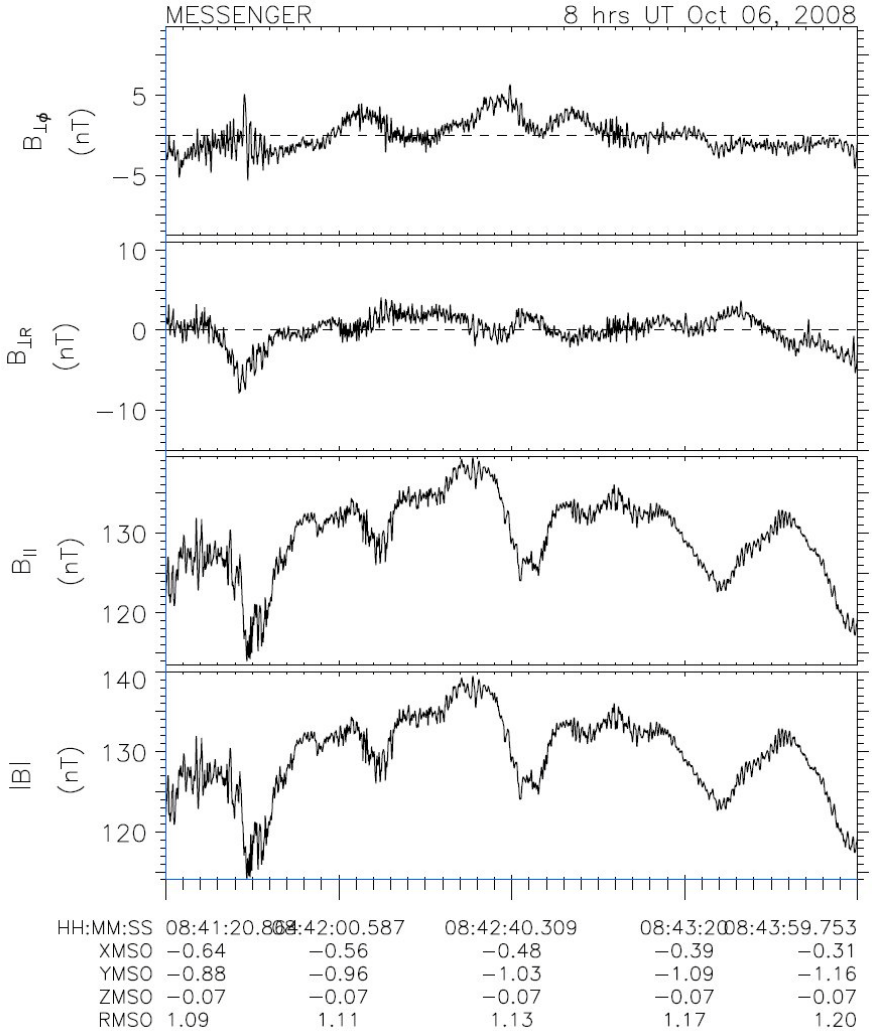
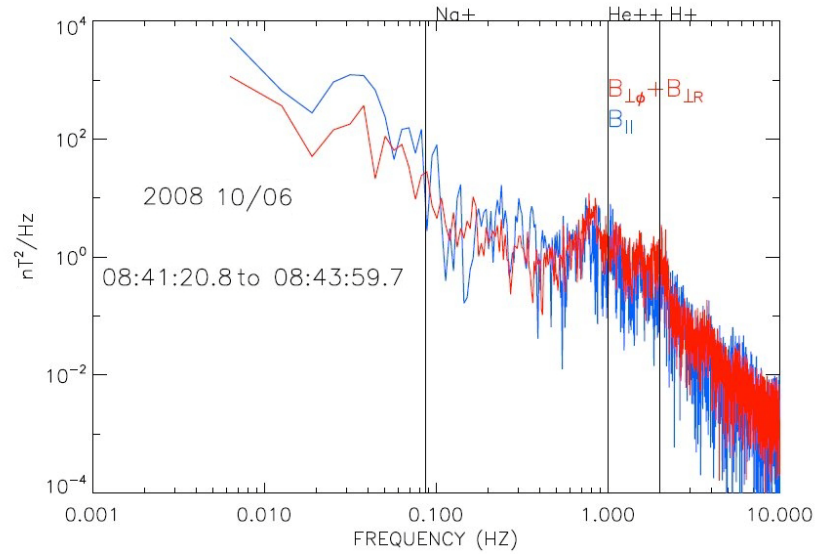
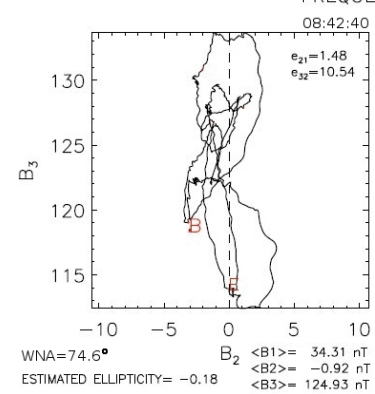
Example 3







T~28s

ψ~75°

ε~-0.18

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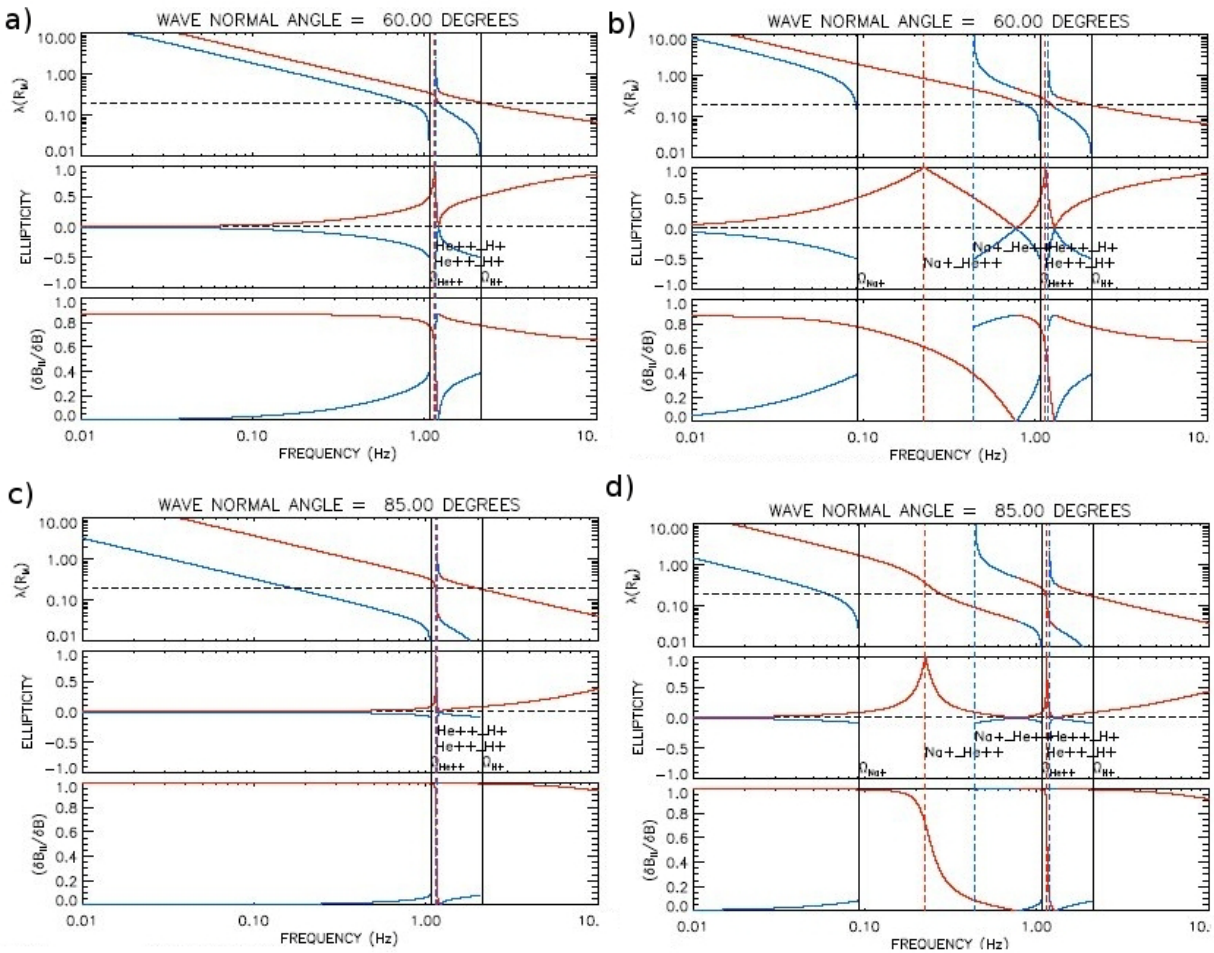
Cold Plasma Theory

Wavelength too large for plasma wave mode

Oscillations are most likey transcient

Caused by?

- Compressional surface waves on the magnetopause,
- or compression of inner magnetosphere by plasmoids,
- or Flux transfer events



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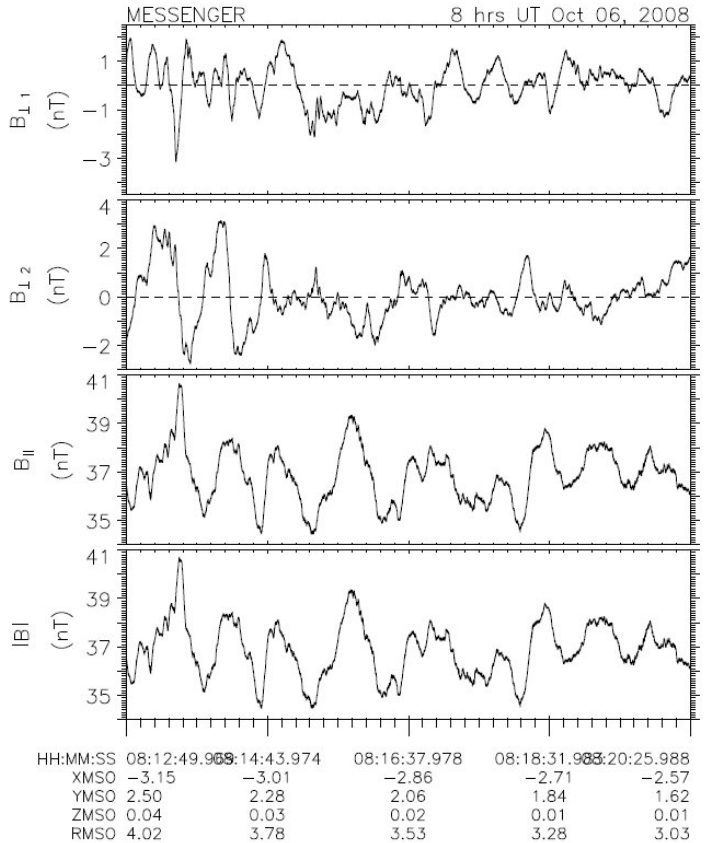
Power Spectra of Tail

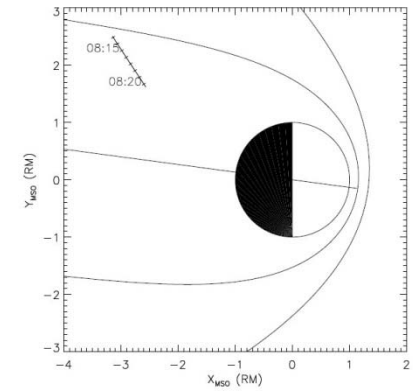
T~40s of Tail

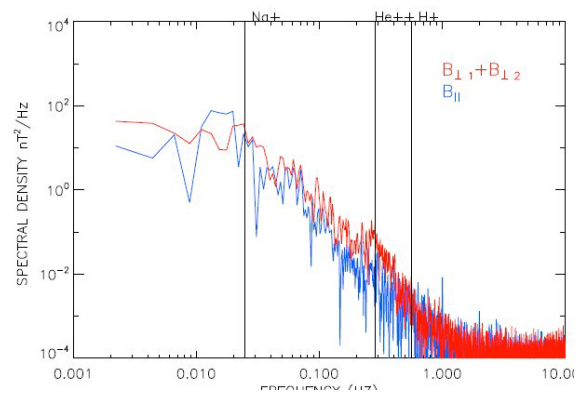
DT of
Tailward TCRs
58, 30, 36, 62s

Mercury-ward TCRs
194,172,72,49,29s

DT of FTE's 30s







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Conclusions

Strongly compressional Quasi-periodic oscillations ~20 to~30s period around CA, observed during southward IMF, but not for northward IMF.

If a plasma mode, wavelengths are too large for the size of the magnetosphere.

They are probably caused by either

1)surface waves on the magnetopause

2) or compression of the inner magnetosphere by plasmoids

3)or FTEs.