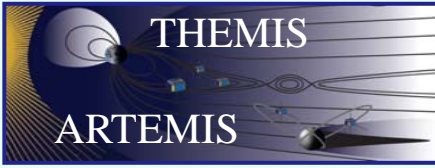


# THEMIS Tail 5 Update

S. Frey  
SSL UCB

- Design Drivers
- Line-up with MMS
- Tail Season 5



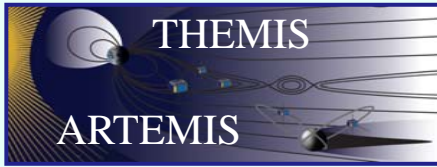
# Orbit Design Driver



## THEMIS outlook 2012 -2017: P3,P4,P5

- Maintain conjunctions near apogee in 24h orbits\*
- Keep one probe within 0.5  $R_e$  of NS during conjunctions
- Vary formation twice per year to address latest science
  - Tail season 5, dayside 5
- Conjunctions with new missions to enhance science
  - RBSP LD in 2012, large separations along orbit
  - MMS LD in 2014, align with MMS tetrahedron in tail
- Current orbits
- Finite fuel budget

\*after 2014 P3 may go to 5/4 TS, referenced to MMS



# Line-Up With MMS



Conjunction with MMS in 2014 and 2016, 2017

Ideally: Lower P3-perigee to ~1.1 to 1.09 Re in 2012 ASAP

Raise P3 apogee to ~15 Re in 2016,  $T3=5/4TS$

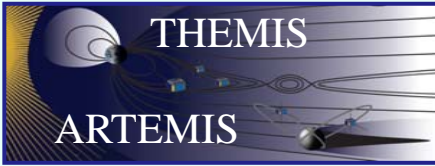
CONSIDERABLE FUEL COST for THEMIS T5 +MMS setup

## Estimated Remaining Fuel After

Fuel [kg]	D4	T5	$dm_{fuel}$	D5
P3	25.8	17.6	8.2	12.3
P4	22.4	18.4	4.0	18.4
P5	12.5	8.1	4.4	7.9

TBA:

- Can we adjust to launch delay
- Is it worth the fuel
- Is there an alternative
- Does it conflict with Tail5



# Tail Season 5



## Desired Conjunctions of P3,P4,P5

- Small string of pearls formation at  $-2 \text{ Re} < Y\text{-GSM} < 8 \text{ Re}$
- Azimuthal separation(dy) > vertical separation (dz)
- $dy \sim 2000\text{km}$ ,  $dz \sim 500\text{km}$
- Crossing NS

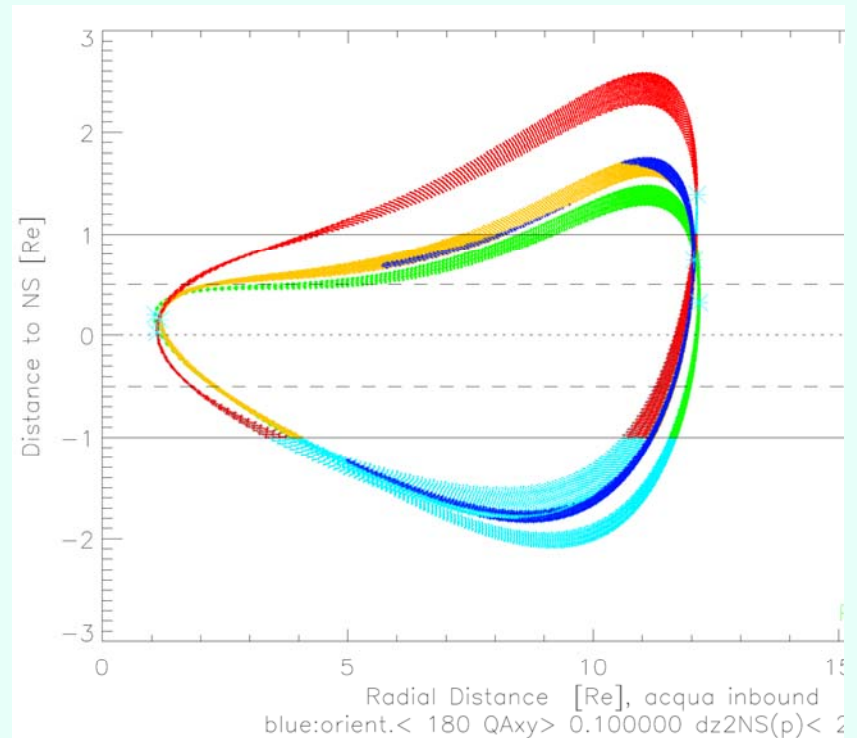
## Time Frame

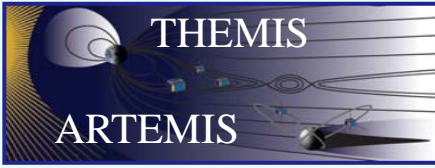
- WD: 23-06-2012 09:30 UT
- 22 May 2012 -22 Aug 2012  
(WD-32d to WD+60d)

## WORK IN PROGRESS

- Final perigee altitudes
- $dy > dz$

## *Dist. To NS vs. Radial Dist.*



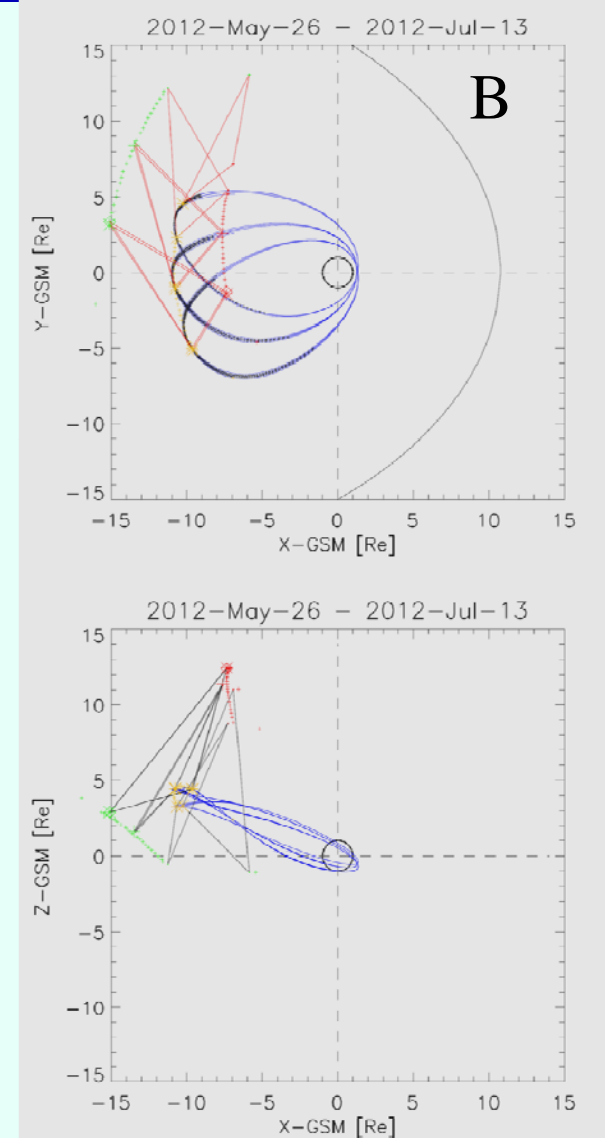
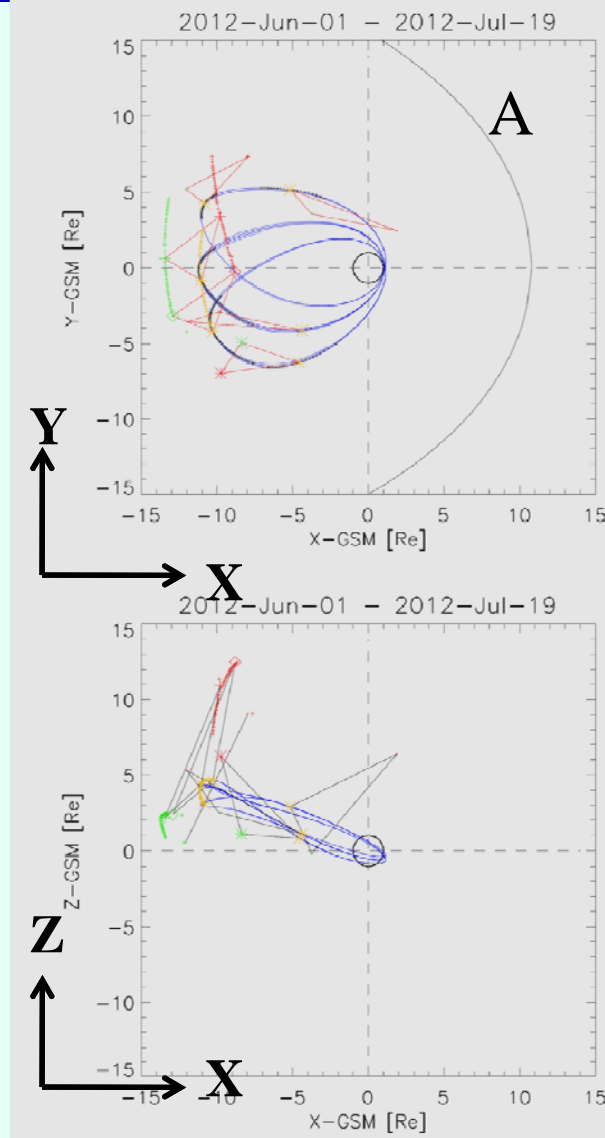


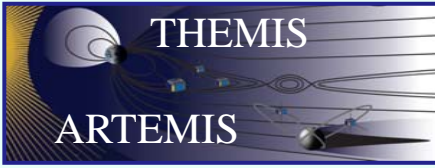
# Tail 5 Conjunctions



- A) Targeting MMS
- B) Targeting T5

- Smaller scales are triangles near apogee
- Small dx, dz require larger dy
- Trend into Dusk: Small dz on outbound phase





# Tail 5 Options

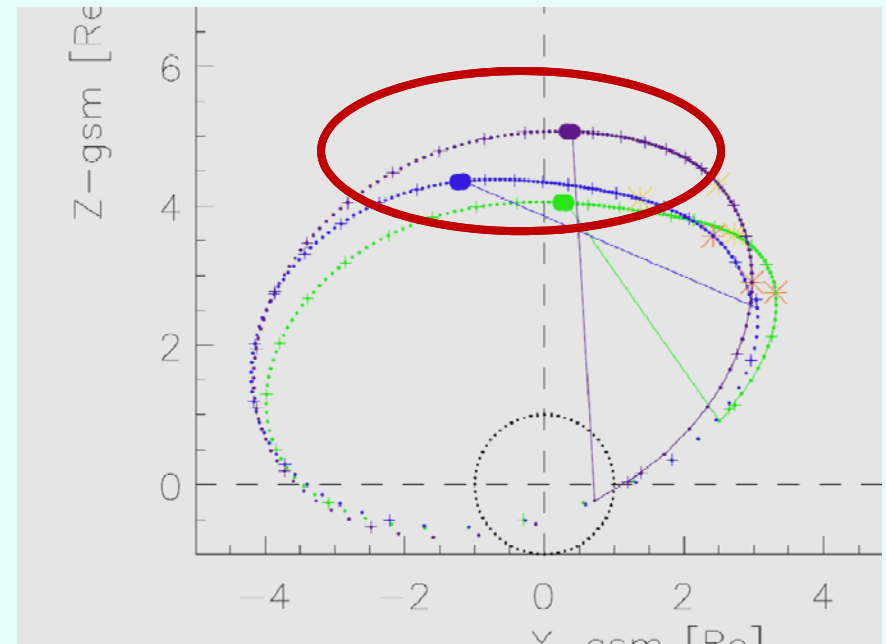
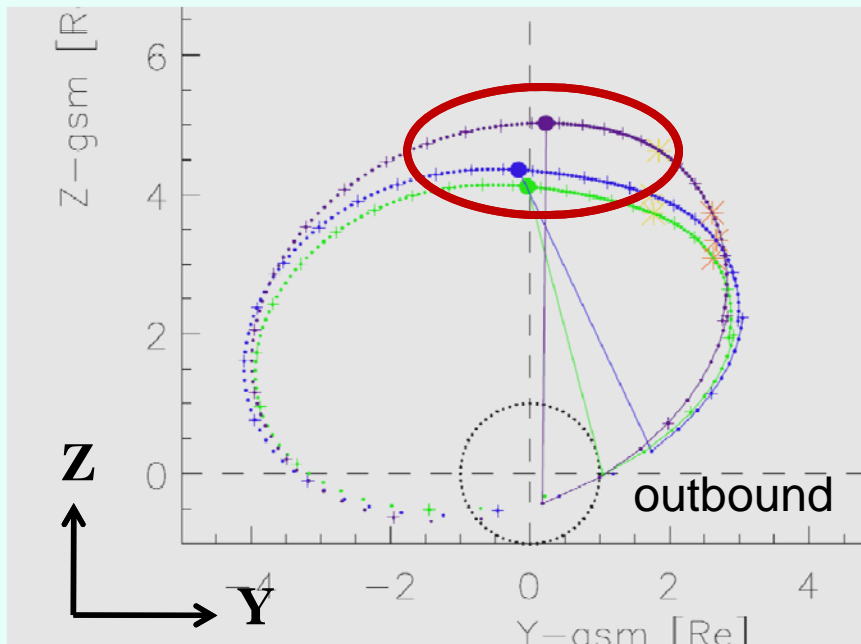


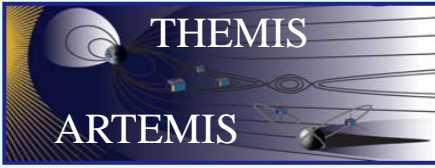
Wd-24d-WD+24d

dy34 [km] dz34  
 600 min 170  
 860 median 1420  
 1290 max 1970

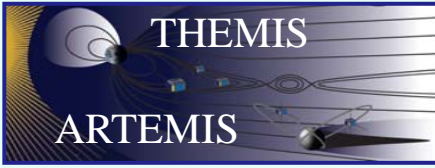
dz bound by  
 dInc34 ~1 deg  
 dAper34 ~10 deg

dy34 [km] dz34  
 3120 min 940  
 6040 median 1810  
 6300 max 2780

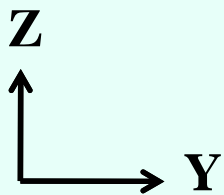
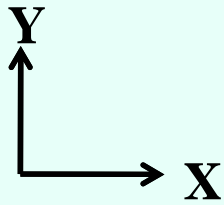
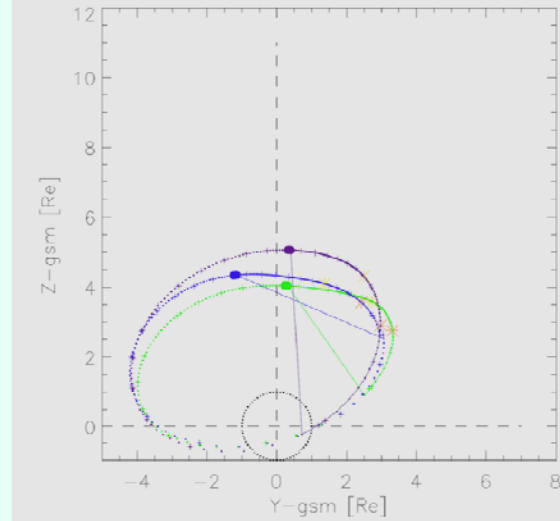
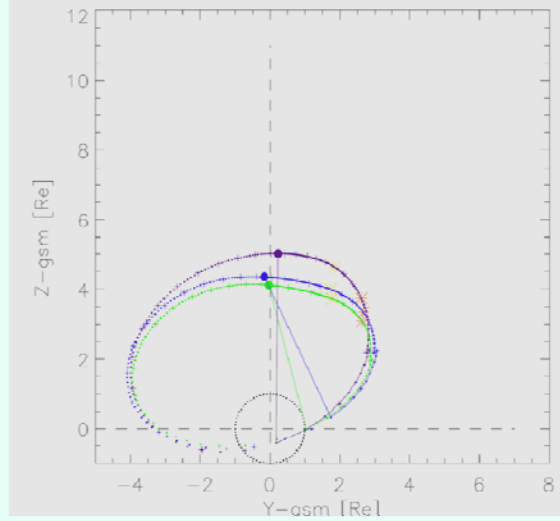
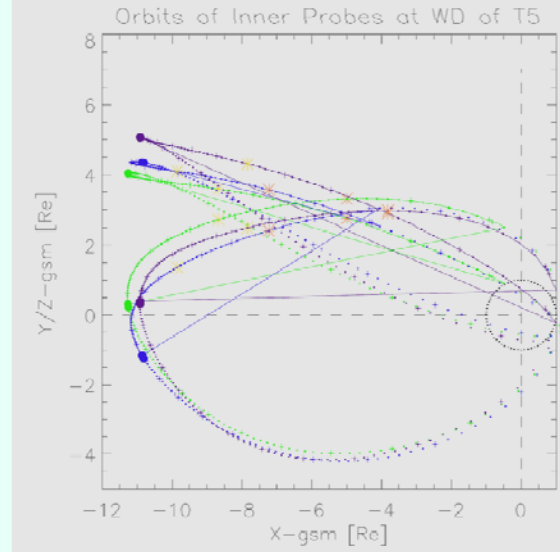
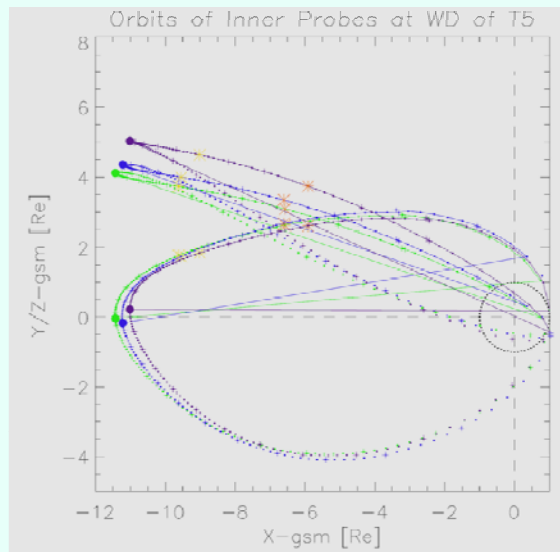




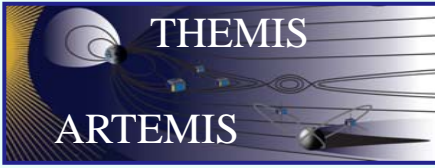
Thank You



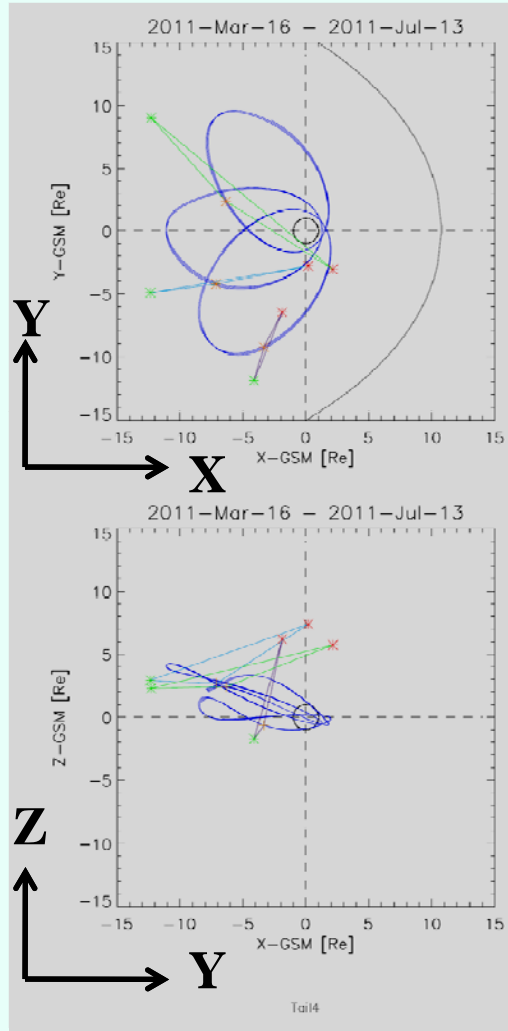
# Tail 5 Options 2



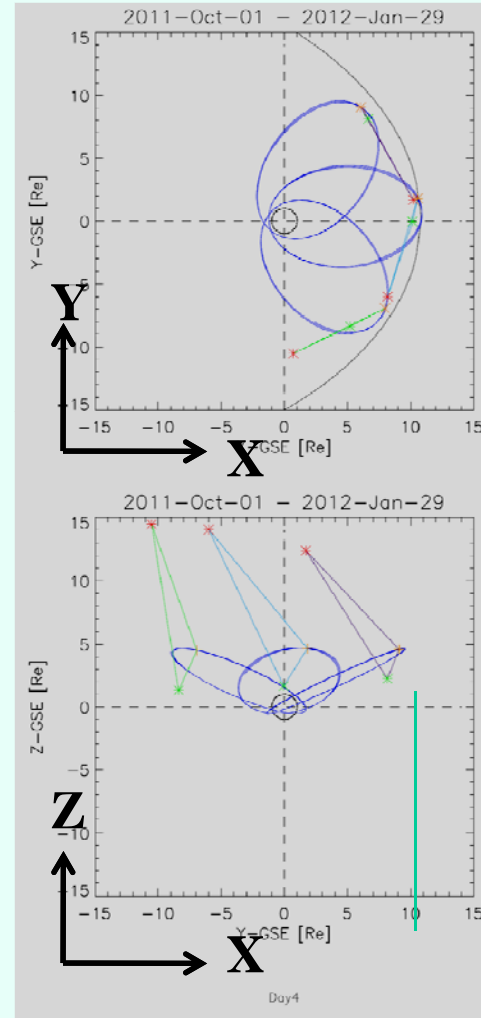




# CONJUNCTIONS T4, D4



TAIL 4



DAY 4