Earth observation: planning at ISOC

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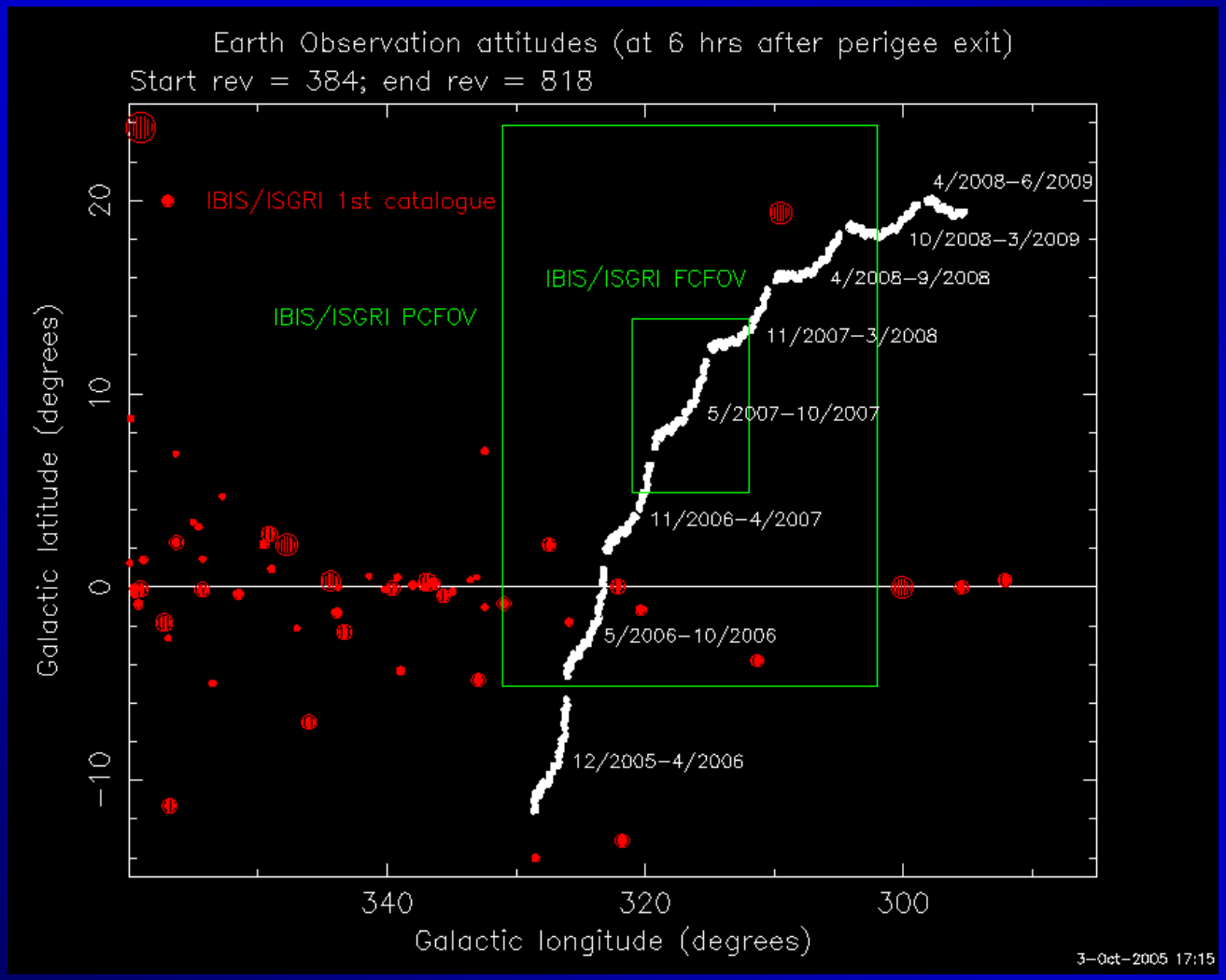
Selecting the time and target

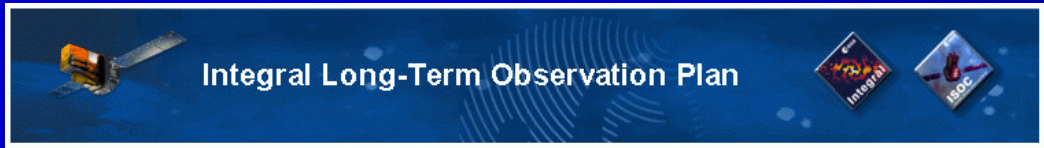


Decision at ISWT:

1) do it asap
⇒ with no observation constraints:
⇒ Jan 2006

2) Target = *earth position @ 6 hrs > perigee exit* ≡ $\oplus_{6hrs}$

The long-term plan



Rev	Time Interval	Source (*)	Proposal	Comments (**)
...	...	...	...	...
398	2006-Jan-15 to 2006-Jan-18	GPS quadrant 1/2	399821	ISWT proposal; SPI annealing
		Arp 220	320067	SPI annealing
399	2006-Jan-18 to 2006-Jan-21	GPS quadrant 1/2	399822	ISWT proposal; SPI annealing
		GPS quadrant 1/2	399823	ISWT proposal; SPI annealing
		Arp 220	320067	SPI annealing
400	2006-Jan-21 to 2006-Jan-24	GPS quadrant 1/2	399824	ISWT proposal; SPI annealing
		Arp 220	320067	SPI annealing
		Cas A / Tycho	320056	
401	2006-Jan-24 to 2006-Jan-27	Field_1	320108	
402	2006-Jan-27 to 2006-Jan-30	SN1006 / Cen X-4	329700/0003	Amalgamated
		Mid-Latitude North	320013	
403	2006-Jan-30 to 2006-Feb- 2	GPS quadrant 1/2	399825	ISWT proposal
		SN1006 / Cen X-4	329700/0003	Amalgamated
404	2006-Feb- 2 to 2006-Feb- 5	GPS quadrant 3/4	399814	ISWT proposal
		SN1006 / Cen X-4	329700/0003	Amalgamated
405	2006-Feb- 5 to 2006-Feb- 8	SN1006 / Cen X-4	329700/0003	Amalgamated
		Mid-Latitude North	320013	
406	2006-Feb- 8 to 2006-Feb-11	OMC FF		Calibration observation
		Galactic Bulge region	320109	Monitoring every revolution, 1 Hex dither
		SN1006 / Cen X-4	329700/0003	Amalgamated
407	2006-Feb-11 to 2006-Feb-14	GPS quadrant 1/2	399826	ISWT proposal
		Galactic Bulge region	320109	Monitoring every revolution, 1 Hex dither
		SN1006 / Cen X-4	329700/0003	Amalgamated
...	...	...	...	...

asap
=
after SPI annealing:

401, 402, 403, ...

But at expense of GO observations!

What to plan?

Target Earth = earth observation constraint!

⇒ Manual interventions (mainly MOC): reduce to absolute minimum

⇒ Safety: if decision = no earth observation, then use pre-planned safe attitude (then no additional actions)

- Proposed sequence (to ensure proper commanding of instruments):

1) Point at $\oplus_{6hrs}$ ≡ "pre-earth" observation
2) Plan "earth" observation at safe attitude
3) Point at $\oplus_{6hrs}$ ≡ "post-earth" observation

- If slews from/to $\oplus_{6hrs}$ to/from safe attitude taken out:

⇒ "earth" observation = earth observation

What to plan - 2 ?

Planning constraints at ISOC:

- $\oplus_{6hrs}$ becomes constraint BEFORE start of science time (note: start of science time can NOT be advanced)
- $\oplus_{6hrs} \neq$ safe perigee passage
  (note: in ISOC planning system; can NOT be changed)

$\Rightarrow$ "pre-earth" pointing NOT in rev N, but in N-1

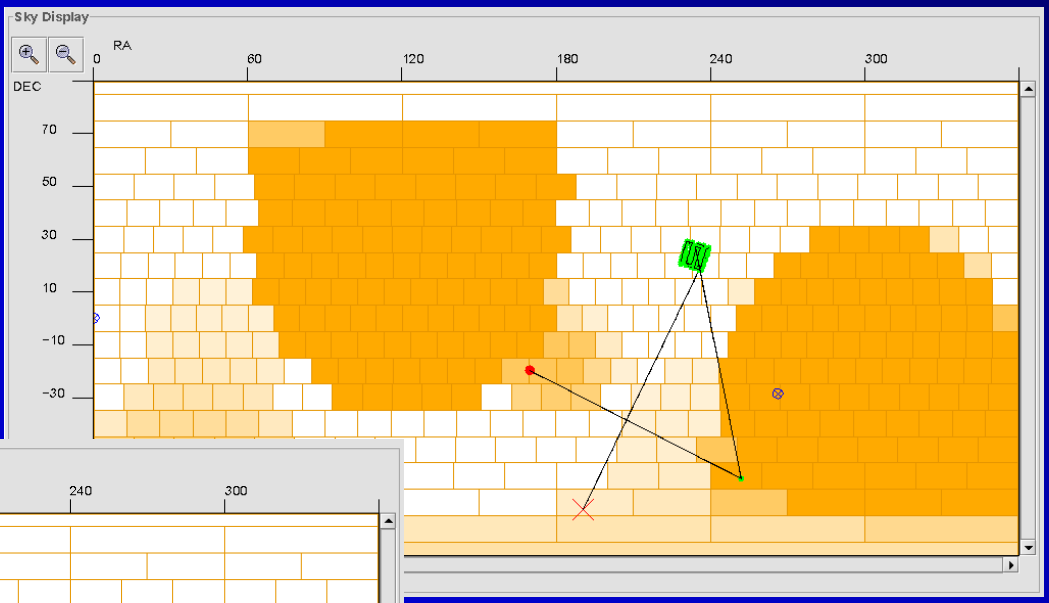
- Slew from "earth" observation to "post-earth" pointing can ONLY start when $\oplus_{6hrs}$ is unconstraint @ start of slew

$\Rightarrow$ "post-earth" observation starts later

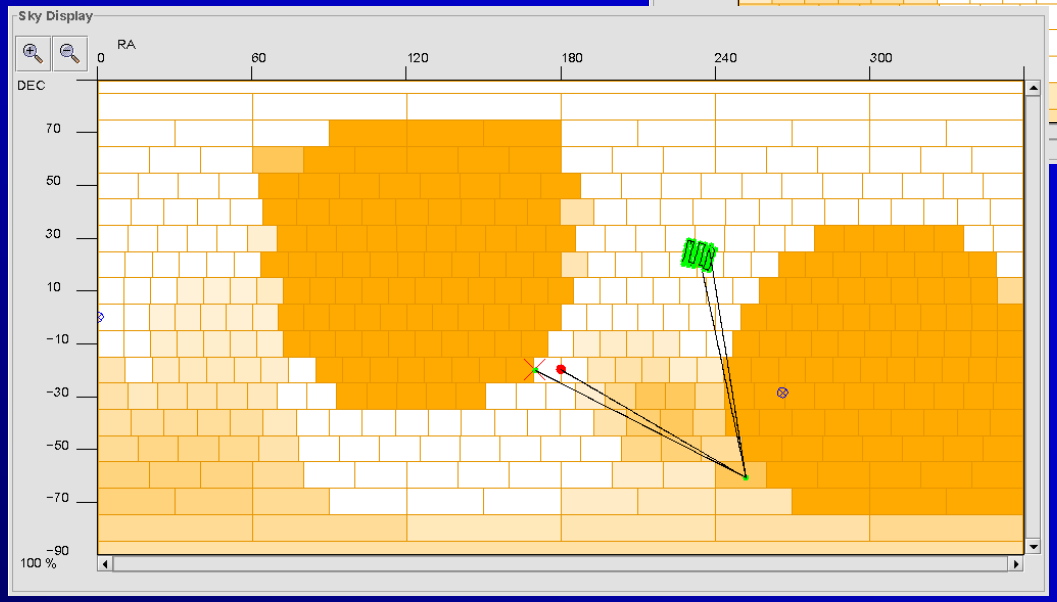
- Distance $\oplus_{6hrs} \Leftrightarrow$ safe attitude = large $\Rightarrow$ RWB
- Safe perigee passage = (α,δ) of safe attitude

Planning results

Example planning:
Rev N-1 = Rev 399
Rev N = Rev 400



Rev 399



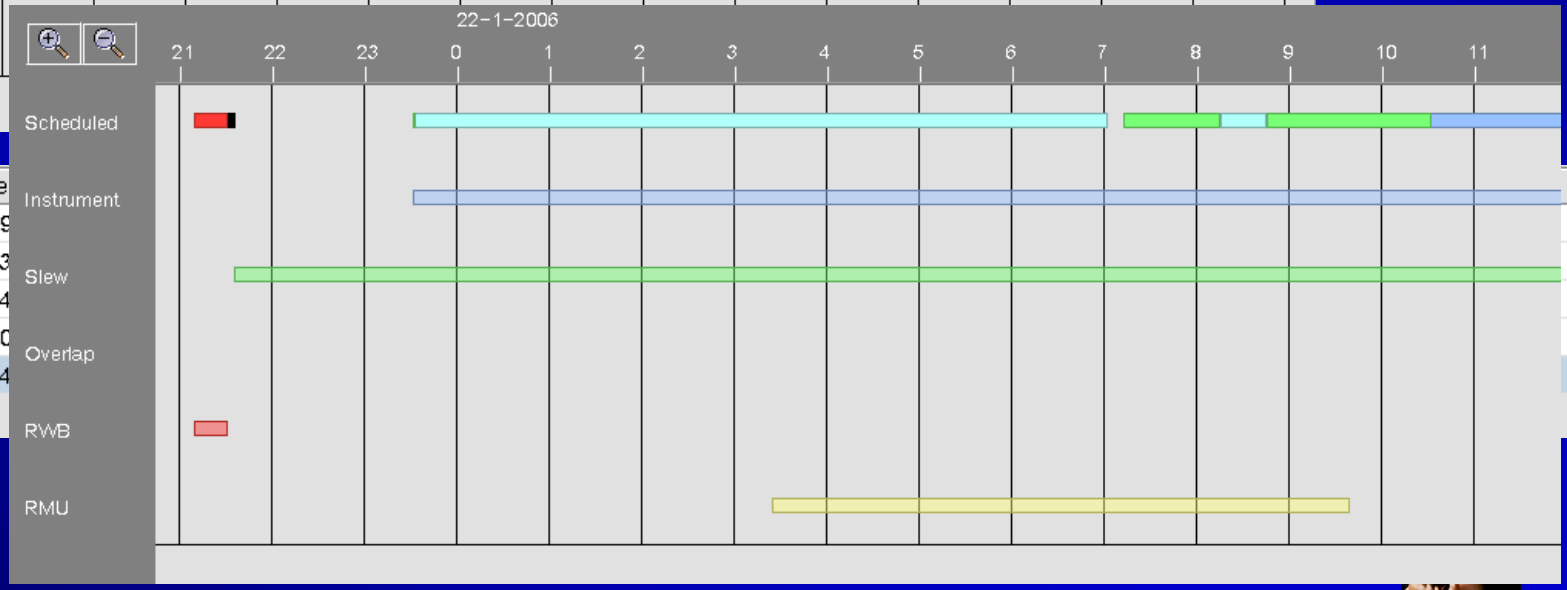
Rev 400

Planning results - 2

Rev 399

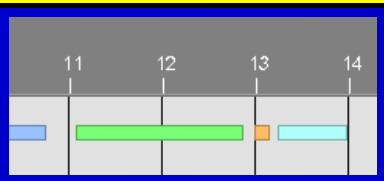
Start Time	Duration	Source	Ra	Dec	Dither	Start	End	Exp ID	PI
2006-01-21T21:32:40Z		Perigee Exit	11:20:00.00	-20:00:00.0					
2006-01-21T23:33:36Z	27000	Earth 1	170.000	-20.000	Staring	1	1	4000001	Public
2006-01-22T08:16:00Z	1800	Post earthpointing	251.860	-60.983	Staring	1	1	4000002	Public
2006-01-22T10:32:27Z	73348	Arp 220	233.738	23.503	5x5	62	83	4000003	Dudley
2006-01-23T08:04:29Z	90018	Arp 220	233.738	23.503	5x5	84	110	4000004	Dudley
2006-01-24T13:00:00Z	2652	Pre-earth pointing	251.723	-60.936	Staring	1	1	4000005	Public
2006-01-24T16:44:53Z		Perigee Entry	12:00:00.00	-20:00:00.0	Unknown strategy				

Rev 400

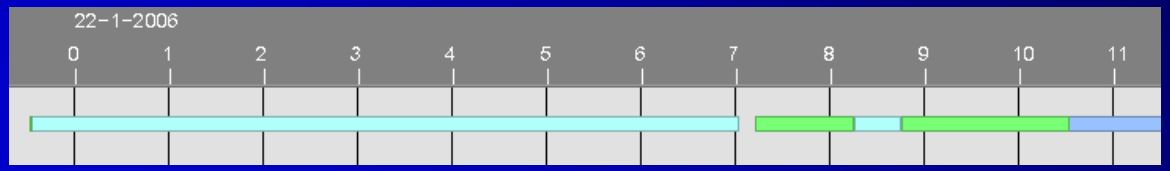


Start Time	PI
2006-01-18T21:47:59	
2006-01-18T23:50:53	
2006-01-20T08:53:04	
2006-01-21T13:15:00	
2006-01-21T16:59:34	

Conclusions



Rev N-1



Rev N

- Rev N-1:

time = slew time from astronomical target to $\oplus_{6hrs}$ + GSHO time + "pre-earth" pointing $\cong t_{slew,1}$ + 1 hr

- Rev N:

time = total earth observation + slew from safe attitude to $\oplus_{6hrs}$ + "post-earth" pointing + slew time from $\oplus_{6hrs}$ to astronomical target $\cong$ 7.5 hr + 1 hr + 0.5 hr + $t_{slew,2}$ = 9 hr + $t_{slew,2}$

- Total time to be used for earth observation sequence $\cong$ 10 hr + $t_{slew,1}$ + $t_{slew,2}$

Note: $t_{slew,1}$ & $t_{slew,2}$ can be minimized by choice of scheduling sequence of astronomical targets