S14: Hyperion and Tethys

Tethys and Hyperion: what we know so far and what we expect to learn

SOST Preview

September 19, 2005

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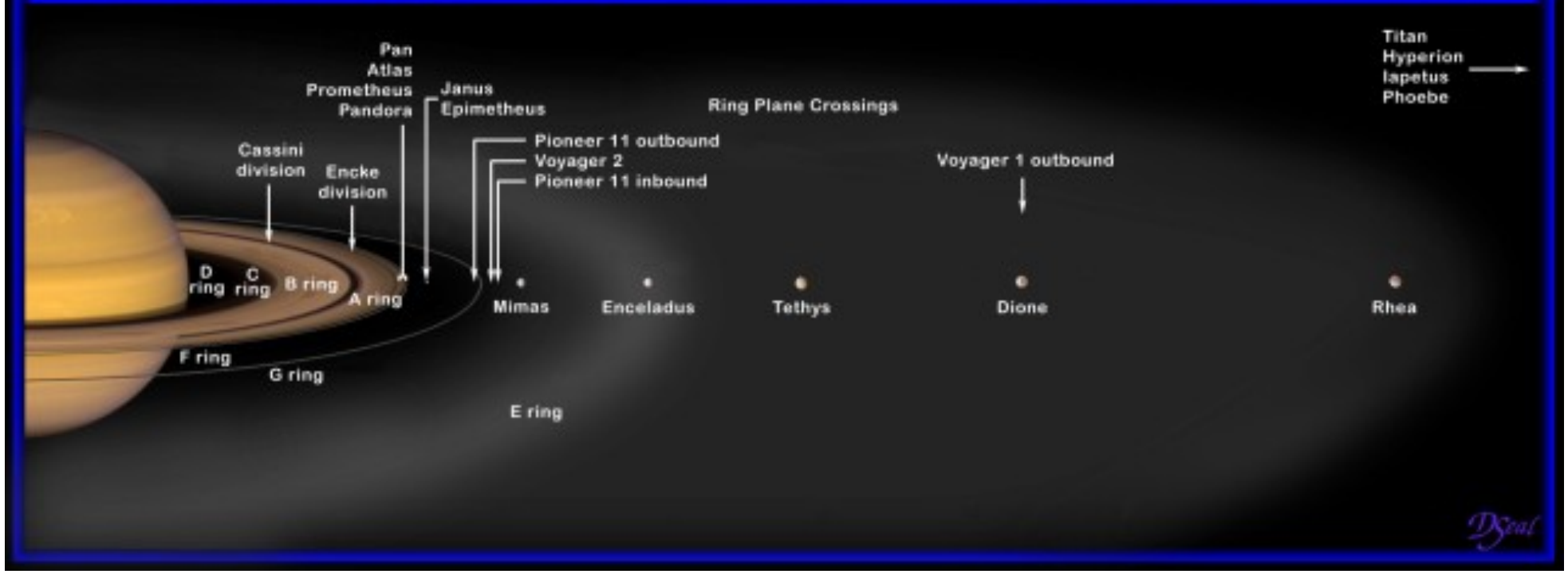
Saturn's Satellites and Ring Structure



Iapetus	Dec. 31, 2004	120,000
Enceladus	Feb. 17, 2005	1200
Enceladus	March 9, 2005	500
Enceladus	July 14, 2005	175
Tethys	***Sept. 24, 2005***	***1500***
Hyperion	***Sept. 26, 2005***	***500***
Rhea	Nov. 26, 2005	500
Rhea	Aug. 30, 2007	5100
Iapetus	Sept. 10, 2007	1000
Enceladus	March 12, 2008	<500

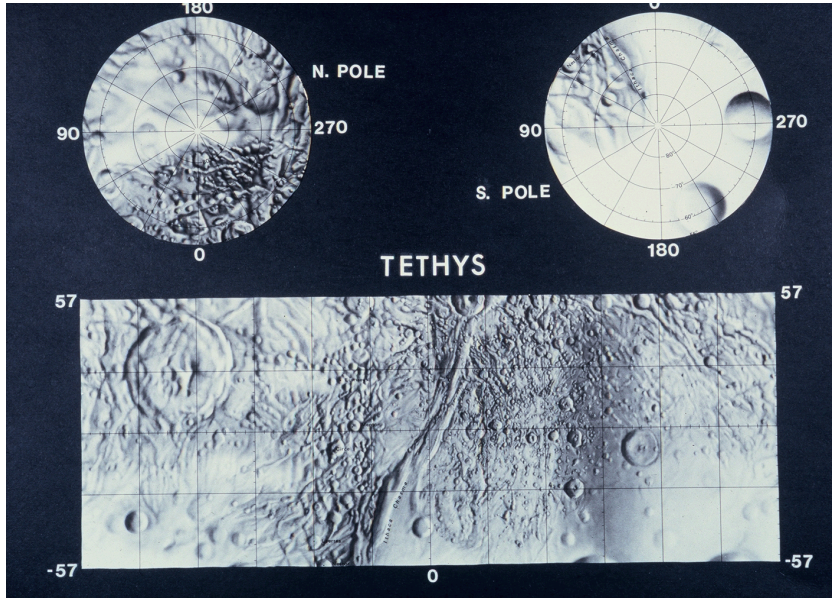
Summary of characteristics

	Tethys	Hyperion
Distance from Saturn (10^3 km)	295	1481
Period (days)	1.89 (synchronous)	21.28 *Chaotic rotation!!*
Radius (km)	530	164X130X107
i	1.1	0
e	0.028	0.4
Density (gm/cc)	1.2 *	
Geometric albedo	0.8	0.3
Composition	Water ice + ??	Water ice + organics
Discovered	1684 (Cassini)	1848 (Bond, Lassell)

*Not updated with new NAV results

- Determine the general characteristics and geological histories of the satellites: **What is Ithaca Chasma (Tethys)? Is is related to Odysseus? What were the resurfacing events on Tethys? What is the dynamical history of Hyperion?**
- Investigate the composition of the satellites, with emphasis on volatiles and organic materials: **What are the trace substances on Tethys and Hyperion? How are Iapetus, Hyperion, and Phoebe related?**
- Constrain models of the bulk composition, internal structure, and density: **Why do some satellites melt and others don't? is Hyperion a "rubble pile"?**
- Investigate interactions with the magnetosphere and ring system of Saturn: **How does the E-ring interact with the inner satellites? Are any other satellites a source for the E-ring?**

Introduction to Tethys



Tethys is the medium sized satellite with the most diversity: cratered plains of different ages, indicating various resurfacing episodes; a single large crater; a massive chasm (is it related to the crater?); evidence for localized resurfacing; albedo features.

Overview of Tethys Flybys

(For didactic purposes only – last 3 numbers have not been updated)

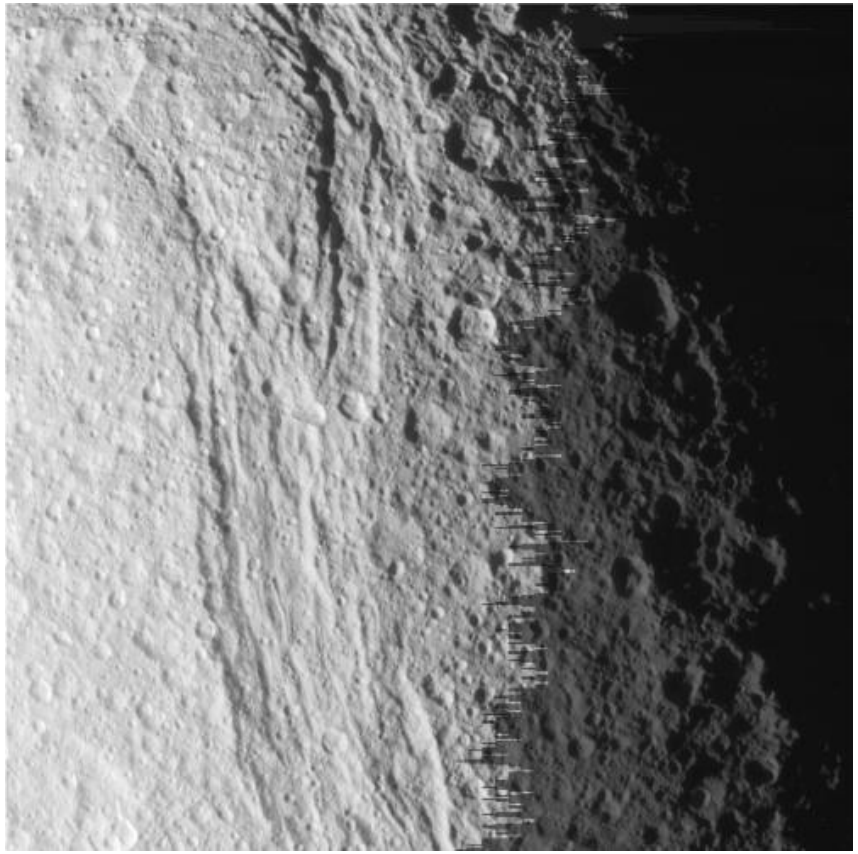
Rev	Sequence	Date	Time	Closest Approach	Phase Angle
4	S09	3/9/2005	11:42	83,232	60°
7	S10	5/2/2005	21:59	49,586	60º
15	S14	9/24/2005	1:28	1500	29º
45	S30	5/26/2007	20:57	97,187	44°
47	S31	6/27/2007	19:51	15,838	80°
49	S33	8/29/2007	11:23	47,355	110°
50	S34	9/30/2007	10:10	144,000	79°

(Hyperion has no Voyager class flybys)

Note: the flybys on Rev 15 and 47 are on opposite hemispheres (15 is leading)

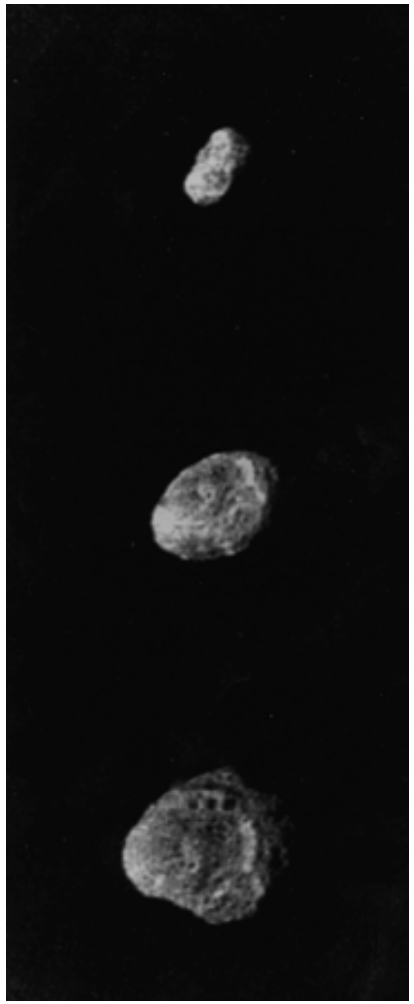
Sampling of Tethys so far

Different aged surfaces
(VGR)



Ithaca Chasma
(Cassini)

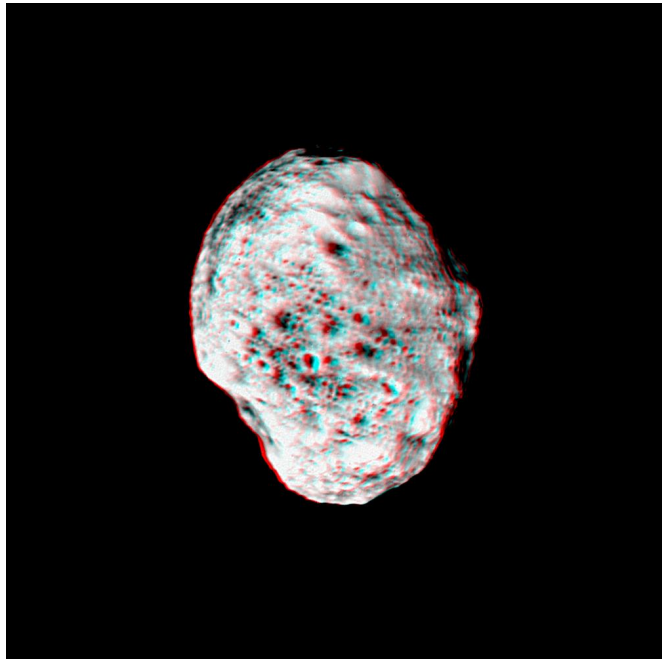
Sampling of Hyperion

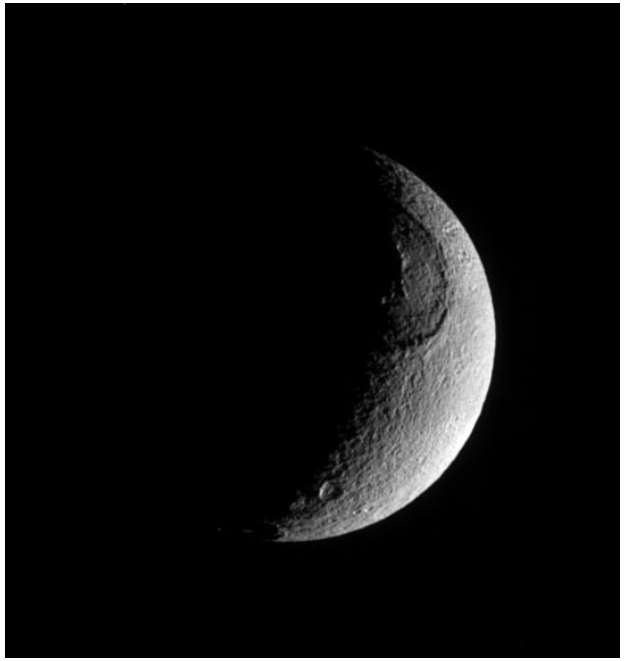


1.7 million km – about
Voyager resolution

Closest approach so far is just under 200,000 km

Hyperion (015HY) and Tethys (015TE) Preview Overview





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19 September 2005

Rev 15
Tethys and Hyperion Flybys

- Hyperion targeted flyby originally planned for 1000 km
- Tethys targeted flyby originally not planned
- Nav team (Brent Buffington) discovered unique opportunity for Tethys flyby at relatively low ΔV cost
- Trajectory change implemented
  - Includes closer approach to Hyperion
  - Tethys observations are part of Saturn TWT segment

Summary: 015HY

- Closest Approach:
  - 500 km altitude
  - Sept. 26 2005 02:24:47 SCET
  - 47.6° phase at C/A (low phase inbound)
- Science Highlights:
  - ORS + RSS inbound
  - ORS + RSS + RADAR outbound

Summary: 015TE

- Closest Approach:
  - 1502 km altitude
  - Sept. 24 2005 02:42:17 SCET
  - 68.1° phase at C/A (low phase inbound)
- Science Highlights:
  - ORS around C/A
  - RADAR outbound

015TE Attitude Strategy

SATURN rev 15 Segment		2005-265T18:43:00	002T18:57:00	2005-268T13:40:00			
SP_015SA_WAYPTTURN265_PRIME	M, R	2005-265T18:43:00	000T00:27:00	2005-265T19:10:00	ISS_NAC to Saturn (0.0,-20.0,0.0 deg	POS_X to NSP	(0, -20À ,0) offset for 2nd axis
NEW WAYPOINT		**2005-265T19:10:00**	**000T16:05:00**	**2005-266T11:15:00**	**ISS_NAC to Saturn (0.0,-20.0,0.0 de**	**POS_X to NSP**	
ISS_015MI_238W042PH001_PRIME	M, U	2005-265T19:10:00	000T00:30:00	2005-265T19:40:00	ISS_NAC to Mimas (0.0,-20.0,0.0 deg	POS_X to NSP	(0, -20 ,0) offset for 2nd axis
VIMS_015SA_CYLMAP002_PRIME	C, M, U	2005-265T19:40:00	000T04:35:00	2005-266T00:15:00	ISS_NAC to Saturn (0.0,-20.0,0.0 deg	POS_Z to NSP	(0, -20 ,0) offset for 2nd axis
VIMS_015TE_VMAP001_PRIME	M	2005-266T00:15:00	000T01:00:00	2005-266T01:15:00	ISS_NAC to Tethys (0.0,-20.0,0.0 deg	POS_Z to NSP	ISS NAC to Tethys
SP_015EA_DLTURN266_PRIME	M	2005-266T01:15:00	000T00:30:00	2005-266T01:45:00	XBAND to Earth	NEG_X to Sun	SP Turn to Earth
SP_015EA_M70METOTP266_PRIME	M, N	2005-266T01:45:00	000T09:00:00	2005-266T10:45:00	XBAND to Earth	Rolling	OTM-34 prime; no roll after maneuver; 2nd axis for MIMI
SP_015SA_WAYPTTURN266_PRIME	M, R	2005-266T10:45:00	000T00:30:00	2005-266T11:15:00	NEG_Z to Saturn	POS_X to NSP	
NEW WAYPOINT		**2005-266T11:15:00**	**000T06:08:00**	**2005-266T17:23:00**	**NEG_Z to Saturn**	**POS_X to NSP**	
RADAR_015SA_GLOBALMAP001_PRIME	M	2005-266T11:15:00	000T04:15:00	2005-266T15:30:00	NEG_Z to Saturn (0.0,-8.25,0.0 deg. c	POS_X to NSP	
VIMS_015CP_CALYPSO001_PRIME	C, I, M, U	2005-266T15:30:00	000T01:45:00	2005-266T17:15:00	NEG_Y to Calypso (0.0,-20.0,0.0 deg.	POS_X to NSP	(0, -20 ,0) offset for 2nd axis
SP_015DR_RAMAVOID266_PRIME	M	2005-266T17:15:00	000T00:08:00	2005-266T17:23:00	NEG_Z to Dust_RAM	POS_X to NSP	Ring plane crossing; 2nd axis for Mag
NEW WAYPOINT		**2005-266T17:23:00**	**000T01:28:00**	**2005-266T18:51:00**	**NEG_Z to Dust_RAM**	**POS_X to NSP**	
MP_015DR_DUSTHAZRD001_PRIME	M	2005-266T17:23:00	000T01:17:00	2005-266T18:40:00	NEG_Z to Dust_RAM	POS_X to NSP	
SP_015SA_WAYPTTURN466_PRIME	M	2005-266T18:40:00	000T00:11:00	2005-266T18:51:00	NEG_Z to Saturn	POS_X to NSP	Ring plane crossing; 2nd axis for Mag
NEW WAYPOINT		**2005-266T18:51:00**	**000T10:09:00**	**2005-267T05:00:00**	**NEG_Z to Saturn**	**POS_X to NSP**	
RADAR_015SA_GLOBALMAP002_PRIME	M	2005-266T18:51:00	000T05:09:00	2005-267T00:00:00	NEG_Z to Saturn (0.0,-18.0,0.0 deg. c	POS_X to NSP	2nd axis for Mag
Periapse per = 18.6 d, inc ...		2005-266T21:35:47	000T00:00:01	2005-266T21:35:48			
Begin Custom		**2005-267T00:00:00**	**000T00:01:00**	**2005-267T00:01:00**	**NEG_Z to Saturn**	**POS_X to NSP**	
ISS_015TE_STEREO001_PRIME	C, M, U	2005-267T00:00:00	000T01:10:00	2005-267T01:10:00	ISS_NAC to Tethys (0.0,-45.0,0.0 deg	POS_X to NSP	Pick up at NEG_Z to Saturn, POS_X to NSP; Hand off at ISS_NAC to Tethys (0.0,-45.0,0.0 deg. offset), NEG_Z to NSP. pickup at NEG_Z to SA, POS_X to NSP, handoff at ISS_NAC to TE (0,-45,0), POS_X to NSP
CIRS_015TE_EWSCAN001_PRIME	I, M, U	2005-267T01:10:00	000T00:30:00	2005-267T01:40:00	CIRS_FP3 to Tethys (0.0,-45.0,0.0 de	POS_X to NSP	Pick up at ISS_NAC to Tethys, NEG_Z to NSP; Hand off at ISS_NAC to Tethys, NEG_Z to NSP.
ISS_015TE_REGMAP001_PRIME	C, M, U	2005-267T01:40:00	000T01:50:00	2005-267T03:30:00	ISS_NAC to Tethys	NEG_Z to NSP	Pick up at ISS_NAC to Tethys, NEG_Z to NSP; Hand off at ISS_NAC to Tethys, POS_X to NSP. turn to UVIS_FUV to ra/dec 81.5729,28.6075, NEG_X to ra/dec 358.4,-12.3 for stellar occ.
CIRS_015TE_FP1FP3MAP001_PRIME	I, M, U	2005-267T03:30:00	000T00:57:00	2005-267T04:27:00	CIRS_FP1 to Tethys	POS_X to NSP	Pick up at NEG_Y to Tethys, POS_Z to North_Pole_Dir; Hand off at ISS_NAC to Saturn (0.0,-20.0,0.0 deg. offset), POS_X to NSP.
End Custom		**2005-267T04:27:00**	**000T00:01:00**	**2005-267T04:28:00**	**NEG_Z to Saturn**	**POS_X to NSP**	
SP_015DR_RAMAVOID267_PRIME	M	2005-267T04:27:00	000T00:33:00	2005-267T05:00:00	NEG_Z to Dust_RAM	POS_X to NSP	Ring plane crossing
NEW WAYPOINT		**2005-267T05:00:00**	**000T01:00:00**	**2005-267T06:00:00**	**NEG_Z to Dust_RAM**	**POS_X to NSP**	
MP_015DR_DUSTHAZRD002_PRIME	M	2005-267T05:00:00	000T00:27:00	2005-267T05:27:00	NEG_Z to Dust_RAM	POS_X to NSP	
SP_015SA_WAYPTTURN267_PRIME	M	2005-267T05:27:00	000T00:33:00	2005-267T06:00:00	NEG_Z to Saturn	POS_X to NSP	Ring plane crossing
NEW WAYPOINT		**2005-267T06:00:00**	**000T04:50:00**	**2005-267T10:50:00**	**NEG_Z to Saturn**	**POS_X to NSP**	
RADAR_015TE_SCATTRAD003_PRIME	M	2005-267T06:00:00	000T01:31:00	2005-267T07:31:00	NEG_Z to Tethys	POS_X to NSP	
RADAR_015SA_GLOBALMAP003_PRIME	M	2005-267T07:31:00	000T02:37:00	2005-267T10:08:00	NEG_Z to Saturn (0.0,-7.25,0.0 deg. c	POS_X to NSP	
SP_015EA_DLTURN267_PRIME	N	2005-267T10:08:00	000T00:17:00	2005-267T10:25:00	XBAND to Earth	NEG_X to NEP	SP Turn to Earth
SP_015EA_G34BWGOTB267_PRIME	N	2005-267T10:20:00	000T09:00:00	2005-267T19:20:00	XBAND to Earth	Rolling	OTM-34 back-up; no roll after maneuver; 2nd axis for MIMI
SP_015EA_RWDTURN467_PRIME	N	2005-267T10:25:00	000T00:25:00	2005-267T10:50:00	XBAND to Earth	NEG_X to 255.0/10.0	Turn is done during downlink (as noted by the "RWD")

015HY Attitude Strategy

SOST rev 15 Segment		2005-268T13:40:00	001T05:40:00	2005-269T19:20:00			
SP_015HY_WAYPTTURN268_PRIME		2005-268T13:50:00	000T00:20:00	2005-268T14:10:00	ISS_NAC to Hyperion	POS_X to NSP	SP Turn to Waypoint
NEW WAYPOINT		**2005-268T14:10:00**	**000T08:10:46**	**2005-268T22:20:46**	**ISS_NAC to Hyperion**	**POS_X to NSP**	
SP_015HY_DEADTIME268_PRIME		**2005-268T14:10:00**	**000T00:14:53**	**2005-268T14:24:53**	**ISS_NAC to Hyperion**	**POS_X to NSP**	
ISS_015HY_ROTCOL015_PRIME	C, U	2005-268T14:24:53	GMB_E015_Hyperion-000T11:5	000T00:45:53	2005-268T15:10:46	ISS_NAC to Hyperion	POS_X to NSP	NAC to Hyperion, +X to NSP
VIMS_015HY_HYPERION001_PRIME	C, R, U	2005-268T15:10:46	GMB_E015_Hyperion-000T11:1	000T02:09:00	2005-268T17:19:46	ISS_NAC to Hyperion	POS_X to NSP	
ISS_015HY_ROTCOL010_PRIME	C, R, U	2005-268T17:19:46	GMB_E015_Hyperion-000T09:0	000T00:01:45	2005-268T17:21:31	ISS_NAC to Hyperion	POS_X to NSP	
ISS_015HY_COLORF010_PRIME	C, R, U	2005-268T17:21:31	GMB_E015_Hyperion-000T09:0	000T00:09:15	2005-268T17:30:46	ISS_NAC to Hyperion	POS_X to NSP	
VIMS_015HY_HYPERION002_PRIME	C, R, U	2005-268T17:30:46	GMB_E015_Hyperion-000T08:5	000T00:29:00	2005-268T17:59:46	ISS_NAC to Hyperion	POS_X to NSP	
RSS_015HY_MASS001_PRIME		2005-268T17:59:46	GMB_E015_Hyperion-000T08:2	000T02:20:00	2005-268T20:19:46	XBAND to Earth	POS_X to NSP	11.3 min turn to, from Earth
ISS_015HY_COLORF011_PRIME	C, U, V	2005-268T20:19:46	GMB_E015_Hyperion-000T06:0	000T00:11:00	2005-268T20:30:46	ISS_NAC to Hyperion	POS_X to NSP	
VIMS_015HY_HYPERION003_PRIME	C, U	2005-268T20:30:46	GMB_E015_Hyperion-000T05:5	000T00:50:00	2005-268T21:20:46	ISS_NAC to Hyperion	POS_X to NSP	
ISS_015HY_ROTOBS002_PRIME	C, U	2005-268T21:20:46	GMB_E015_Hyperion-000T05:0	000T00:01:45	2005-268T21:22:31	ISS_NAC to Hyperion	POS_X to NSP	
ISS_015HY_COLORF012_PRIME	C, U	2005-268T21:22:31	GMB_E015_Hyperion-000T05:0	000T00:09:15	2005-268T21:31:46	ISS_NAC to Hyperion	POS_X to NSP	
VIMS_015HY_HYPERION004_PRIME	I, U	2005-268T21:31:46	GMB_E015_Hyperion-000T04:5	000T00:23:00	2005-268T21:54:46	ISS_NAC to Hyperion	POS_X to NSP	
ISS_015HY_COLORF013_PRIME	U, V	2005-268T21:54:46	GMB_E015_Hyperion-000T04:3	000T00:06:00	2005-268T22:00:46	ISS_NAC to Hyperion	POS_X to NSP	
SP_015SK_WAYPTTURN268_PRIME		2005-268T22:00:46	GMB_E015_Hyperion-000T04:2	000T00:20:00	2005-268T22:20:46	ISS_NAC to 270.0/0.0	POS_X to NSP	19.1 min turn
NEW WAYPOINT		**2005-268T22:20:46**	**000T21:59:14**	**2005-269T20:20:00**	**ISS_NAC to 270.0/0.0**	**POS_X to NSP**	
Begin Custom		**2005-268T22:20:46**	**GMB_E015_Hyperion-000T04:0**	**000T00:01:00**	**2005-268T22:21:46**		
CIRS_015HY_FP3GLOBAL001_PRIME	I, U, V	2005-268T22:20:46	GMB_E015_Hyperion-000T04:0	000T01:00:00	2005-268T23:20:46	CIRS_FP3 to Hyperion	POS_X to NSP	Pick up at ISS_NAC to 270.0/0.0, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP.
ISS_015HY_ROTOBS004_PRIME	C, U, V	2005-268T23:20:46	GMB_E015_Hyperion-000T03:0	000T00:20:00	2005-268T23:40:46	ISS_NAC to Hyperion	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP.
UVIS_015HY_ICYMAP008_PRIME	C, I, V	2005-268T23:40:46	GMB_E015_Hyperion-000T02:4	000T00:59:00	2005-269T00:39:46	ISS_NAC to Hyperion	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP.
ISS_015HY_MORPHO001_PRIME	C, U, V	2005-269T00:39:46	GMB_E015_Hyperion-000T01:4	000T00:30:00	2005-269T01:09:46	ISS_NAC to Hyperion	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP. NAC to Hyperion, +X to NSP
CIRS_015HY_FP1GREEN001_PRIME	I, U, V	2005-269T01:09:46	GMB_E015_Hyperion-000T01:1	000T00:20:00	2005-269T01:29:46	CIRS_FP1 to Hyperion	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP.
ISS_015HY_MORPHO003_PRIME	C, M, U, V	2005-269T01:29:46	GMB_E015_Hyperion-000T00:5	000T00:49:00	2005-269T02:18:46	ISS_NAC to Hyperion	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP. NAC to Hyperion, +X to NSP
CIRS_015HY_FP1DSKOUT001_PRIME	I, M, R, U, V	2005-269T02:18:46	GMB_E015_Hyperion-000T00:0	000T01:00:00	2005-269T03:18:46	CIRS_FP1 to 359.9/-1.9	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP. 31 min turn; start tracking at HY+00:25
UVIS_015HY_ICYMAP013_PRIME	C, I, R, V	2005-269T03:18:46	GMB_E015_Hyperion+000T00:5	000T00:51:30	2005-269T04:10:16	ISS_NAC to Hyperion	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP.
RSS_015HY_MASS002_PRIME		2005-269T04:10:16	GMB_E015_Hyperion+000T01:4	000T01:45:00	2005-269T05:55:16	XBAND to Earth	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at XBAND to Earth, POS_X to NSP. 25.8 min turn to, from Earth
RADAR_015HY_SCATTRAD001_PRIME	R	2005-269T05:55:16	GMB_E015_Hyperion+000T03:3	000T03:01:46	2005-269T08:57:02	NEG_Z to Hyperion	NEG_X to North_Pole_Dir	Pick up at XBAND to Earth, POS_X to NSP; Hand off at ISS_NAC to Hyperion, POS_X to NSP. 15 min turn to, from RADAR. RADAR must control primary and secondary axes to obtain correct polarization
VIMS_015HY_HYPERION005_PRIME	C, I, R, U	2005-269T08:57:02	GMB_E015_Hyperion+000T06:3	000T01:25:51	2005-269T10:22:53	ISS_NAC to Hyperion	POS_X to NSP	Pick up at ISS_NAC to Hyperion, POS_X to NSP; Hand off at ISS_NAC to 270.0/0.0, POS_X to NSP. include 20 min turn to WP at end
End Custom		**2005-269T10:22:53**	**GMB_E015_Hyperion+000T07:**	**000T00:01:00**	**2005-269T10:23:53**		
SP_015HY_DEADTIME269_PRIME	**R**	**2005-269T10:22:53**	**GMB_E015_Hyperion+000T07:**	**000T00:05:00**	**2005-269T10:27:53**	**ISS_NAC to 270.0/0.0**	**POS_X to NSP**	
SP_015EA_DLTURN269_PRIME	R	2005-269T10:28:00	000T00:15:00	2005-269T10:43:00	XBAND to Earth	POS_X to NSP	21.6 min to NEG_Z to Earth, NEG_Y to NEP
SP_015EA_G34BWGNON269_PRIME	R	2005-269T10:43:00	000T08:37:00	2005-269T19:20:00	XBAND to Earth	Rolling/SRU	

015 HY Flyby Geometry

Event Name: H1_15HY, Targeted Hyperion, Outbound. 050720 SPK: Table Creation Date (YYMMDD) 050916

Event Name at Event Time Only	SCET Date (YYYY-DOYTHH:MM:SS.FF) UTC	SCET Date (MM/DD/YYYY HH:MM:SS) UTC	SCET Date (MM/DD/YYYY HH:MM:SS) ET	Hours wrt Event Epoch	Minutes wrt Event Epoch	S/C Range (km)	S/C Altitude wrt Tri-axial Ellipsoid (km)	S/C North Latitude (deg)	S/C West Longitude SMEQPM Date (deg)	S/C Inertial Velocity (km/s)	S/C Radial Inertial Velocity (km/s)	S/C Tangential Inertial Velocity (km/s)	Central Body Angular Diameter (mrad)	Phase = Sun-Central_Body-S/C Angle (deg)	Sun-S/C-Central_Body Angle (deg)	S/C Local True Solar Time wrt Central Body (hh:mm)	Sub-solar Latitude wrt Central Body (deg)	Sub-solar West Longitude wrt Central Body SMEQPM Date (deg)
	2005-268T02:24:46.67	25-Sep-05	02:25:51	-24	-1440	504,946.7	504,821.0	-37.2	131.6	6.362	-6.357	0.247	0.6	53.1	126.9	14.58	-3.2	176.2
	2005-268T06:24:46.67	25-Sep-05	06:25:51	-20	-1200	415,510.2	415,383.4	-36.9	135.2	6.084	-6.082	0.180	0.8	52.7	127.3	14.57	-3.2	179.5
	2005-268T08:24:46.67	25-Sep-05	08:25:51	-18	-1080	372,107.5	371,980.2	-36.8	137.0	5.980	-5.978	0.149	0.9	52.6	127.4	14.56	-3.2	-178.8
	2005-268T10:24:46.67	25-Sep-05	10:25:51	-16	-960	329,380.9	329,253.0	-36.6	138.8	5.895	-5.893	0.120	1.0	52.4	127.6	14.56	-3.2	-177.1
	2005-268T12:24:46.67	25-Sep-05	12:25:51	-14	-840	287,206.0	287,077.6	-36.5	140.6	5.825	-5.824	0.095	1.1	52.3	127.7	14.55	-3.2	-175.5
	2005-268T14:24:46.67	25-Sep-05	14:25:51	-12	-720	245,475.8	245,346.9	-36.4	142.4	5.770	-5.769	0.074	1.3	52.1	127.8	14.55	-3.2	-173.8
	2005-268T16:24:46.67	25-Sep-05	16:25:51	-10	-600	204,097.3	203,967.9	-36.4	144.2	5.727	-5.726	0.057	1.6	52.0	128.0	14.54	-3.2	-172.1
	2005-268T18:24:46.67	25-Sep-05	18:25:51	-8	-480	162,990.0	162,860.1	-36.3	146.0	5.694	-5.694	0.045	2.0	51.9	128.1	14.54	-3.2	-170.5
	2005-268T20:24:46.67	25-Sep-05	20:25:51	-6	-360	122,083.9	121,953.4	-36.3	147.8	5.671	-5.670	0.041	2.7	51.8	128.2	14.53	-3.2	-168.8
	2005-268T21:24:46.67	25-Sep-05	21:25:51	-5	-300	101,686.8	101,556.1	-36.2	148.7	5.662	-5.662	0.043	3.2	51.7	128.3	14.53	-3.3	-168.0
	2005-268T22:24:46.67	25-Sep-05	22:25:51	-4	-240	81,317.9	81,187.0	-36.2	149.7	5.655	-5.655	0.049	4.0	51.6	128.4	14.52	-3.3	-167.1
	2005-268T23:24:46.67	25-Sep-05	23:25:51	-3	-180	60,970.9	60,839.7	-36.2	150.7	5.650	-5.649	0.062	5.4	51.5	128.5	14.51	-3.3	-166.3
	2005-269T00:24:46.67	26-Sep-05	00:25:51	-2	-120	40,640.2	40,508.7	-36.2	151.9	5.646	-5.646	0.090	8.1	51.2	128.8	14.50	-3.3	-165.5
	2005-269T01:24:46.67	26-Sep-05	01:25:51	-1	-60	20,322.9	20,191.0	-36.2	153.9	5.644	-5.641	0.178	16.1	50.4	129.6	14.45	-3.3	-164.6
	2005-269T01:54:46.67	26-Sep-05	01:55:51	-1	-30	10,173.9	10,041.3	-36.2	156.5	5.644	-5.633	0.355	32.2	48.9	131.1	14.36	-3.3	-164.2
	2005-269T02:09:46.67	26-Sep-05	02:10:51	0	-15	5,114.6	4,981.0	-36.0	161.2	5.644	-5.599	0.706	64.1	45.9	134.1	14.19	-3.3	-164.0
	2005-269T02:19:46.67	26-Sep-05	02:20:51	0	-5	1,805.5	1,668.0	-34.0	177.7	5.644	-5.277	2.001	181.9	35.2	144.8	13.13	-3.3	-163.9
H1_15HY	**2005-269T02:24:46.67**	**26-Sep-05**	**02:25:51**	**0**	**0**	**640.0**	**505.0**	**-1.0**	**-116.2**	**5.644**	**0.043**	**5.644**	**518.3**	**47.6**	**132.4**	**08.49**	**-3.3**	**-163.8**
	2005-269T02:29:46.67	26-Sep-05	02:30:51	0	5	1,814.5	1,687.3	33.0	-52.3	5.644	5.281	1.991	181.0	109.7	70.3	04.34	-3.3	-163.7
	2005-269T02:39:46.67	26-Sep-05	02:40:51	0	15	5,124.2	4,994.3	35.7	-36.1	5.644	5.599	0.705	64.0	121.8	58.2	03.30	-3.3	-163.6
	2005-269T02:54:46.67	26-Sep-05	02:55:51	1	30	10,183.5	10,052.7	36.0	-31.5	5.644	5.633	0.355	32.2	124.9	55.1	03.12	-3.3	-163.4
	2005-269T03:24:46.67	26-Sep-05	03:25:51	1	60	20,332.6	20,201.3	36.1	-28.9	5.644	5.641	0.177	16.1	126.5	53.5	03.03	-3.3	-163.0
	2005-269T04:24:46.67	26-Sep-05	04:25:51	2	120	40,649.9	40,518.1	36.2	-27.0	5.646	5.645	0.088	8.1	127.3	52.7	02.59	-3.3	-162.1
	2005-269T05:24:46.67	26-Sep-05	05:25:51	3	180	60,979.3	60,847.3	36.2	-25.8	5.649	5.649	0.057	5.4	127.5	52.5	02.57	-3.3	-161.3
	2005-269T06:24:46.67	26-Sep-05	06:25:51	4	240	81,322.3	81,190.0	36.2	-24.8	5.653	5.653	0.041	4.0	127.6	52.4	02.57	-3.3	-160.5
	2005-269T07:24:46.67	26-Sep-05	07:25:51	5	300	101,681.9	101,549.5	36.2	-23.8	5.658	5.658	0.031	3.2	127.7	52.3	02.56	-3.3	-159.6
	2005-269T08:24:46.67	26-Sep-05	08:25:51	6	360	122,061.3	121,928.7	36.2	-22.9	5.664	5.664	0.024	2.7	127.7	52.3	02.56	-3.3	-158.8
	2005-269T10:24:46.67	26-Sep-05	10:25:51	8	480	162,891.6	162,758.7	36.3	-21.2	5.678	5.678	0.023	2.0	127.7	52.3	02.56	-3.3	-157.1
	2005-269T12:24:46.67	26-Sep-05	12:25:51	10	600	203,834.7	203,701.6	36.3	-19.5	5.695	5.695	0.036	1.6	127.7	52.3	02.56	-3.3	-155.5
	2005-269T14:24:46.67	26-Sep-05	14:25:51	12	720	244,909.2	244,775.8	36.4	-17.9	5.715	5.715	0.054	1.3	127.6	52.3	02.56	-3.3	-153.8
	2005-269T16:24:46.67	26-Sep-05	16:25:51	14	840	286,130.3	285,996.8	36.5	-16.3	5.736	5.736	0.076	1.1	127.6	52.4	02.56	-3.3	-152.1
	2005-269T18:24:46.67	26-Sep-05	18:25:51	16	960	327,510.5	327,376.8	36.6	-14.7	5.760	5.759	0.101	1.0	127.5	52.5	02.56	-3.3	-150.5
	2005-269T20:24:46.67	26-Sep-05	20:25:51	18	1080	369,059.8	368,926.0	36.7	-13.1	5.784	5.783	0.129	0.9	127.3	52.6	02.57	-3.3	-148.8
	2005-269T22:24:46.67	26-Sep-05	22:25:51	20	1200	410,785.6	410,651.7	36.9	-11.6	5.810	5.808	0.160	0.8	127.2	52.8	02.57	-3.3	-147.1
	2005-270T02:24:46.67	27-Sep-05	02:25:51	24	1440	494,786.3	494,652.4	37.1	-8.5	5.864	5.859	0.230	0.7	126.9	53.1	02.58	-3.3	-143.8

015 TE Flyby Geometry

Event Name at Event Time Only	SCET Date (YYYY-DOYTHH:MM:SS.FF) UTC	SCET Date (MM/DD/YYYY HH:MM:SS) UTC	SCET Date (MM/DD/YYYY HH:MM:SS) ET	Hours wrt Event Epoch	Minutes wrt Event Epoch	S/C Range (km)	S/C Altitude wrt Tri-axial Ellipsoid (km)	S/C North Latitude (deg)	S/C West Longitude SMEQPM Date (deg)	S/C Inertial Velocity (km/s)	S/C Radial Inertial Velocity (km/s)	S/C Tangential Inertial Velocity (km/s)	Central Body Angular Diameter (mrad)	Phase = Sun-Central_Body-S/C Angle (deg)	Sun-S/C-Central_Body Angle (deg)	S/C Local True Solar Time wrt Central Body (hh:mm)	Sub-solar Latitude wrt Central Body (deg)	Sub-solar West Longitude wrt Central Body SMEQPM Date (deg)
	2005-266T02:42:17.14	23-Sep-05	02:43:21	-24	-1440	435,910.7	435,377.0	1.0	-149.9	7.063	-2.784	6.491	2.5	36.5	143.4	09.56	-19.4	179.1
	2005-266T06:42:17.14	23-Sep-05	06:43:21	-20	-1200	427,781.0	427,252.0	0.7	-109.1	2.542	0.838	2.400	2.5	44.0	136.0	09.20	-19.4	-149.1
	2005-266T08:42:17.14	23-Sep-05	08:43:21	-18	-1080	434,394.2	433,866.0	0.5	-92.2	0.868	0.815	0.299	2.5	44.9	135.1	09.15	-19.4	-133.2
	2005-266T10:42:17.14	23-Sep-05	10:43:21	-16	-960	437,198.7	436,670.2	0.4	-77.7	2.799	-0.173	2.794	2.5	43.5	136.5	09.21	-19.4	-117.3
	2005-266T12:42:17.14	23-Sep-05	12:43:21	-14	-840	430,236.3	429,706.8	0.3	-65.6	5.355	-1.860	5.022	2.5	40.2	139.7	09.36	-19.4	-101.4
	2005-266T14:42:17.14	23-Sep-05	14:43:21	-12	-720	409,194.9	408,664.4	0.2	-55.6	7.972	-4.061	6.860	2.6	35.3	144.7	10.00	-19.4	-85.5
	2005-266T16:42:17.14	23-Sep-05	16:43:21	-10	-600	370,747.9	370,216.4	0.2	-47.7	10.533	-6.686	8.139	2.9	29.1	150.9	10.32	-19.3	-69.6
	2005-266T18:42:17.14	23-Sep-05	18:43:21	-8	-480	312,056.0	311,523.7	0.1	-41.8	12.738	-9.652	8.312	3.4	22.6	157.3	11.12	-19.3	-53.7
	2005-266T20:42:17.14	23-Sep-05	20:43:21	-6	-360	232,677.4	232,144.5	-0.1	-37.2	13.609	-12.144	6.142	4.6	19.2	160.8	11.57	-19.3	-37.9
	2005-266T21:42:17.14	23-Sep-05	21:43:21	-5	-300	188,186.0	187,652.8	-0.3	-34.3	13.085	-12.418	4.126	5.7	19.5	160.5	12.17	-19.3	-29.9
	2005-266T22:42:17.14	23-Sep-05	22:43:21	-4	-240	144,351.1	143,817.4	-0.5	-30.2	12.009	-11.812	2.165	7.4	20.5	159.5	12.32	-19.3	-22.0
	2005-266T23:42:17.14	23-Sep-05	23:43:21	-3	-180	103,677.0	103,142.7	-0.8	-24.5	10.790	-10.760	0.801	10.3	21.2	158.8	12.42	-19.3	-14.0
	2005-267T00:42:17.14	24-Sep-05	00:43:21	-2	-120	66,762.6	66,227.7	-1.2	-17.4	9.796	-9.794	0.207	16.0	21.3	158.7	12.45	-19.3	-6.1
	2005-267T01:42:17.14	24-Sep-05	01:43:21	-1	-60	32,722.7	32,187.3	-2.4	-8.6	9.198	-9.182	0.548	32.7	19.8	160.2	12.41	-19.3	1.9
	2005-267T02:12:17.14	24-Sep-05	02:13:21	-1	-30	16,371.3	15,835.8	-4.6	-1.8	9.056	-8.986	1.121	65.4	16.5	163.5	12.30	-19.3	5.8
	2005-267T02:27:17.14	24-Sep-05	02:28:21	0	-15	8,362.3	7,827.0	-8.8	5.7	9.021	-8.751	2.191	128.2	10.7	169.3	12.08	-19.3	7.8
	2005-267T02:37:17.14	24-Sep-05	02:38:21	0	-5	3,380.4	2,847.5	-21.9	26.5	9.012	-7.205	5.413	318.2	16.5	163.5	10.50	-19.3	9.1
15TE	**2005-267T02:42:17.14**	**24-Sep-05**	**02:43:21**	**0**	**0**	**2,030.0**	**1,502.7**	**-38.0**	**86.7**	**9.011**	**0.001**	**9.011**	**534.0**	**68.1**	**111.9**	**06.52**	**-19.3**	**9.8**
	2005-267T02:47:17.14	24-Sep-05	02:48:21	0	5	3,380.5	2,848.2	-21.5	146.6	9.012	7.205	5.412	318.2	120.8	59.2	02.55	-19.3	10.5
	2005-267T02:57:17.14	24-Sep-05	02:58:21	0	15	8,361.8	7,826.8	-8.4	167.4	9.020	8.750	2.192	128.2	143.3	36.7	01.37	-19.3	11.8
	2005-267T03:12:17.14	24-Sep-05	03:13:21	1	30	16,367.5	15,832.0	-4.1	174.9	9.050	8.980	1.126	65.5	150.1	29.9	01.15	-19.3	13.8
	2005-267T03:42:17.14	24-Sep-05	03:43:21	1	60	32,687.1	32,151.5	-1.9	-178.3	9.165	9.148	0.571	32.8	153.5	26.5	01.04	-19.3	17.7
	2005-267T04:42:17.14	24-Sep-05	04:43:21	2	120	66,328.5	65,793.2	-0.8	-169.0	9.576	9.573	0.253	16.2	155.2	24.8	00.58	-19.3	25.7
	2005-267T05:42:17.14	24-Sep-05	05:43:21	3	180	101,802.3	101,267.5	-0.5	-160.8	10.157	10.156	0.123	10.5	155.6	24.4	00.57	-19.3	33.6
	2005-267T06:42:17.14	24-Sep-05	06:43:21	4	240	139,567.8	139,033.7	-0.3	-153.2	10.842	10.836	0.352	7.7	155.6	24.4	00.59	-19.3	41.6
	2005-267T07:42:17.14	24-Sep-05	07:43:21	5	300	179,871.0	179,337.8	-0.2	-145.9	11.582	11.558	0.740	6.0	155.3	24.7	01.01	-19.3	49.5
	2005-267T08:42:17.14	24-Sep-05	08:43:21	6	360	222,789.9	222,257.5	-0.2	-139.0	12.344	12.283	1.226	4.8	154.7	25.3	01.05	-19.3	57.5
	2005-267T10:42:17.14	24-Sep-05	10:43:21	8	480	316,197.7	315,667.0	-0.1	-125.8	13.848	13.631	2.439	3.4	152.9	27.1	01.16	-19.3	73.3
	2005-267T12:42:17.14	24-Sep-05	12:43:21	10	600	418,475.0	417,945.7	-0.1	-113.5	15.233	14.729	3.886	2.6	150.4	29.6	01.30	-19.3	89.2
	2005-267T14:42:17.14	24-Sep-05	14:43:21	12	720	527,499.4	526,970.9	-0.2	-101.7	16.435	15.496	5.475	2.0	147.3	32.7	01.47	-19.3	105.1
	2005-267T16:42:17.14	24-Sep-05	16:43:21	14	840	640,721.8	640,193.6	-0.2	-90.2	17.414	15.890	7.123	1.7	143.7	36.3	02.04	-19.3	121.0
	2005-267T18:42:17.14	24-Sep-05	18:43:21	16	960	755,380.4	754,851.9	-0.2	-79.0	18.147	15.893	8.758	1.4	139.7	40.2	02.23	-19.3	136.9
	2005-267T20:42:17.14	24-Sep-05	20:43:21	18	1080	868,636.3	868,107.1	-0.2	-68.0	18.618	15.501	10.311	1.2	135.5	44.5	02.42	-19.3	152.8
	2005-267T22:42:17.14	24-Sep-05	22:43:21	20	1200	977,676.5	977,146.1	-0.2	-57.0	18.820	14.725	11.721	1.1	131.1	48.8	03.02	-19.3	168.7
	2005-268T02:42:17.14	25-Sep-05	02:43:21	24	1440	1,172,494.8	1,171,961.7	-0.2	-35.1	18.422	12.112	13.880	0.9	122.2	57.8	03.42	-19.3	-159.5

015 TE Data Playback Schedule

Event or Observation	Observation Type (APGEN)	Observation Record Start Time (yyyy-dddThh:mm:ss) (SCET)	Start Time - Reference Epoch (ddThh:mm)	Start Playback (Ground UTC)		Start Playback (Pacific Time)	
				Best Estimate	Latest Possible	Best Estimate	Latest Possible
INMS_015SA_PTOTM34001_RIDER	INMS_1498	2005-266T10:45:00	-00T15:57	24-Sep Sat 11:45 AM	Sat 11:45 AM	24-Sep Sat 04:45 AM	Sat 04:45 AM
RADAR_015OT_WARM4GMAP001_RIDE	RADAR_364800	2005-266T10:45:00	-00T15:57	24-Sep Sat 11:45 AM	Sat 11:45 AM	24-Sep Sat 04:45 AM	Sat 04:45 AM
RADAR_015SA_GLOBALMAP001_PRIMI	RADAR_364800	2005-266T11:15:00	-00T15:27	24-Sep Sat 12:06 PM	Sat 12:08 PM	24-Sep Sat 05:06 AM	Sat 05:08 AM
CDA_015RE_0700ERNGX007_PRIME	CDA_524	2005-266T11:47:11	-00T14:55	24-Sep Sat 12:27 PM	Sat 12:31 PM	24-Sep Sat 05:27 AM	Sat 05:31 AM
CDA_015DR_0600DUST074_RIDER	CDA_524	2005-266T12:18:10	-00T14:24	24-Sep Sat 12:51 PM	Sat 12:58 PM	24-Sep Sat 05:51 AM	Sat 05:58 AM
CDA_015DI_0600DIORX008_PRIME	CDA_524	2005-266T12:49:48	-00T13:52	24-Sep Sat 01:11 PM	Sat 01:21 PM	24-Sep Sat 06:11 AM	Sat 06:21 AM
CDA_015DR_0600DUST075_RIDER	CDA_524	2005-266T13:20:47	-00T13:21	24-Sep Sat 01:36 PM	Sat 01:48 PM	24-Sep Sat 06:36 AM	Sat 06:48 AM
RPWS_015SA_SEDDF001_PRIME	RPWS_30464	2005-266T13:37:38	-00T13:04	24-Sep Sat 01:47 PM	Sat 02:00 PM	24-Sep Sat 06:47 AM	Sat 07:00 AM
CDA_015RE_0500ERNGX007_PRIME	CDA_524	2005-266T14:14:45	-00T12:27	24-Sep Sat 02:14 PM	Sat 02:30 PM	24-Sep Sat 07:14 AM	Sat 07:30 AM
1WAY_TO_2WAY_G34BWGNON267	P/B_PAUSE	5 min. Prevents Gap	n/a	24-Sep Sat 02:30 PM	Sat 02:30 PM	24-Sep Sat 07:30 AM	Sat 07:30 PM
CDA_015DR_0500DUST076_RIDER	CDA_524	2005-266T14:45:45	-00T11:56	24-Sep Sat 02:42 PM	Sat 03:01 PM	24-Sep Sat 07:42 AM	Sat 08:01 AM
CIRS_015CP_CALYPSO001_VIMS	CIRS_4000	2005-266T15:30:00	-00T11:12	24-Sep Sat 03:14 PM	Sat 03:37 PM	24-Sep Sat 08:14 AM	Sat 08:37 AM
ISS_015CP_CALYPSO001_VIMS	ISS_Phot_1_by_1	2005-266T15:30:00	-00T11:12	24-Sep Sat 03:14 PM	Sat 03:37 PM	24-Sep Sat 08:14 AM	Sat 08:37 AM
UVIS_015CP_ICYLON001_VIMS	UVIS_5032	2005-266T15:30:00	-00T11:12	24-Sep Sat 03:14 PM	Sat 03:37 PM	24-Sep Sat 08:14 AM	Sat 08:37 AM
VIMS_015CP_CALYPSO001_PRIME	VIMS_18432	2005-266T15:30:00	-00T11:12	24-Sep Sat 03:14 PM	Sat 03:37 PM	24-Sep Sat 08:14 AM	Sat 08:37 AM
CDA_015TE_0500TEORX007_PRIME	CDA_524	2005-266T15:30:14	-00T11:12	24-Sep Sat 03:14 PM	Sat 03:37 PM	24-Sep Sat 08:14 AM	Sat 08:37 AM
CDA_015DR_0500DUST077_RIDER	CDA_524	2005-266T15:45:39	-00T10:56	24-Sep Sat 03:39 PM	Sat 04:09 PM	24-Sep Sat 08:39 AM	Sat 09:09 AM
CDA_015RE_0400ERNGX007_PRIME	CDA_524	2005-266T16:10:35	-00T10:31	24-Sep Sat 04:14 PM	Sat 04:57 PM	24-Sep Sat 09:14 AM	Sat 09:57 AM
CDA_015DR_0400DUST078_RIDER	CDA_524	2005-266T16:36:03	-00T10:06	24-Sep Sat 04:55 PM	Sat 05:50 PM	24-Sep Sat 09:55 AM	Sat 10:50 AM
CDA_015EN_0400ENORX014_PRIME	CDA_524	2005-266T17:19:39	-00T09:22	24-Sep Sat 05:53 PM	Sat 07:08 PM	24-Sep Sat 10:53 AM	Sat 12:08 PM
MAG_015OT_INTFLD001_PRIME	MAG_1976	2005-266T17:30:00	-00T09:12	24-Sep Sat 06:01 PM	Sat 07:17 PM	24-Sep Sat 11:01 AM	Sat 12:17 PM
CDA_015DR_0400DUST079_RIDER	CDA_524	2005-266T17:40:49	-00T09:01	24-Sep Sat 06:10 PM	Sat 07:27 PM	24-Sep Sat 11:10 AM	Sat 12:27 PM
CDA_015RE_0300ERNGX004_PRIME	CDA_524	2005-266T18:20:10	-00T08:22	24-Sep Sat 06:37 PM	Sat 07:57 PM	24-Sep Sat 11:37 AM	Sat 12:57 PM
RADAR_015SA_GLOBALMAP002_PRIMI	RADAR_364800	2005-266T18:51:00	-00T07:51	24-Sep Sat 07:03 PM	Sat 08:27 PM	24-Sep Sat 12:03 PM	Sat 01:27 PM
CDA_015DR_0300DUST080_RIDER	CDA_524	2005-266T18:55:42	-00T07:46	24-Sep Sat 07:07 PM	Sat 08:33 PM	24-Sep Sat 12:07 PM	Sat 01:33 PM
CDA_015MI_0300MIORX001_PRIME	CDA_524	2005-266T20:15:21	-00T06:26	24-Sep Sat 08:11 PM	Sun 06:28 AM	24-Sep Sat 01:11 PM	Sat 11:28 PM
CDA_015DR_0300DUST081_RIDER	CDA_524	2005-266T21:15:24	-00T05:26	25-Sep Sun 06:22 AM	Sun 06:40 AM	24-Sep Sat 11:22 PM	Sat 11:40 PM
CDA_015RE_0300ERNGX005_PRIME	CDA_524	2005-266T22:30:42	-00T04:11	25-Sep Sun 06:33 AM	Sun 06:52 AM	24-Sep Sat 11:33 PM	Sat 11:52 PM
CDA_015DR_0400DUST082_RIDER	CDA_524	2005-266T23:10:36	-00T03:31	25-Sep Sun 06:40 AM	Sun 07:00 AM	24-Sep Sat 11:40 PM	Sun 12:00 AM
CDA_015EN_0400ENORX015_PRIME	CDA_524	2005-266T23:45:35	-00T02:56	25-Sep Sun 06:45 AM	Sun 07:05 AM	24-Sep Sat 11:45 PM	Sun 12:05 AM
CIRS_015TE_STEREO001_ISS	CIRS_4000	2005-267T00:00:00	-00T02:42	25-Sep Sun 06:48 AM	Sun 07:08 AM	24-Sep Sat 11:48 PM	Sun 12:08 AM
ISS_015TE_STEREO001_PRIME	ISS_Phot_1_by_1	2005-267T00:00:00	-00T02:42	25-Sep Sun 06:48 AM	Sun 07:08 AM	24-Sep Sat 11:48 PM	Sun 12:08 AM
UVIS_015TE_ICYMAP006_ISS	UVIS_32096	2005-267T00:00:00	-00T02:42	25-Sep Sun 06:48 AM	Sun 07:08 AM	24-Sep Sat 11:48 PM	Sun 12:08 AM
CDA_015DR_0400DUST083_RIDER	CDA_524	2005-267T00:05:18	-00T02:36	25-Sep Sun 06:49 AM	Sun 07:10 AM	24-Sep Sat 11:49 PM	Sun 12:10 AM
MAG_015TE_TETAR001_RIDER	MAG_1976	2005-267T00:41:58	-00T02:00	25-Sep Sun 07:00 AM	Sun 07:23 AM	25-Sep Sun 12:00 AM	Sun 12:23 AM
CDA_015RE_0400ERNGX008_PRIME	CDA_524	2005-267T00:50:24	-00T01:51	25-Sep Sun 07:02 AM	Sun 07:25 AM	25-Sep Sun 12:02 AM	Sun 12:25 AM
CAPS_015TE_ENCOUNTER001_RIDER	CAPS_16000	2005-267T00:59:26	-00T01:42	25-Sep Sun 07:05 AM	Sun 07:29 AM	25-Sep Sun 12:05 AM	Sun 12:29 AM
CIRS_015TE_EWSCAN001_PRIME	CIRS_4000	2005-267T01:10:00	-00T01:32	25-Sep Sun 07:10 AM	Sun 07:34 AM	25-Sep Sun 12:10 AM	Sun 12:34 AM
ISS_015TE_EWSCAN001_CIRS	ISS_Phot_1_by_1	2005-267T01:10:00	-00T01:32	25-Sep Sun 07:10 AM	Sun 07:34 AM	25-Sep Sun 12:10 AM	Sun 12:34 AM
UVIS_015TE_ICYLON019_CIRS	UVIS_5032	2005-267T01:10:00	-00T01:32	25-Sep Sun 07:10 AM	Sun 07:34 AM	25-Sep Sun 12:10 AM	Sun 12:34 AM
CDA_015DR_0500DUST084_RIDER	CDA_524	2005-267T01:15:52	-00T01:26	25-Sep Sun 07:16 AM	Sun 07:41 AM	25-Sep Sun 12:16 AM	Sun 12:41 AM
CDA_015TE_0500TEORX008_PRIME	CDA_524	2005-267T01:39:22	-00T01:02	25-Sep Sun 07:40 AM	Sun 08:07 AM	25-Sep Sun 12:40 AM	Sun 01:07 AM
CIRS_015TE_ISS001_ISS	CIRS_4000	2005-267T01:40:00	-00T01:02	25-Sep Sun 07:40 AM	Sun 08:08 AM	25-Sep Sun 12:40 AM	Sun 01:08 AM
ISS_015TE_REGMAP001_PRIME	ISS_Phot_1_by_1	2005-267T01:40:00	-00T01:02	25-Sep Sun 07:40 AM	Sun 08:08 AM	25-Sep Sun 12:40 AM	Sun 01:08 AM
MAG_015TE_TETAR002_RIDER	MAG_1976	2005-267T01:40:00	-00T01:02	25-Sep Sun 07:40 AM	Sun 08:08 AM	25-Sep Sun 12:40 AM	Sun 01:08 AM
UVIS_015TE_ICYMAP007_ISS	UVIS_32096	2005-267T01:40:00	-00T01:02	25-Sep Sun 07:40 AM	Sun 08:08 AM	25-Sep Sun 12:40 AM	Sun 01:08 AM
CAPS_015SA_SURVEY009_RIDER	CAPS_16000	2005-267T01:59:26	-00T00:42	25-Sep Sun 07:48 AM	Sun 08:17 AM	25-Sep Sun 12:48 AM	Sun 01:17 AM
CDA_015DR_0500DUST085_RIDER	CDA_524	2005-267T02:00:32	-00T00:41	25-Sep Sun 07:49 AM	Sun 08:18 AM	25-Sep Sun 12:49 AM	Sun 01:18 AM
RPWS_015TE_TECA001_PRIME	RPWS_182784	2005-267T02:10:00	-00T00:32	25-Sep Sun 07:51 AM	Sun 08:21 AM	25-Sep Sun 12:51 AM	Sun 01:21 AM
CDA_015RE_0500ERNGX008_PRIME	CDA_524	2005-267T02:42:49	00T00:00	25-Sep Sun 08:15 AM	Sun 12:16 PM	25-Sep Sun 01:15 AM	Sun 05:16 AM
CDA_015DR_0600DUST086_RIDER	CDA_524	2005-267T03:13:49	00T00:31	25-Sep Sun 10:18 AM	Sun 12:41 PM	25-Sep Sun 03:18 AM	Sun 05:41 AM
CIRS_015TE_FP1FP3MAP001_PRIME	CIRS_4000	2005-267T03:30:00	00T00:47	25-Sep Sun 10:23 AM	Sun 12:46 PM	25-Sep Sun 03:23 AM	Sun 05:46 AM
ISS_015TE_FP1FP3MAP001_CIRS	ISS_Phot_1_by_1	2005-267T03:30:00	00T00:47	25-Sep Sun 10:23 AM	Sun 12:46 PM	25-Sep Sun 03:23 AM	Sun 05:46 AM
UVIS_015TE_ICYMAP008_CIRS	UVIS_32096	2005-267T03:30:00	00T00:47	25-Sep Sun 10:23 AM	Sun 12:46 PM	25-Sep Sun 03:23 AM	Sun 05:46 AM
CDA_015DI_0600DIORX009_PRIME	CDA_524	2005-267T04:07:48	00T01:25	25-Sep Sun 10:33 AM	Sun 12:59 PM	25-Sep Sun 03:33 AM	Sun 05:59 AM
CDA_015DR_0600DUST087_RIDER	CDA_524	2005-267T04:38:47	00T01:56	25-Sep Sun 10:41 AM	Sun 01:10 PM	25-Sep Sun 03:41 AM	Sun 06:10 AM
MAG_015OT_SURVEY010_PRIME	MAG_1976	2005-267T04:41:58	00T01:59	25-Sep Sun 10:41 AM	Sun 01:10 PM	25-Sep Sun 03:41 AM	Sun 06:10 AM
CDA_015RE_0700ERNGX008_PRIME	CDA_524	2005-267T05:10:26	00T02:28	25-Sep Sun 10:44 AM	Sun 01:14 PM	25-Sep Sun 03:44 AM	Sun 06:14 AM
CDA_015DR_0700DUST088_RIDER	CDA_524	2005-267T05:41:25	00T02:59	25-Sep Sun 10:48 AM	Sun 01:19 PM	25-Sep Sun 03:48 AM	Sun 06:19 AM
RADAR_015TE_SCATTRAD003_PRIME	RADAR_364800	2005-267T06:00:00	00T03:17	25-Sep Sun 10:49 AM	Sun 01:21 PM	25-Sep Sun 03:49 AM	Sun 06:21 AM
CDA_015RE_0800ERNGX008_PRIME	CDA_524	2005-267T06:54:56	00T04:12	25-Sep Sun 11:12 AM	Sun 01:49 PM	25-Sep Sun 04:12 AM	Sun 06:49 AM
RADAR_015SA_GLOBALMAP003_PRIMI	RADAR_364800	2005-267T07:31:00	00T04:48	25-Sep Sun 11:28 AM	Sun 02:11 PM	25-Sep Sun 04:28 AM	Sun 07:11 AM
MIMI_015CO_SURVEY002_RIDER	MIMI_8000	2005-267T07:40:00	00T04:57	25-Sep Sun 11:29 AM	Sun 02:12 PM	25-Sep Sun 04:29 AM	Sun 07:12 AM
CDA_015DR_0800DUST066_RIDER	CDA_524	2005-267T07:45:55	00T05:03	25-Sep Sun 11:30 AM	Sun 02:14 PM	25-Sep Sun 04:30 AM	Sun 07:14 AM
CDA_015RH_0900RHORX008_RIDER	CDA_524	2005-267T08:45:05	00T06:02	25-Sep Sun 11:37 AM	Sun 02:27 PM	25-Sep Sun 04:37 AM	Sun 07:27 AM
CDA_015DR_0900DUST067_RIDER	CDA_524	2005-267T09:36:04	00T06:53	25-Sep Sun 11:44 AM	Sun 02:41 PM	25-Sep Sun 04:44 AM	Sun 07:41 AM

015 HY Data Playback Schedule

Event or Observation	Observation Type (APGEN)	Observation Record Start Time (yyyy-dddThh:mm:ss) (SCET)	Start Time - Reference Epoch (ddThh:mm)	Start Playback (Ground UTC)		Start Playback (Pacific Time)	
				Best Estimate	Latest Possible	Best Estimate	Latest Possible
INMS_015SA_SURVEY003_RIDER	INMS_1498	2005-268T13:50:00	-00T12:34	26-Sep Mon 12:10 PM	Mon 12:10 PM	26-Sep Mon 05:10 AM	Mon 05:10 AM
MAG_015OT_SURVEY006_PRIME	MAG_1976	2005-268T13:50:00	-00T12:34	26-Sep Mon 12:10 PM	Mon 12:10 PM	26-Sep Mon 05:10 AM	Mon 05:10 AM
RPWS_015SA_OUTSURVEY016_PRIME	RPWS_30464	2005-268T13:50:00	-00T12:34	26-Sep Mon 12:10 PM	Mon 12:10 PM	26-Sep Mon 05:10 AM	Mon 05:10 AM
MIMI_015CO_SURVEY004_RIDER	MIMI_8000	2005-268T13:50:01	-00T12:34	26-Sep Mon 12:10 PM	Mon 12:10 PM	26-Sep Mon 05:10 AM	Mon 05:10 AM
CIRS_015HY_ISSRIDER001_ISS	CIRS_4000	2005-268T14:24:53	-00T11:59	26-Sep Mon 12:17 PM	Mon 12:18 PM	26-Sep Mon 05:17 AM	Mon 05:18 AM
ISS_015HY_ROTCOL015_PRIME	ISS_Phot_1_by_1	2005-268T14:24:53	-00T11:59	26-Sep Mon 12:17 PM	Mon 12:18 PM	26-Sep Mon 05:17 AM	Mon 05:18 AM
UVIS_015HY_ICYLON001_ISS	UVIS_5032	2005-268T14:24:53	-00T11:59	26-Sep Mon 12:17 PM	Mon 12:18 PM	26-Sep Mon 05:17 AM	Mon 05:18 AM
CDA_015TI_2000TIORX010_RIDER	CDA_524	2005-268T14:37:26	-00T11:47	26-Sep Mon 12:30 PM	Mon 12:33 PM	26-Sep Mon 05:30 AM	Mon 05:33 AM
CIRS_015HY_HYPERIONV001_VIMS	CIRS_4000	2005-268T15:10:46	-00T11:14	26-Sep Mon 01:03 PM	Mon 01:11 PM	26-Sep Mon 06:03 AM	Mon 06:11 AM
UVIS_015HY_ICYLON002_VIMS	UVIS_5032	2005-268T15:10:46	-00T11:14	26-Sep Mon 01:03 PM	Mon 01:11 PM	26-Sep Mon 06:03 AM	Mon 06:11 AM
VIMS_015HY_HYPERION001_PRIME	VIMS_18432	2005-268T15:10:46	-00T11:14	26-Sep Mon 01:03 PM	Mon 01:11 PM	26-Sep Mon 06:03 AM	Mon 06:11 AM
RSS_015HY_THERMAL001_RSS	RSS_Activity	2005-268T16:19:46	-00T10:05	26-Sep Mon 01:42 PM	Mon 02:05 PM	26-Sep Mon 06:42 AM	Mon 07:05 AM
CDA_015DR_2100DUST086_RIDER	CDA_524	2005-268T16:38:26	-00T09:46	26-Sep Mon 01:53 PM	Mon 02:20 PM	26-Sep Mon 06:53 AM	Mon 07:20 AM
CDA_015HY_DUST003_RIDER	CDA_524	2005-268T17:16:00	-00T09:08	26-Sep Mon 02:14 PM	Mon 02:49 PM	26-Sep Mon 07:14 AM	Mon 07:49 AM
CIRS_015HY_HYPERION002_ISS	CIRS_4000	2005-268T17:19:46	-00T09:05	26-Sep Mon 02:16 PM	Mon 02:52 PM	26-Sep Mon 07:16 AM	Mon 07:52 AM
ISS_015HY_ROTCOL010_PRIME	ISS_Phot_1_by_1	2005-268T17:19:46	-00T09:05	26-Sep Mon 02:16 PM	Mon 02:52 PM	26-Sep Mon 07:16 AM	Mon 07:52 AM
UVIS_015HY_ICYLON003_ISS	UVIS_5032	2005-268T17:19:46	-00T09:05	26-Sep Mon 02:16 PM	Mon 02:52 PM	26-Sep Mon 07:16 AM	Mon 07:52 AM
ISS_015HY_COLORF010_PRIME	ISS_Phot_1_by_1	2005-268T17:21:31	-00T09:03	26-Sep Mon 02:19 PM	Mon 02:56 PM	26-Sep Mon 07:19 AM	Mon 07:56 AM
CIRS_015HY_HYPERIONV002_VIMS	CIRS_4000	2005-268T17:30:46	-00T08:54	26-Sep Mon 02:44 PM	Mon 03:24 PM	26-Sep Mon 07:44 AM	Mon 08:24 AM
UVIS_015HY_ICYLON004_VIMS	UVIS_5032	2005-268T17:30:46	-00T08:54	26-Sep Mon 02:44 PM	Mon 03:24 PM	26-Sep Mon 07:44 AM	Mon 08:24 AM
VIMS_015HY_HYPERION002_PRIME	VIMS_18432	2005-268T17:30:46	-00T08:54	26-Sep Mon 02:44 PM	Mon 03:24 PM	26-Sep Mon 07:44 AM	Mon 08:24 AM
1WAY_TO_2WAY_G34BWGNON267	P/B_PAUSE	5 min. Prevents Gap	n/a	26-Sep Mon 02:50 PM	Mon 02:50 PM	26-Sep Mon 07:50 AM	Mon 07:50 AM
RSS_015HY_MASS001_PRIME	RSS_Activity	2005-268T17:59:46	-00T08:25	26-Sep Mon 03:02 PM	Mon 03:51 PM	26-Sep Mon 08:02 AM	Mon 08:51 AM
CDA_015HY_HYPDUST001_RIDER	CDA_524	2005-268T19:37:00	-00T06:47	26-Sep Mon 03:23 PM	Mon 04:13 PM	26-Sep Mon 08:23 AM	Mon 09:13 AM
CIRS_015HY_HYPERION003_ISS	CIRS_4000	2005-268T20:19:46	-00T06:05	26-Sep Mon 03:31 PM	Mon 04:23 PM	26-Sep Mon 08:31 AM	Mon 09:23 AM
ISS_015HY_COLORF011_PRIME	ISS_Phot_1_by_1	2005-268T20:19:46	-00T06:05	26-Sep Mon 03:31 PM	Mon 04:23 PM	26-Sep Mon 08:31 AM	Mon 09:23 AM
UVIS_015HY_ICYMAP001_ISS	UVIS_32096	2005-268T20:19:46	-00T06:05	26-Sep Mon 03:31 PM	Mon 04:23 PM	26-Sep Mon 08:31 AM	Mon 09:23 AM
VIMS_015HY_HYPERIONC003_ISS	VIMS_18432	2005-268T20:19:46	-00T06:05	26-Sep Mon 03:31 PM	Mon 04:23 PM	26-Sep Mon 08:31 AM	Mon 09:23 AM
CIRS_015HY_HYPERIONV003_VIMS	CIRS_4000	2005-268T20:30:46	-00T05:54	26-Sep Mon 04:03 PM	Mon 05:01 PM	26-Sep Mon 09:03 AM	Mon 10:01 AM
UVIS_015HY_ICYMAP002_VIMS	UVIS_32096	2005-268T20:30:46	-00T05:54	26-Sep Mon 04:03 PM	Mon 05:01 PM	26-Sep Mon 09:03 AM	Mon 10:01 AM
VIMS_015HY_HYPERION003_PRIME	VIMS_18432	2005-268T20:30:46	-00T05:54	26-Sep Mon 04:03 PM	Mon 05:01 PM	26-Sep Mon 09:03 AM	Mon 10:01 AM
CIRS_015HY_HYPERION004_ISS	CIRS_4000	2005-268T21:20:46	-00T05:04	26-Sep Mon 04:54 PM	Mon 06:10 PM	26-Sep Mon 09:54 AM	Mon 11:10 AM
ISS_015HY_ROTOBS002_PRIME	ISS_Phot_1_by_1	2005-268T21:20:46	-00T05:04	26-Sep Mon 04:54 PM	Mon 06:10 PM	26-Sep Mon 09:54 AM	Mon 11:10 AM
UVIS_015HY_ICYMAP003_ISS	UVIS_32096	2005-268T21:20:46	-00T05:04	26-Sep Mon 04:54 PM	Mon 06:10 PM	26-Sep Mon 09:54 AM	Mon 11:10 AM
ISS_015HY_COLORF012_PRIME	ISS_Phot_1_by_1	2005-268T21:22:31	-00T05:02	26-Sep Mon 04:58 PM	Mon 06:15 PM	26-Sep Mon 09:58 AM	Mon 11:15 AM
ISS_015HY_HYPERION004_VIMS	ISS_Phot_1_by_1	2005-268T21:31:46	-00T04:53	26-Sep Mon 05:28 PM	Mon 06:49 PM	26-Sep Mon 10:28 AM	Mon 11:49 AM
UVIS_015HY_ICYMAP004_VIMS	UVIS_32096	2005-268T21:31:46	-00T04:53	26-Sep Mon 05:28 PM	Mon 06:49 PM	26-Sep Mon 10:28 AM	Mon 11:49 AM
VIMS_015HY_HYPERION004_PRIME	VIMS_18432	2005-268T21:31:46	-00T04:53	26-Sep Mon 05:28 PM	Mon 06:49 PM	26-Sep Mon 10:28 AM	Mon 11:49 AM
ISS_015HY_COLORF013_PRIME	ISS_Phot_1_by_1	2005-268T21:54:46	-00T04:30	26-Sep Mon 06:12 PM	Mon 07:43 PM	26-Sep Mon 11:12 AM	Mon 12:43 PM
UVIS_015HY_ICYMAP005_ISS	UVIS_32096	2005-268T21:54:46	-00T04:30	26-Sep Mon 06:12 PM	Mon 07:43 PM	26-Sep Mon 11:12 AM	Mon 12:43 PM
VIMS_015HY_HYPERIONC004_ISS	VIMS_18432	2005-268T21:54:46	-00T04:30	26-Sep Mon 06:12 PM	Mon 07:43 PM	26-Sep Mon 11:12 AM	Mon 12:43 PM
CIRS_015HY_FP3GLOBAL001_PRIME	CIRS_4000	2005-268T22:20:46	-00T04:04	26-Sep Mon 06:38 PM	Mon 08:11 PM	26-Sep Mon 11:38 AM	Mon 01:11 PM
ISS_015HY_FP3GLOBAL001_CIRS	ISS_Phot_1_by_1	2005-268T22:20:46	-00T04:04	26-Sep Mon 06:38 PM	Mon 08:11 PM	26-Sep Mon 11:38 AM	Mon 01:11 PM
UVIS_015HY_ICYMAP006_CIRS	UVIS_32096	2005-268T22:20:46	-00T04:04	26-Sep Mon 06:38 PM	Mon 08:11 PM	26-Sep Mon 11:38 AM	Mon 01:11 PM
VIMS_015HY_HYPERIONC009_CIRS	VIMS_18432	2005-268T22:20:46	-00T04:04	26-Sep Mon 06:38 PM	Mon 08:11 PM	26-Sep Mon 11:38 AM	Mon 01:11 PM
CIRS_015HY_HYPERION006_ISS	CIRS_4000	2005-268T23:20:46	-00T03:04	26-Sep Mon 07:59 PM	Tue 11:58 AM	26-Sep Mon 12:59 PM	Tue 04:58 AM
ISS_015HY_ROTOBS004_PRIME	ISS_Phot_1_by_1	2005-268T23:20:46	-00T03:04	26-Sep Mon 07:59 PM	Tue 11:58 AM	26-Sep Mon 12:59 PM	Tue 04:58 AM
UVIS_015HY_ICYMAP007_ISS	UVIS_32096	2005-268T23:20:46	-00T03:04	26-Sep Mon 07:59 PM	Tue 11:58 AM	26-Sep Mon 12:59 PM	Tue 04:58 AM
VIMS_015HY_HYPERIONC005_ISS	VIMS_18432	2005-268T23:20:46	-00T03:04	26-Sep Mon 07:59 PM	Tue 11:58 AM	26-Sep Mon 12:59 PM	Tue 04:58 AM
CIRS_015HY_HYPERIONU001_UVIS	CIRS_4000	2005-268T23:40:46	-00T02:44	27-Sep Tue 11:51 AM	Tue 12:18 PM	27-Sep Tue 04:51 AM	Tue 05:18 AM
ISS_015HY_ICYMAP008_UVIS	ISS_Phot_1_by_1	2005-268T23:40:46	-00T02:44	27-Sep Tue 11:51 AM	Tue 12:18 PM	27-Sep Tue 04:51 AM	Tue 05:18 AM
UVIS_015HY_ICYMAP008_PRIME	UVIS_32096	2005-268T23:40:46	-00T02:44	27-Sep Tue 11:51 AM	Tue 12:18 PM	27-Sep Tue 04:51 AM	Tue 05:18 AM
VIMS_015HY_HYPERIONC012_UVIS	VIMS_18432	2005-268T23:40:46	-00T02:44	27-Sep Tue 11:51 AM	Tue 12:18 PM	27-Sep Tue 04:51 AM	Tue 05:18 AM
MAG_015HY_HYTAR001_RIDER	MAG_1976	2005-269T00:24:46	-00T02:00	27-Sep Tue 12:14 PM	Tue 12:48 PM	27-Sep Tue 05:14 AM	Tue 05:48 AM
CIRS_015HY_HYPERION007_ISS	CIRS_4000	2005-269T00:39:46	-00T01:45	27-Sep Tue 12:22 PM	Tue 12:54 PM	27-Sep Tue 05:22 AM	Tue 05:54 AM
ISS_015HY_MORPHO001_PRIME	ISS_Phot_1_by_1	2005-269T00:39:46	-00T01:45	27-Sep Tue 12:22 PM	Tue 12:54 PM	27-Sep Tue 05:22 AM	Tue 05:54 AM
UVIS_015HY_ICYMAP009_ISS	UVIS_32096	2005-269T00:39:46	-00T01:45	27-Sep Tue 12:22 PM	Tue 12:54 PM	27-Sep Tue 05:22 AM	Tue 05:54 AM
VIMS_015HY_HYPERIONC006_ISS	VIMS_18432	2005-269T00:39:46	-00T01:45	27-Sep Tue 12:22 PM	Tue 12:54 PM	27-Sep Tue 05:22 AM	Tue 05:54 AM
CIRS_015HY_FP1GREEN001_PRIME	CIRS_4000	2005-269T01:09:46	-00T01:15	27-Sep Tue 12:51 PM	Tue 01:23 PM	27-Sep Tue 05:51 AM	Tue 06:23 AM
ISS_015HY_FP1GREEN001_CIRS	ISS_Phot_1_by_1	2005-269T01:09:46	-00T01:15	27-Sep Tue 12:51 PM	Tue 01:23 PM	27-Sep Tue 05:51 AM	Tue 06:23 AM
UVIS_015HY_ICYMAP010_CIRS	UVIS_32096	2005-269T01:09:46	-00T01:15	27-Sep Tue 12:51 PM	Tue 01:23 PM	27-Sep Tue 05:51 AM	Tue 06:23 AM
VIMS_015HY_HYPERIONC013_CIRS	VIMS_18432	2005-269T01:09:46	-00T01:15	27-Sep Tue 12:51 PM	Tue 01:23 PM	27-Sep Tue 05:51 AM	Tue 06:23 AM
CIRS_015HY_HYPERION008_ISS	CIRS_4000	2005-269T01:29:46	-00T00:55	27-Sep Tue 12:57 PM	Tue 01:31 PM	27-Sep Tue 05:57 AM	Tue 06:31 AM
ISS_015HY_MORPHO003_PRIME	ISS_Phot_1_by_1	2005-269T01:29:46	-00T00:55	27-Sep Tue 12:57 PM	Tue 01:31 PM	27-Sep Tue 05:57 AM	Tue 06:31 AM
UVIS_015HY_ICYMAP011_ISS	UVIS_32096	2005-269T01:29:46	-00T00:55	27-Sep Tue 12:57 PM	Tue 01:31 PM	27-Sep Tue 05:57 AM	Tue 06:31 AM
VIMS_015HY_HYPERIONC007_ISS	VIMS_18432	2005-269T01:29:46	-00T00:55	27-Sep Tue 12:57 PM	Tue 01:31 PM	27-Sep Tue 05:57 AM	Tue 06:31 AM
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UVIS_015HY_ICYMAP012_CIRS	UVIS_32096	2005-269T02:18:46	-00T00:06	27-Sep Tue 01:52 PM	Tue 04:33 PM	27-Sep Tue 06:52 AM	Tue 09:33 AM
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RSS_015HY_THERMAL002_RSS	RSS_Activity	2005-269T02:34:46	00T00:09	27-Sep Tue 02:10 PM	Tue 04:53 PM	27-Sep Tue 07:10 AM	Tue 09:53 AM
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CAPS_015SA_SURVEY002_RIDER	CAPS_16000	2005-269T02:54:46	00T00:29	27-Sep Tue 03:48 PM	Tue 05:19 PM	27-Sep Tue 08:48 AM	Tue 10:19 AM
MIMI_015CO_SURVEY003_RIDER	MIMI_8000	2005-269T02:54:46	00T00:29	27-Sep Tue 03:48 PM	Tue 05:19 PM	27-Sep Tue 08:48 AM	Tue 10:19 AM
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CIRS_015HY_HYPERIONU002_UVIS	CIRS_4000	2005-269T03:18:46	00T00:53	27-Sep Tue 03:53 PM	Tue 05:26 PM	27-Sep Tue 08:53 AM	Tue 10:26 AM
ISS_015HY_ICYMAP013_UVIS	ISS_Phot_1_by_1	2005-269T03:18:46	00T00:53	27-Sep Tue 03:53 PM	Tue 05:26 PM	27-Sep Tue 08:53 AM	Tue 10:26 AM
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RSS_015HY_MASS002_PRIME	RSS_Activity	2005-269T04:10:16	00T01:45	27-Sep Tue 04:20 PM	Tue 05:58 PM	27-Sep Tue 09:20 AM	Tue 10:58 AM
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CDA_015DR_GAP001_RIDER	CDA_524	2005-269T05:15:01	00T02:50	27-Sep Tue 04:23 PM	Tue 06:01 PM	27-Sep Tue 09:23 AM	Tue 11:01 AM
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CIRS_015HY_HYPERIONV005_VIMS	CIRS_4000	2005-269T08:57:02	00T06:32	27-Sep Tue 05:27 PM	Tue 07:05 PM	27-Sep Tue 10:27 AM	Tue 12:05 PM
ISS_015HY_HYPERION005_VIMS	ISS_Phot_1_by_1	2005-269T08:57:02	00T06:32	27-Sep Tue 05:27 PM	Tue 07:05 PM	27-Sep Tue 10:27 AM	Tue 12:05 PM
UVIS_015HY_ICYMAP014_VIMS	UVIS_32096	2005-269T08:57:02	00T06:32	27-Sep Tue 05:27 PM	Tue 07:05 PM	27-Sep Tue 10:27 AM	Tue 12:05 PM
VIMS_015HY_HYPERION005_PRIME	VIMS_18432	2005-269T08:57:02	00T06:32	27-Sep Tue 05:27 PM	Tue 07:05 PM	27-Sep Tue 10:27 AM	Tue 12:05 PM

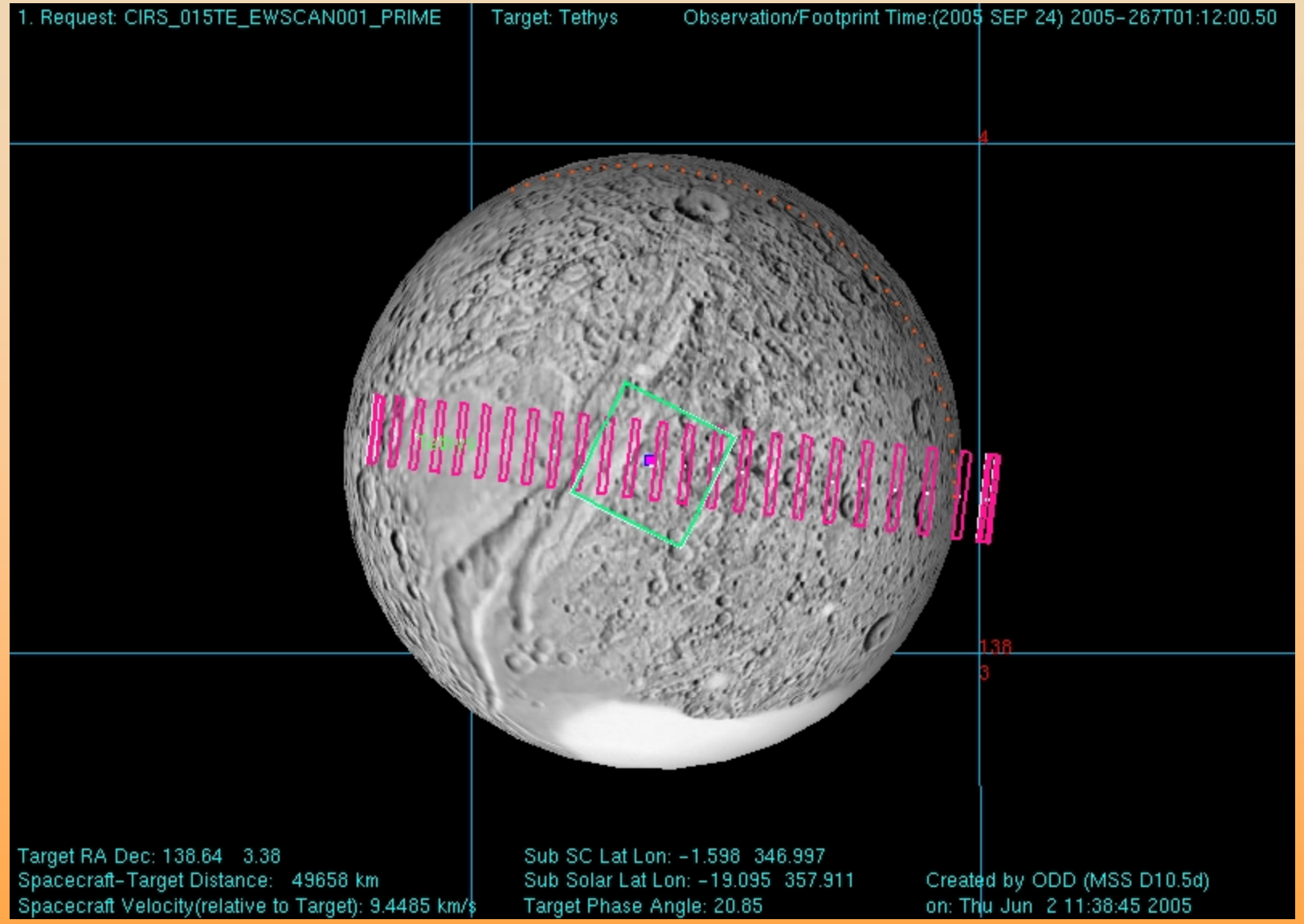
Rev. 15 Tethys and Hyperion: CIRS Preview

John Spencer, John Pearl, Marcia Segura, and the CIRS team

Goals

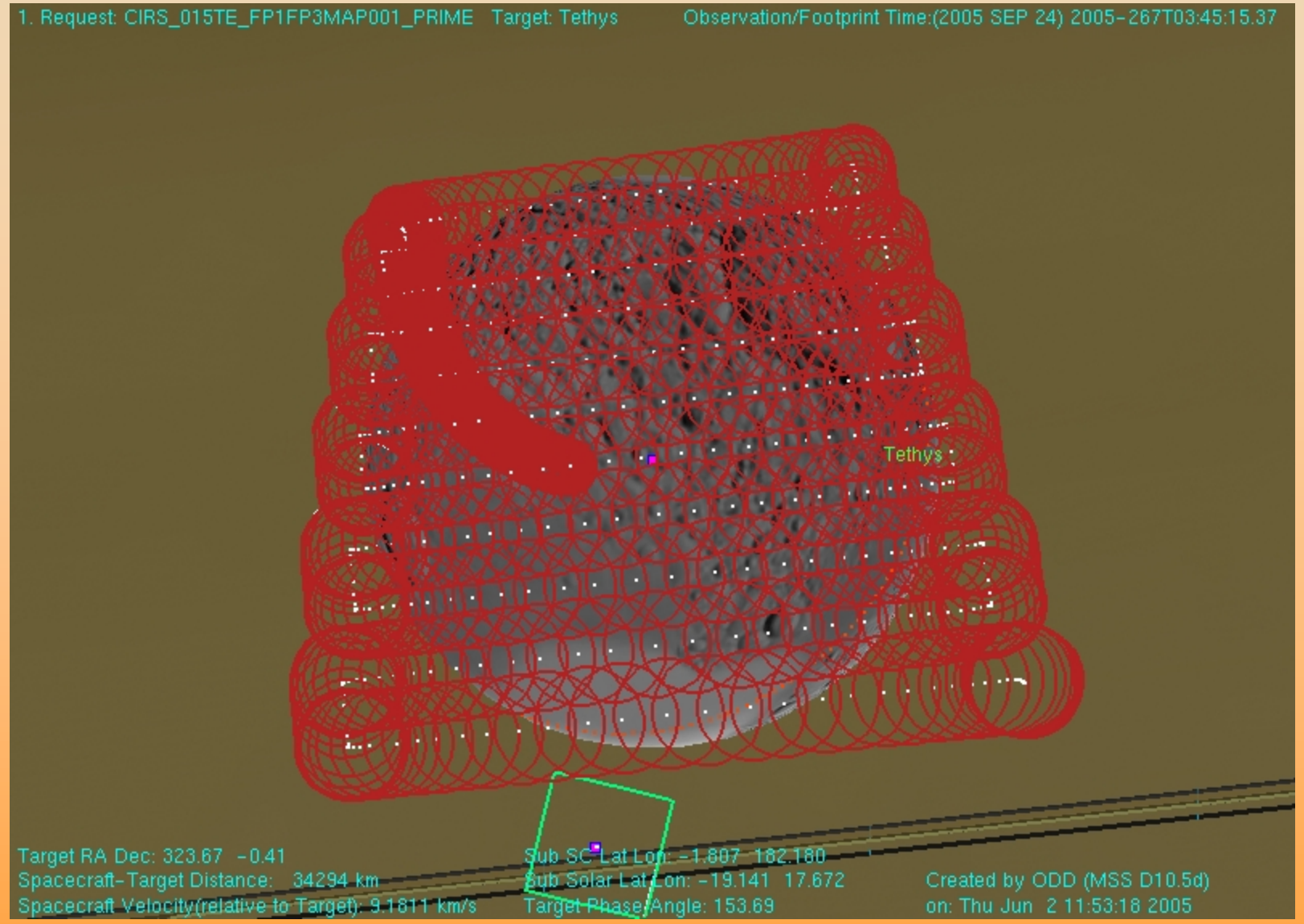
- Daytime and nighttime temperatures of Tethys and Hyperion to constrain:
  - Thermal inertia
  - Bolometric albedo
  - Volatile stability
  - Etc
- 10 - ~500 μm thermal emission spectra of Tethys and Hyperion to search for compositionally diagnostic spectral features

015TE_EWSCAN001



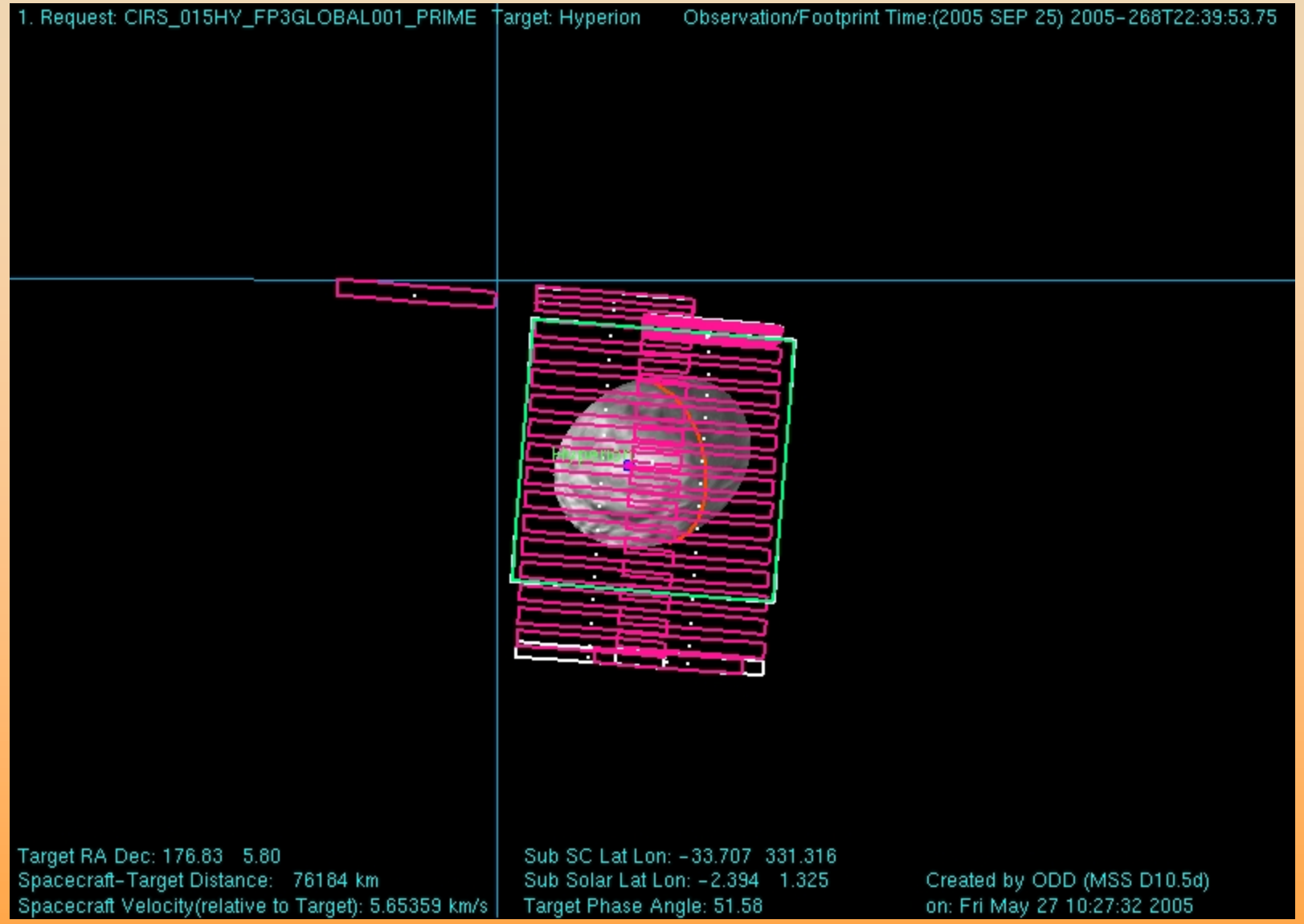
Tethys dayside: 20 degree phase

015TE_FP1FP3MAP001



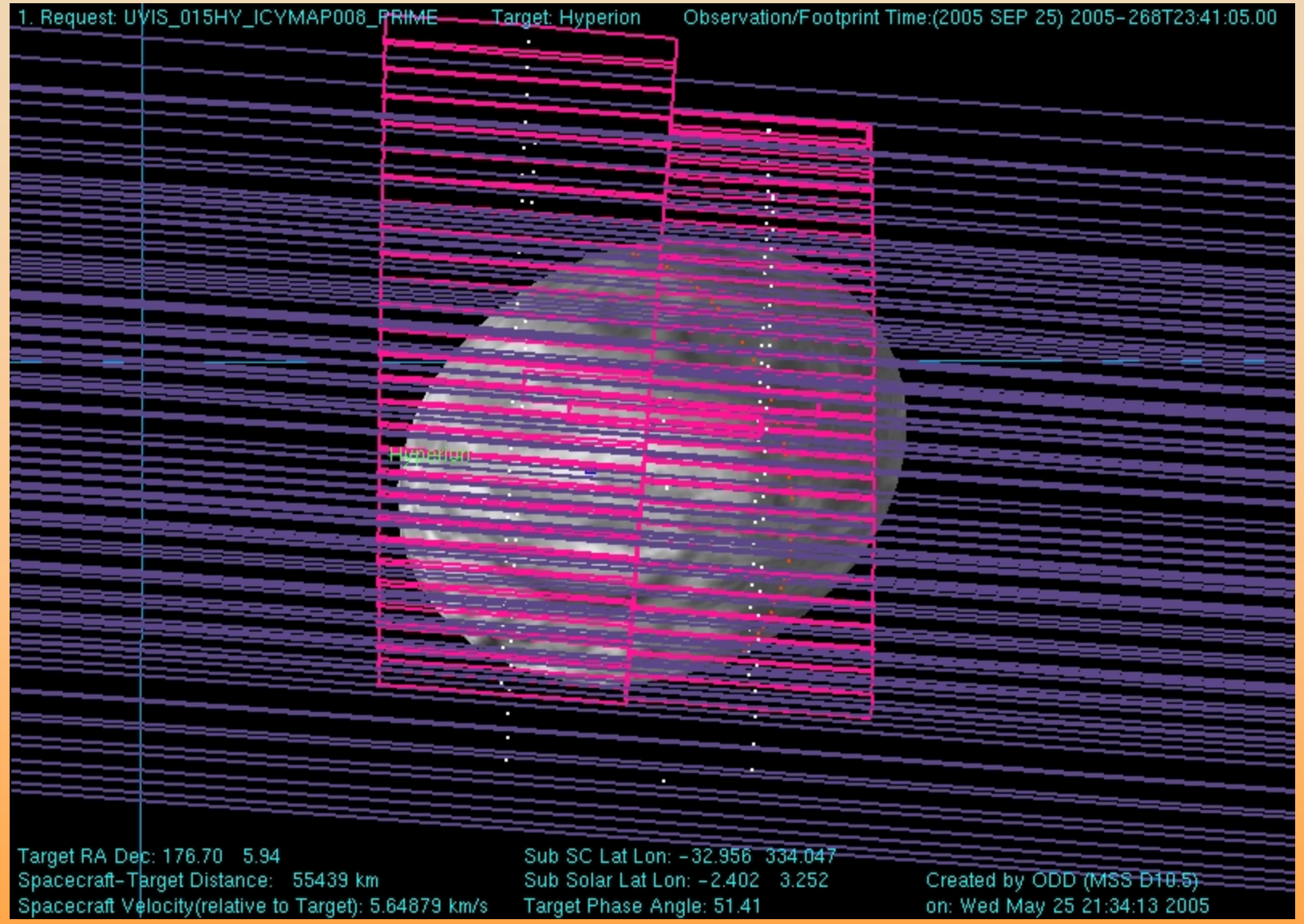
Tethys nightside: 154 degree phase. Saturn behind!

015HY_FP3GLOBAL001



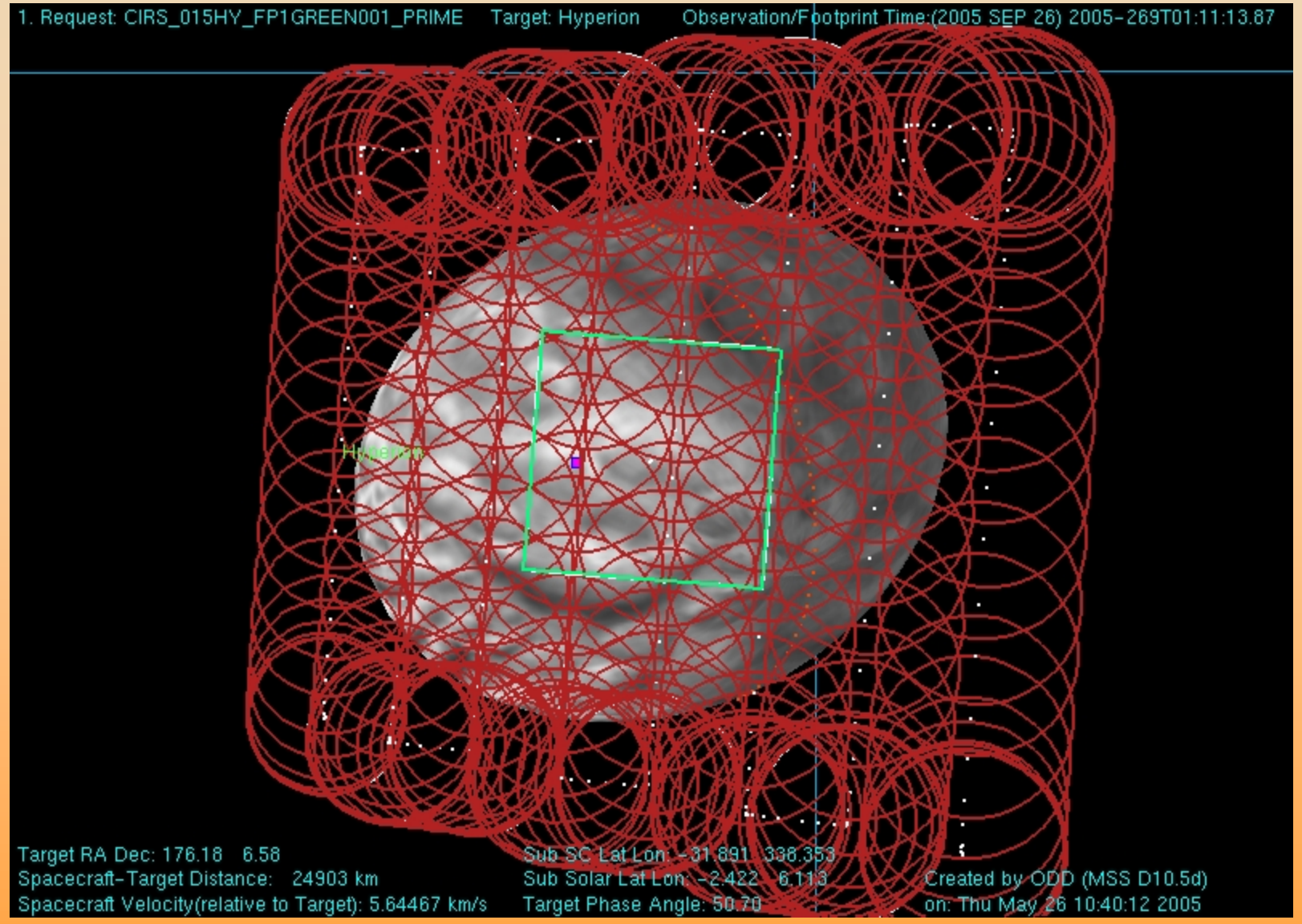
Hyperion FP3 dayside: 52 degree phase.

UVIS_015HY_ICYMAP008



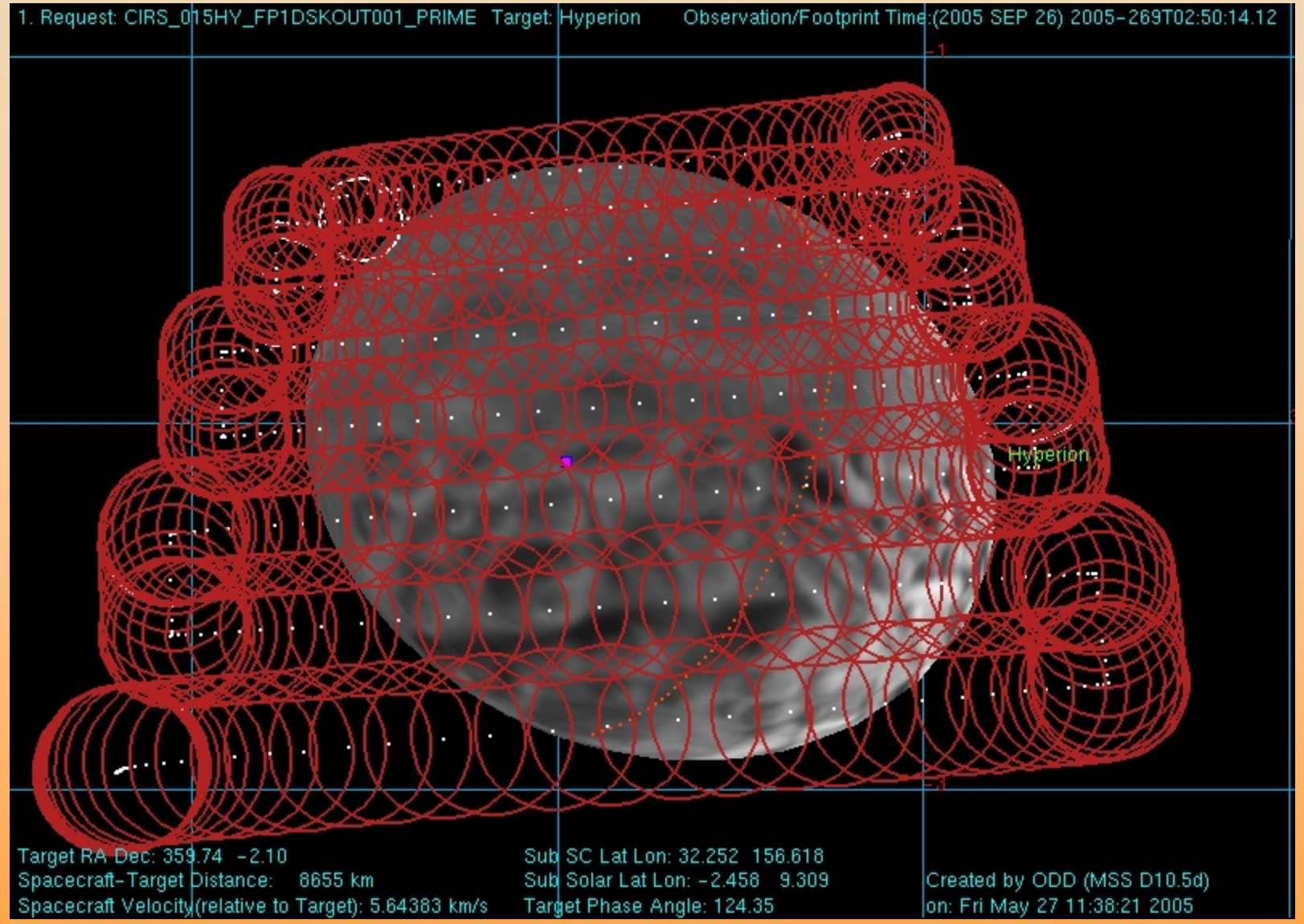
Hyperion FP3 dayside UVIS rider: 51 degree phase.

015HY_FP3GLOBAL001



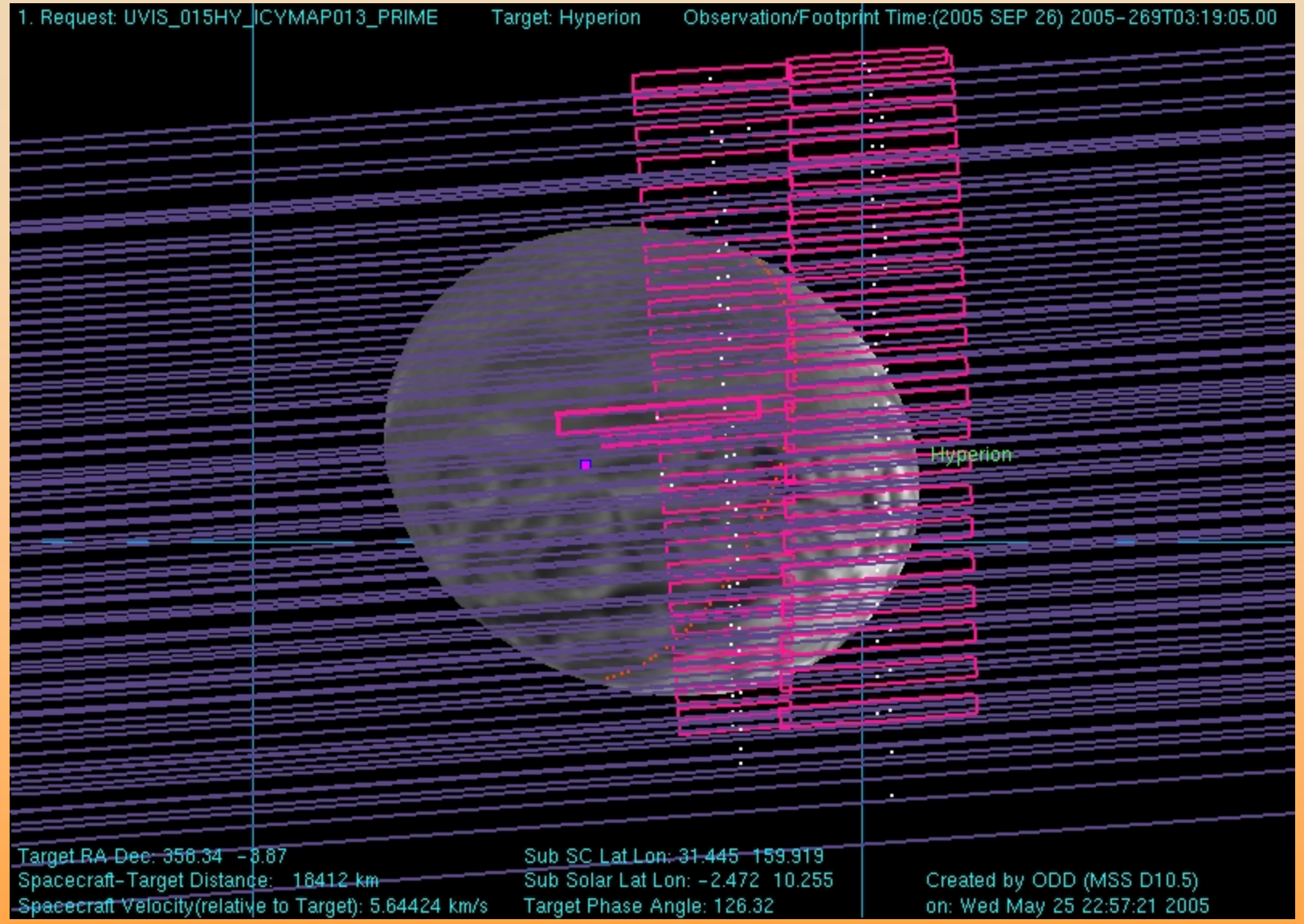
Hyperion FP1 dayside: 51 degree phase.

015HY_FP1DSKOUT001



Hyperion FP1 nightside: 124 degree phase.

UVIS_015HY_ICYMAP013



Hyperion FP3 crescent UVIS rider: 126 degree phase.

Rev 15

UVIS Science at Tethys and Hyperion

C. J. Hansen, A. Hendrix

19 September 2005

Icy Satellite Science Objectives

Saturn's icy satellites orbit at a variety of ranges from Saturn

- **Experience a variety of magnetospheric environments**
- **Experience different amounts of E ring material**

Our goal is to study how these processes affect the uppermost surface skin of Saturn's medium-size icy moons

UVIS Icy Satellite Science Objectives are to Investigate:

- Surface composition, grain size
  - Reflection spectra
- Surface age and evolution
  - UV albedo maps, phase function
- Tenuous atmospheres / exospheres
  - Emission spectra, occultations
    - Oxygen (1304, 1356 Å), Nitrogen (1493 Å)

Surface Composition and Chemistry

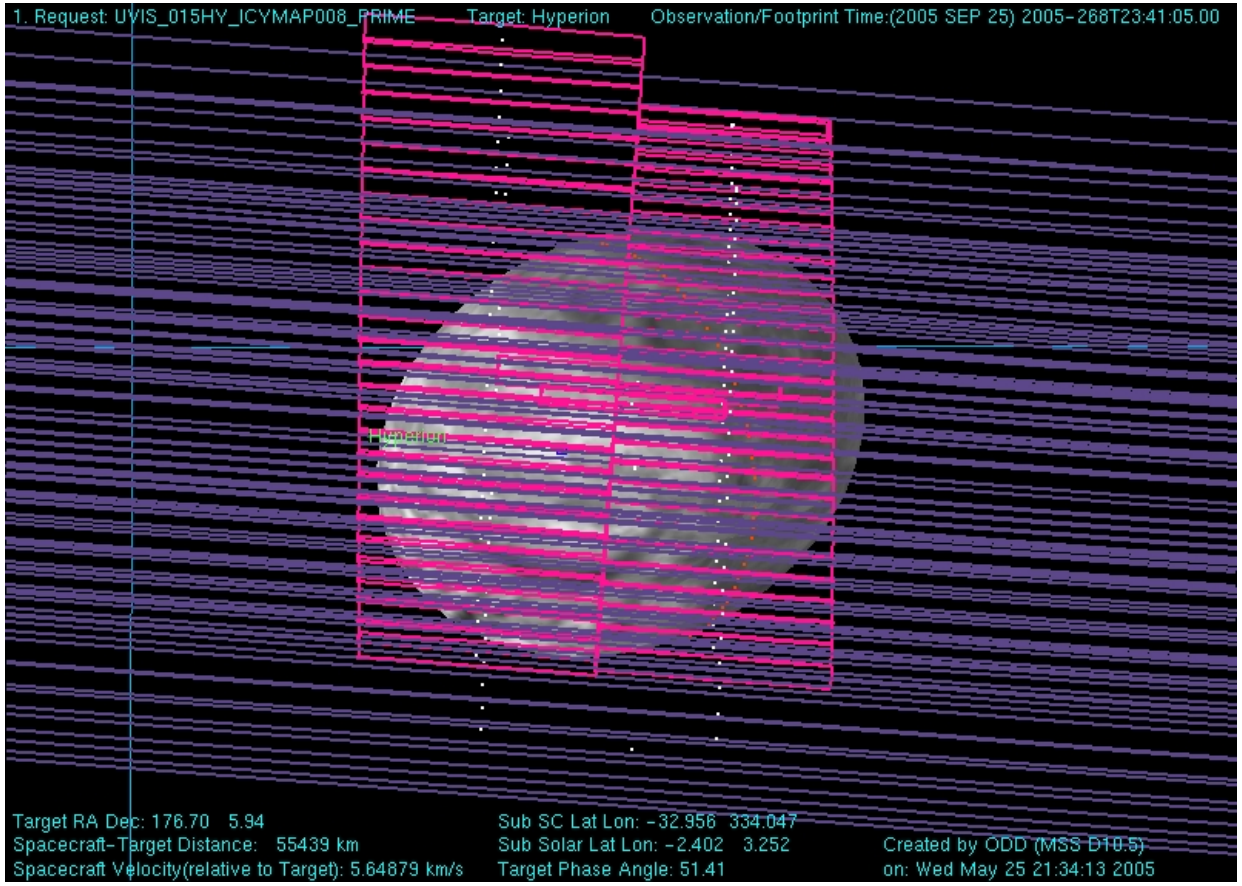
Tethys

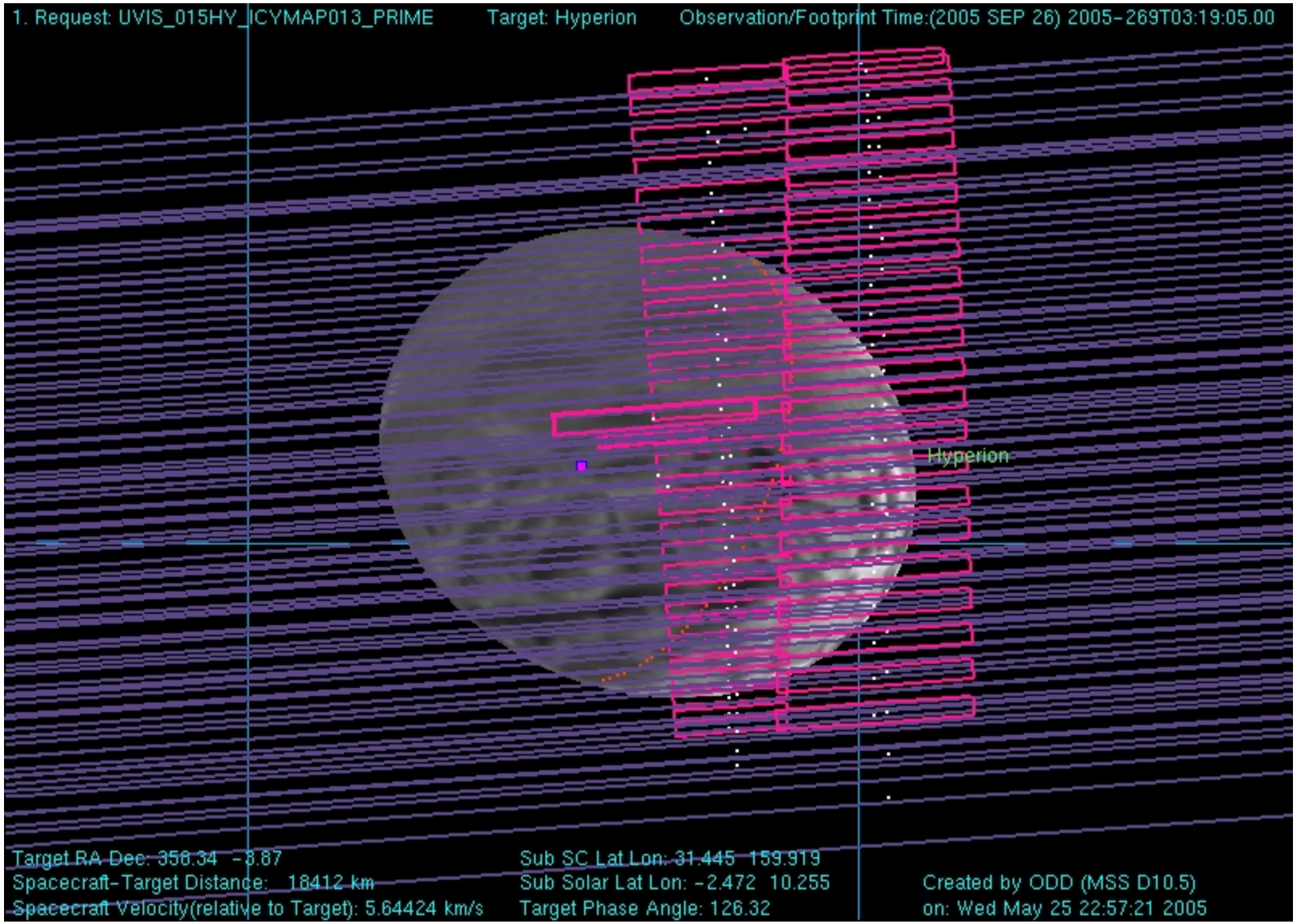
- Tethys is known to have a predominantly water-ice surface. The water spectrum has a distinct upturn at FUV wavelengths, at a wavelength determined by the ice grain size. Predominant grain size gives us insight into surface modification processes.

Hyperion

- Hyperion has been proposed as a source of the Iapetus albedo dichotomy
- As we did with Phoebe, we will compare our Hyperion and Iapetus spectra

Hyperion ICYMAP

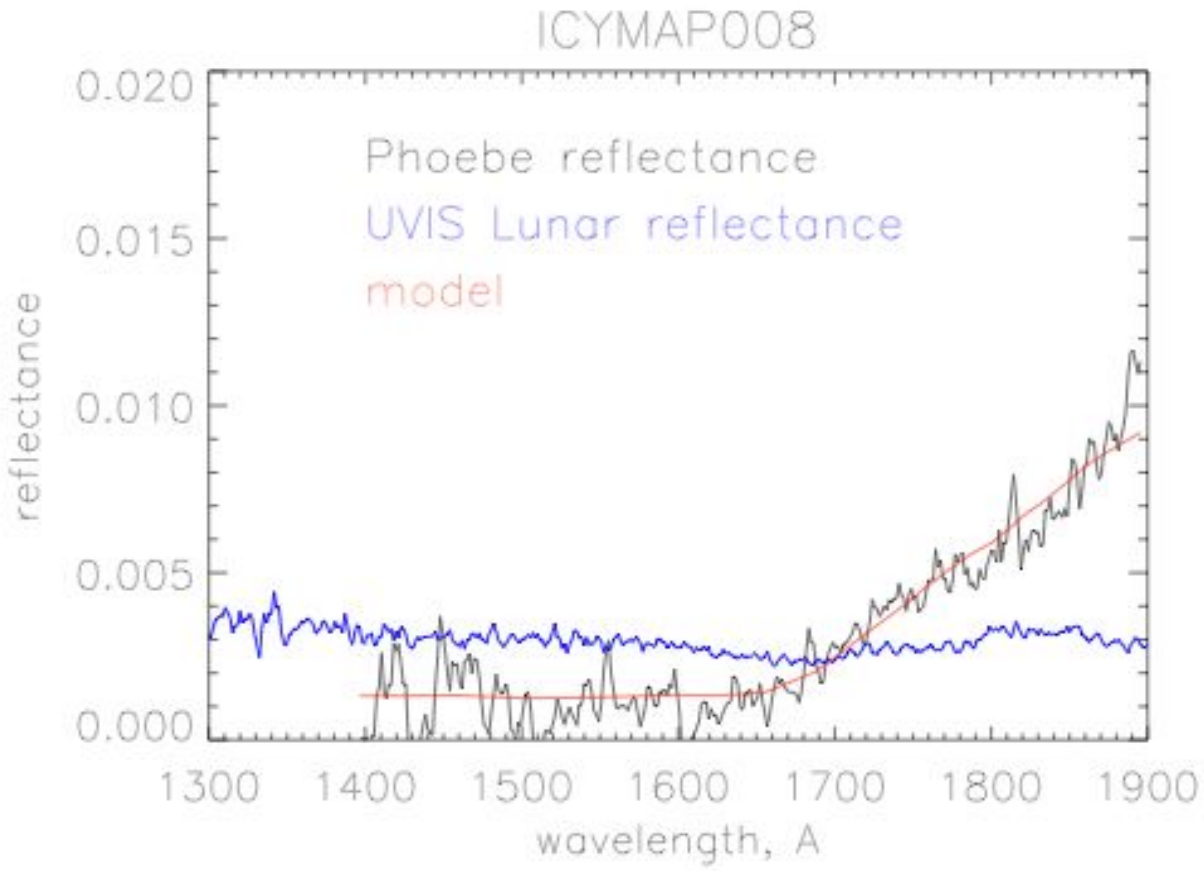



1. Request: UVIS_015HY_ICYMAP013_PRIME
Target: Hyperion
Observation/Footprint Time:(2005 SEP 26) 2005-269T03:19:05.00
Hyperion
Target RA Dec: 356.34 -3.87
Spacecraft-Target Distance: 18412 km
Spacecraft Velocity(relative to Target): 5.64424 km/s
Sub SC Lat Lon: 31.445 159.919
Sub Solar Lat Lon: -2.472 10.255
Target Phase Angle: 126.32
Created by ODD (MSS D10.5)
on: Wed May 25 22:57:21 2005

Main Models for Iapetus Albedo Dichotomy

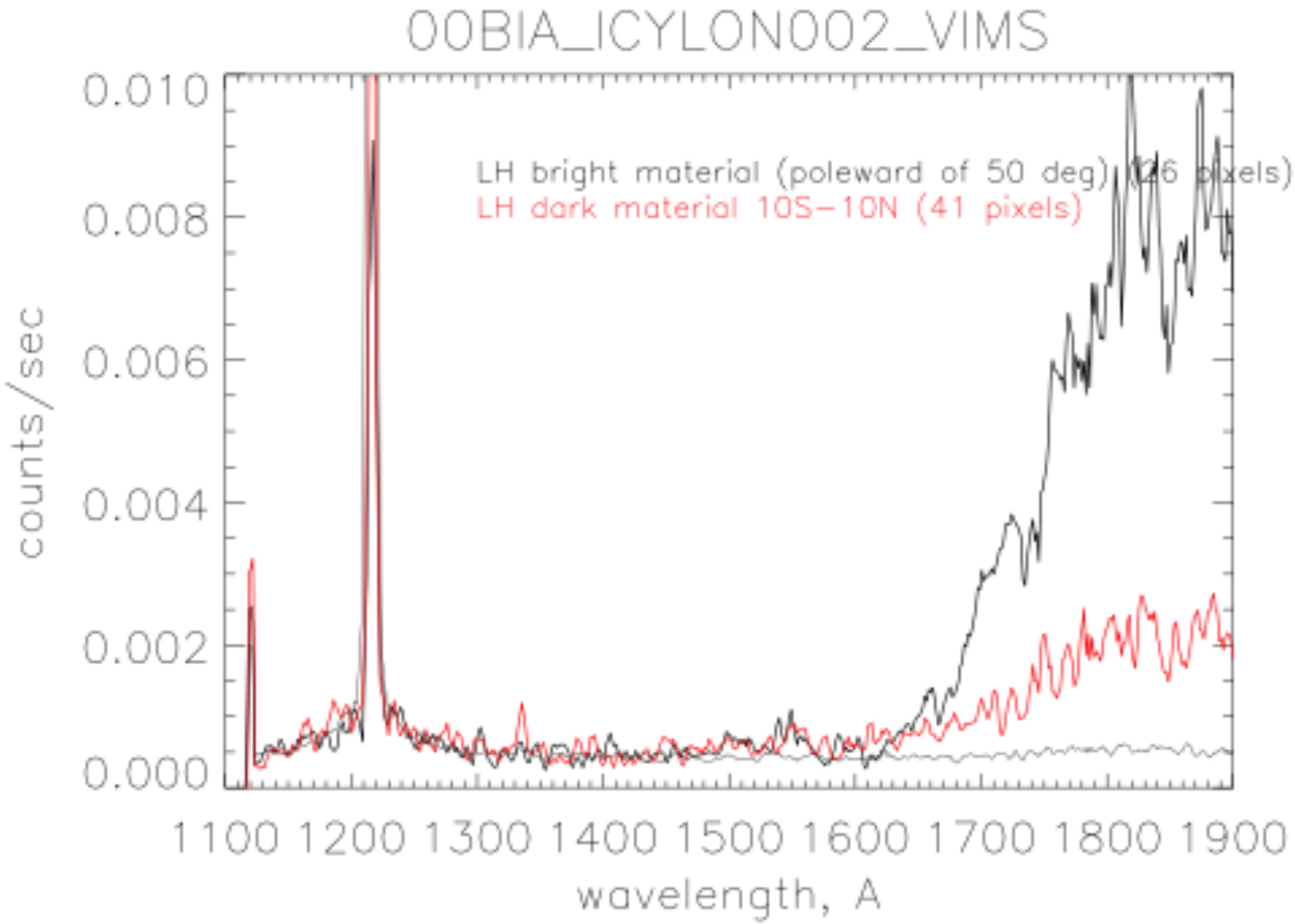
Model	Pros	Cons	Refs
Geologic resurfacing	Infill of dark crater floors; clean edge (?)	Hemispheric pattern	Smith et al. 1982
Accretion from Phoebe	Hemispheric pattern	Color	Soter 1974
As above + volatization	Hemispheric pattern; color?	The math	Cruikshank et al. 1983; Squyres et al., 1984; Bell et al. 1985; Buratti and Mosher, 1995
Accretion from Titan or Hyperion	Pattern and spectra	Low albedo	Matthews 1992; Vilas et al. 1996; Jarvis et al. 2000; Owen et al. 2001
Meteoritic erosion	Hemispheric pattern	Low density (1.2gm/cc)	Cook and Franklin 1970; Wilson and Sagan, 1995, 1996
Accretion of D-type material from outer retrograde satellites	Hemispheric pattern and spectra	Sufficient source; Phoebe not red	Cruikshank et al. 1983; Buratti et al. 2002, 2004; Black et al., 2004 (general exogenic)

Phoebe's Disk-Integrated FUV reflectance spectrum

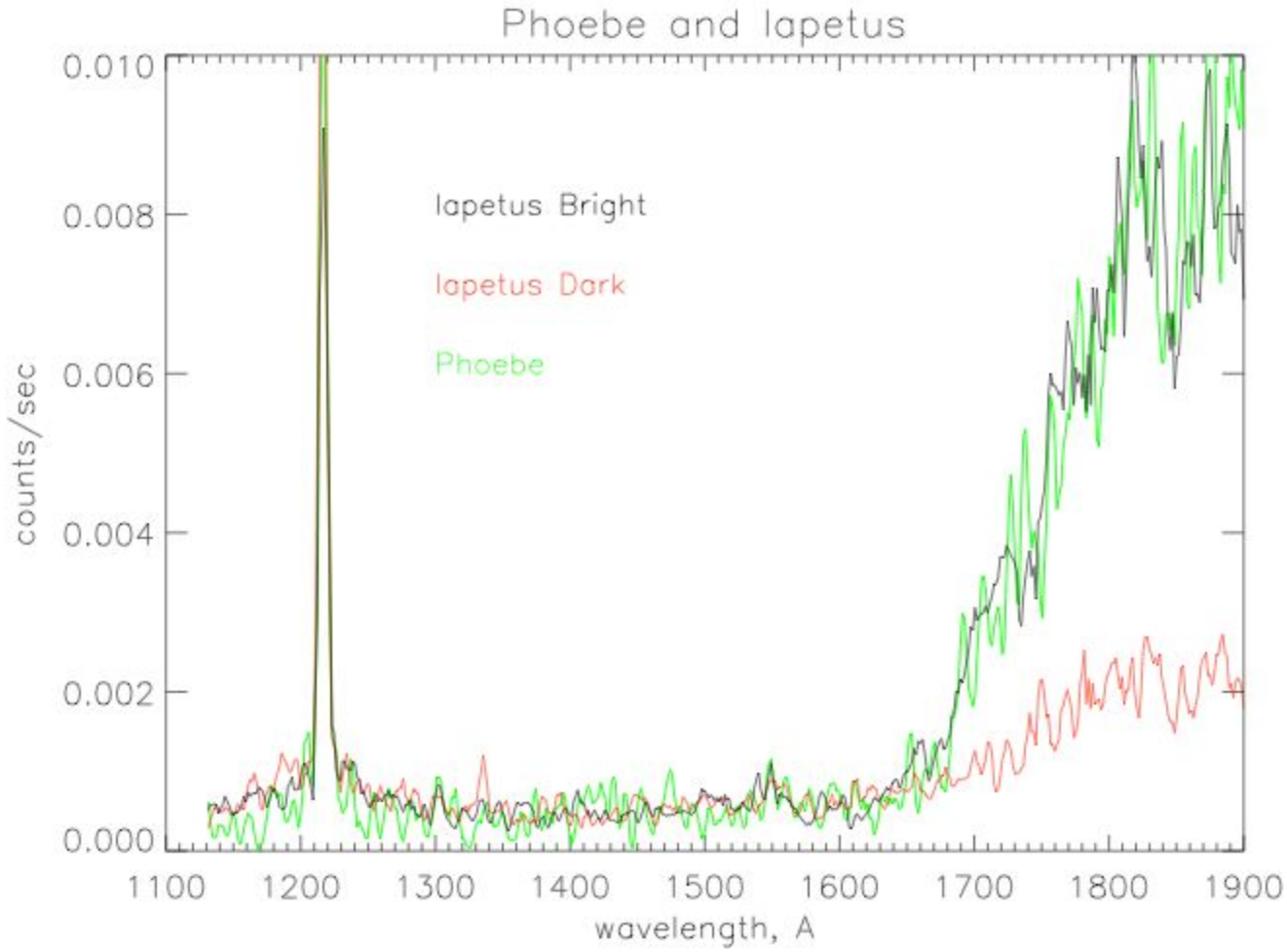


H_2O frost and dark material contribute to Phoebe's FUV spectrum; dark material is similar to carbonaceous chondrite

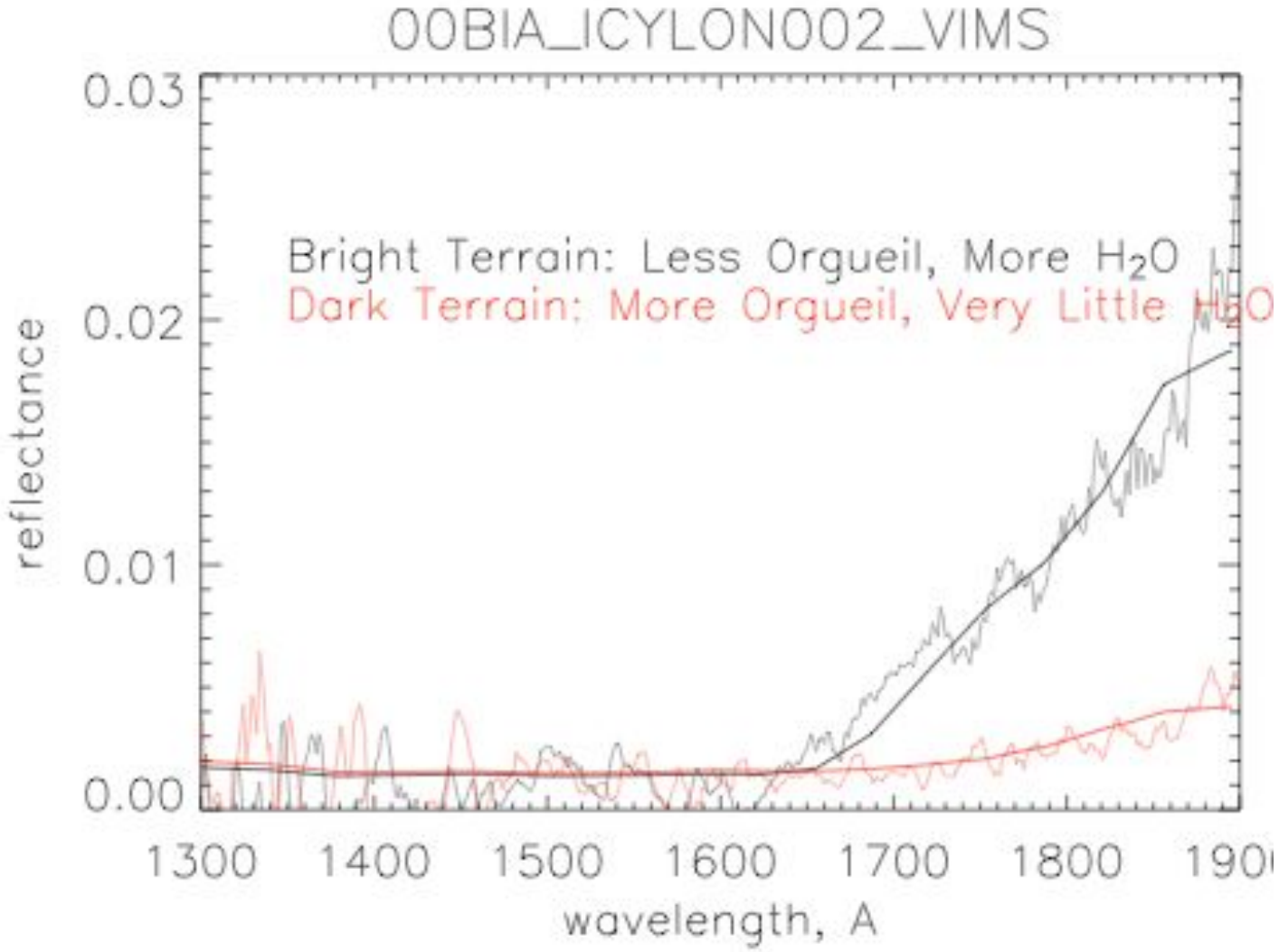
Raw Iapetus spectra: dark and light terrains



Iapetus compared with Phoebe



Iapetus reflectance: dark and light terrains



Summary: Iapetus vs. Phoebe

- What can we say about dark material on Iapetus?
  - It does not look like Phoebe
- Phoebe material is too H_2O-rich to match Iapetus dark spectrum
  - We need very little H_2O to model Iapetus dark material
- If Phoebe material (or any other material) coats Iapetus, then H_2O must be lost in the transport or impact process
- Our results do not discriminate between endogenic and exogenic models for Iapetus dark material
  - Loss of volatiles might be associated with either process

Surface Age and Evolution

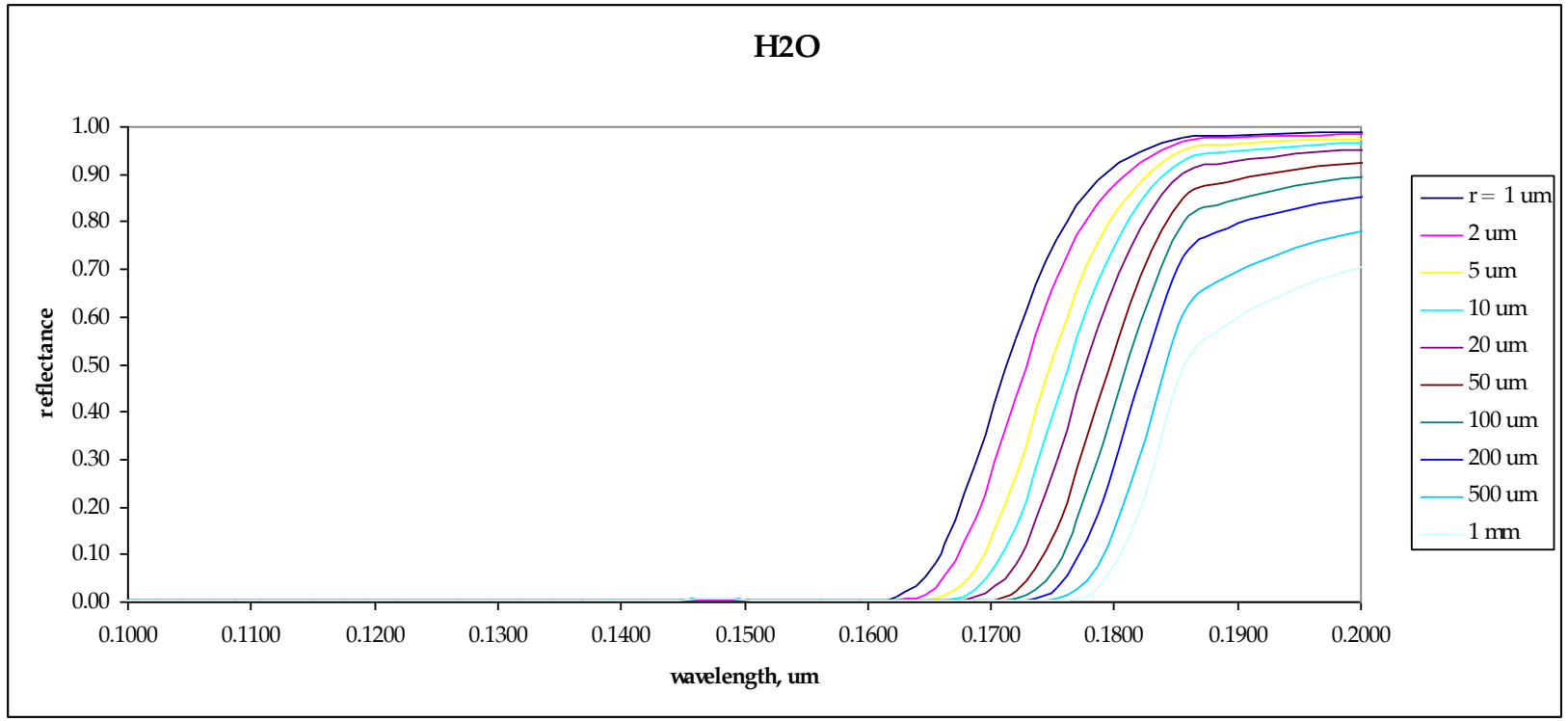
Tethys

- Tethys orbits well within Saturn's E ring
- Presumably the upper layer of Tethys' surface has been modified by E ring particles
- Since the spectrum of water has a distinct upturn at FUV wavelengths, at a wavelength determined by the ice grain size, we can use that diagnostic wavelength to determine the predominant size

Hyperion

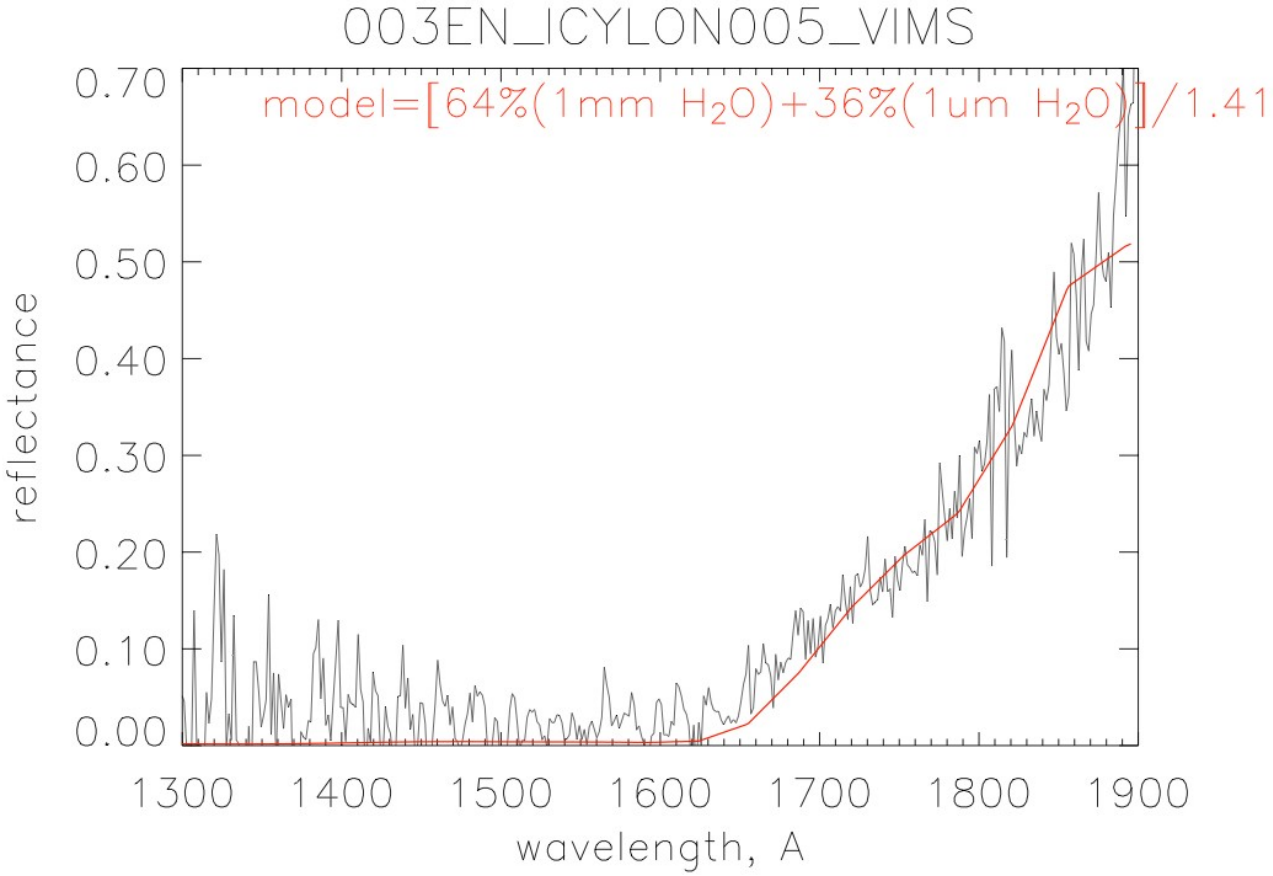
- Hyperion's orbit is outside the E ring so it can be compared to the trends observed on Mimas -> Enceladus -> Tethys -> Dione -> Rhea

Water Ice Spectra, used for grain size discrimination



Spectra provided by Gary Hansen, combination of lab work and theoretical constraints

Example: Enceladus Grain Size



Preliminary Results: 2-grain-size-H_2O model
Relative Amounts of Model Components
Icy Satellites

Model=[X*500 μm H_2O + (1-X)*1 μm H_2O]/Y

	%500 μm H_2O	%1 μm H_2O
Mimas	63%	37%
Enceladus	64%	36%
Tethys	72%	28%
Dione	73%	27%
Rhea	74%	26%

Pretty good fits are obtained with this model.
Inner satellites have more very small grains?

This table is based on ~1 reflectance spectrum per satellite, on a particular region. Spatial resolutions may not be similar.

Tenuous Atmospheres / Exospheres

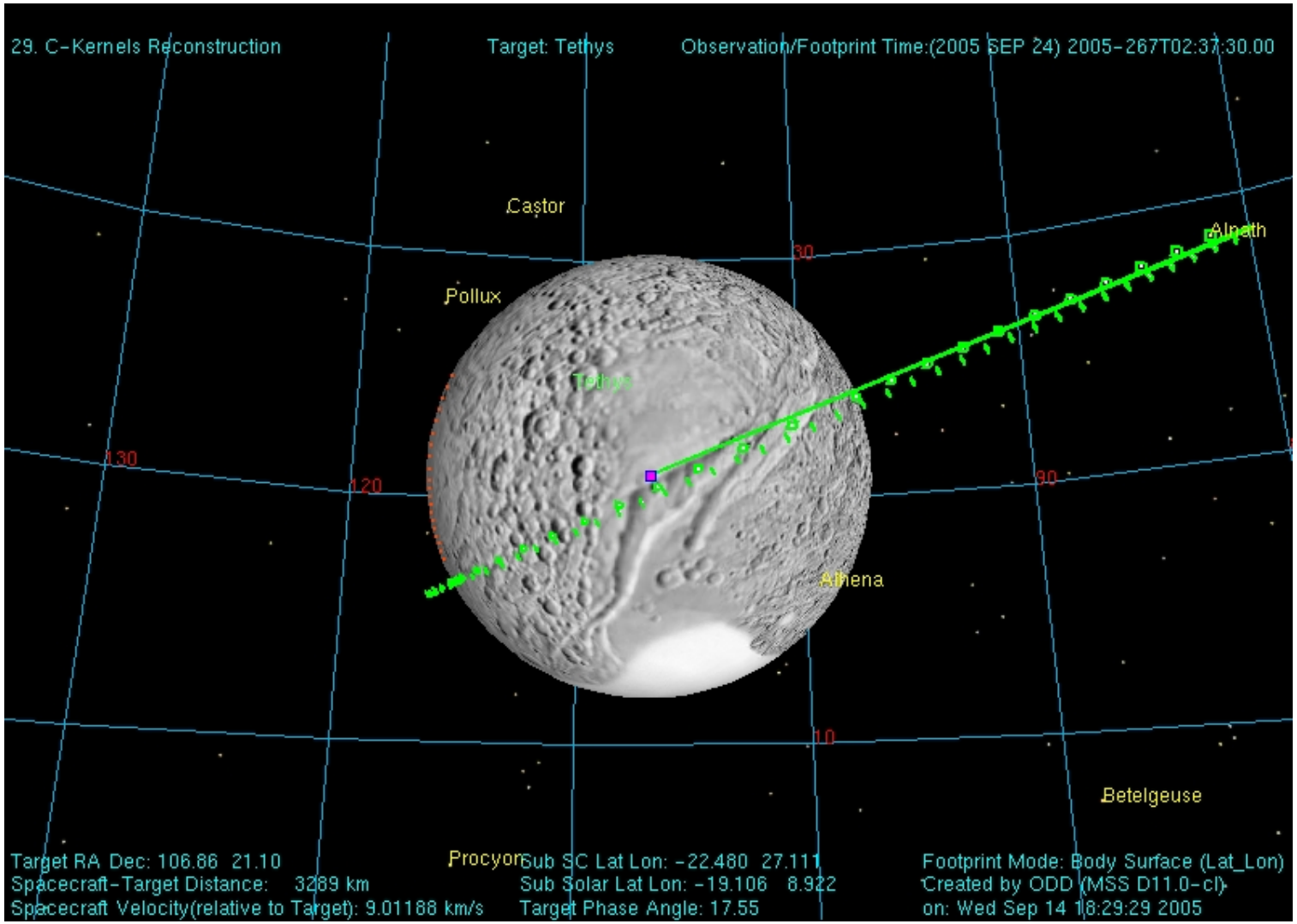
Tethys

- Tethys' position in Saturn's E ring makes it a worthwhile candidate for looking for volatile activity, even though it does not have the young surface geology observed on Enceladus.
  - The UVIS observation of the stellar occultation of beta Tau will be a sensitive probe for the presence of a tenuous atmosphere
    - B7III, 1.65 magnitude

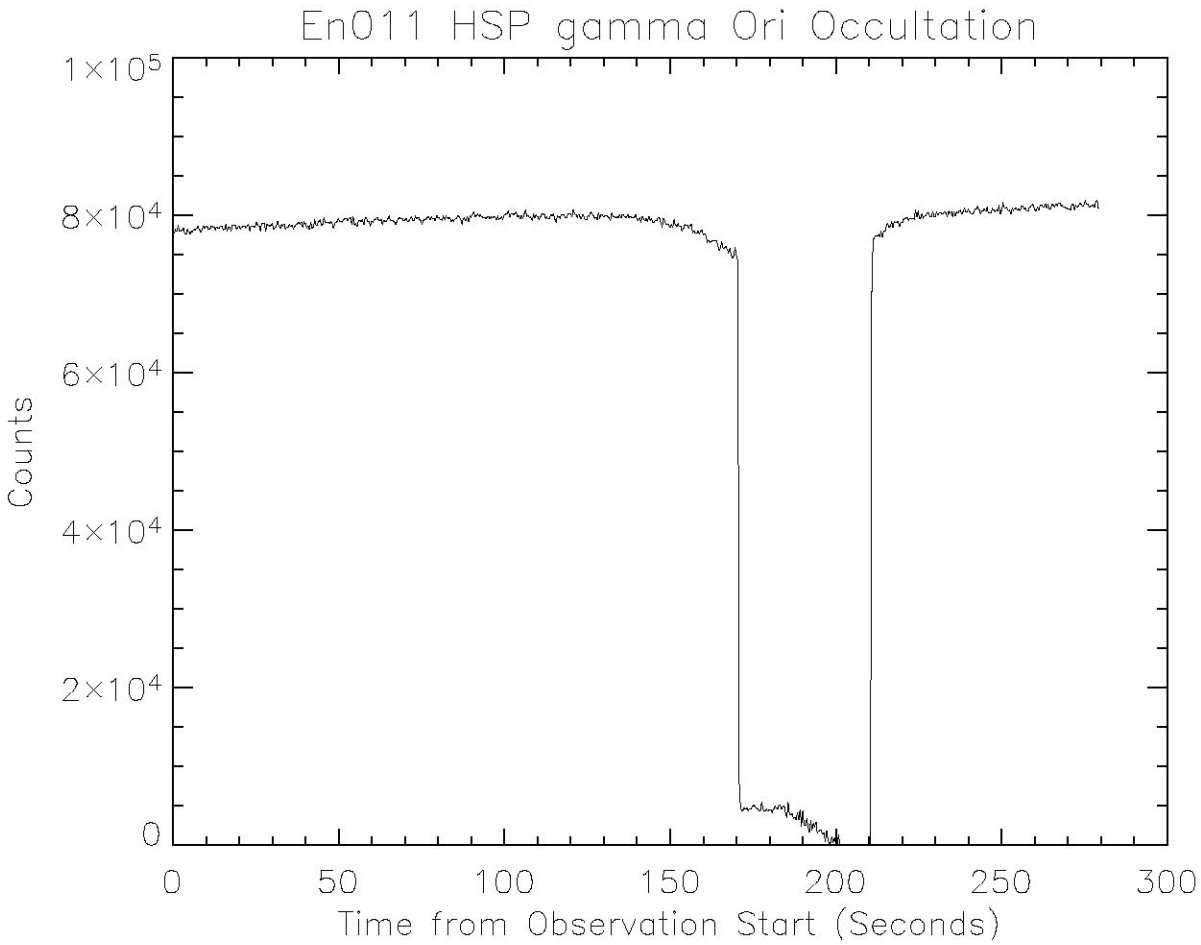
Tethys and Hyperion

- UVIS spectra will be examined for emission features such as 130.4 and 135.6 nm (atomic and molecular oxygen), 149.3 nm (atomic nitrogen), etc.
- Limb observations will be scrutinized at lyman alpha for evidence of hydrogen enhancement off the limb

Tethys Beta Tau Occultation



Example: Enceladus HSP signal vs. Time

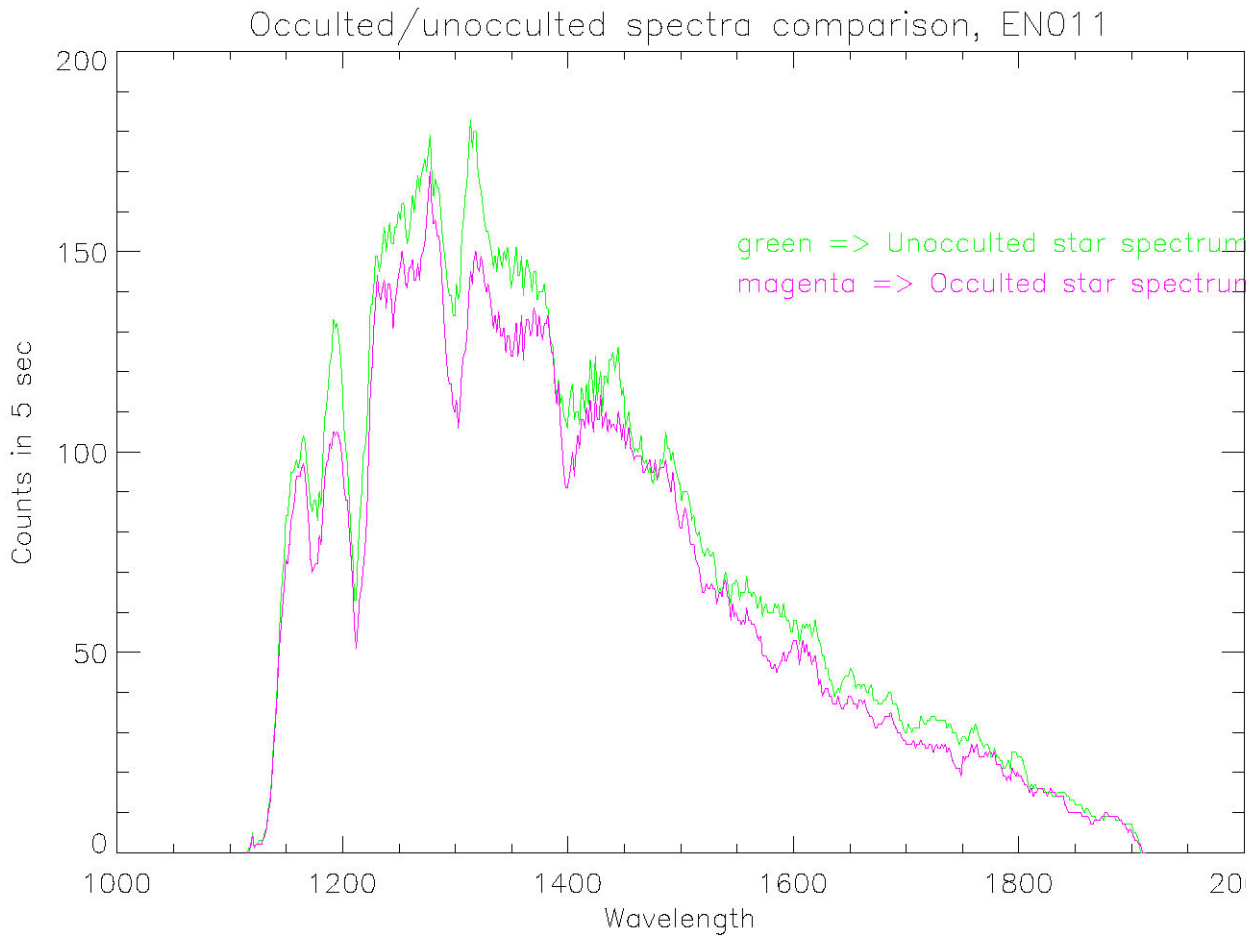


- Clear indication of attenuation of signal during occultation ingress; egress is signature of HSP warmup
- Start to sense atmosphere ~24 sec prior to hard limb occultation
- Ray height at –24 sec is ~ 155 km

Enceladus FUV Data: Comparison of Occulted to Unocculted Spectra

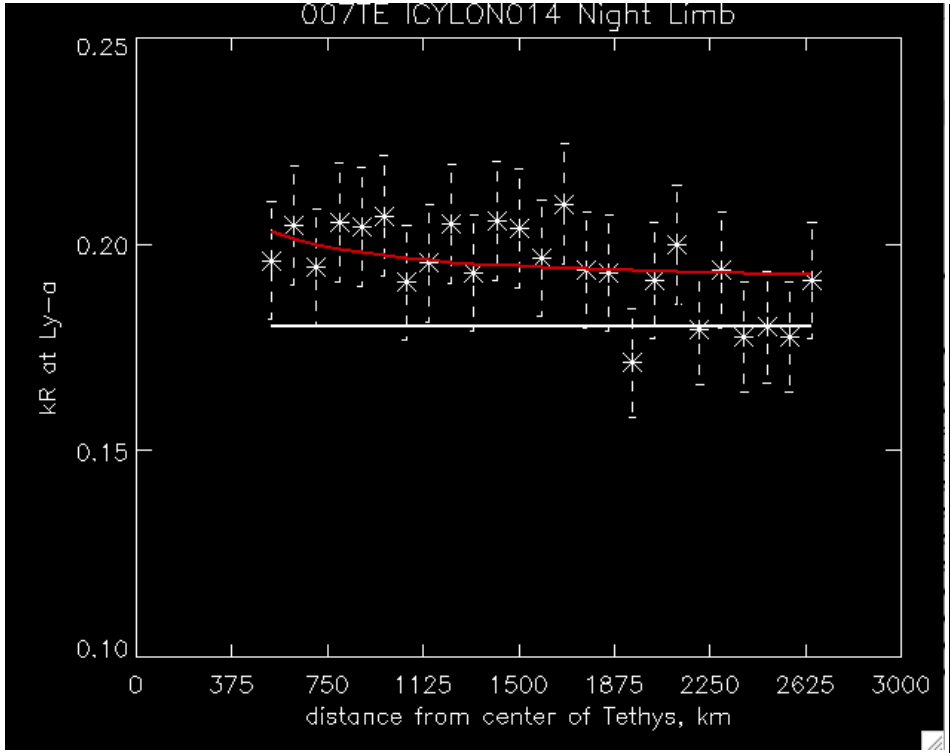
FUV configuration:

- **spectral channels binned by 2 (512 spectral channels from 113.5 nm to 191 nm)**
- **low resolution slit width**
- **5 sec integration time**
- **full spatial resolution**

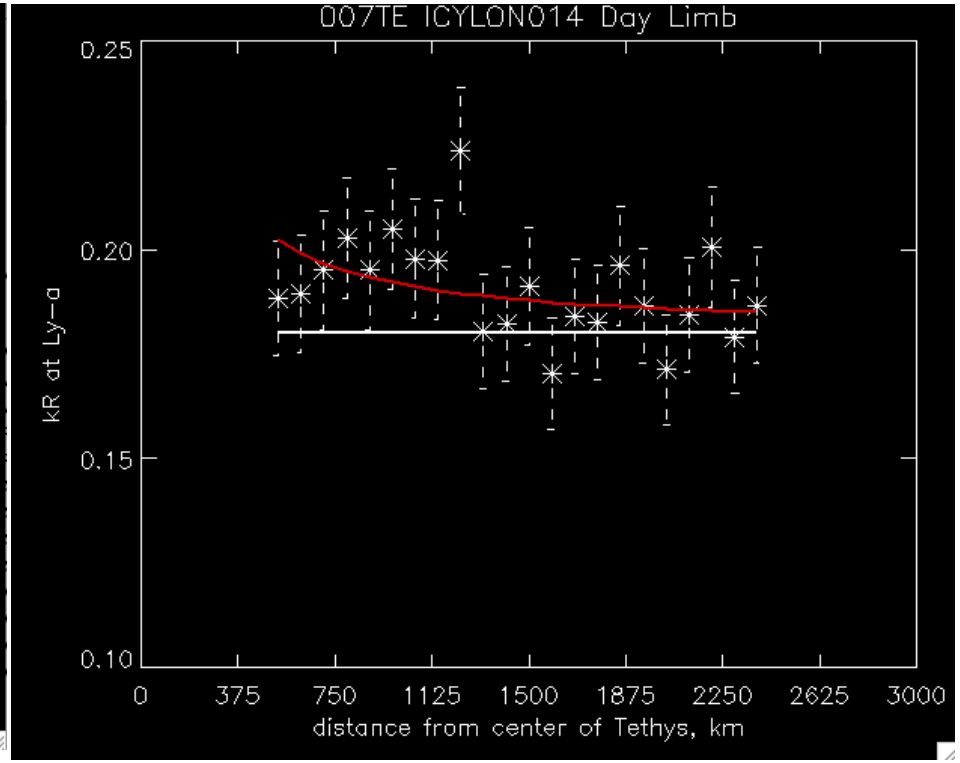


Again, clear signature of an atmosphere is present – both relatively narrow and broad absorption features

Tethys Hydrogen



Night/LH



Day/TH

column emission rate = 0.0232 kR
slant column density= 1.14889e+12 atoms/sec
volume density= 10838.6 atoms/cm3
escape flux = 3.6e+08 atoms/cm2-sec

column emission rate = 0.0222 kR
slant column density= 1.10219e+12 atoms/sec
volume density= 10398.0 atoms/cm3
escape flux = 3.5e+08 atoms/cm2-sec

Possible Sources of H

- Sputtering of H_2O ice by ions
  - $H_2O + H^+ (O^+) \rightarrow H_2O$ vapor, H, H_2
  - *Fraction of sputtered particles that are H atoms?*
- Photodesorption of H_2O ice
  - $H_2O + h\nu \rightarrow H_2O$ vapor, H, H_2
  - Westley *et al.* (1995) measure yields of ~0.5% (85K) - 0.7% (100K)
    - Photodesorption experiments studying H are lacking
  - Our measurements require yields of at least ~0.7%
  - This may be an unimportant source relative to sputtering
- Photodissociation of H_2O vapor
  - From sputtering, sublimation or photodesorption
  - $H_2O + h\nu \rightarrow H + OH$
  - Too cold for sublimation (T<110K)
- E-ring particle bombardment
- Micrometeoroid bombardment

Measured vs. Predicted[a] Fluxes

[a]Jurac *et al.* (2001) H_2O mol/cm^2-sec for O^+ ions

	Predicted	UVIS-Measured	atoms/s
Mimas	1.59e9	2±.5 e9	9.6e24
Enceladus	7.5e8	1±.5e9	5.9e24
Tethys	6.6-7.6e8	3.5±.5e8	1.2e25
Dione	3.9-6.5e8	≤1e8	3.9e24
Rhea	-----	4±.5e8	2.9e25

Measured fluxes are generally consistent with predicted
-- good indicator that sputtering is dominant source
-- may suggest additional source is secondarily important

Conclusions

- Clear Ly-α signal above background
- Escape fluxes are consistent with predicted sputtering rates
- No significant leading-trailing variations so far
  - Suggests that gyroradii of scattering particles are as large as the body

Hyperion Rev 15 -- A VIMS Preview

2005-268T16:16:45 to 2005-269T09:00:11

R. N. Clark and D. Cruikshank, Sept. 17, 2005

VIMS

Visual and Infrared Mapping Spectrometer

- 0.35 to 5.2 μm in 352 wavelengths
- IFOV: 0.5 x 0.5 mrad (standard)
- High resolution IR: 0.5 x 0.25 mrad
- High resolution VIS: 0.17 x 0.17 mrad
- Images up to 64 x 64 pixels square.

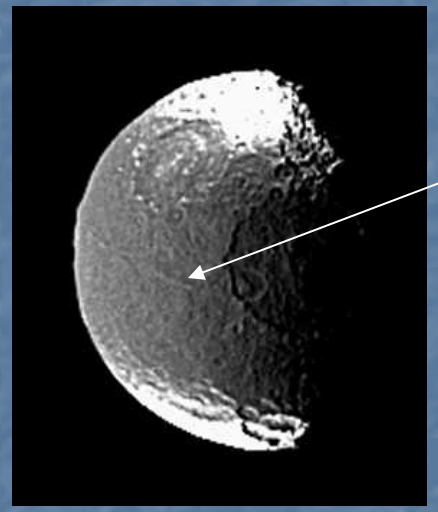
VIMS General Science at Hyperion

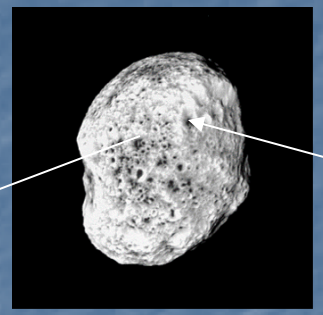
- Identification of minerals and other materials on the surface.
- Mapping the abundance, and grain sizes of surface materials.
- Grain-Size Mapping
- Reflectance from 0.35 to 5.2 μm
- Phase function
- Surface microstructure
- Bond albedo

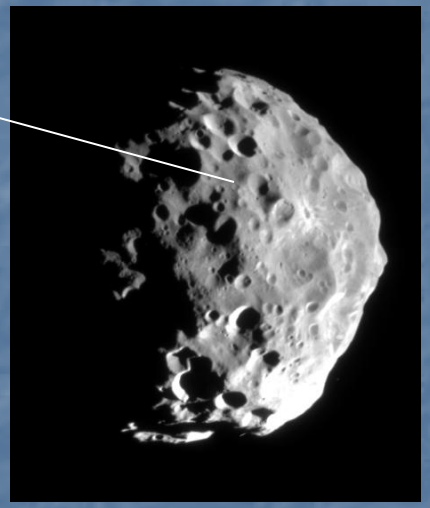
VIMS *Critical* Hyperion Science

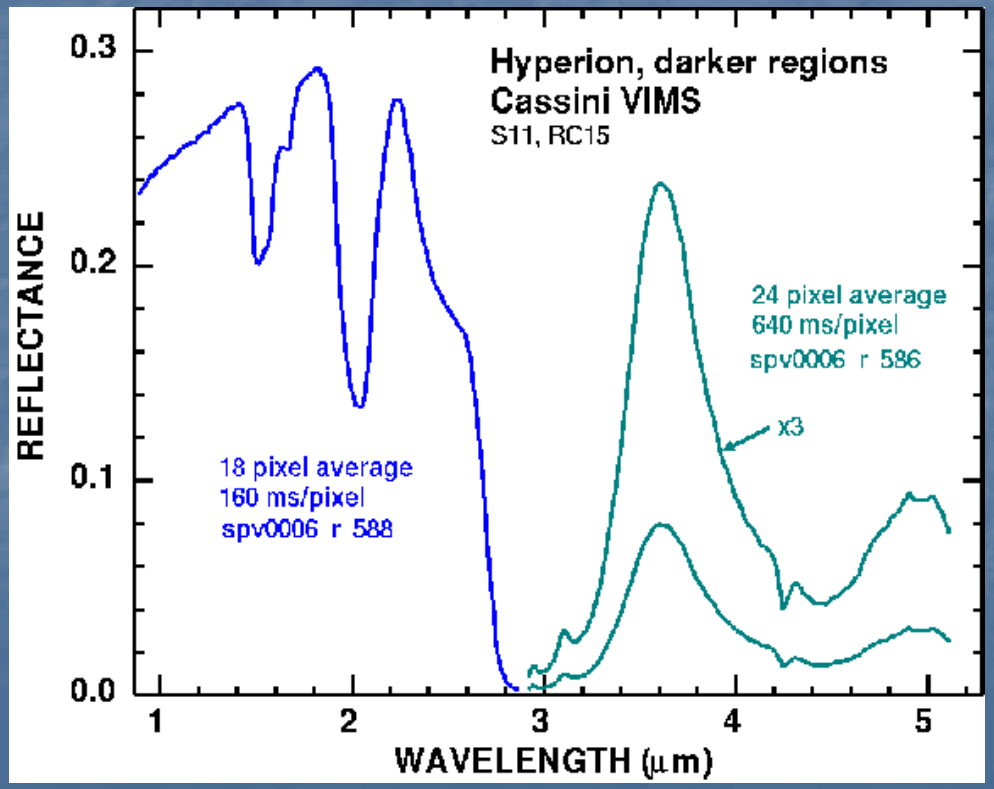
- Hyperion may be the "gateway" from Phoebe to Iapetus
- A big question: Is the low-albedo material on Hyperion spectrally similar to that on Phoebe and Iapetus?
  - CO_2 wavelength and strength
  - CN-bearing compounds, including 2.41 μm feature
  - Degree of H_2O ice intermixing
  - Phase angle dependence of reflectance and Fresnel peak
- We must spatially isolate the Hyperion low-albedo material and get exposure times that will give good S/N at the longest wavelengths

VIMS Spectrum of Hyperion's darker regions, showing CO_2 band at 4.25 μm.

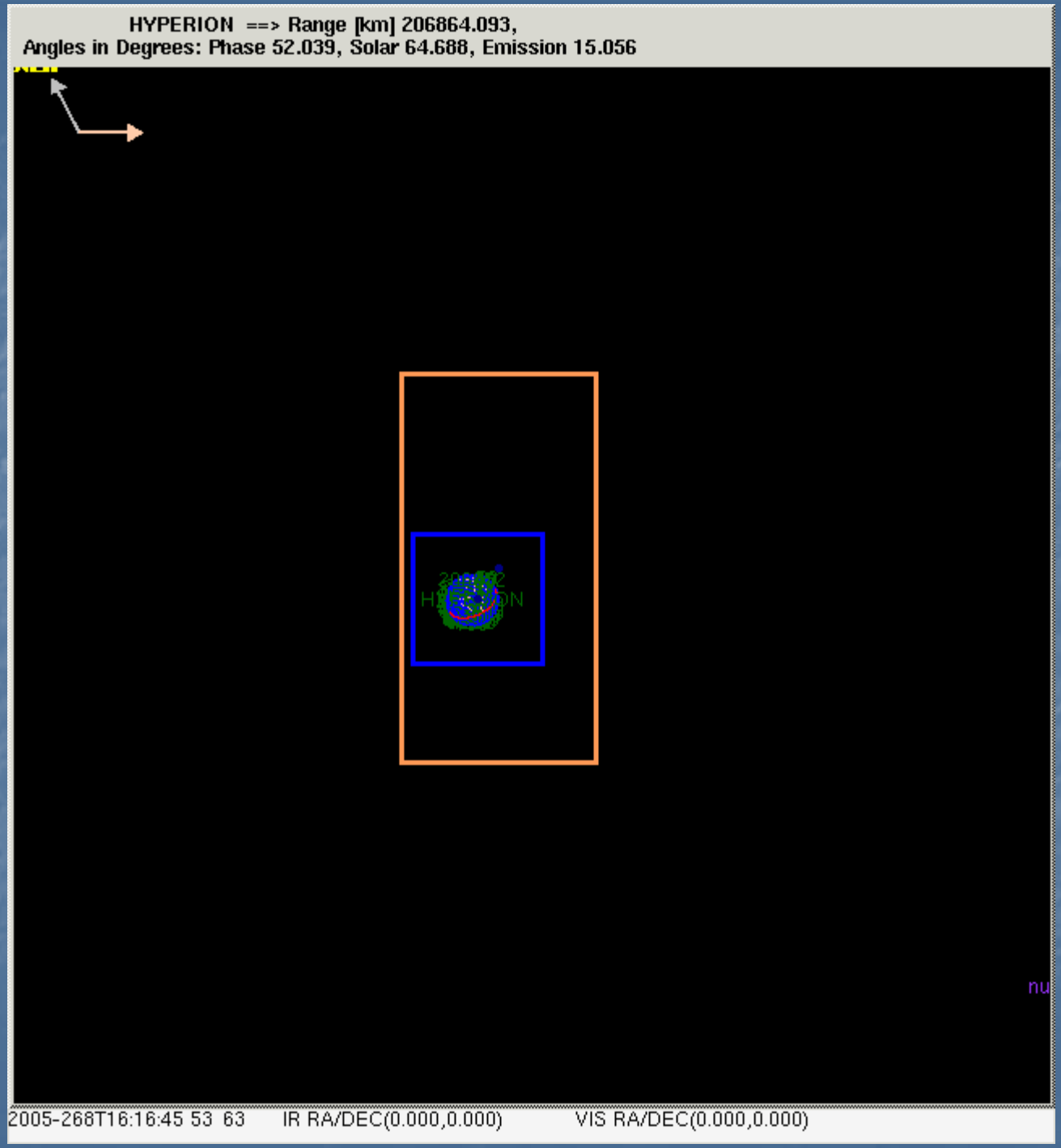








To Saturn


HYPERION ==> Range [km] 206864.093,
Angles in Degrees: Phase 52.039, Solar 64.688, Emission 15.056
2005-268T16:16:45 53 63
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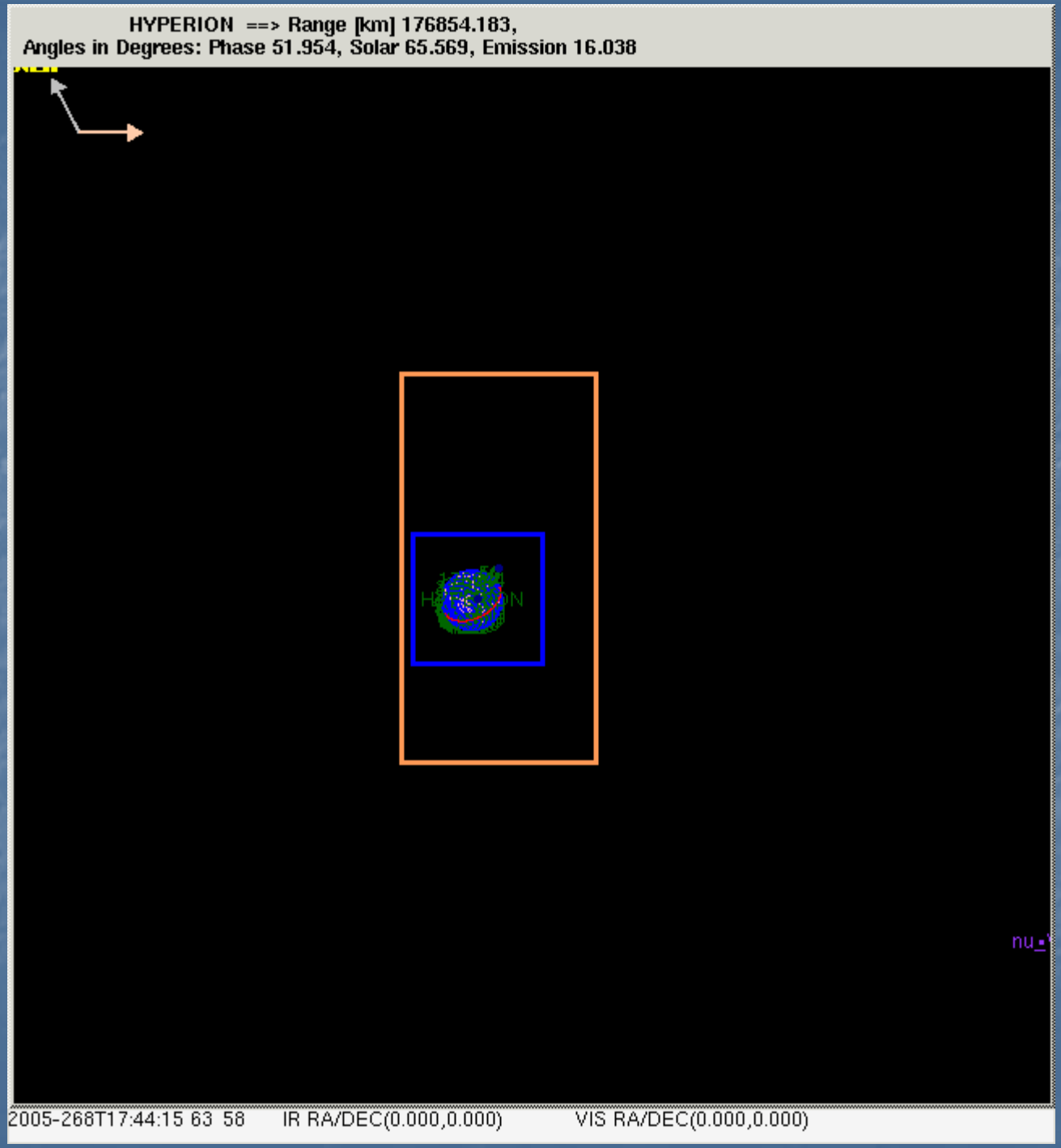
HYPERION ==> Range [km] 176854.183,
Angles in Degrees: Phase 51.954, Solar 65.569, Emission 16.038
2005-268T17:44:15 63 58
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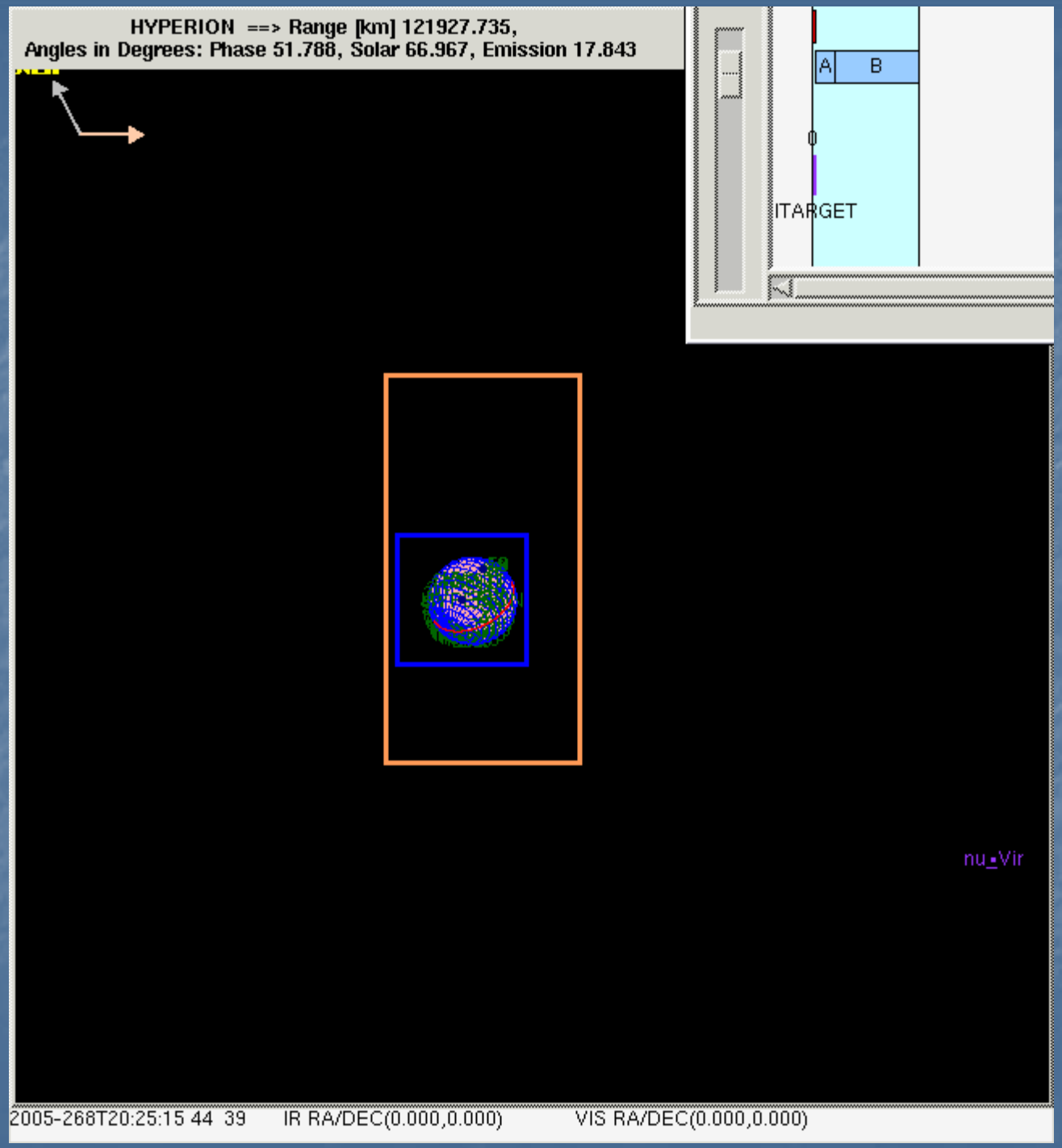
HYPERION ==> Range [km] 121927.735,
Angles in Degrees: Phase 51.788, Solar 66.967, Emission 17.843
A
B
ITARGET
nu_Vir
2005-268T20:25:15 44 39
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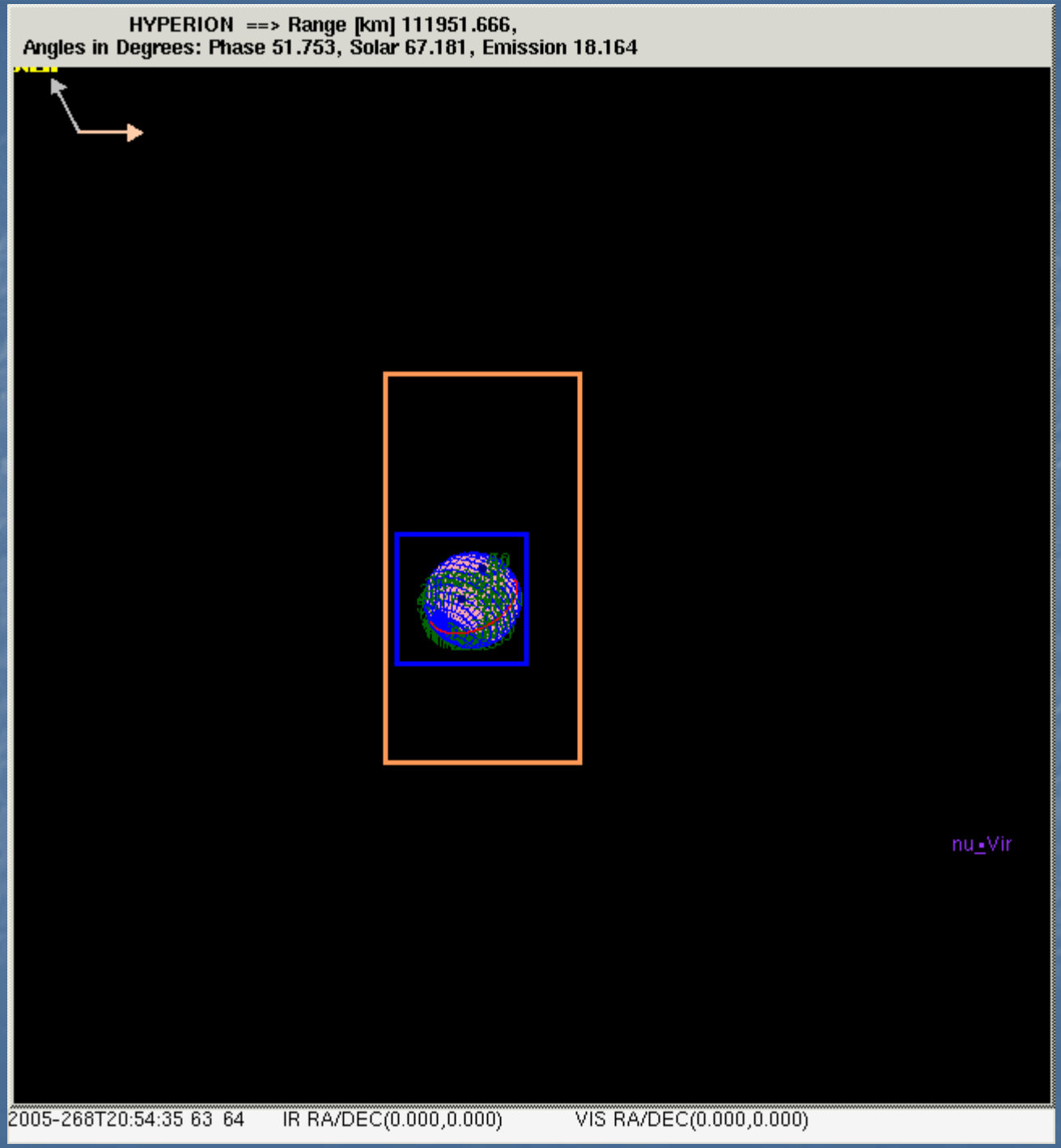
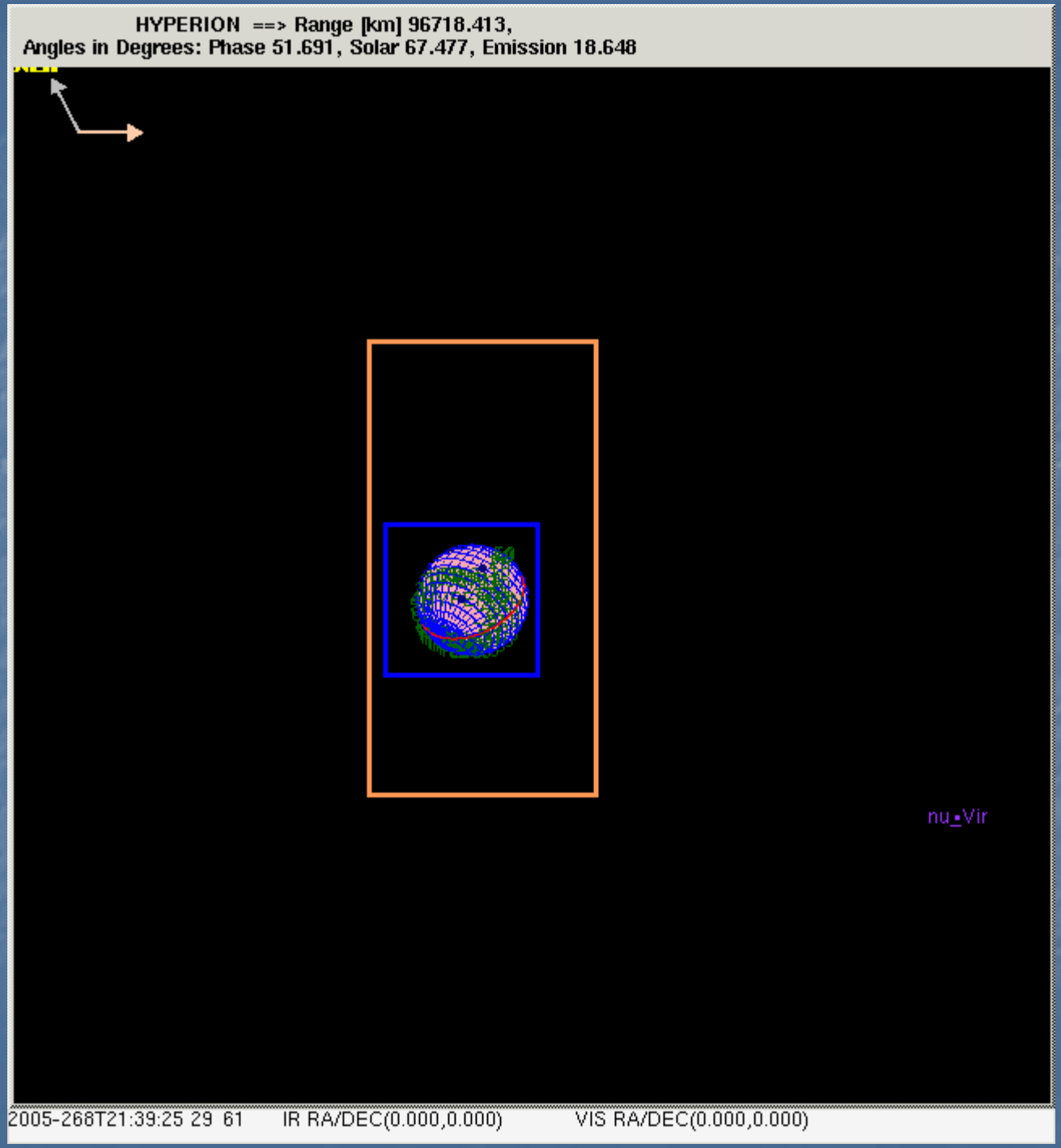

HYPERION ==> Range [km] 111951.666,
Angles in Degrees: Phase 51.753, Solar 67.181, Emission 18.164
nu_Vir
2005-268T20:54:35 63 64 IR RA/DEC(0.000,0.000) VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 96718.413,
Angles in Degrees: Phase 51.691, Solar 67.477, Emission 18.648
nu-Vir
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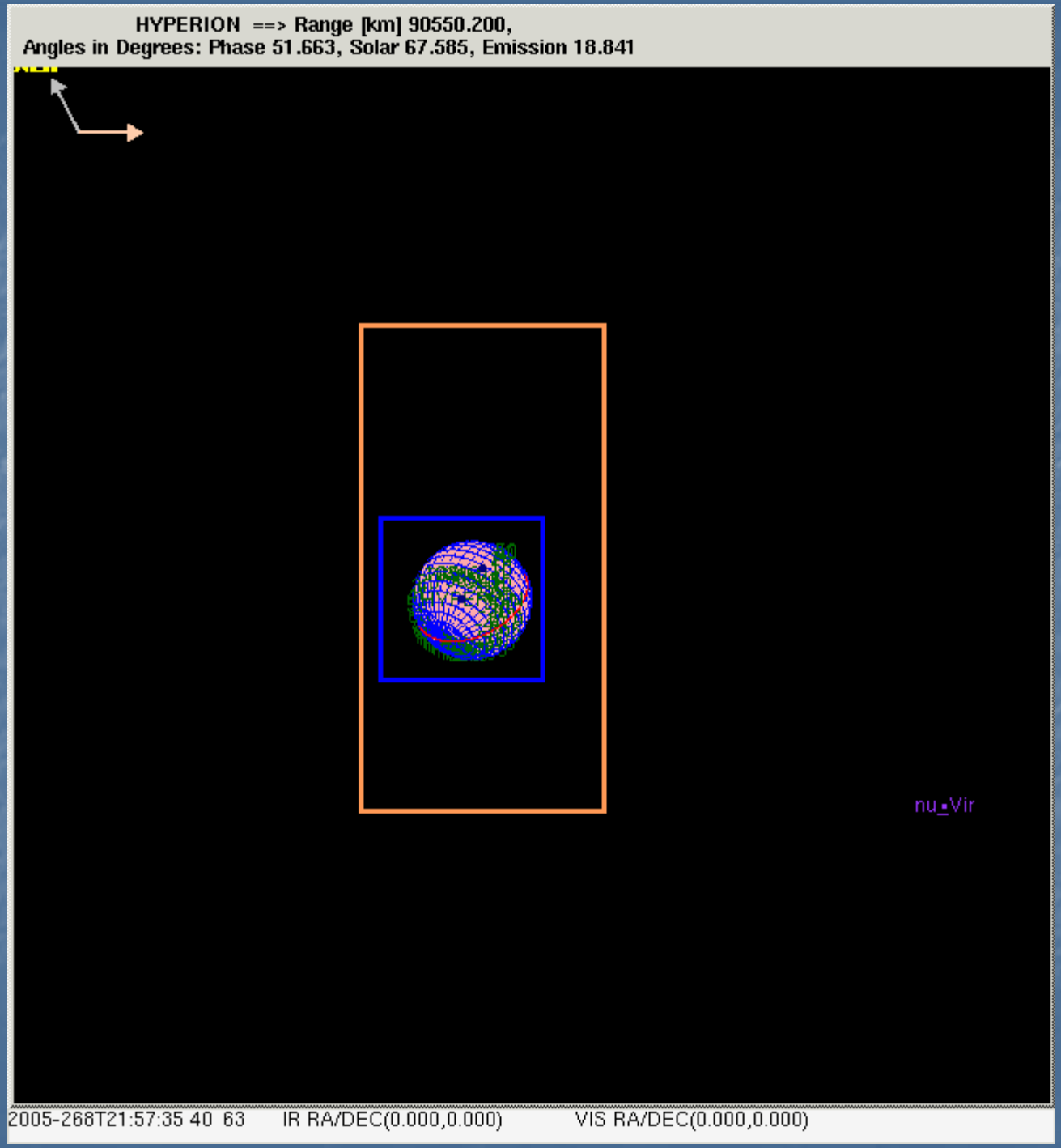
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 90550.200,
Angles in Degrees: Phase 51.663, Solar 67.585, Emission 18.841
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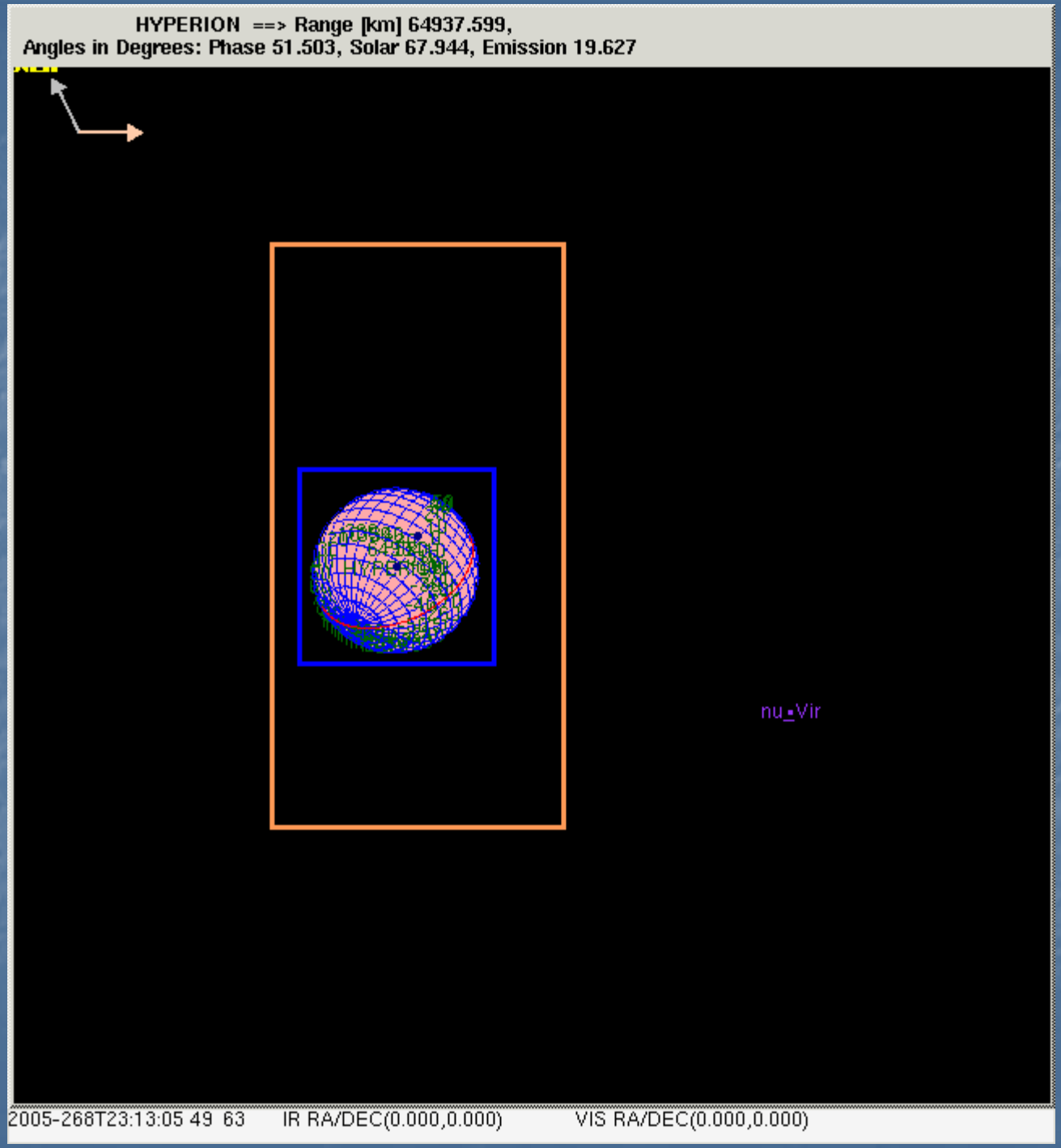
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 64937.599,
Angles in Degrees: Phase 51.503, Solar 67.944, Emission 19.627
nu_Vir
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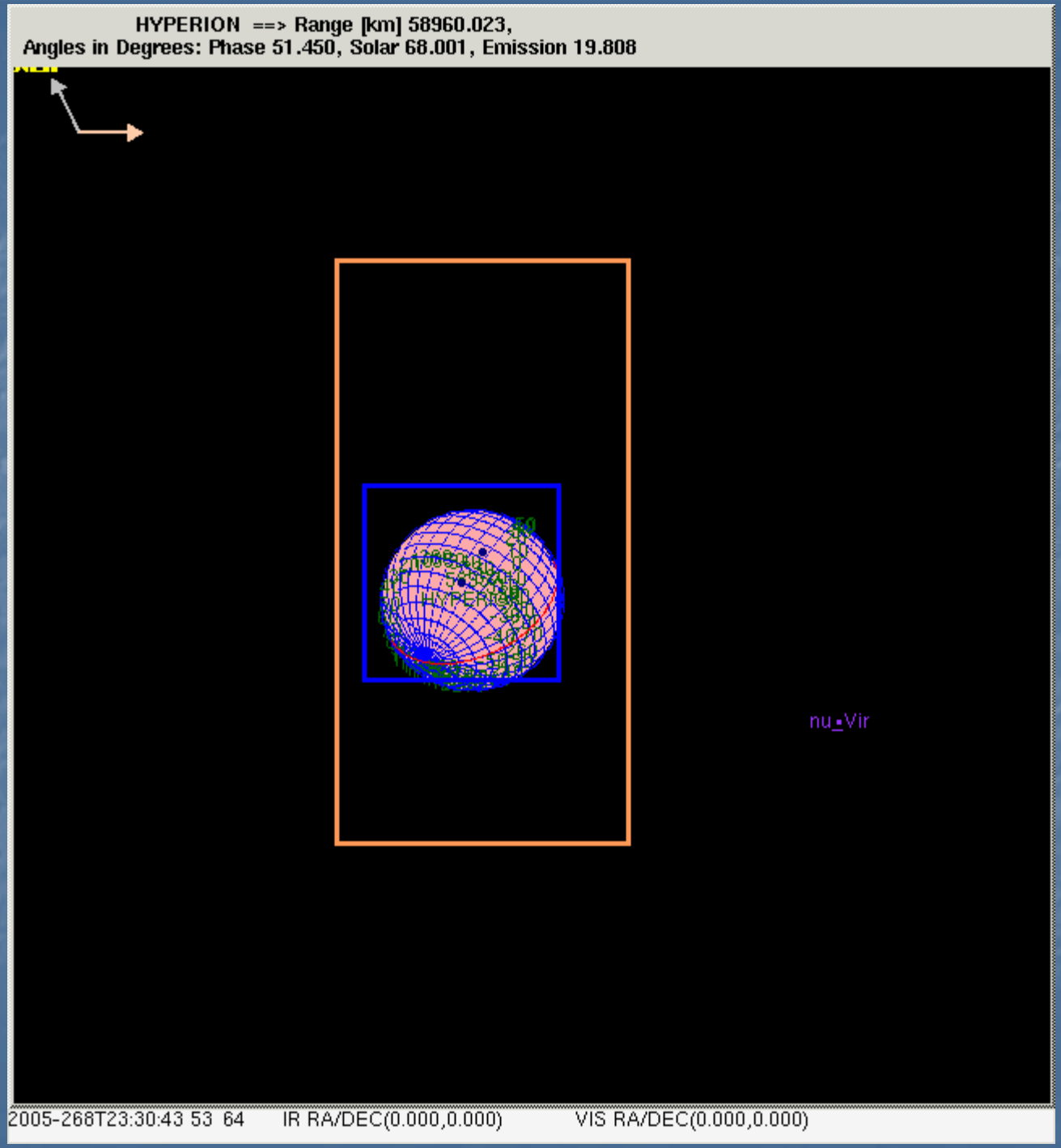
HYPERION ==> Range [km] 58960.023,
Angles in Degrees: Phase 51.450, Solar 68.001, Emission 19.808
nu_Vir
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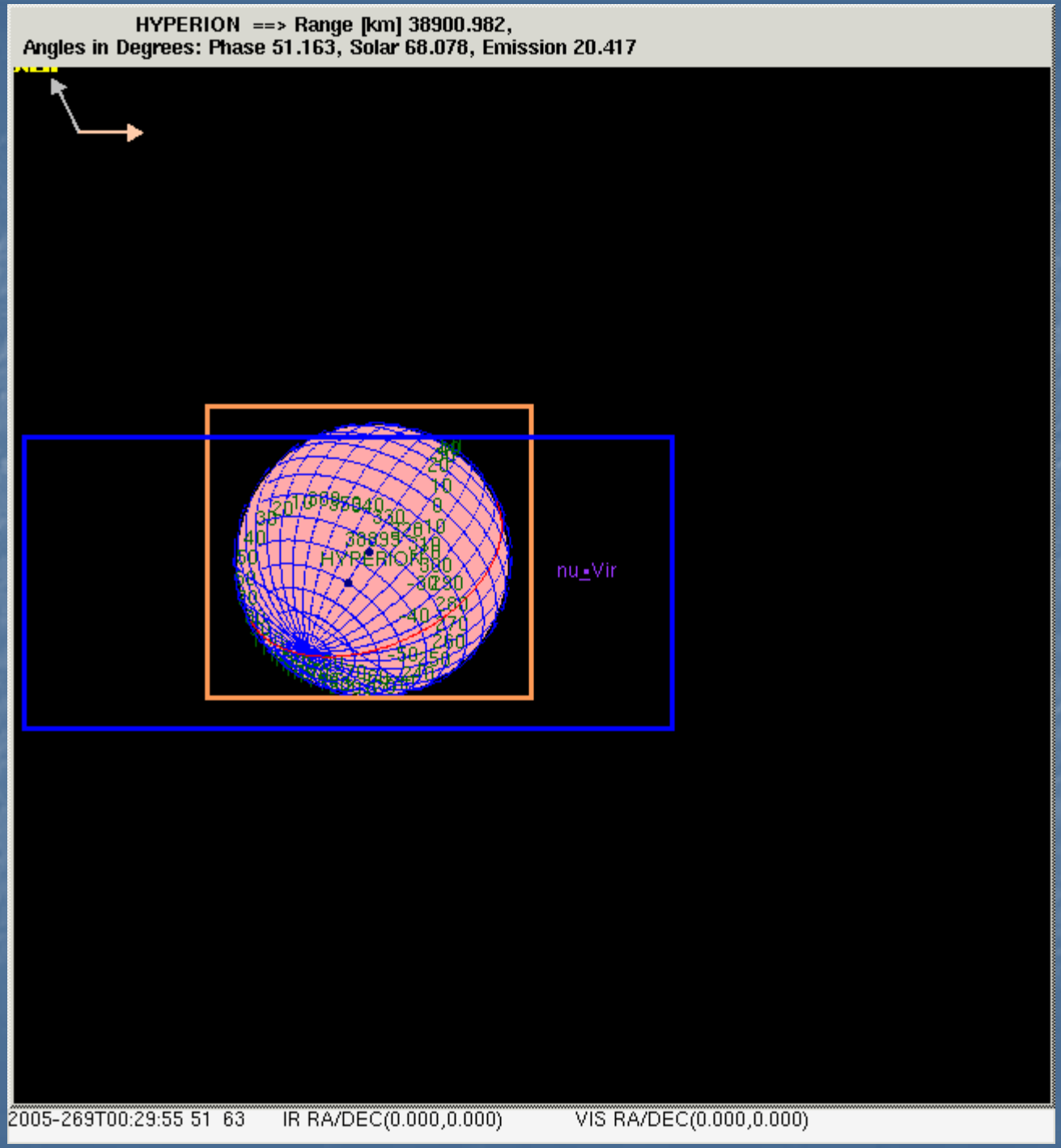
HYPERION ==> Range [km] 38900.982,
Angles in Degrees: Phase 51.163, Solar 68.078, Emission 20.417
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nu_Vir
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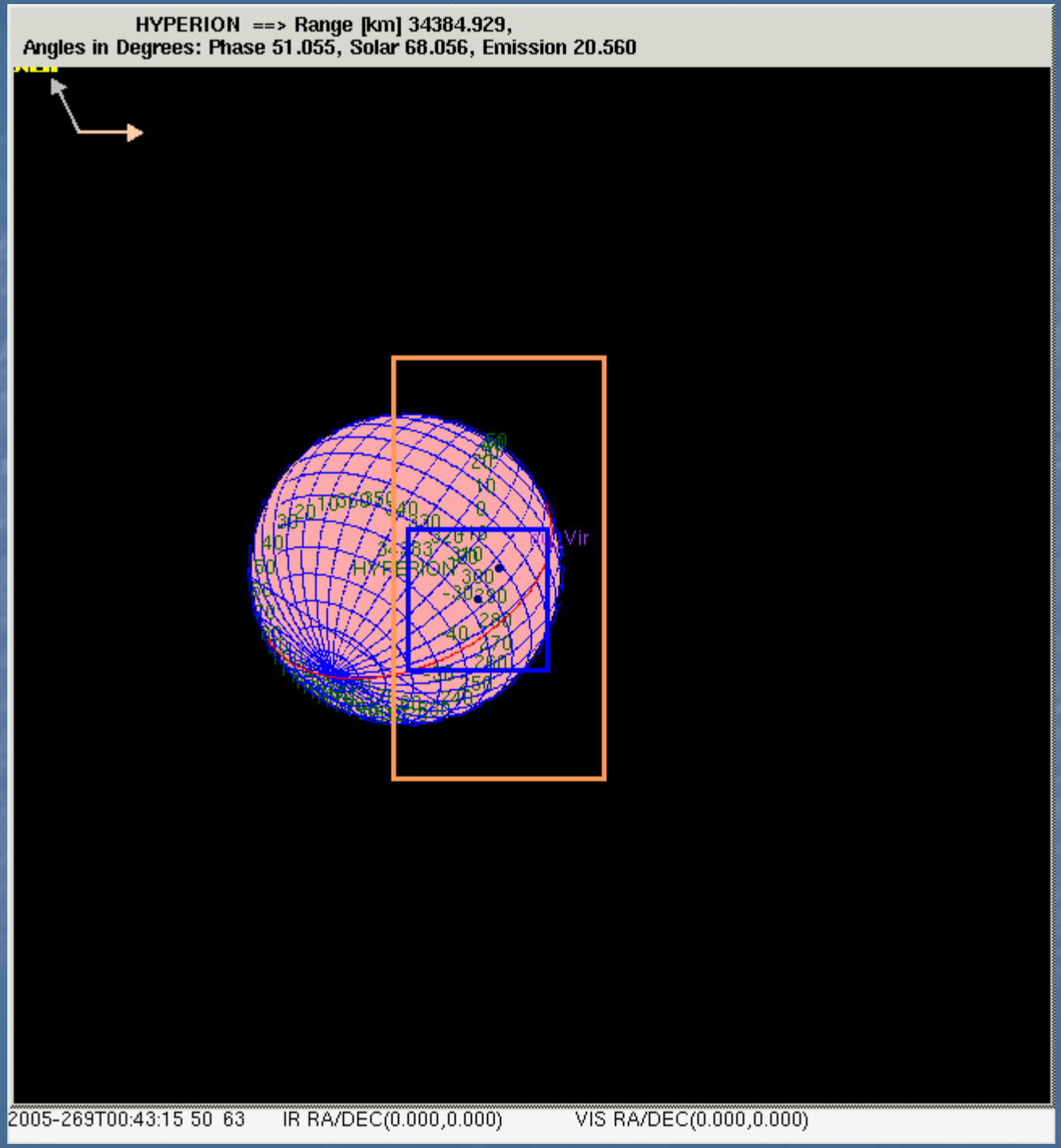
HYPERION ==> Range [km] 34384.929,
Angles in Degrees: Phase 51.055, Solar 68.056, Emission 20.560
HYPERION
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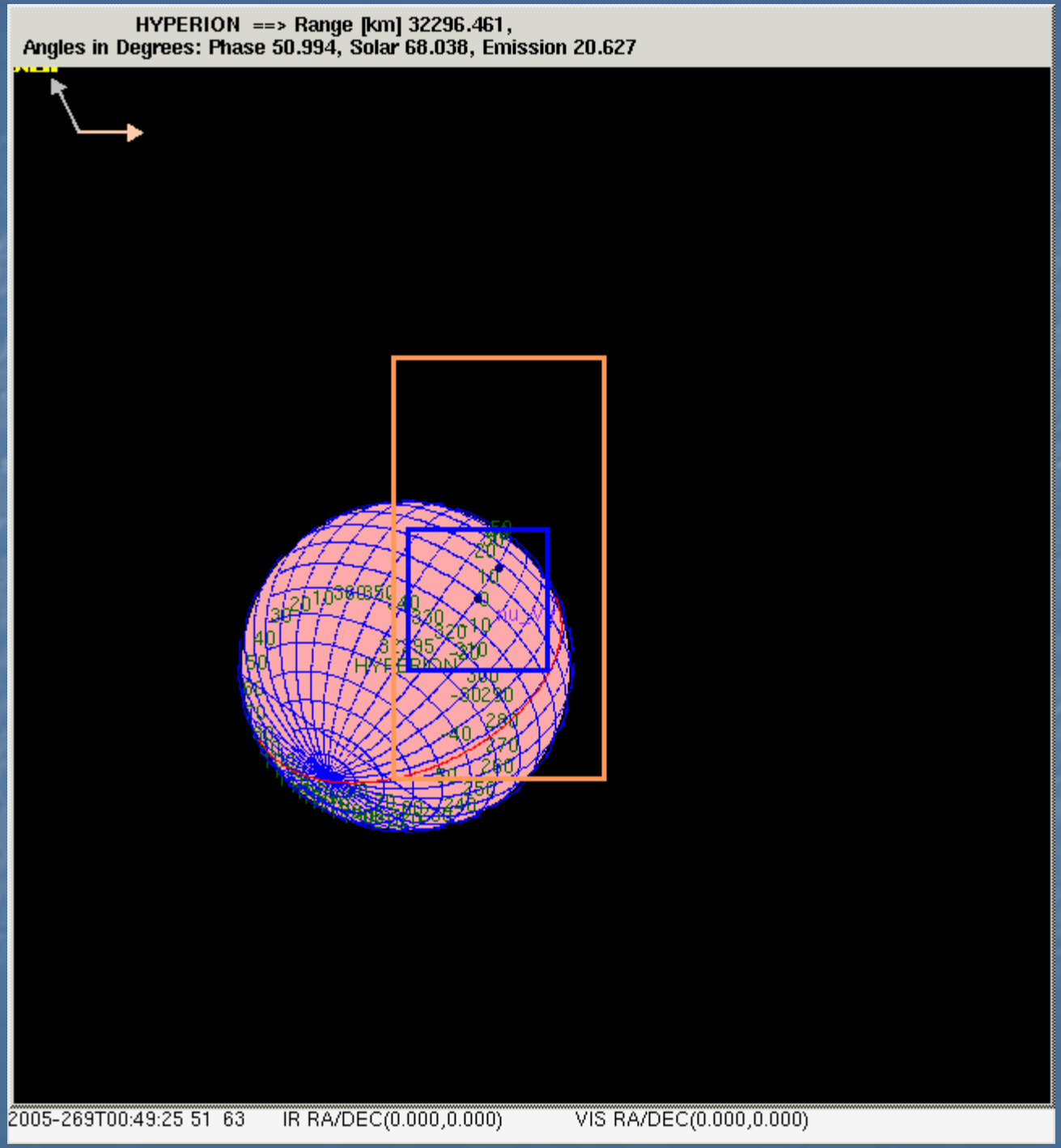
HYPERION ==> Range [km] 32296.461,
Angles in Degrees: Phase 50.994, Solar 68.038, Emission 20.627
2005-269T00:49:25 51 63
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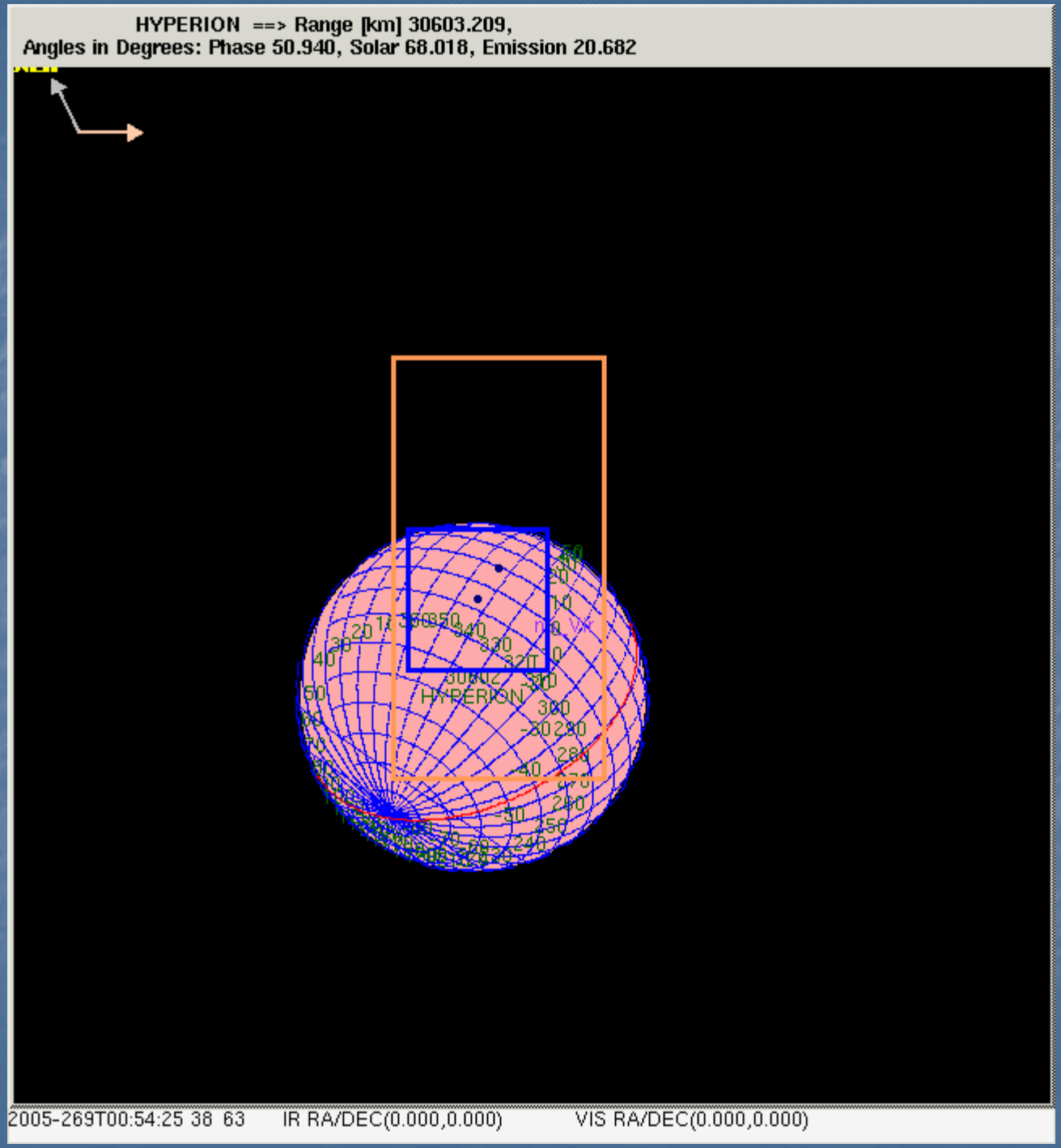
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 30603.209,
Angles in Degrees: Phase 50.940, Solar 68.018, Emission 20.682
HYPERION
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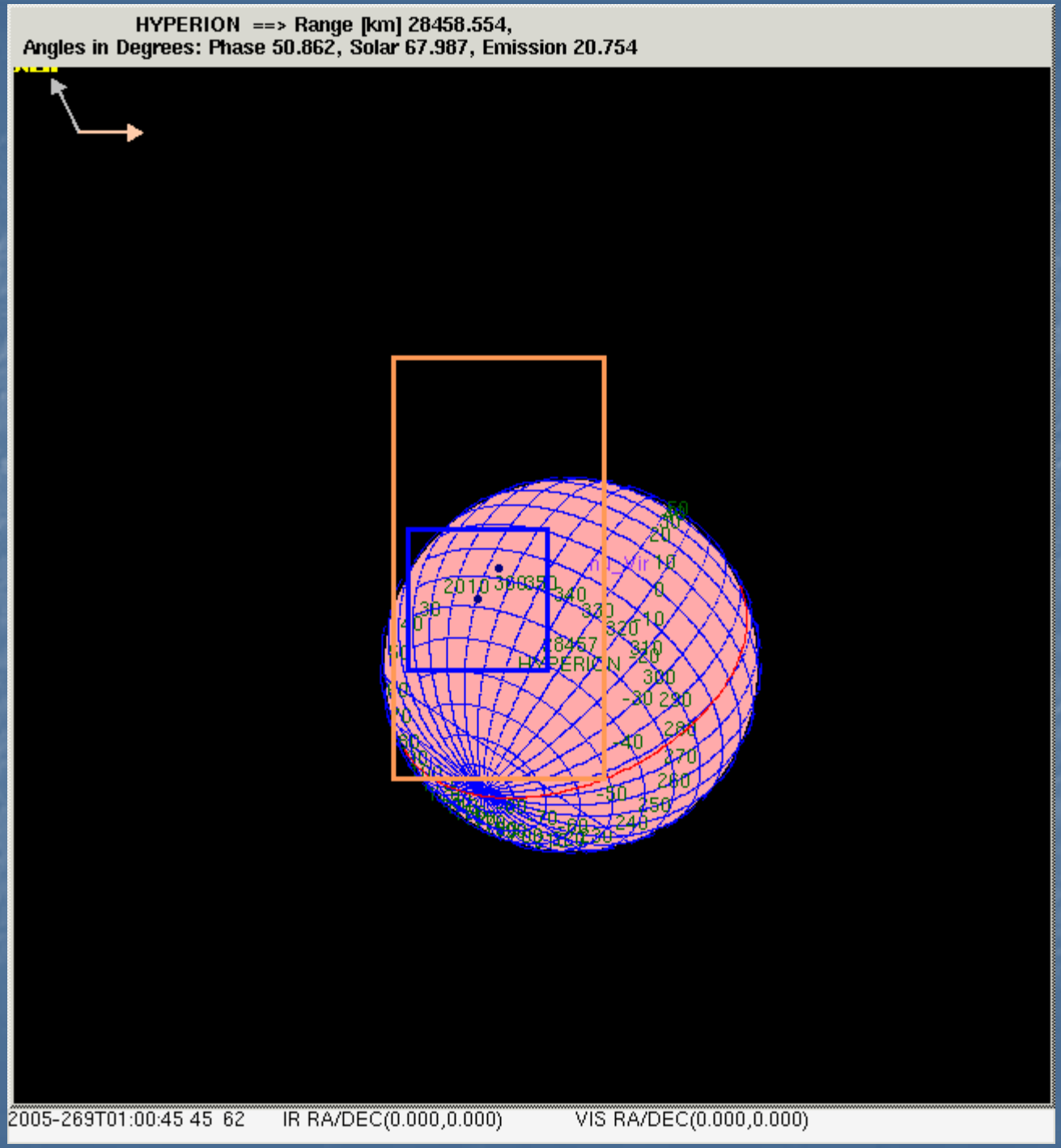
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 28458.554,
Angles in Degrees: Phase 50.862, Solar 67.987, Emission 20.754
2005-269T01:00:45 45 62
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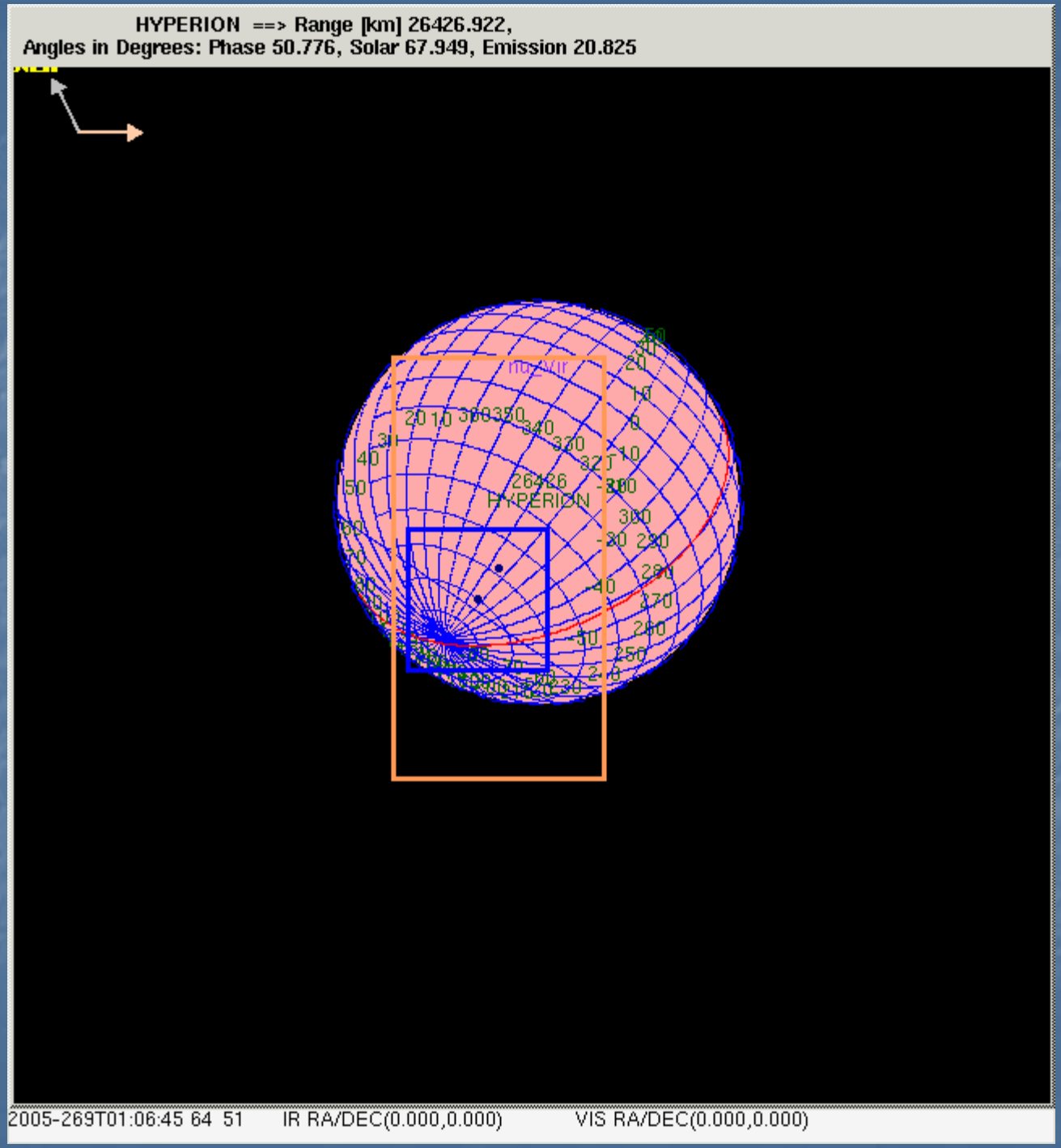
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 26426.922,
Angles in Degrees: Phase 50.776, Solar 67.949, Emission 20.825
26426
HYPERION
2005-269T01:06:45 64 51
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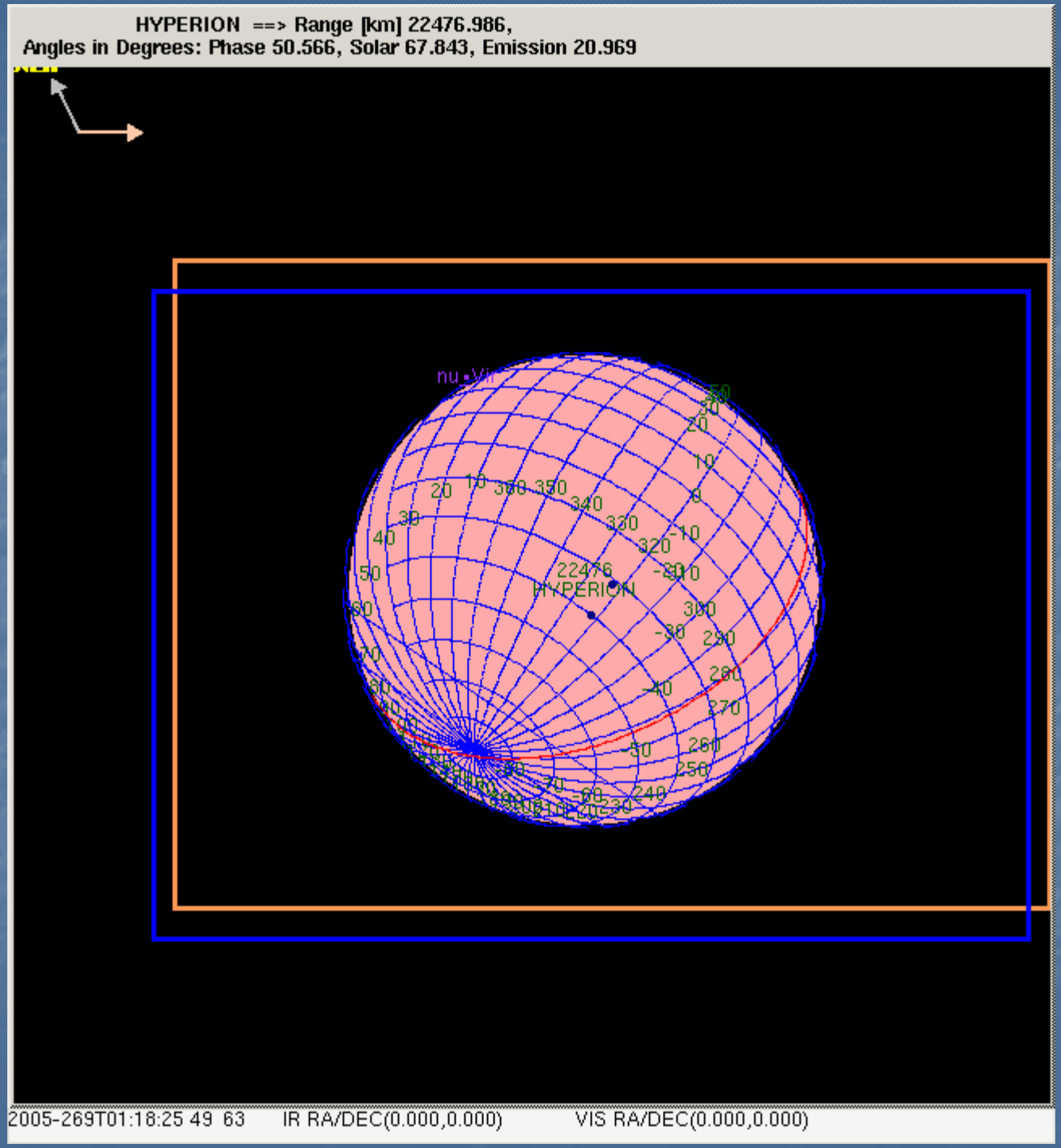
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 22476.986,
Angles in Degrees: Phase 50.566, Solar 67.843, Emission 20.969
nu-Vir
22476
HYPERION
2005-269T01:18:25 49 63
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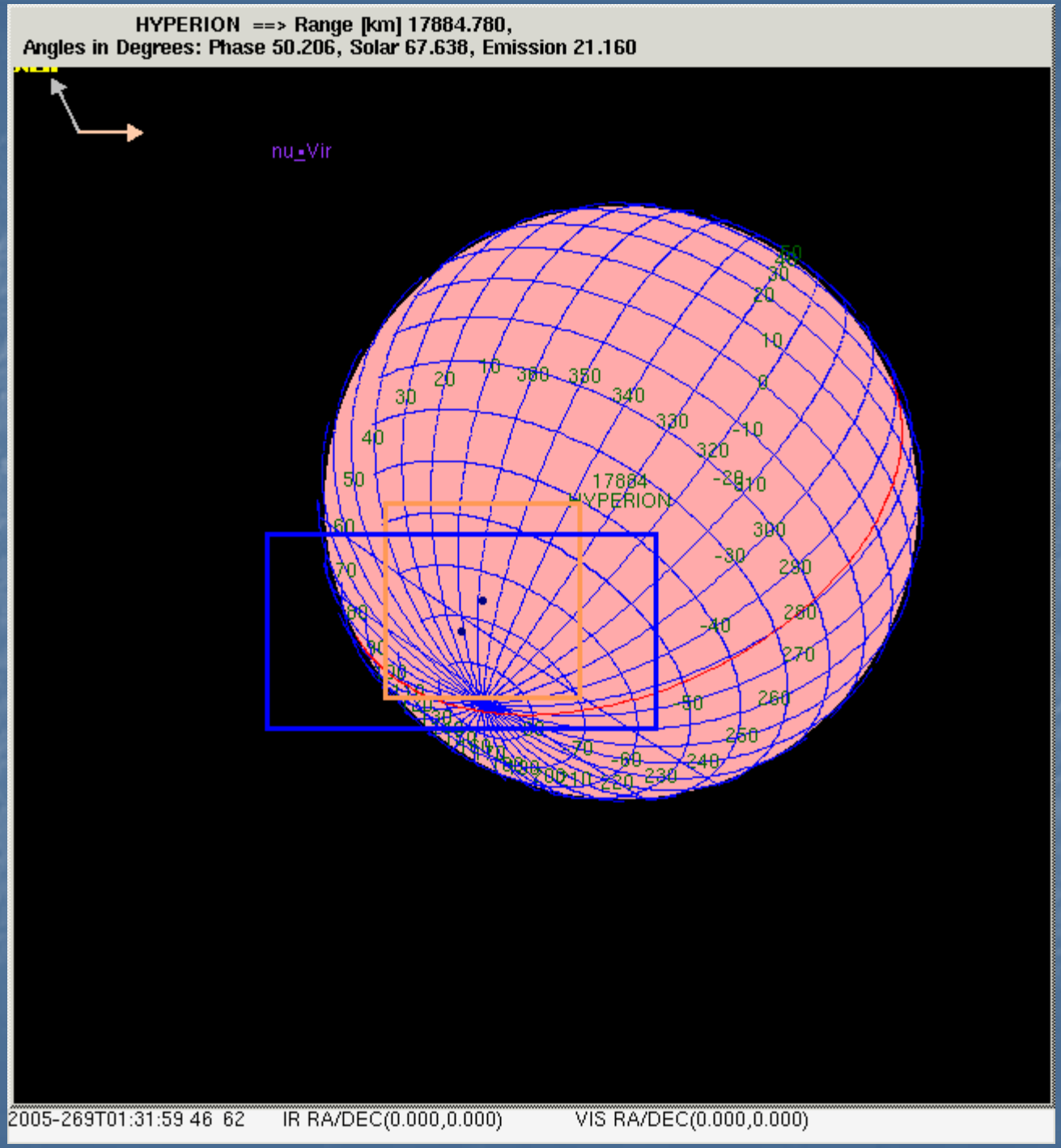
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 17884.780,
Angles in Degrees: Phase 50.206, Solar 67.638, Emission 21.160
nu_Vir
17884
HYPERION
2005-269T01:31:59 46 62
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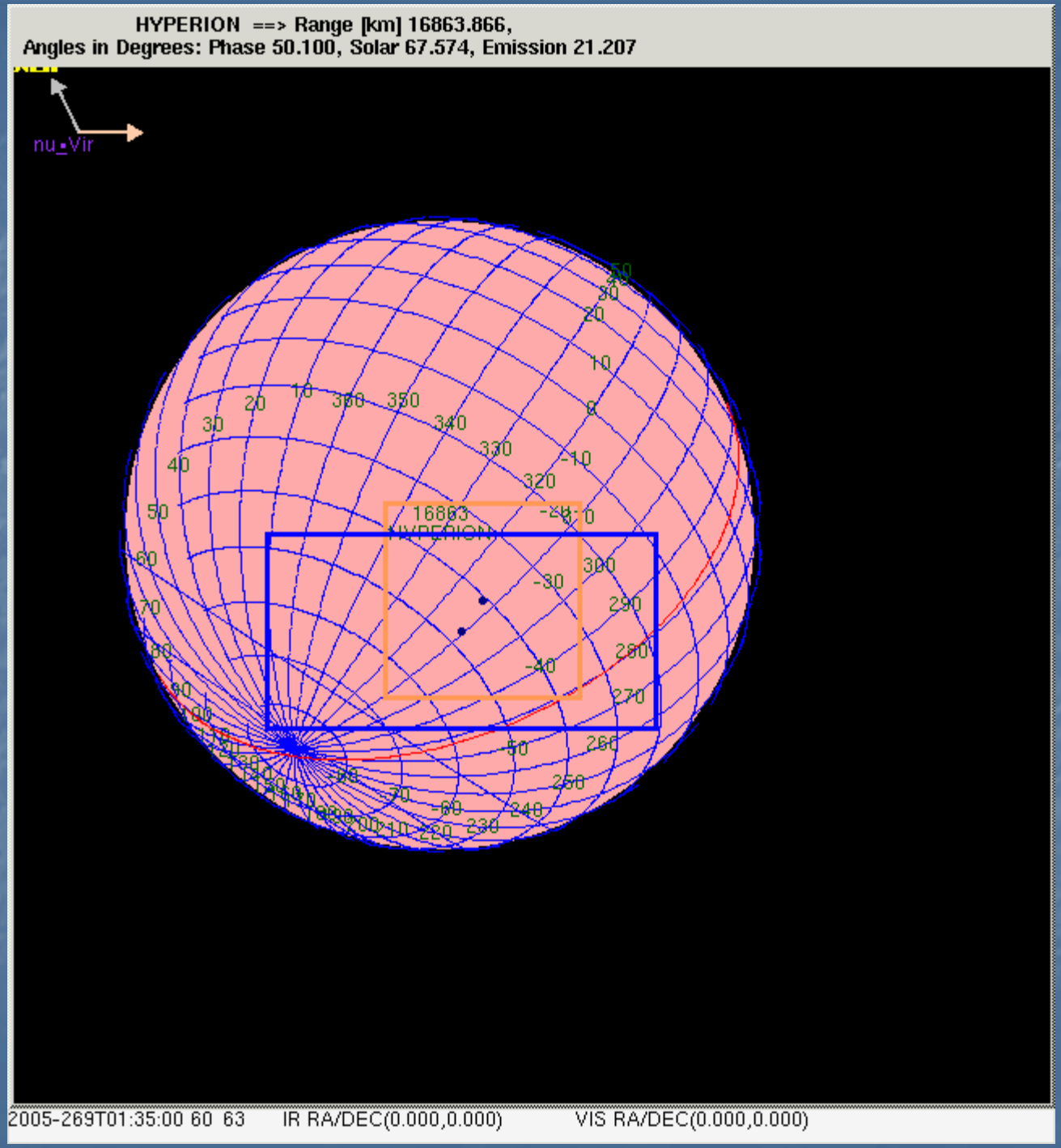
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 16863.866,
Angles in Degrees: Phase 50.100, Solar 67.574, Emission 21.207
nu_Vir
16863
HYPERION
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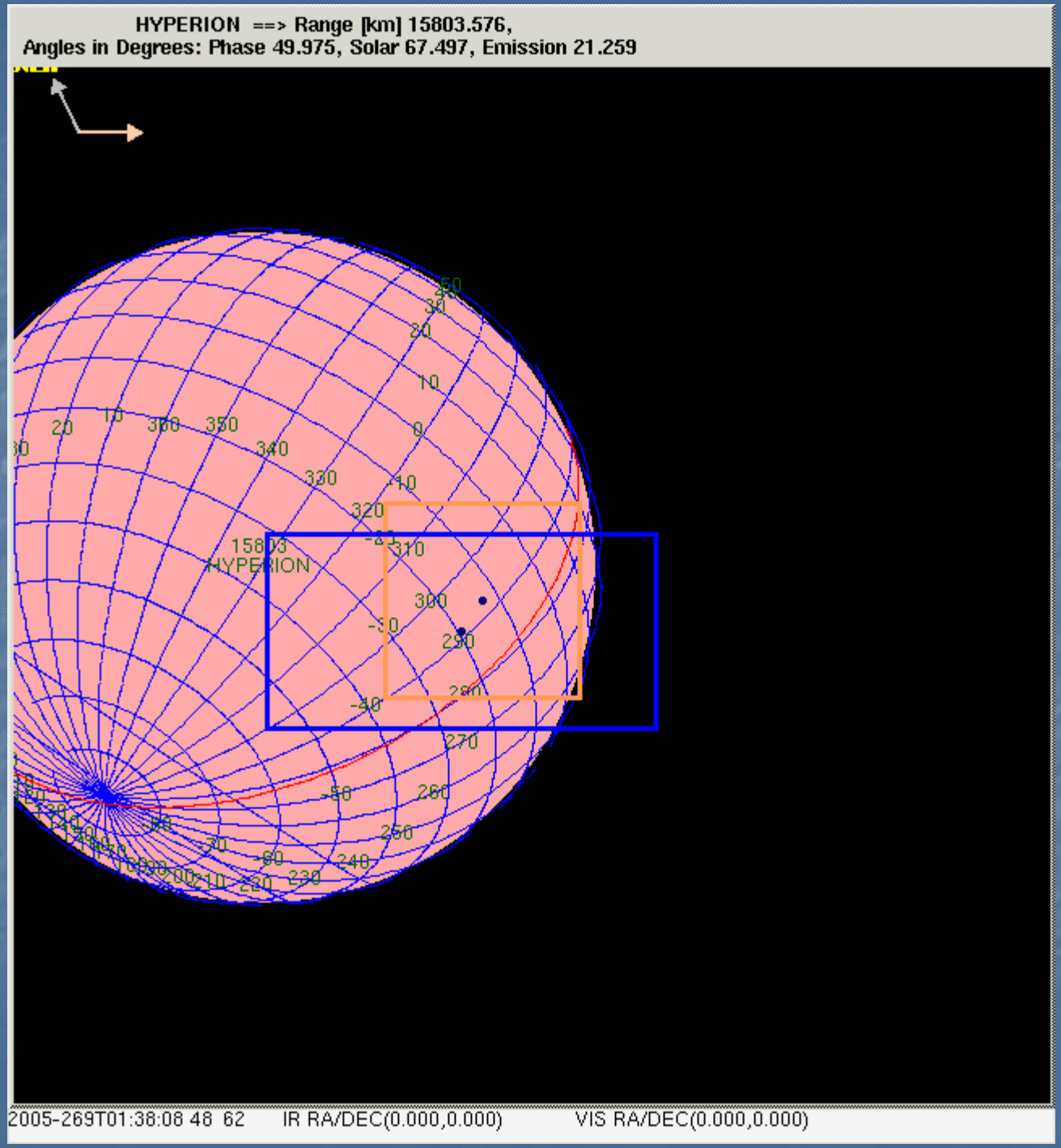
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 15803.576,
Angles in Degrees: Phase 49.975, Solar 67.497, Emission 21.259
15803
HYPERION
2005-269T01:38:08 48 62
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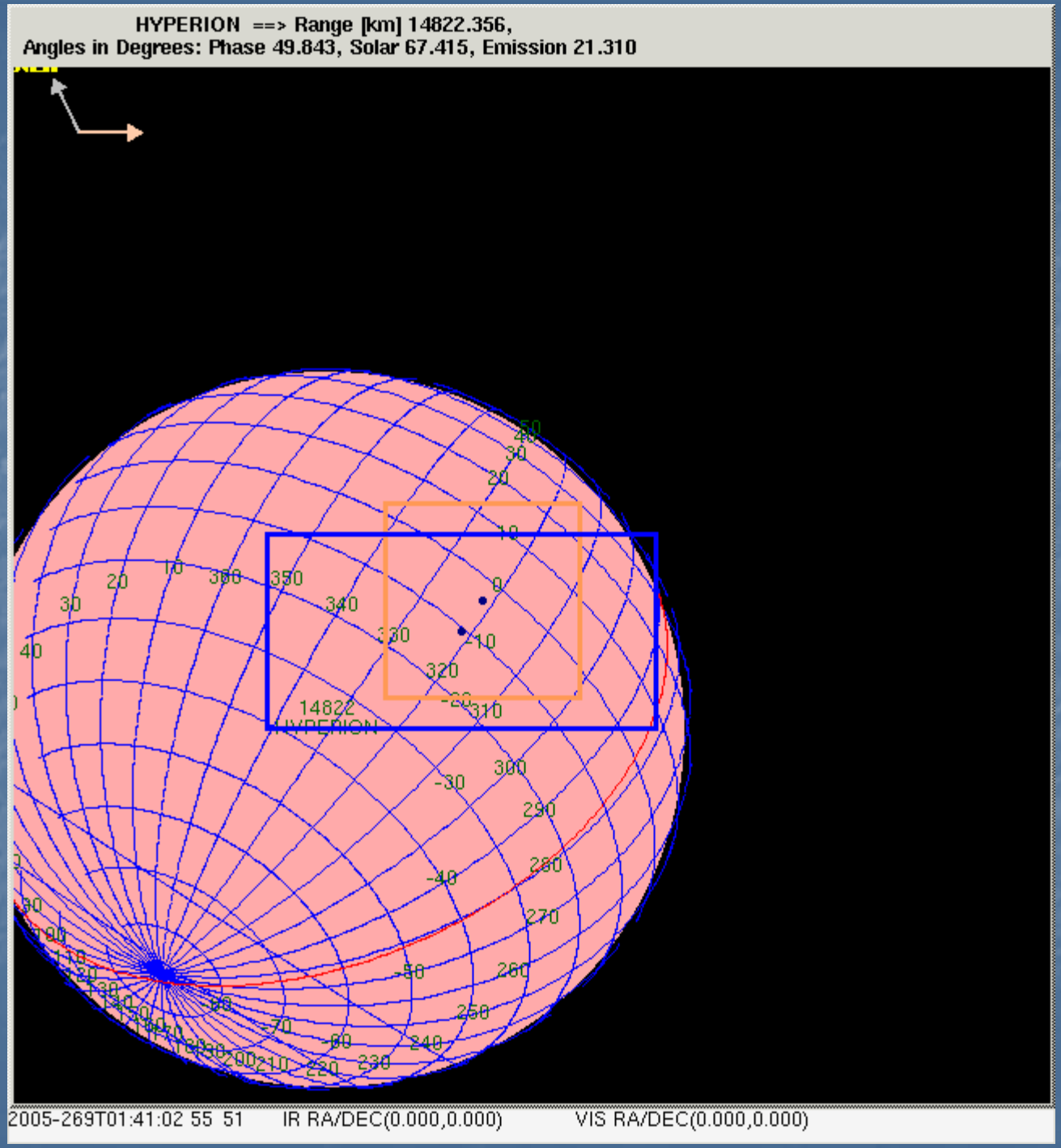
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 14822.356,
Angles in Degrees: Phase 49.843, Solar 67.415, Emission 21.310
14822
HYPERION
2005-269T01:41:02 55 51
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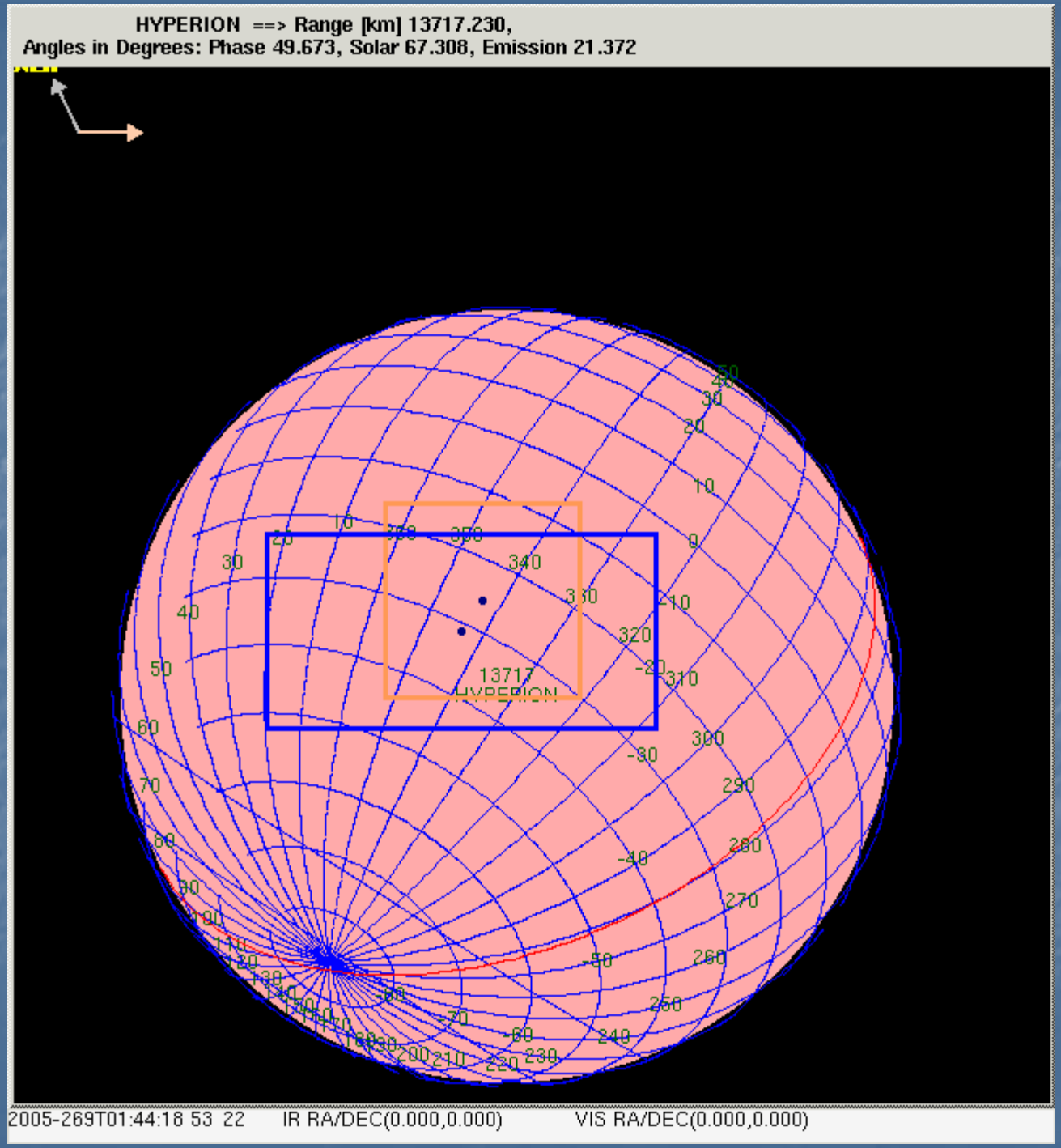
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 13717.230,
Angles in Degrees: Phase 49.673, Solar 67.308, Emission 21.372
13717
HYPERION
2005-269T01:44:18 53 22
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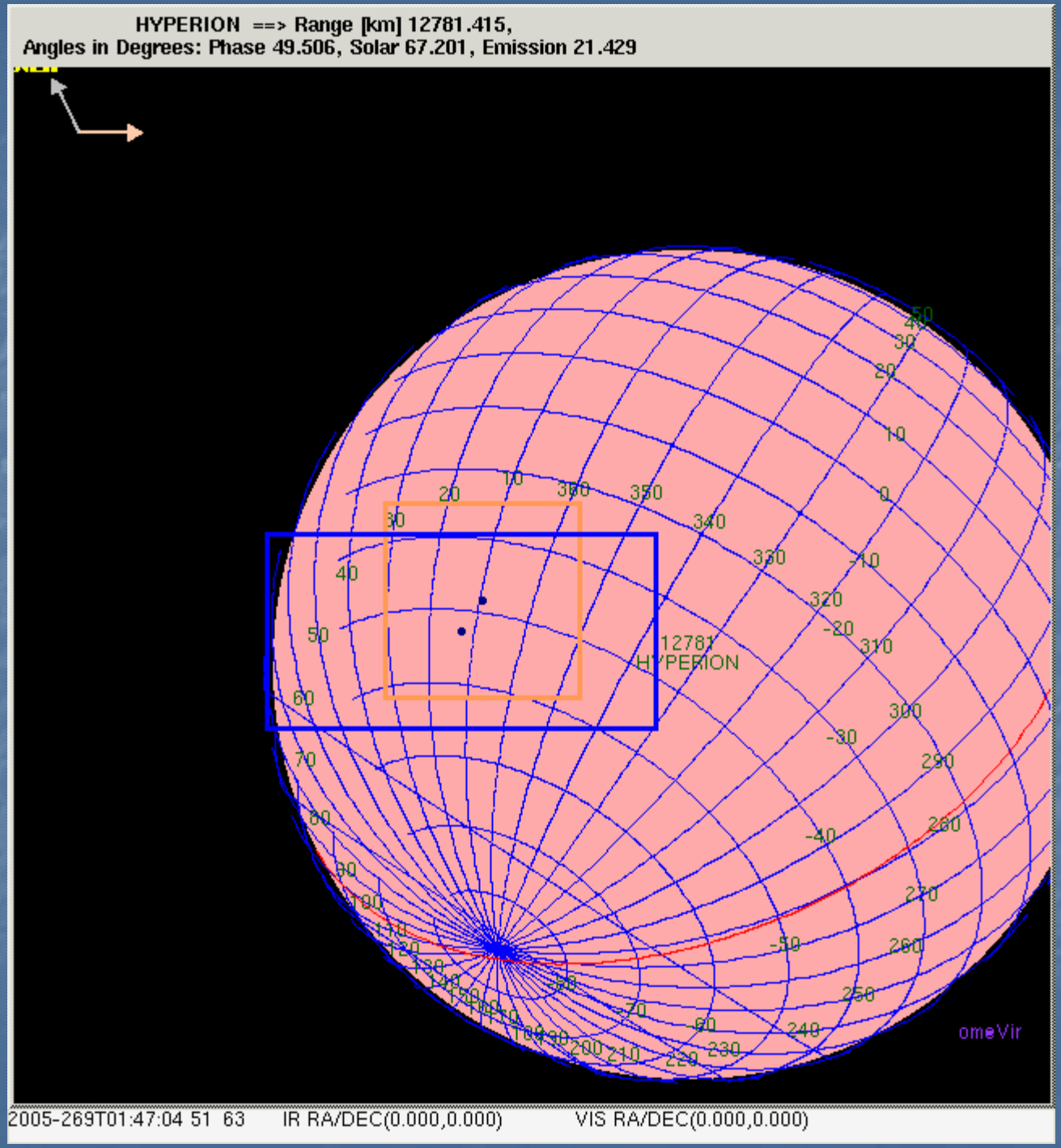
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 12781.415,
Angles in Degrees: Phase 49.506, Solar 67.201, Emission 21.429
12781
HYPERION
omeVir
2005-269T01:47:04 51 63
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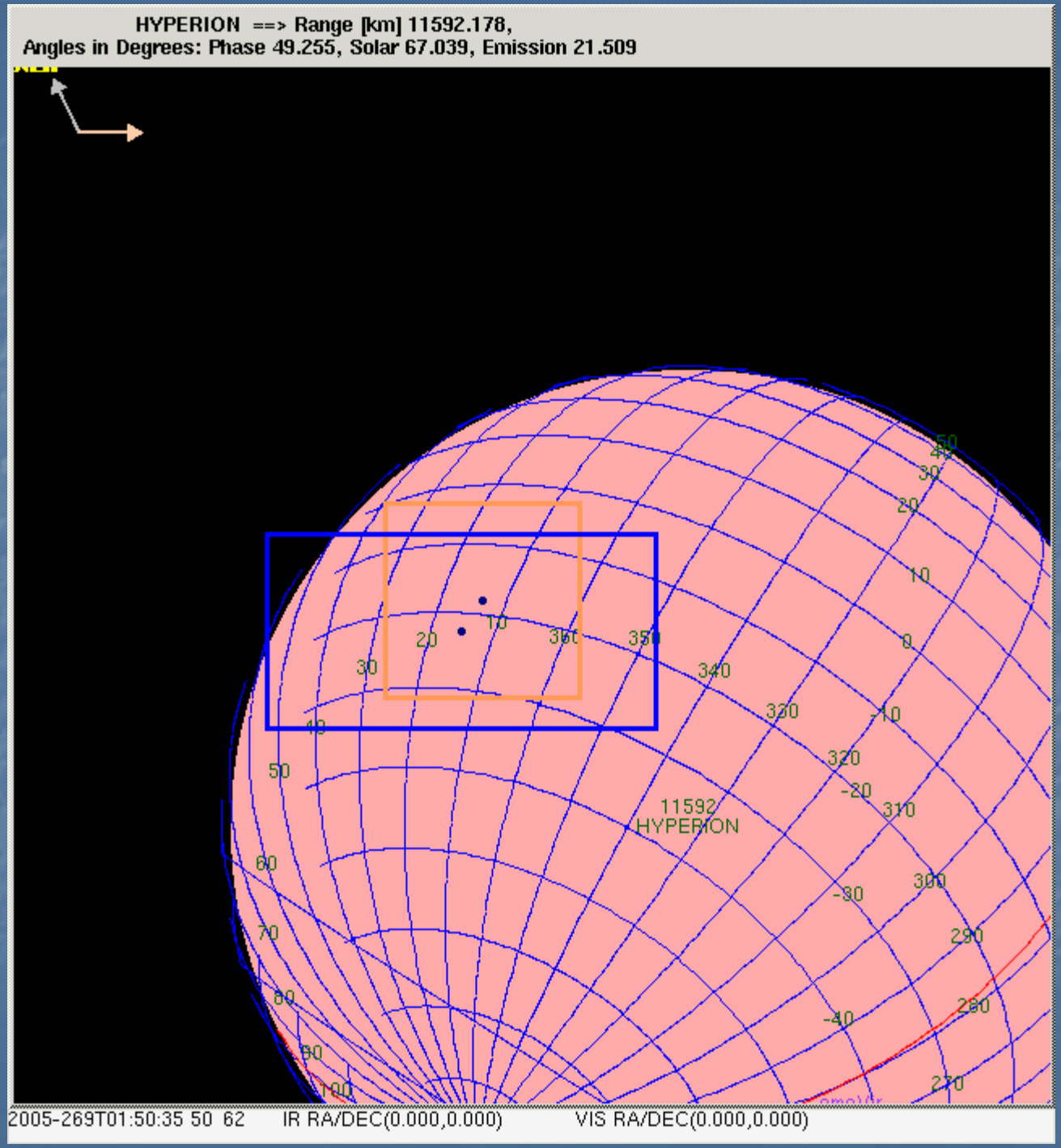
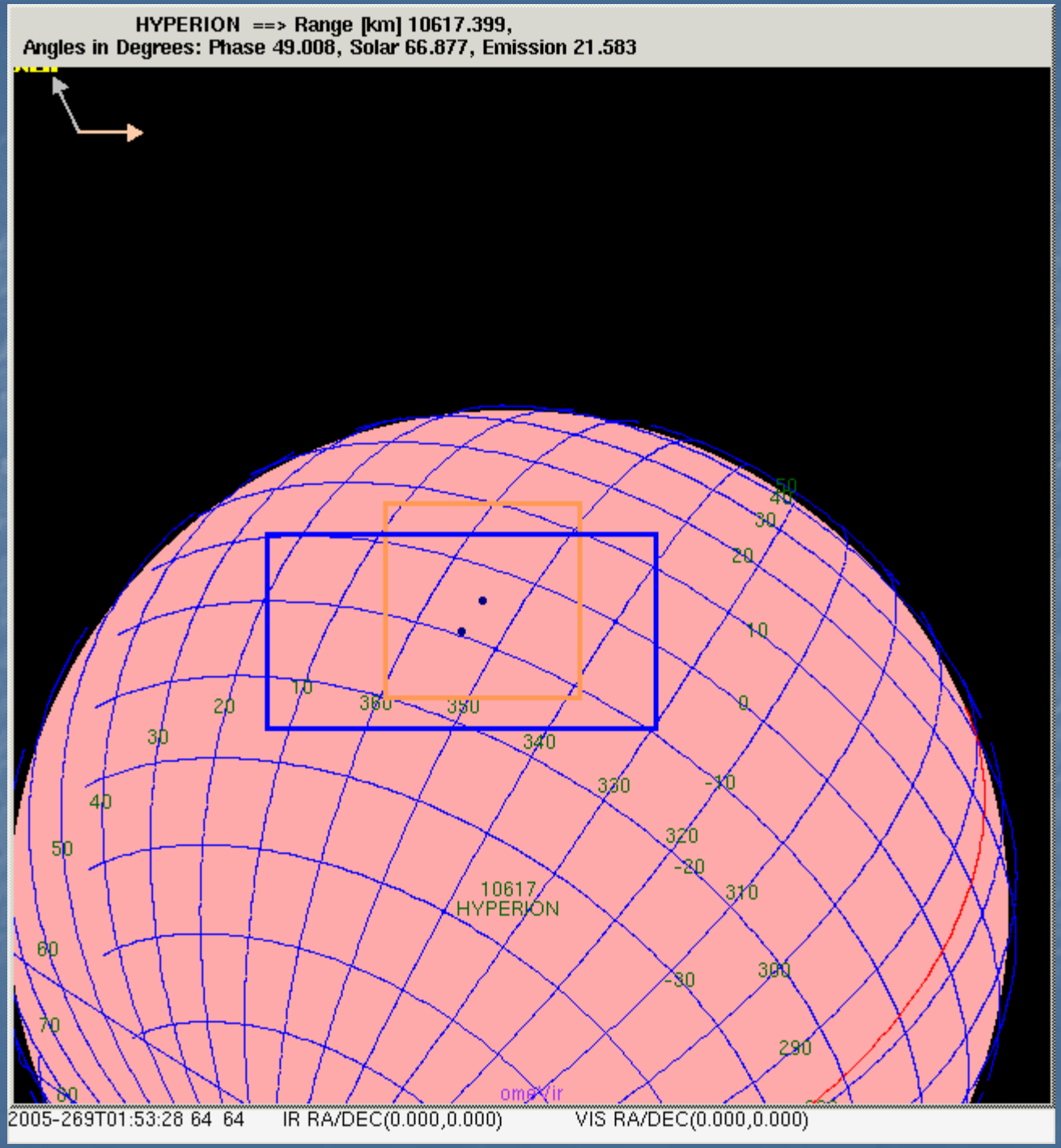
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 11592.178,
Angles in Degrees: Phase 49.255, Solar 67.039, Emission 21.509
11592
HYPERION
2005-269T01:50:35 50 62
IR RA/DEC(0.000,0.000)
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 10617.399,
Angles in Degrees: Phase 49.008, Solar 66.877, Emission 21.583
10617
HYPERION
omnivir
2005-269T01:53:28 64 64
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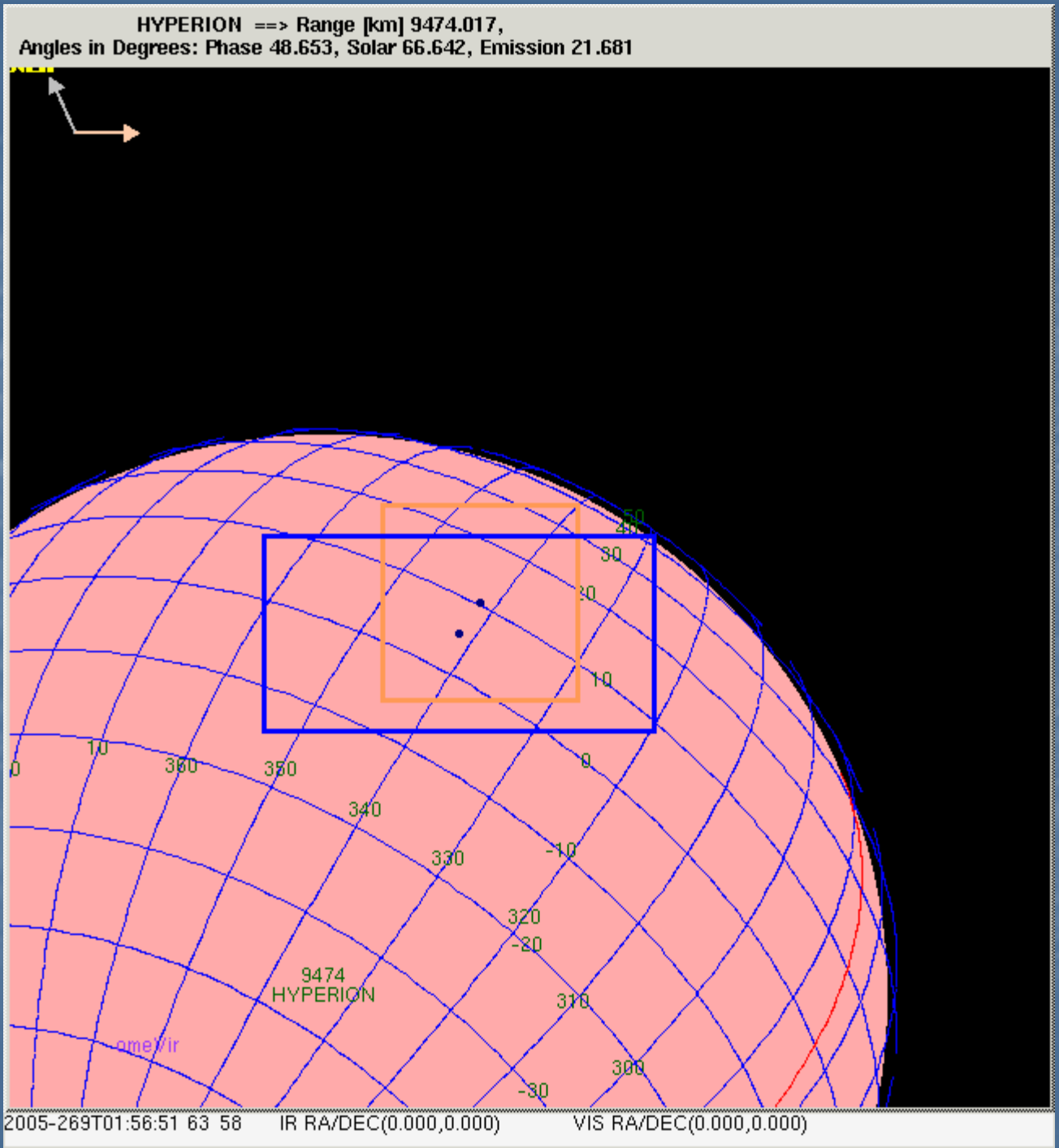
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 9474.017,
Angles in Degrees: Phase 48.653, Solar 66.642, Emission 21.681
50
40
30
20
10
0
-10
-20
-30
10
0
360
350
340
330
320
310
300
9474
HYPERION
omeVir
2005-269T01:56:51 63 58
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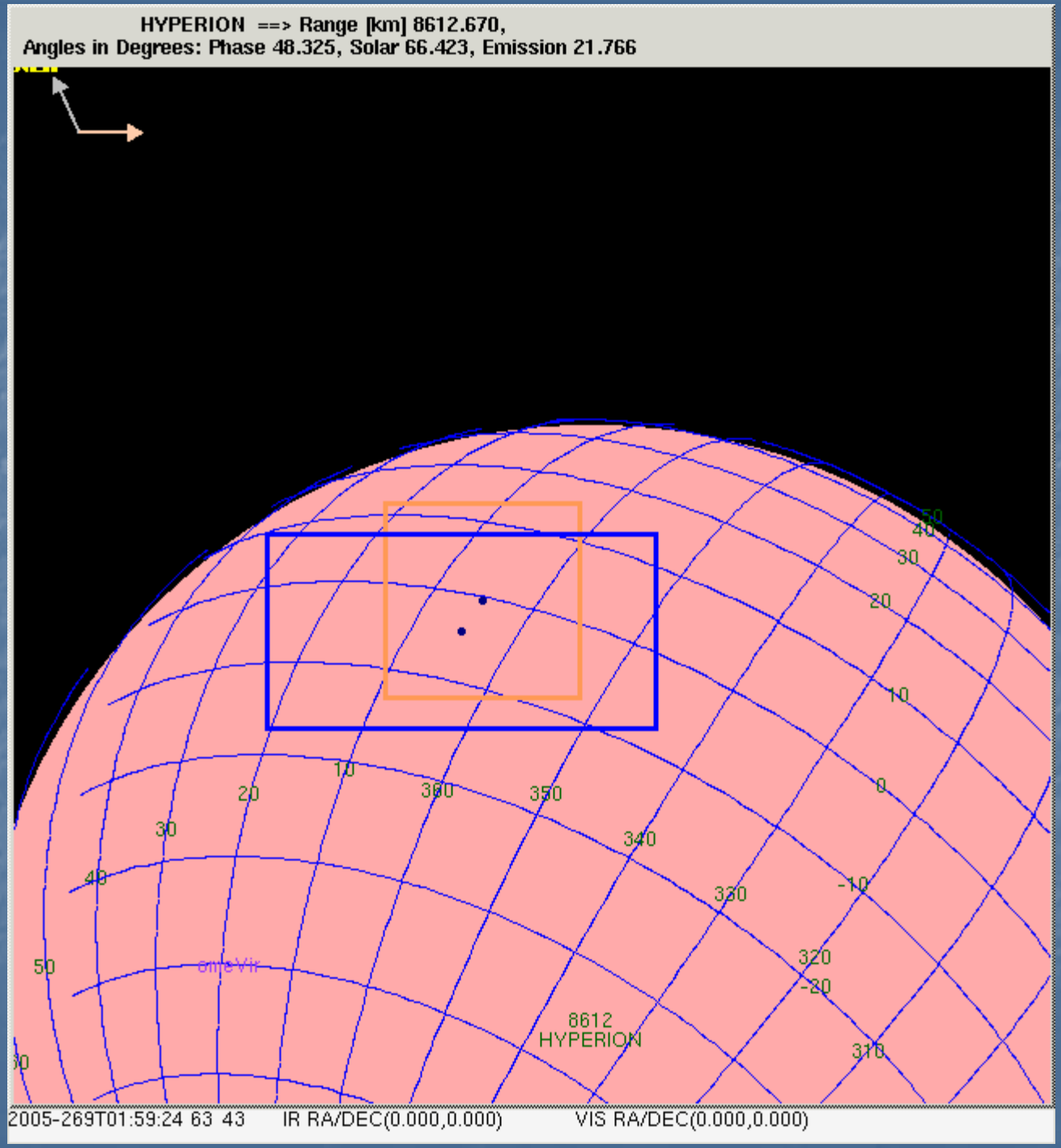
HYPERION ==> Range [km] 8612.670,
Angles in Degrees: Phase 48.325, Solar 66.423, Emission 21.766
8612
HYPERION
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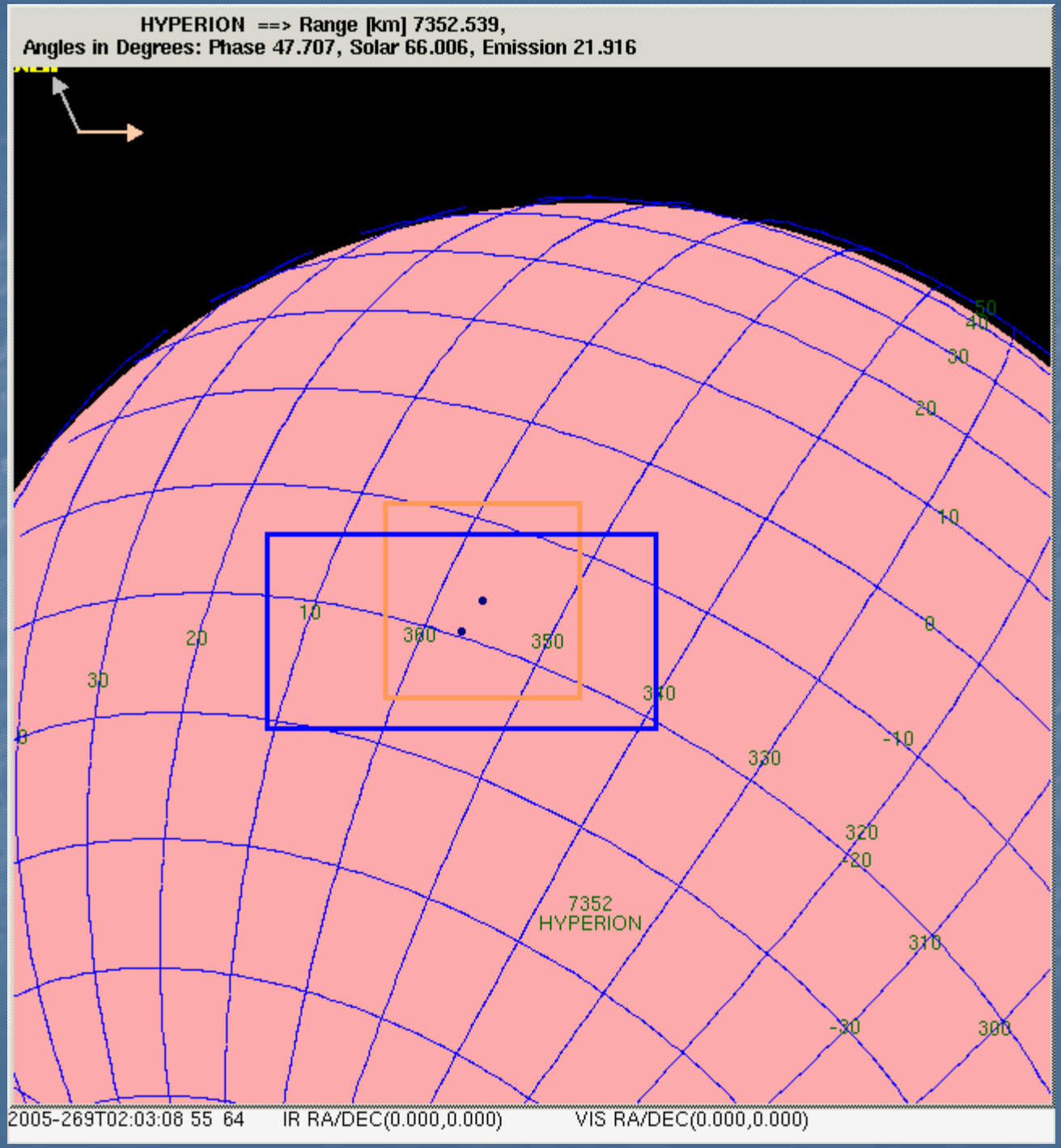
HYPERION ==> Range [km] 7352.539,
Angles in Degrees: Phase 47.707, Solar 66.006, Emission 21.916
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HYPERION
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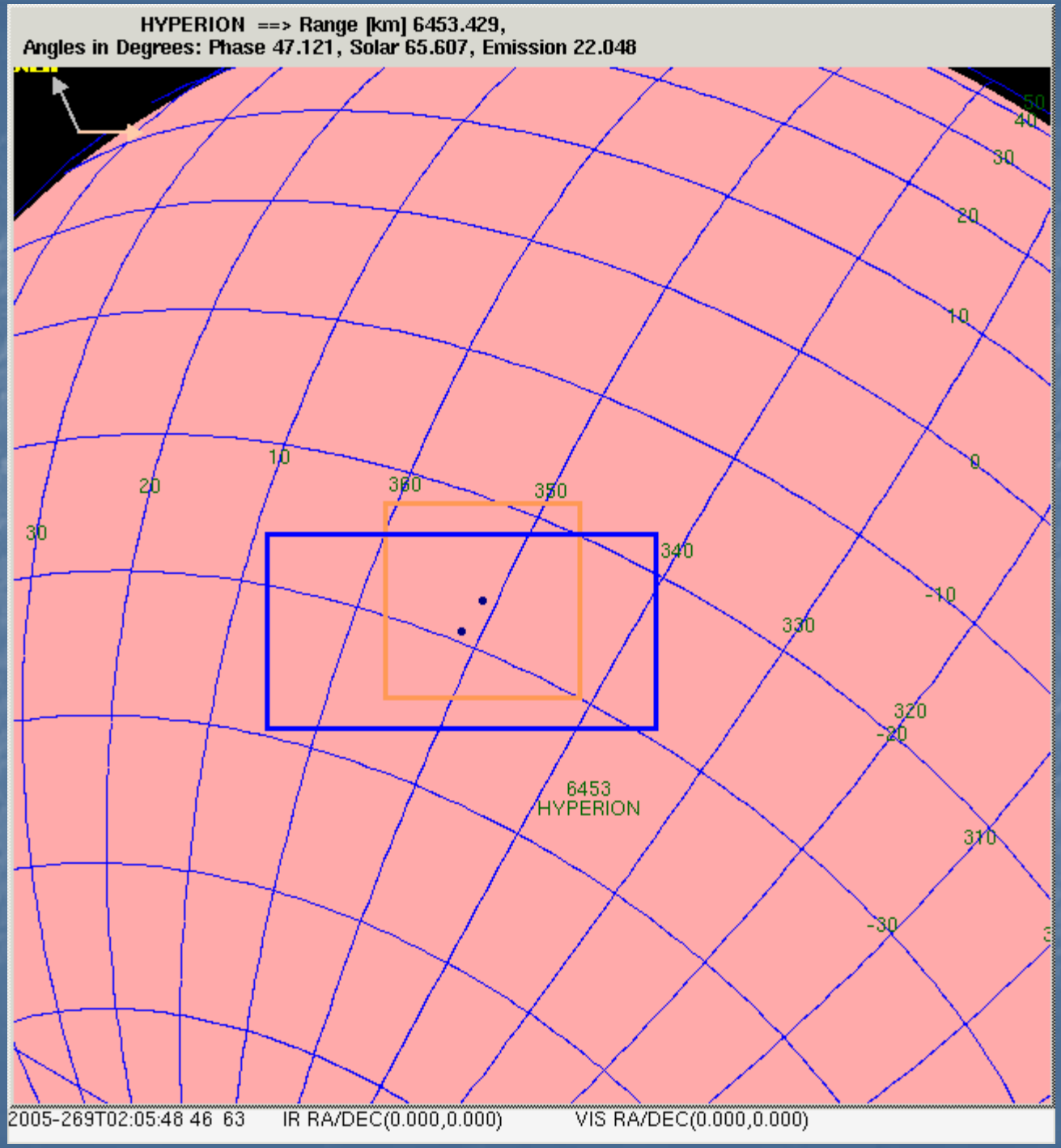
HYPERION ==> Range [km] 6453.429,
Angles in Degrees: Phase 47.121, Solar 65.607, Emission 22.048
50
40
30
20
10
0
-10
-20
-30
10
20
30
360
350
340
330
320
310
6453
HYPERION
2005-269T02:05:48 46 63
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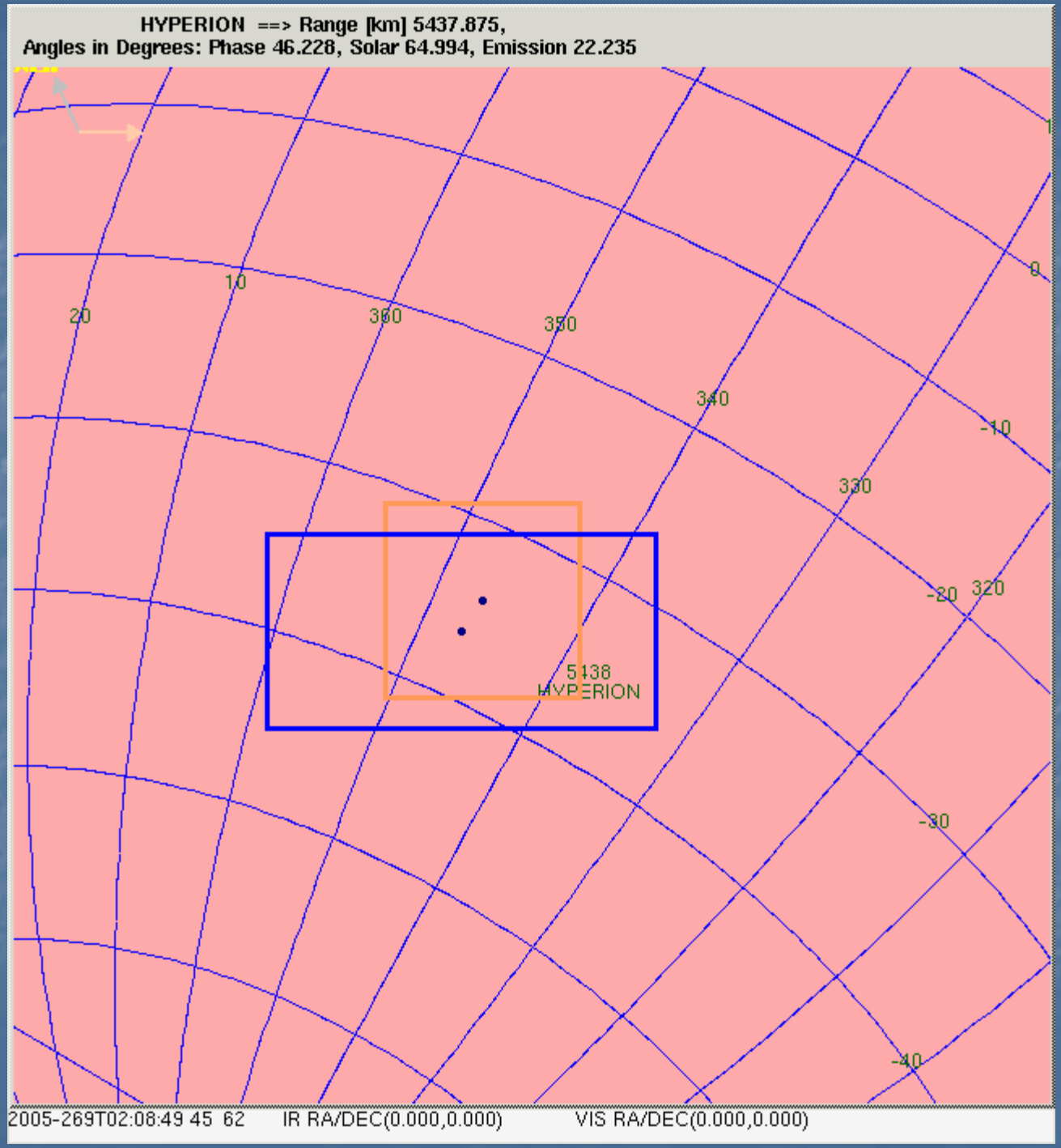
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 5437.875,
Angles in Degrees: Phase 46.228, Solar 64.994, Emission 22.235
20
10
360
350
340
330
320
0
-10
-20
-30
-40
5138
HYPERION
2005-269T02:08:49 45 62
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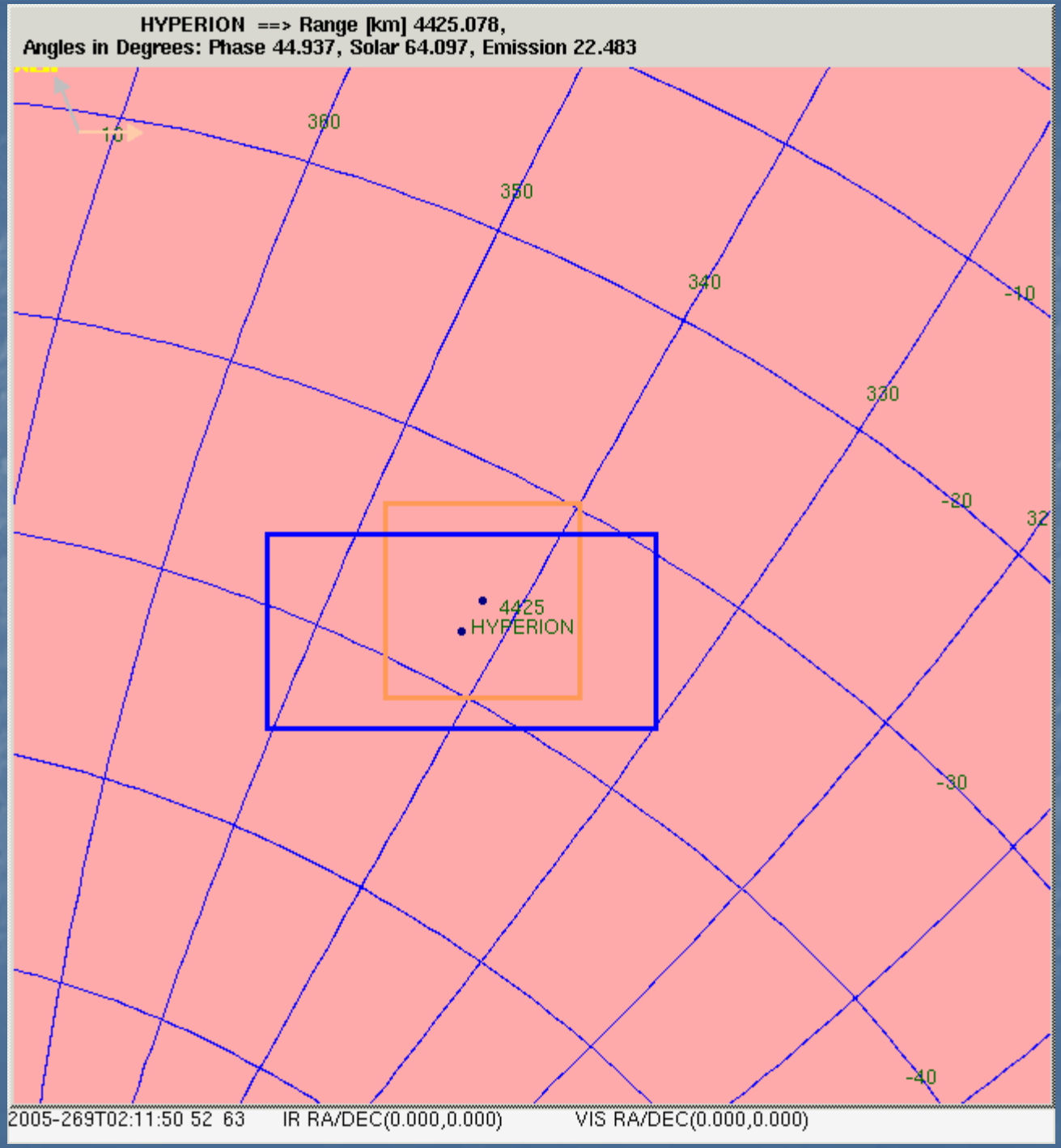
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 4425.078,
Angles in Degrees: Phase 44.937, Solar 64.097, Emission 22.483
360
350
340
330
-10
-20
32
-30
-40
4425
HYPERION
2005-269T02:11:50 52 63
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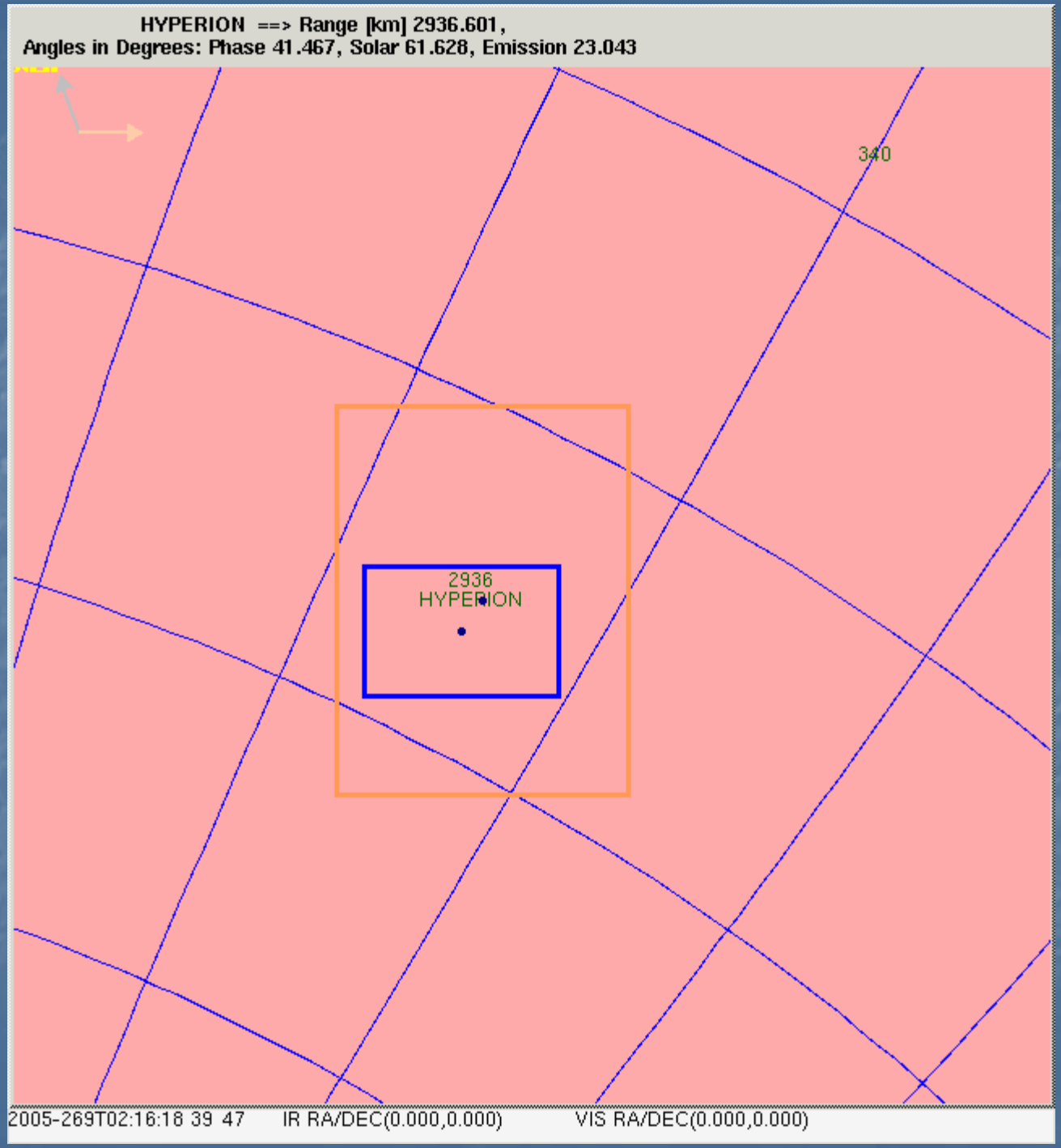
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 2936.601,
Angles in Degrees: Phase 41.467, Solar 61.628, Emission 23.043
340
2936
HYPERION
2005-269T02:16:18 39 47
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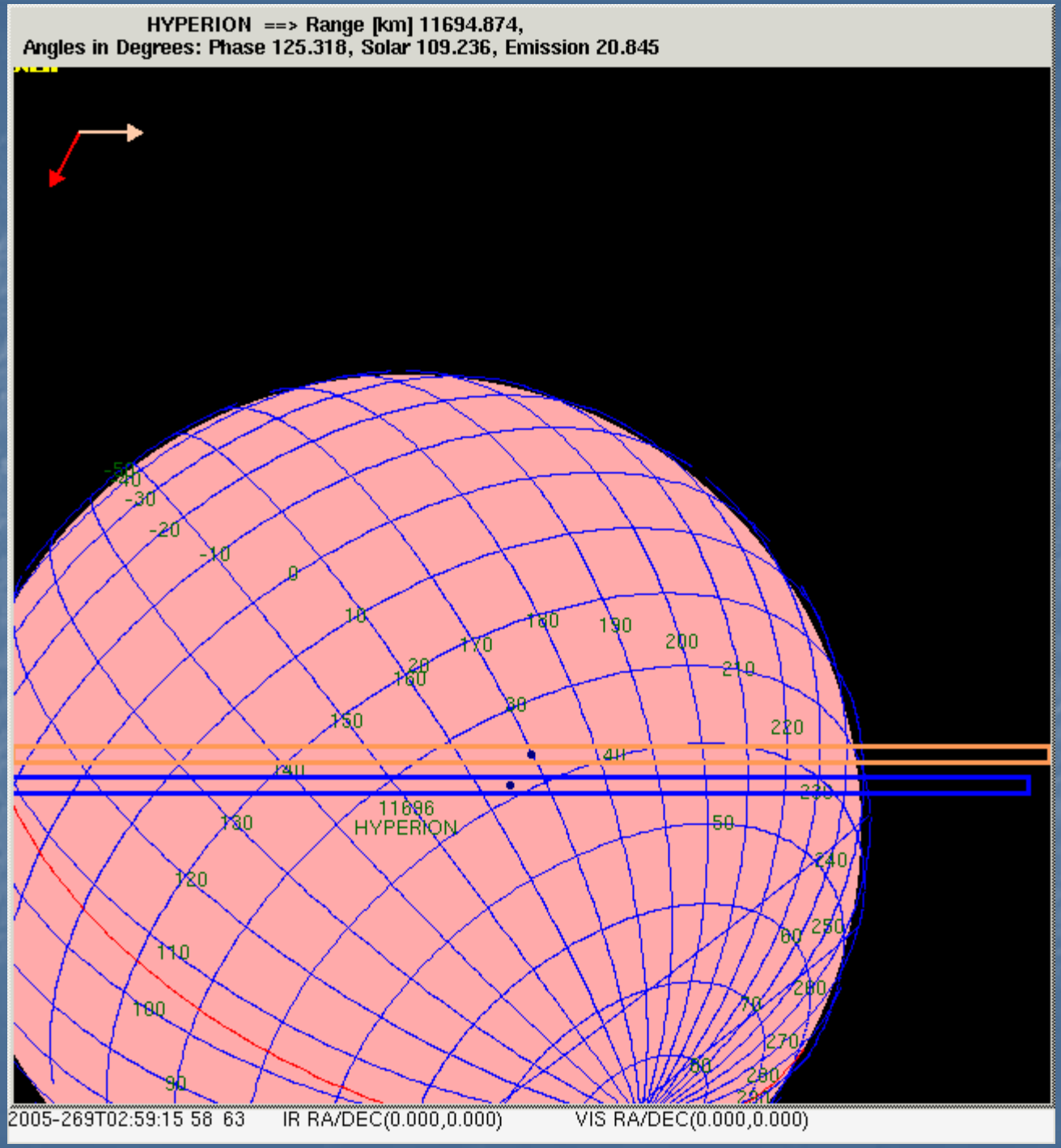
HYPERION ==> Range [km] 11694.874,
Angles in Degrees: Phase 125.318, Solar 109.236, Emission 20.845
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HYPERION
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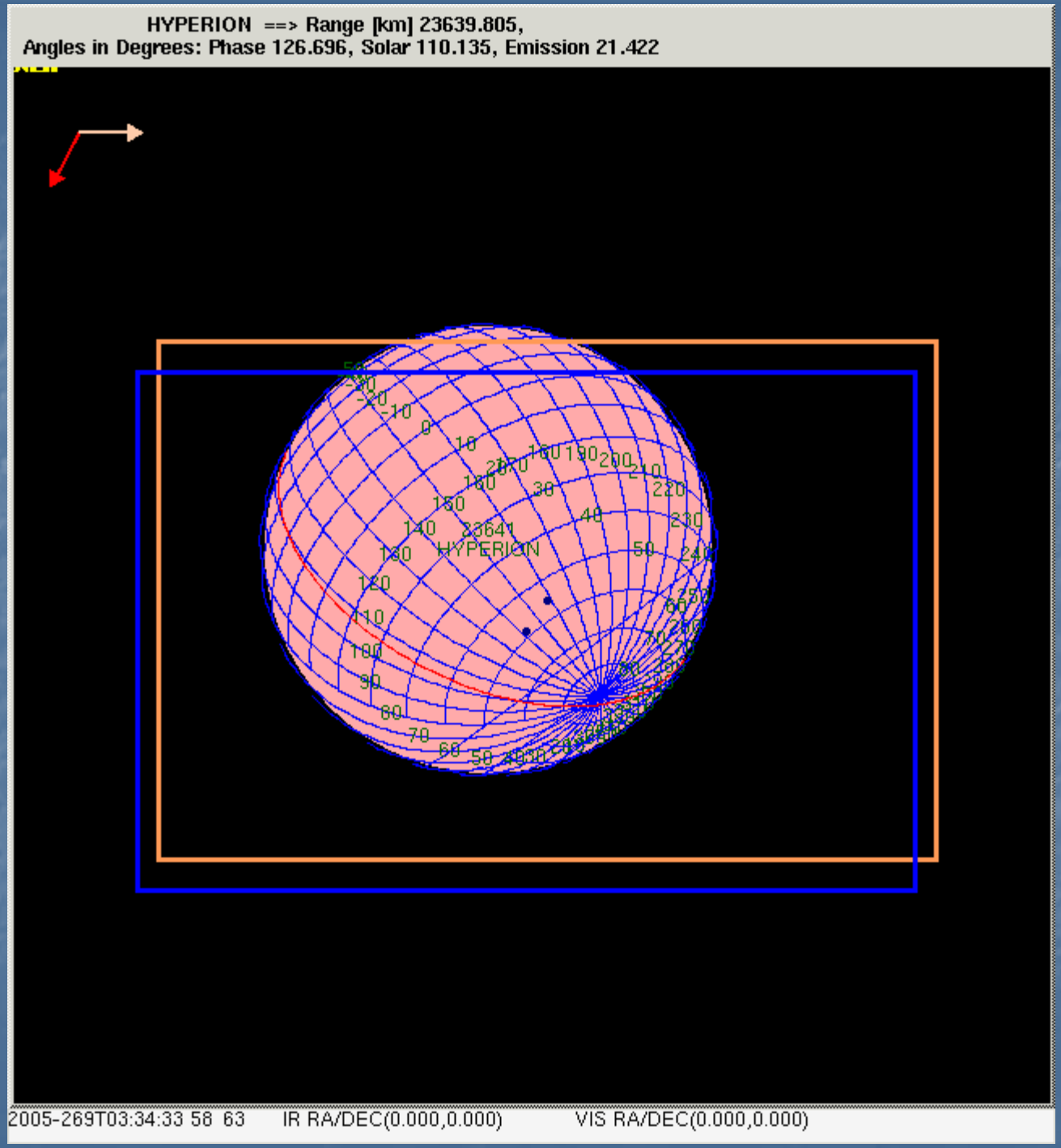
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 23639.805,
Angles in Degrees: Phase 126.696, Solar 110.135, Emission 21.422
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HYPERION
2005-269T03:34:33 58 63
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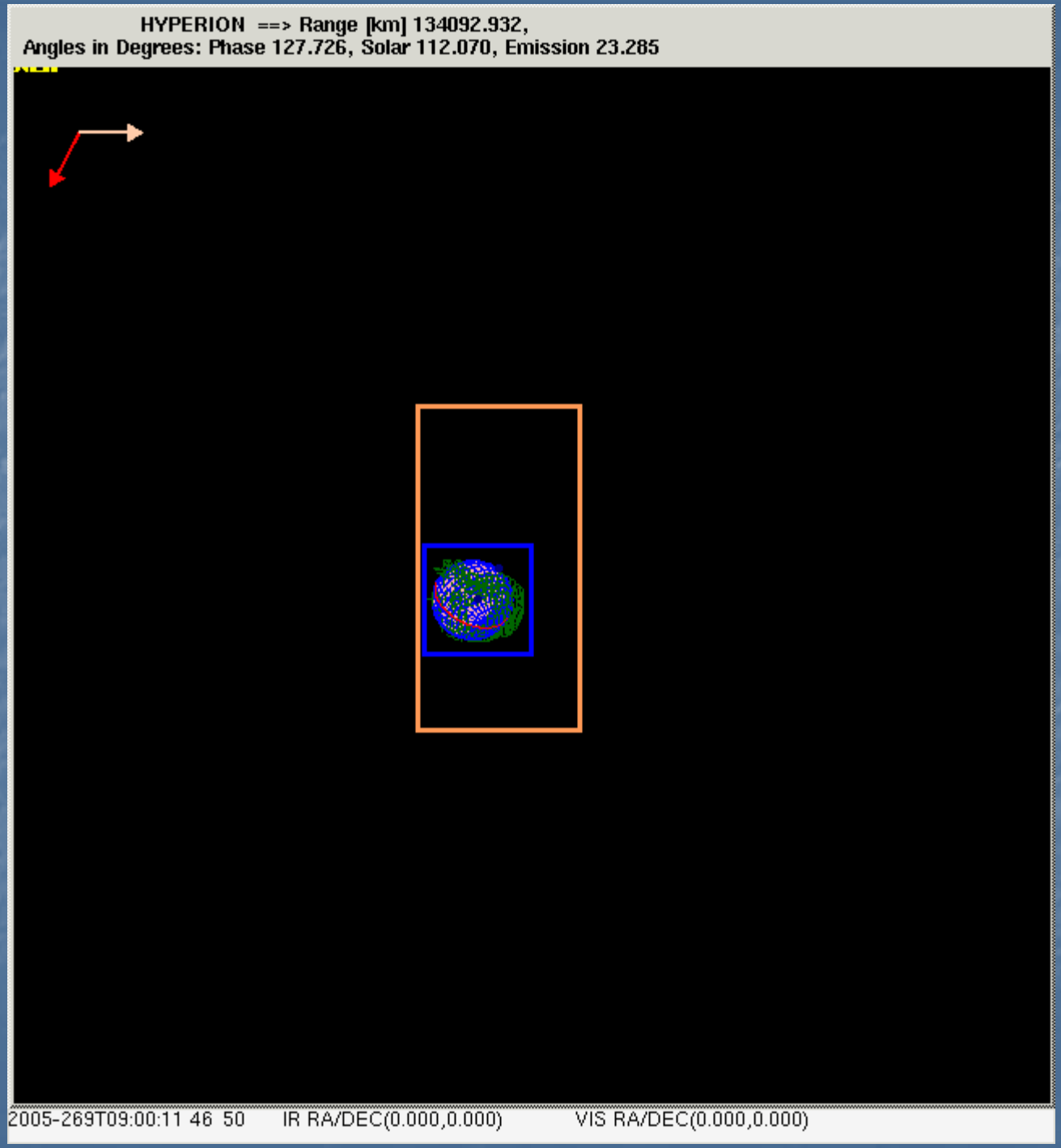
VIS RA/DEC(0.000,0.000)


HYPERION ==> Range [km] 134092.932,
Angles in Degrees: Phase 127.726, Solar 112.070, Emission 23.285
2005-269T09:00:11 46 50
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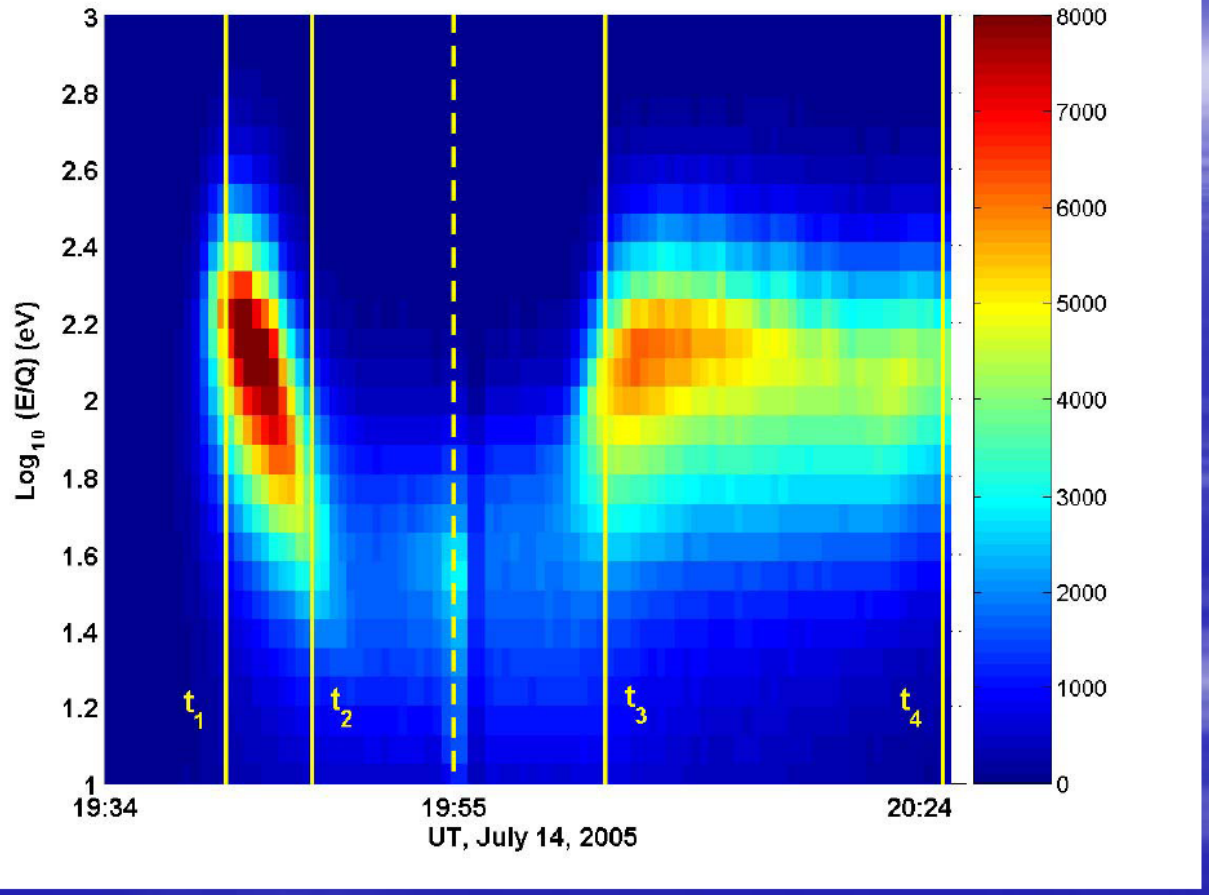
VIS RA/DEC(0.000,0.000)

Tethys/Hyperion preview
19 September, 2005

CAPS Enceladus (11EN) Ion Flux

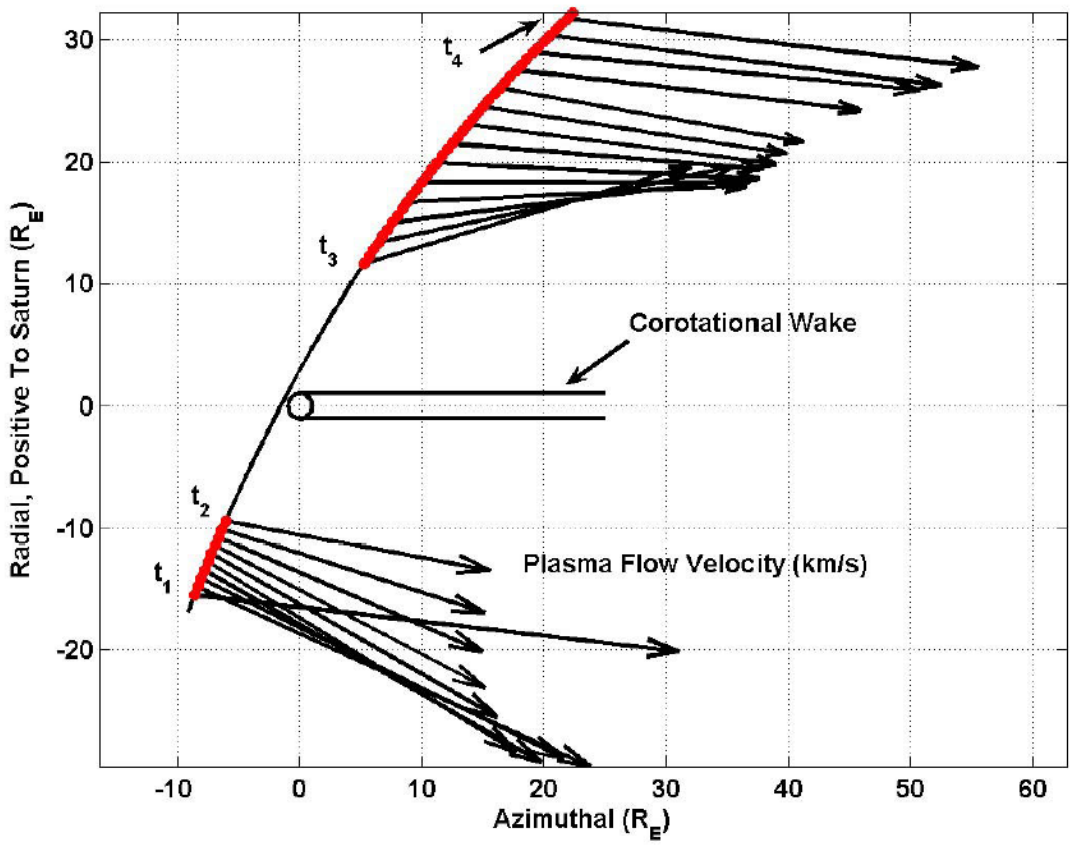


PRELIMINARY

Los Alamos NATIONAL LABORATORY

Tethys/Hyperion preview
19 September, 2005

CAPS Enceladus (11EN) Flow Velocity

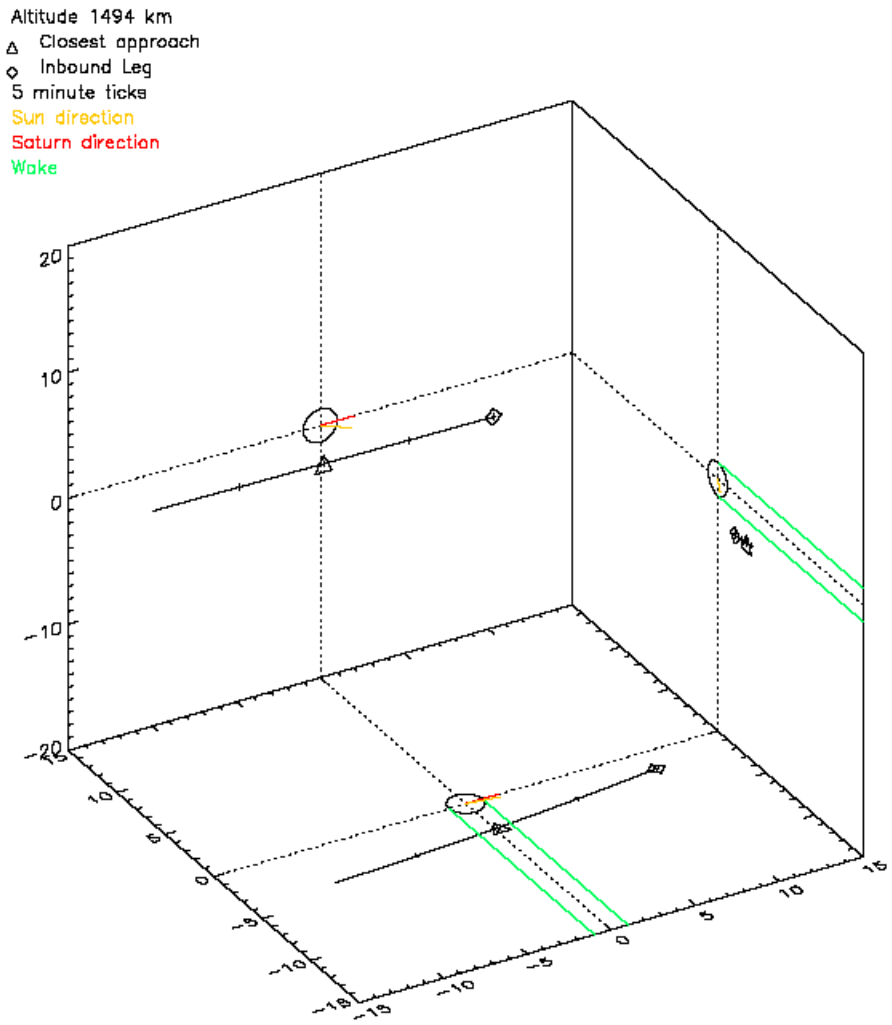


PRELIMINARY

Los Alamos NATIONAL LABORATORY

Tethys/Hyperion preview
19 September, 2005

15TE Tethys encounter

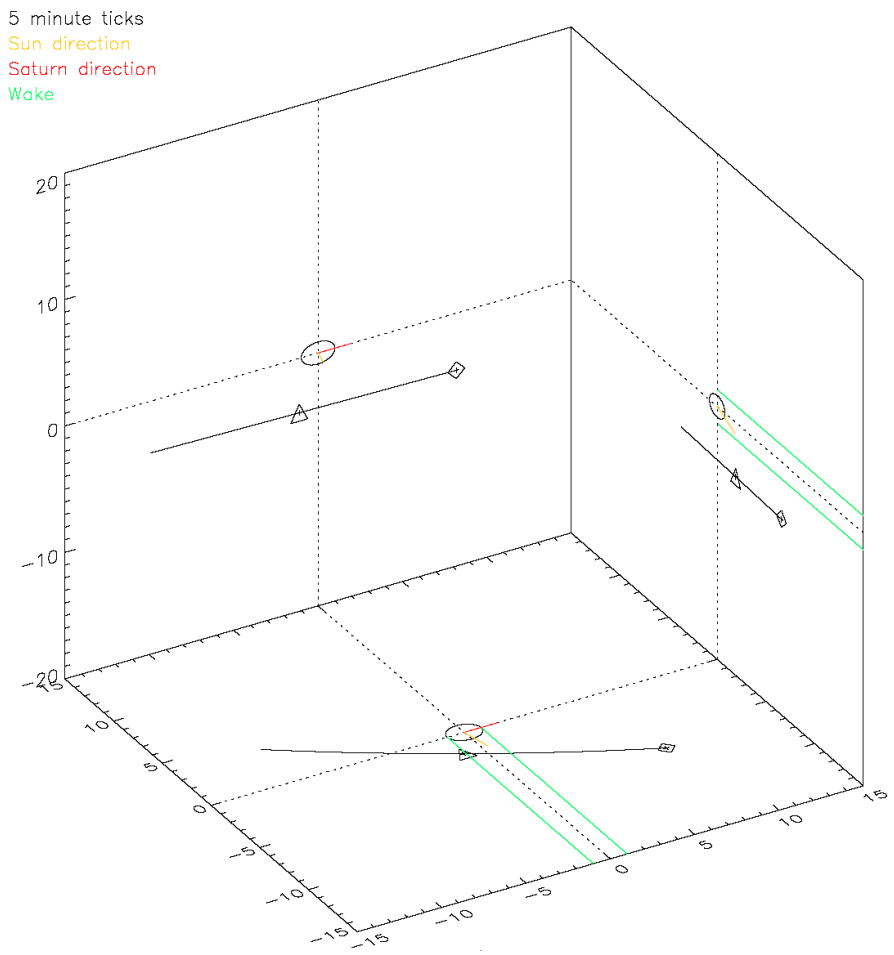


- 2005-267 02:42 (Sept. 24)
- 1494 km altitude
  - 3.8 R_{TE} from body center
  - Downstream encounter
    - No wake crossing, but crosses field lines connected to wake
  - C/a over –38° latitude
    - Possible Alfven wing crossing
  - Near dawn, Tethys LT
  - Near midnight, Saturn LT
- Untargeted encounter
  - Geometry/timing is uncertain
- 16 kbps data ±30 minutes
- Very fast encounter
  - v_{sc} = 9 km/s = **1.0 R_{TE}/min**

15TE Tethys pointing

- ORS pointing around closest approach
  - Corotation in CAPS FOV –22 to +33 min.
  - Fixed s/c orientation from -10 to +20 min.
- Encounter is too fast for actuation (60 s/R_T)
  - Full ACT sweep=204 s, minimum (28°) sweep=52 s
- Will ram actuator at 20° near closest approach
  - Samples v-B plane for corotating flow
  - Data on flow speed but not direction
  - Good ion composition data
  - Electron pitch angle coverage 20°-130°
  - 4s resolution for ions, 2s for electrons (0.067/0.033 R_T)

15HY Hyperion encounter



- 2005-269 02:25 (Sept. 26)
- 467 km altitude
  - 3.6 R_H from body center
  - R_H=180 km, of 180x140x113
  - Downstream (?) encounter
    - No wake crossing, but crosses field lines connected to wake
  - Late morning, Hyperion LT
  - Near dawn, Saturn LT
    - Close to magnetopause?
    - a_H = 25 R_S
- 16 kbps data ±30 minutes
- Very fast encounter
  - v_{sc} = 5.6 km/s = **1.9 R_H/min**

15HY Hyperion pointing

- ISS and CIRS pointing during encounter
- -Y to Hyperion, +X to north
- Geometry and pointing are uncertain
  - Hyperion may be near, or outside the magnetopause
- Flow probably isn't corotational & B is uncertain
- *If* flow is corotational & B is dipolar (±15 min.)
  - Flow is into ACT angle +15°, various elevations
  - B is within 15° of X axis
- Encounter is too fast for actuation (32 s/R_H)
  - Full ACT sweep=204 s, minimum (28°) sweep=52 s
- Ram actuator at 15° near closest approach
  - Best choice *if* we are in a corotating part of the magnetosphere
  - Samples close to gyroplane (flow speed & direction)
  - Good ion composition data
  - Only see electrons at ~90°

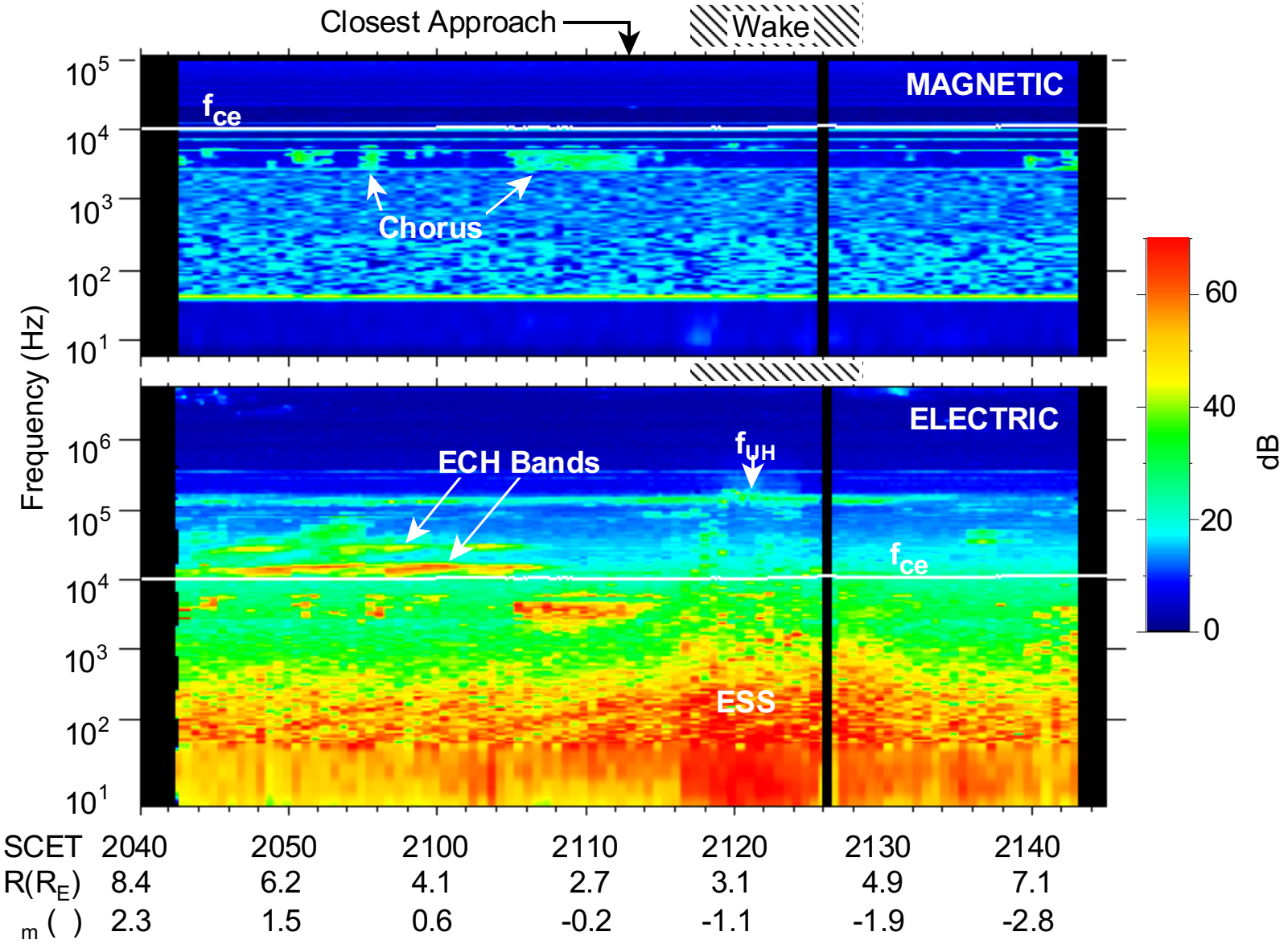
Orbit 15 Tethys/Hyperion Previews RPWS

W. Kurth

19 September 2005

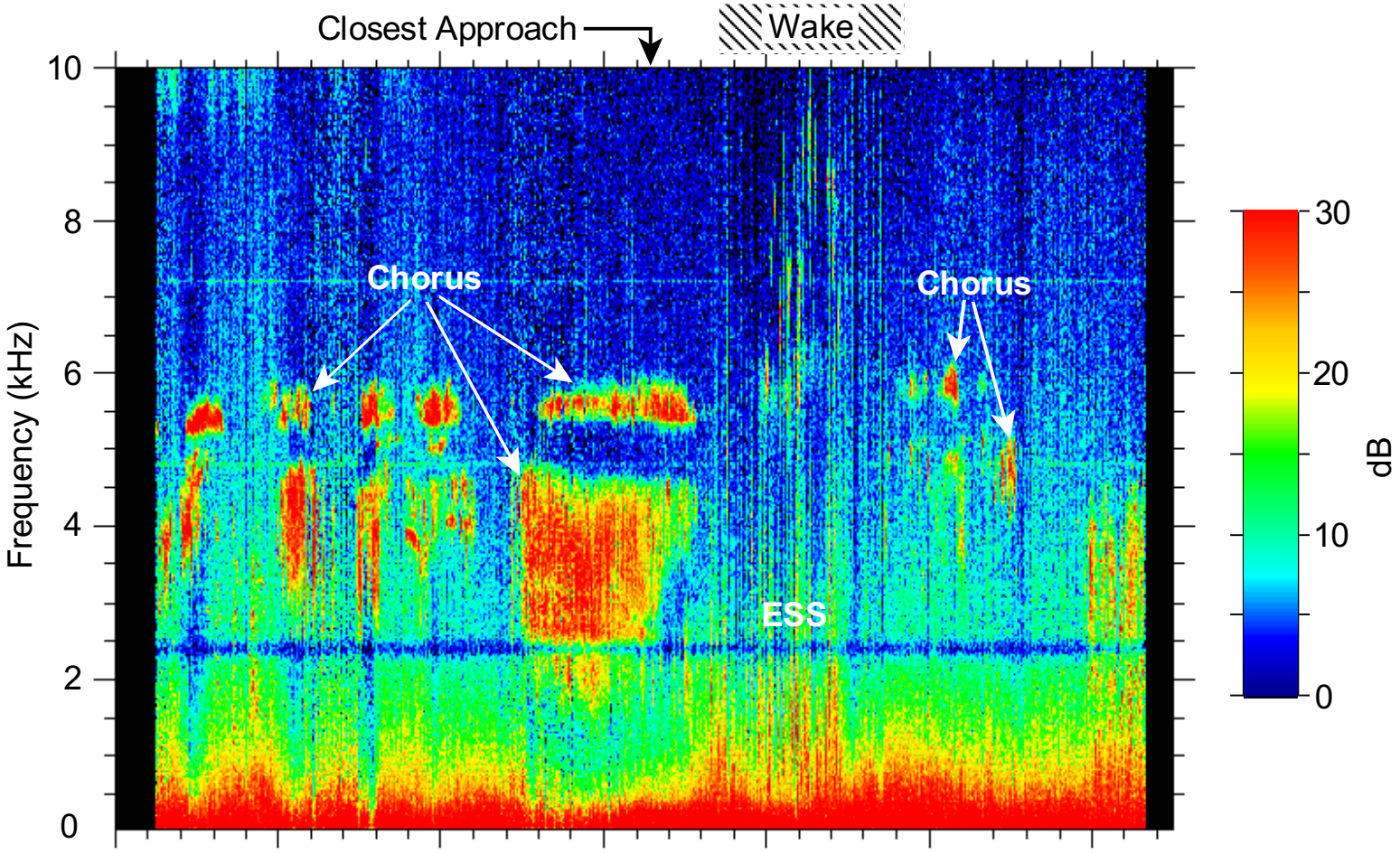
A-G99-123-1

EUROPA 15
31 May, Day 151 1998

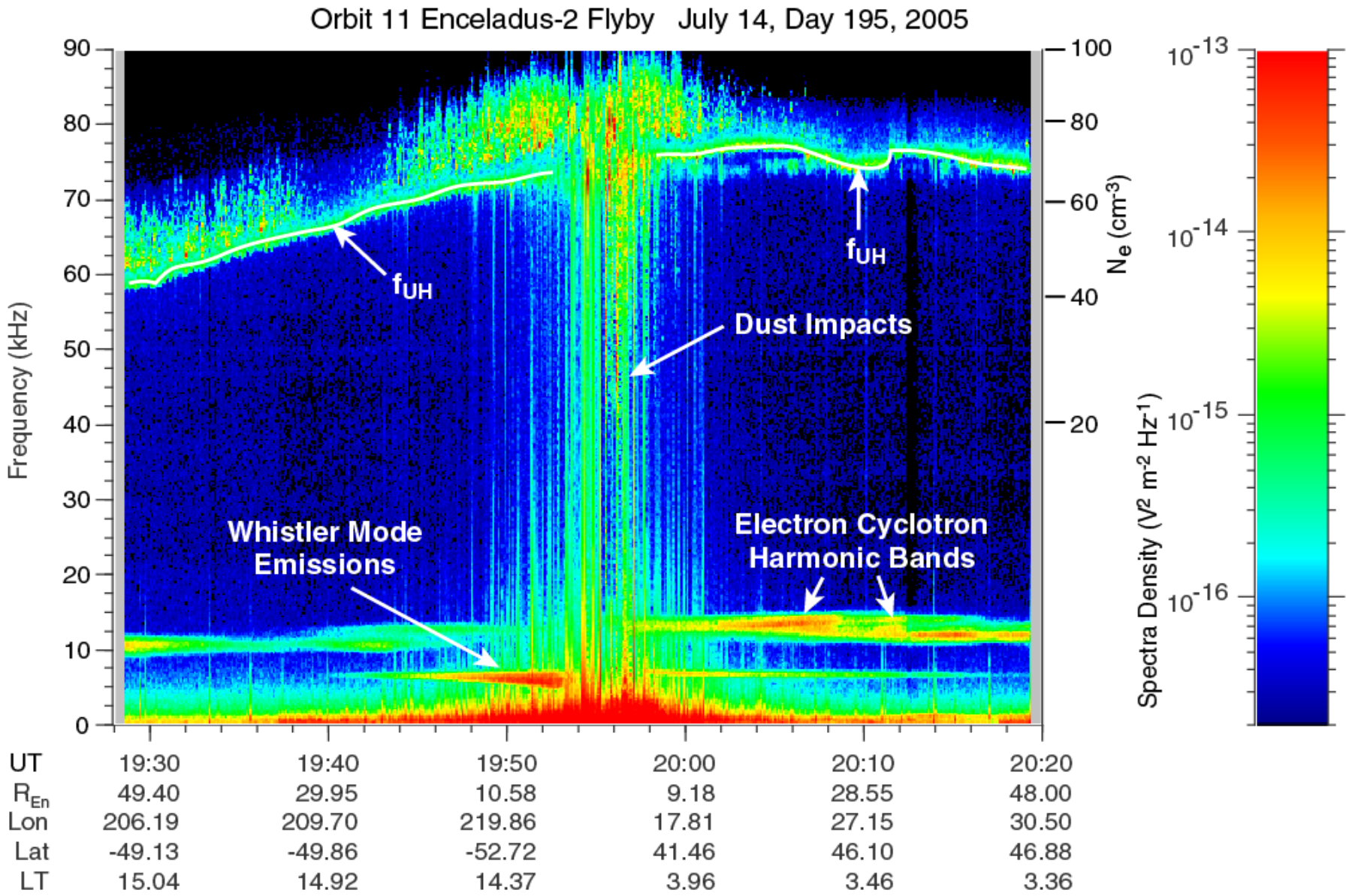


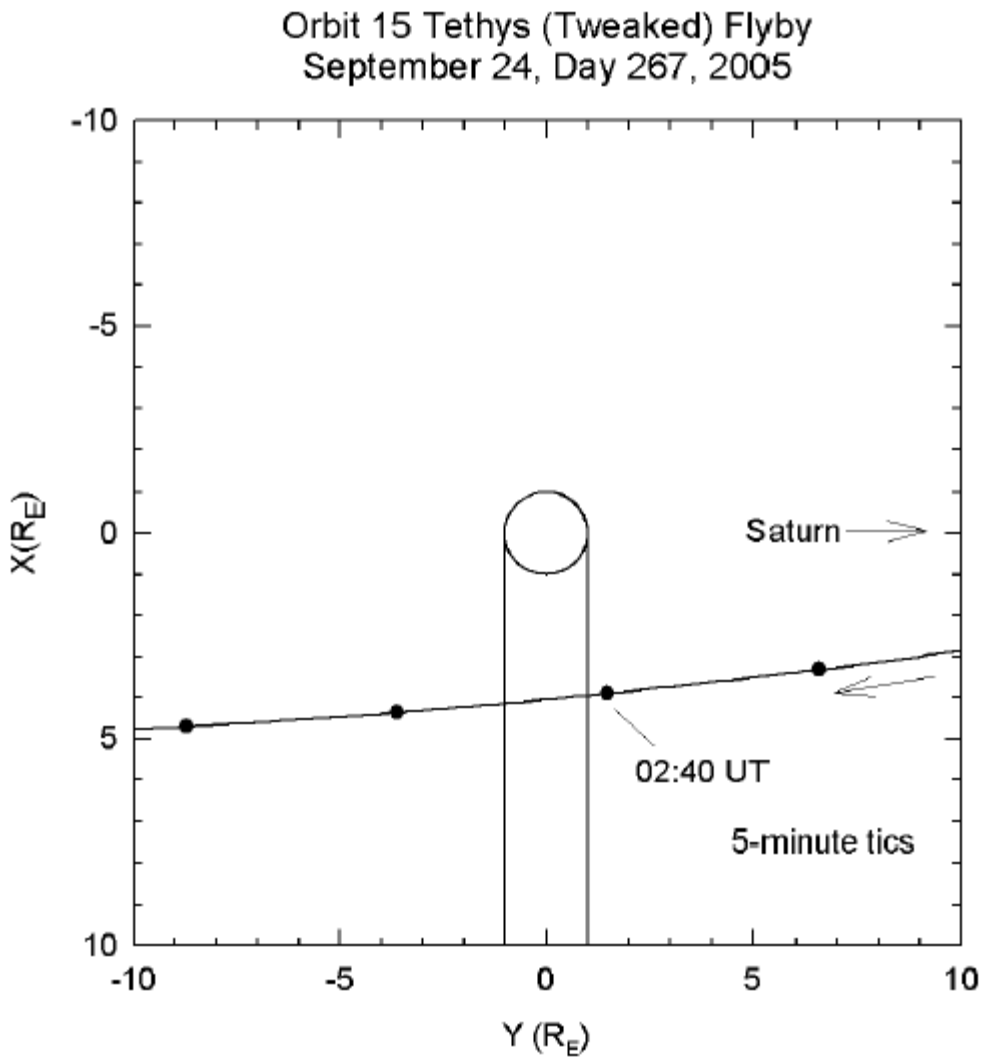
A-G99-129

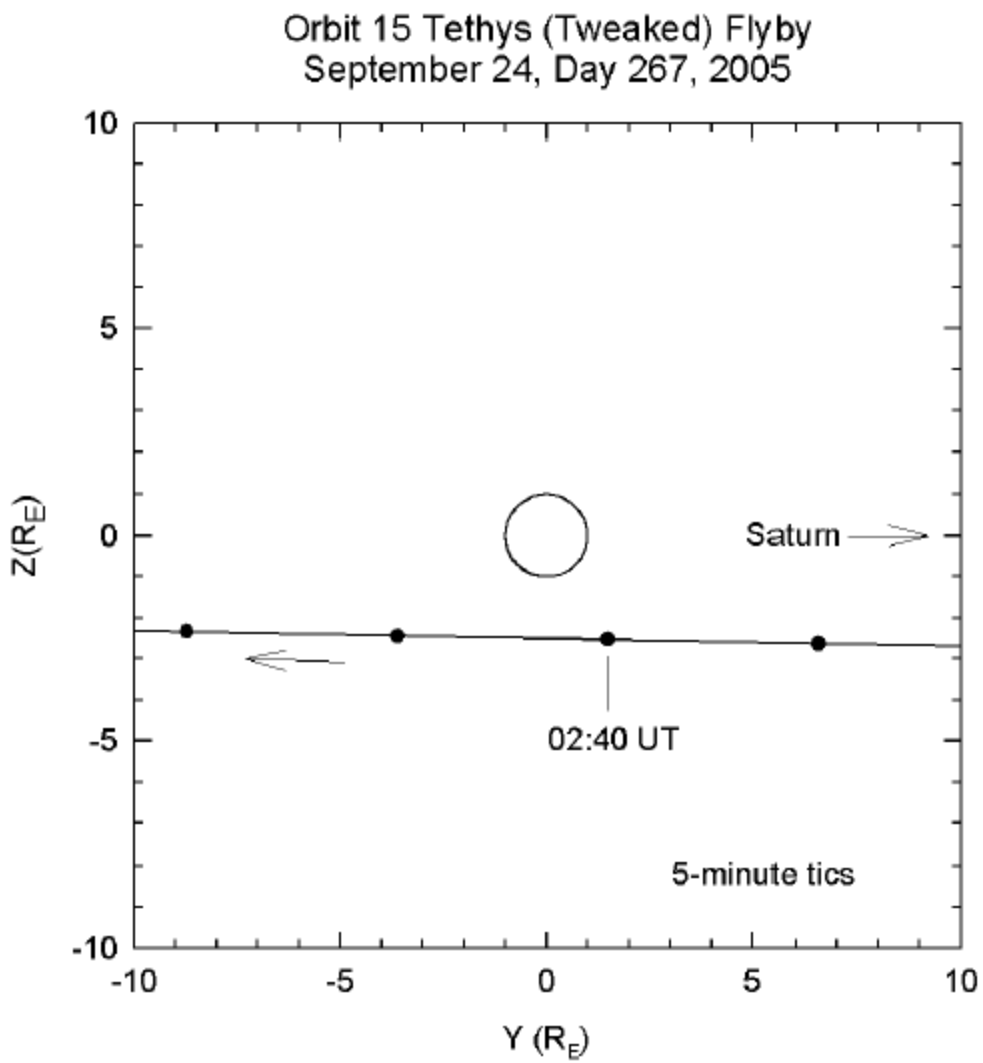
EUROPA 15
31 May, Day 151 1998

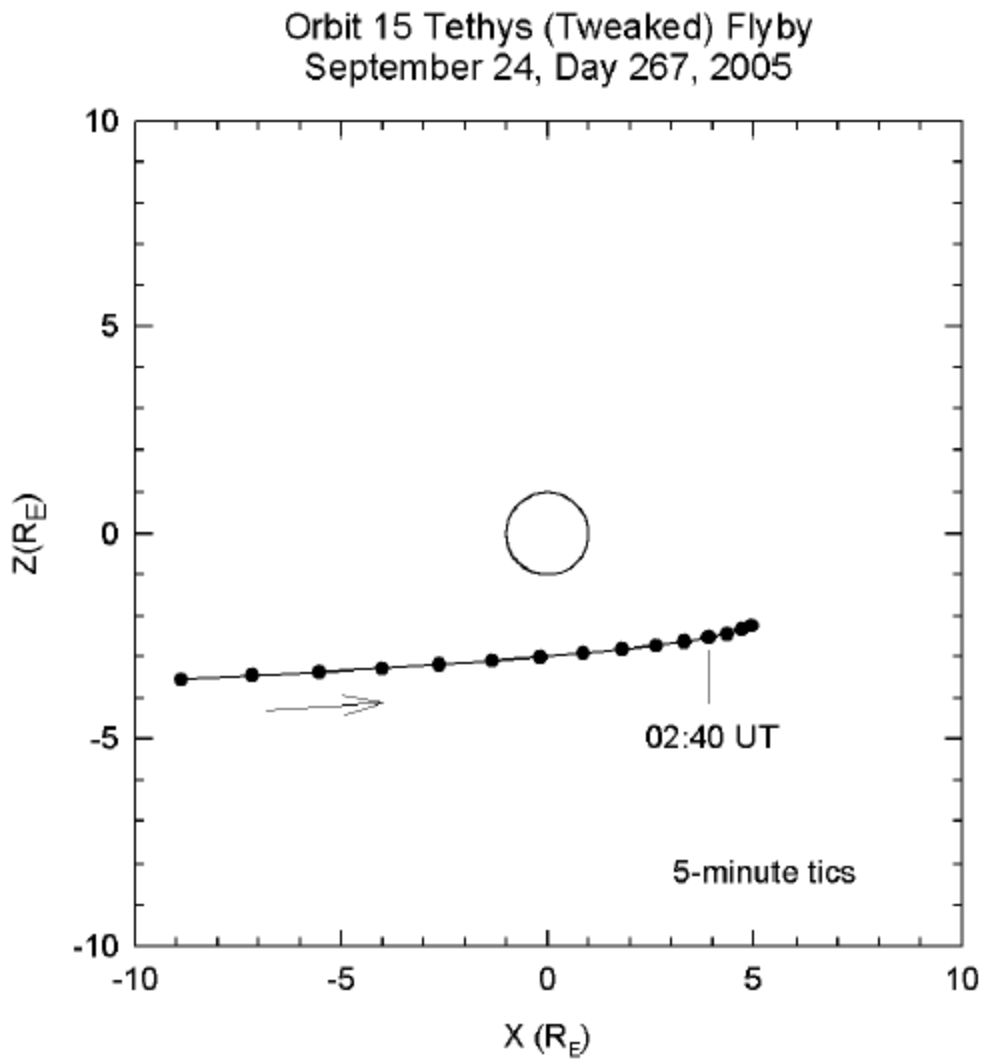


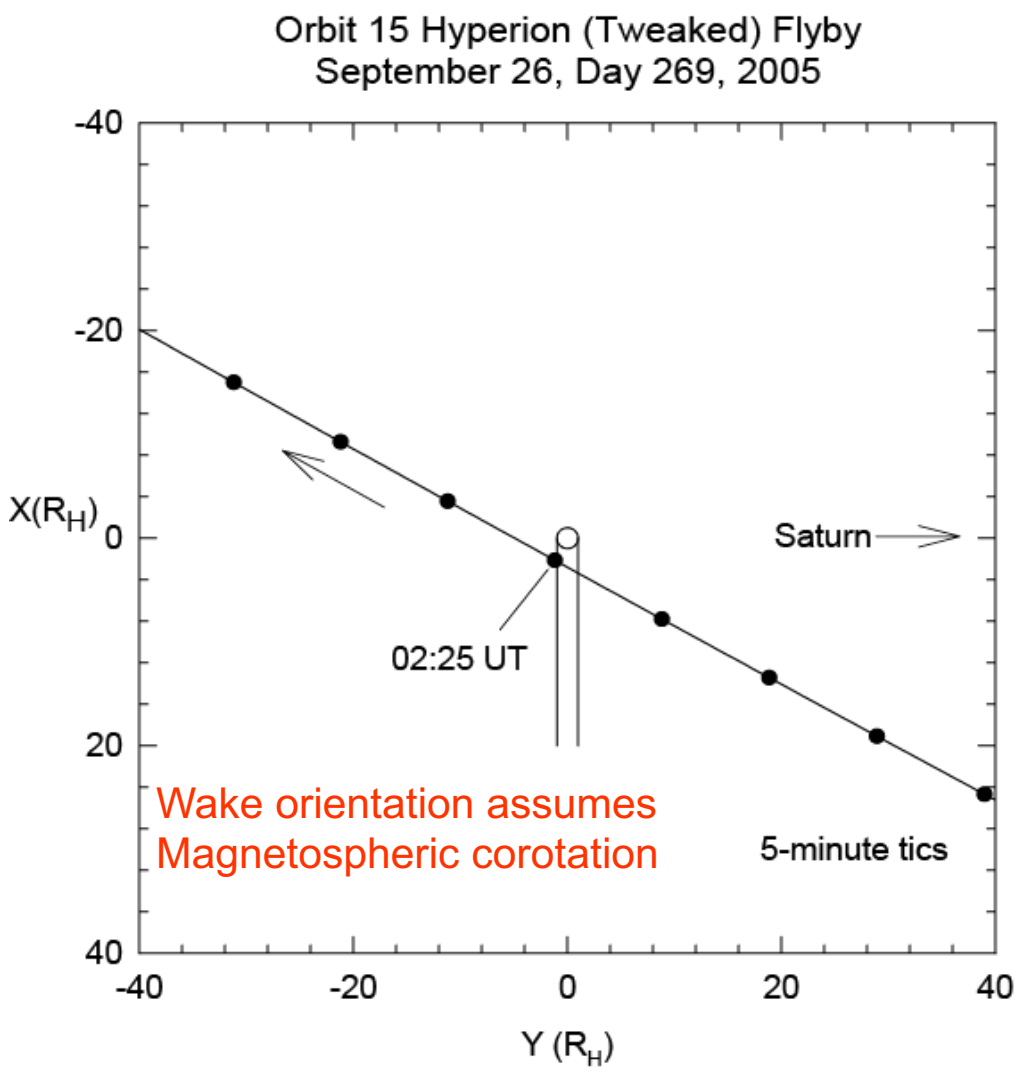
SCET	2040	2050	2100	2110	2120	2130	2140
R(R_E)	8.4	6.2	4.1	2.7	3.1	4.9	7.1
$_m$ ( )	2.3	1.5	0.6	-0.2	-1.1	-1.9	-2.8

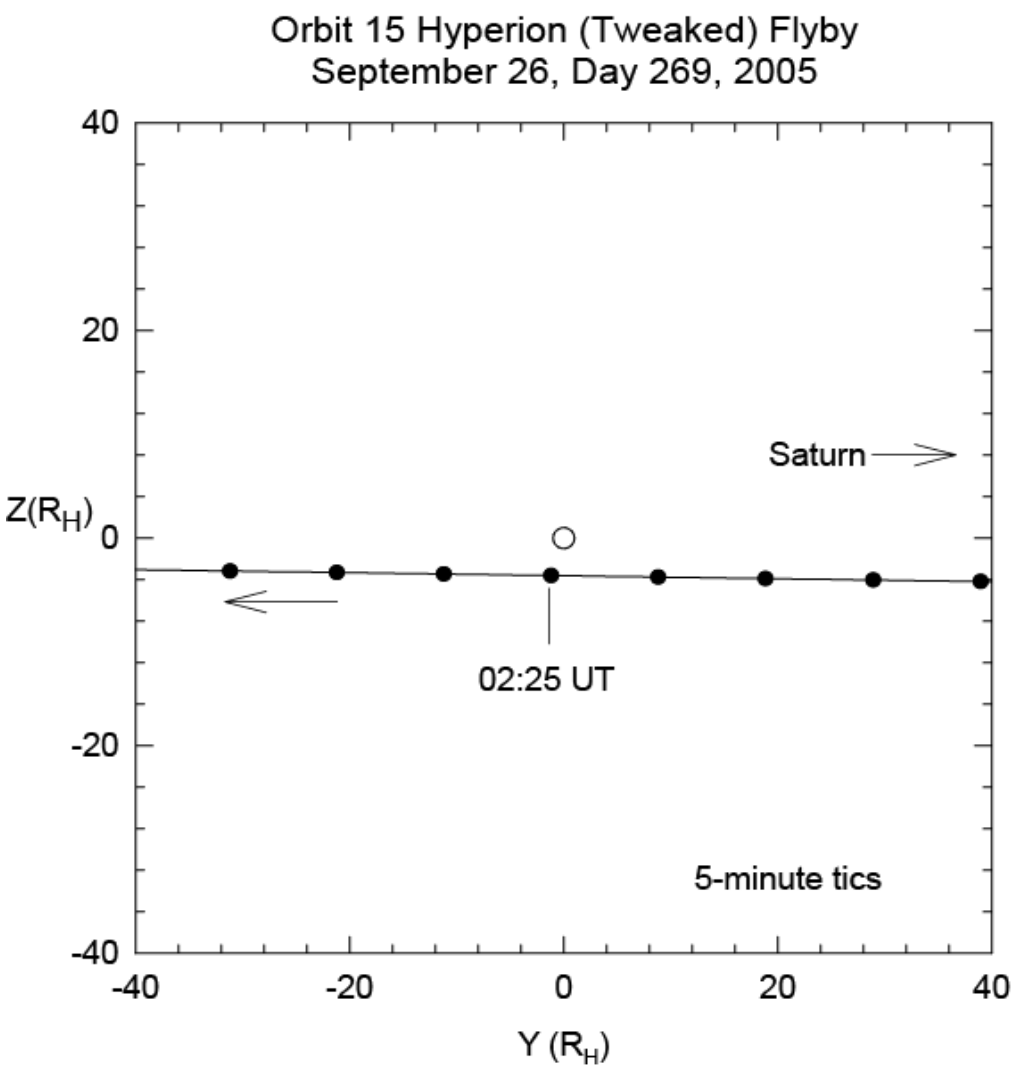

Orbit 11 Enceladus-2 Flyby July 14, Day 195, 2005
Frequency (kHz)
90
80
70
60
50
40
30
20
10
0
N_e (cm^{-3})
100
80
60
40
20
Spectra Density (V^2 m^{-2} Hz^{-1})
10^{-13}
10^{-14}
10^{-15}
10^{-16}
f_{UH}
f_{UH}
Dust Impacts
Whistler Mode Emissions
Electron Cyclotron Harmonic Bands
UT 19:30 19:40 19:50 20:00 20:10 20:20
R_{En} 49.40 29.95 10.58 9.18 28.55 48.00
Lon 206.19 209.70 219.86 17.81 27.15 30.50
Lat -49.13 -49.86 -52.72 41.46 46.10 46.88
LT 15.04 14.92 14.37 3.96 3.46 3.36

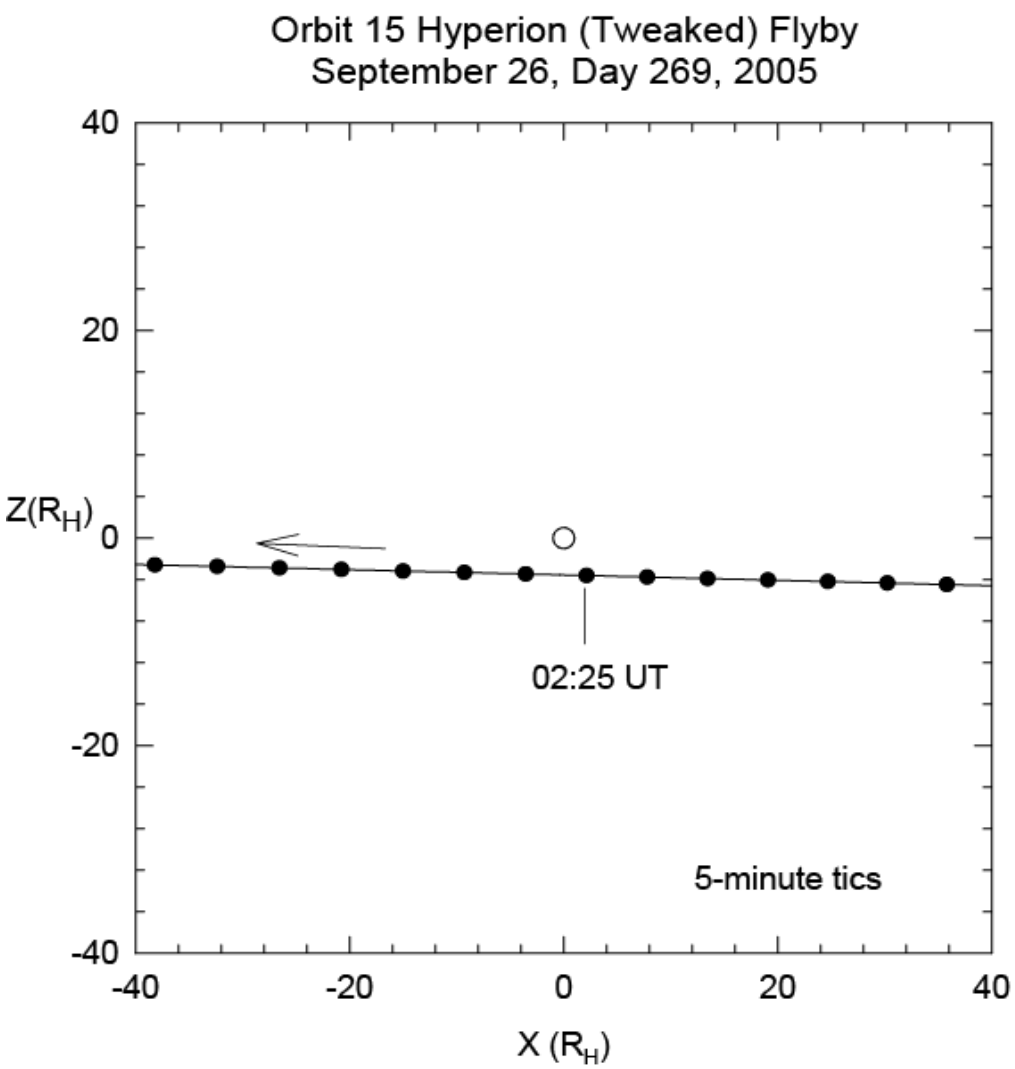

Orbit 15 Tethys (Tweaked) Flyby
September 24, Day 267, 2005
-10
-5
0
5
10
X(R_E)
Saturn
02:40 UT
5-minute tics
-10
-5
0
5
10
Y (R_E)


Orbit 15 Tethys (Tweaked) Flyby
September 24, Day 267, 2005
10
5
0
-5
-10
Z(R_E)
Saturn
02:40 UT
5-minute tics
-10
-5
0
5
10
Y (R_E)


Orbit 15 Tethys (Tweaked) Flyby
September 24, Day 267, 2005
10
5
0
-5
-10
Z(R_E)
-10
-5
0
5
10
X (R_E)
02:40 UT
5-minute tics


Orbit 15 Hyperion (Tweaked) Flyby
September 26, Day 269, 2005
-40
-20
0
20
40
X(R_H)
-40
-20
0
20
40
Y (R_H)
Saturn
02:25 UT
5-minute tics
Wake orientation assumes
Magnetospheric corotation


Orbit 15 Hyperion (Tweaked) Flyby
September 26, Day 269, 2005
40
20
0
-20
-40
Z(R_H)
Saturn
02:25 UT
5-minute tics
-40
-20
0
20
40
Y (R_H)


Orbit 15 Hyperion (Tweaked) Flyby
September 26, Day 269, 2005
40
20
0
-20
-40
Z(R_H)
-40
-20
0
20
40
X (R_H)
02:25 UT
5-minute tics

RPWS Science Objectives

- Look for evidence of a plasma source at both Tethys and Hyperion using the upper hybrid band, LP, etc.
- Examine plasma wave spectrum for evidence of magnetosphere – moon interactions for both Tethys and Hyperion.
- Look for signatures of dust impacts.
- Should Hyperion be in the solar wind, the flyby will be upstream of Hyperion and little evidence of a solar wind – Hyperion interaction would be expected.

Preview of Cassini RADAR Observations of Tethys and Hyperion

Steve Ostro

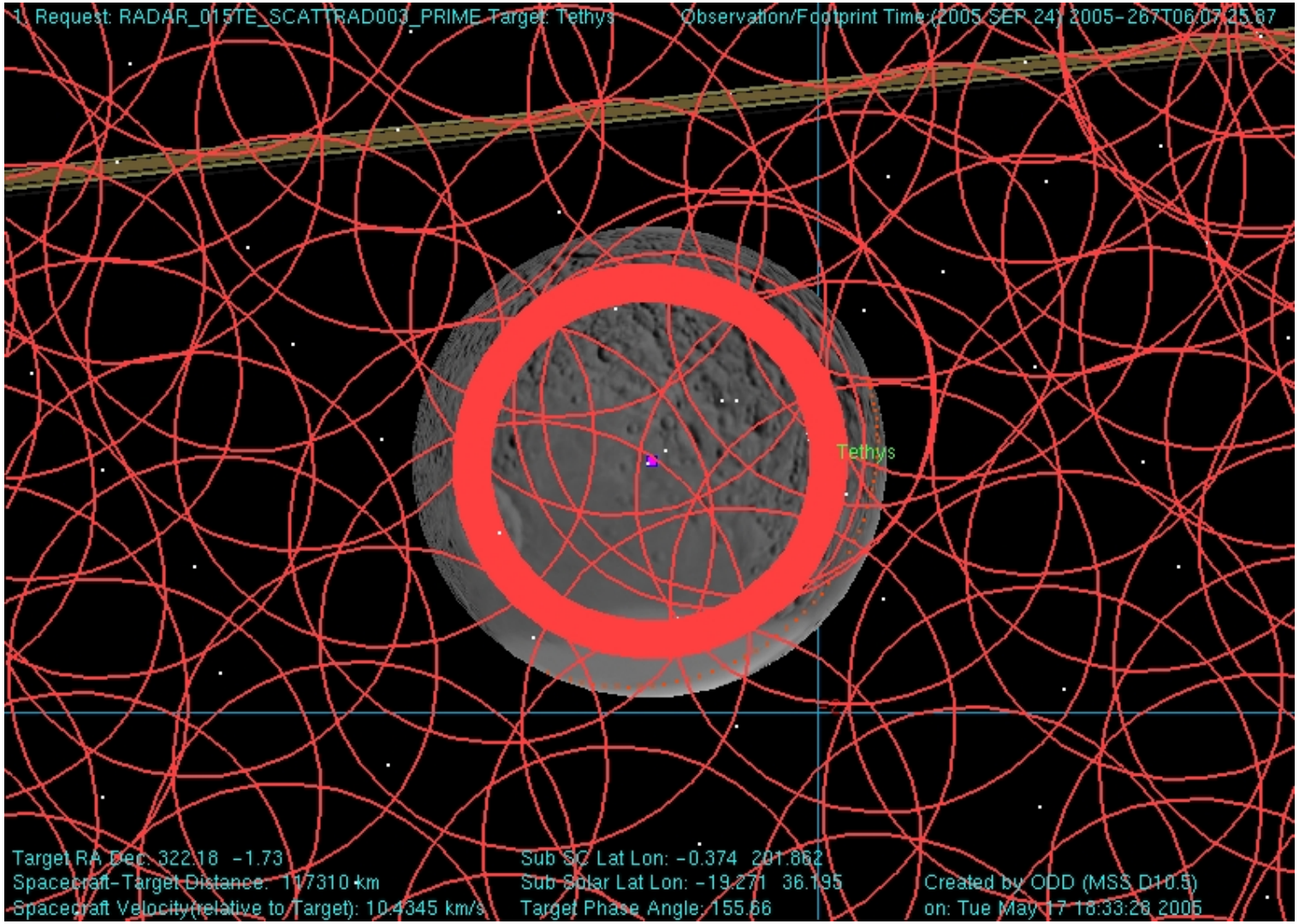
(for the Cassini RADAR Science and Instrument Operations Teams)

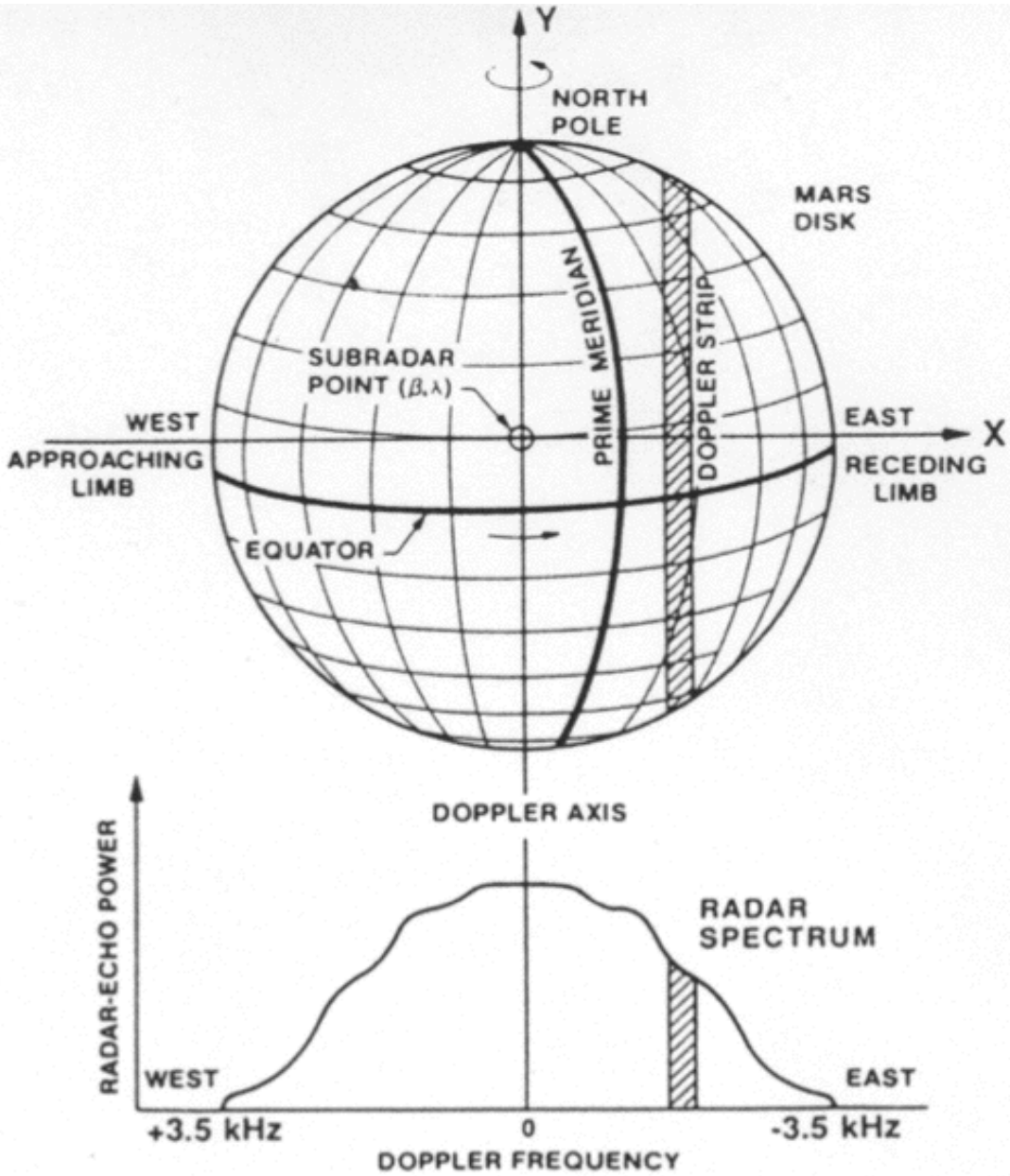
JPL, Sep. 19, 2005

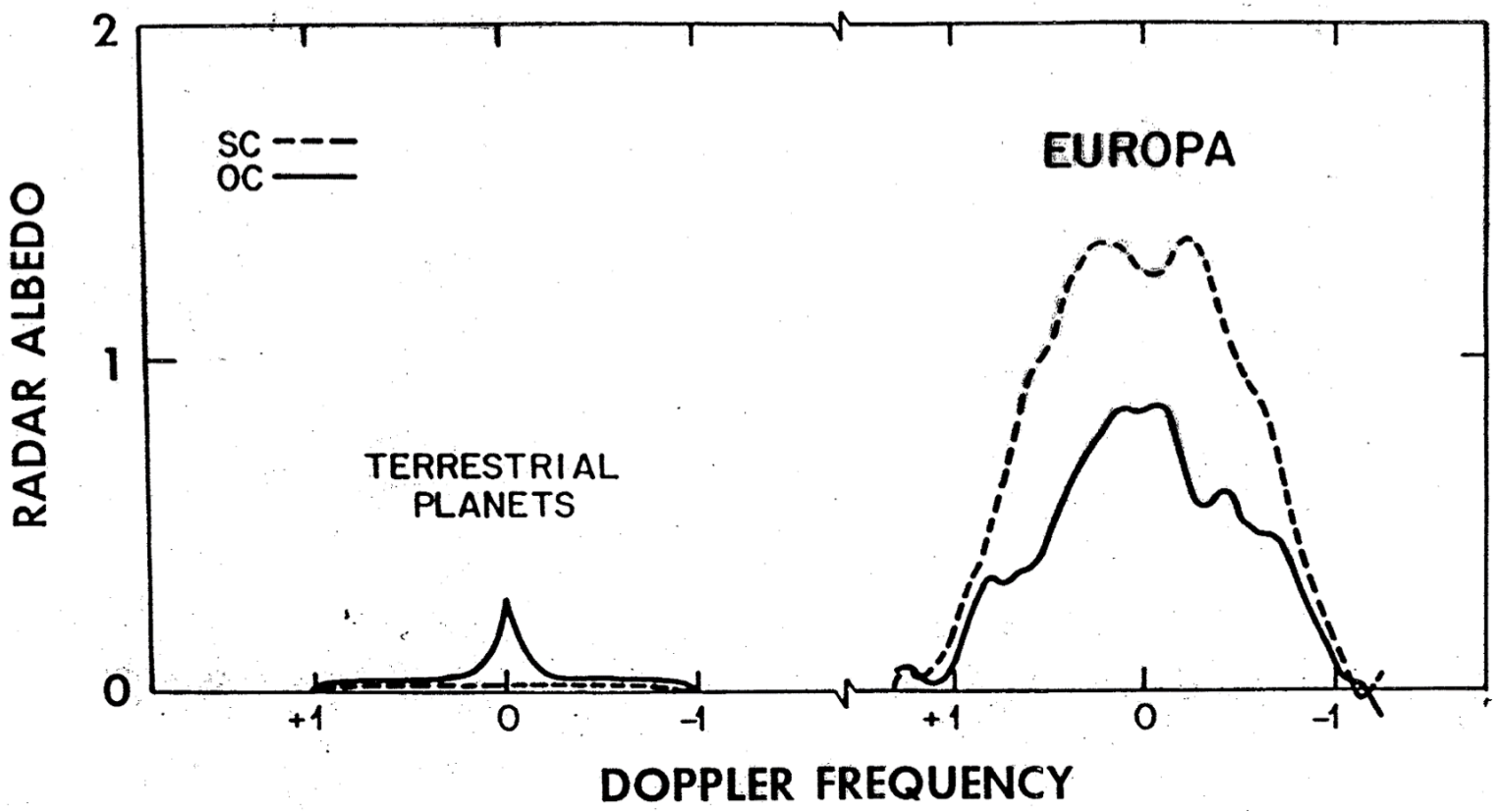
Cassini RADAR Observations of "Icy Satellites"

Rhea	7
Enceladus	6 (E3,E4 successful)
Dione	5 (D0 failed)
Mimas	4 (M0 failed)
Iapetus	3 (IAP 0B/C successful)
Tethys	2
Hyperion	2
Phoebe	1 (P0 successful)
	30 ("four for six" so far)

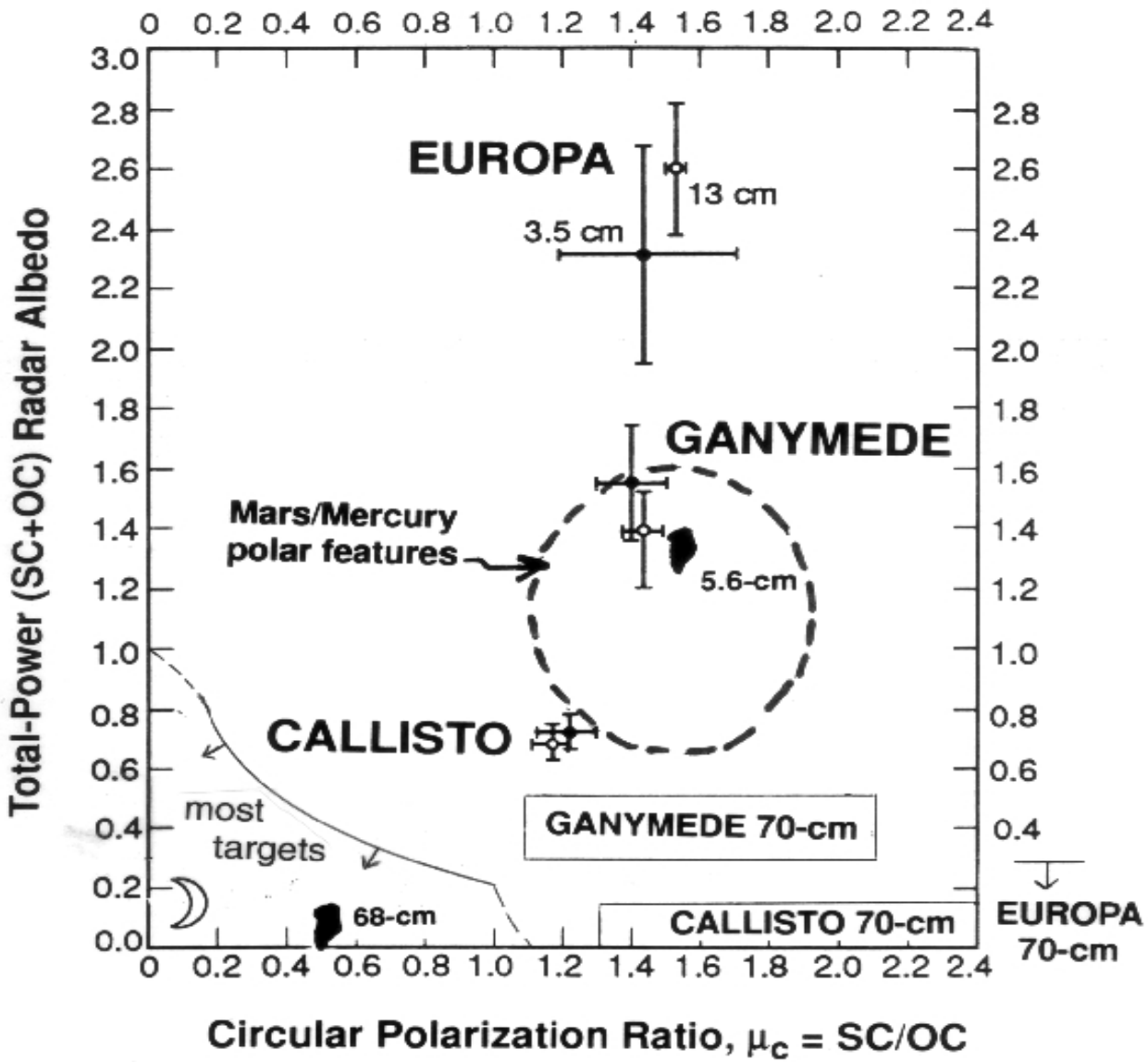
	Tethys 15	Hyperion 15
	Sep. 24, 2005	Sep. 26, 2005
Satellite Diameter	1060 km	282 km
Detection Time	< 1 min	~0.5 min
Distance, km	~150,000	~100,000
Beam/Diameter	~1	~2
Scatterometry start	267T 06:00	269T 05:55
Scatterometry duration (hh:mm)	01:31	03:01


1 Request: RADAR_015TE_SCATTRAD003_PRIME Target: Tethys
Observation/Footprint Time: 2005 SEP 24 / 2005-267T06:07:25.87
Tethys
Target RA Dec: 322.18 -1.73
Spacecraft-Target Distance: 117310 km
Spacecraft Velocity(relative to Target): 10.4345 km/s
Sub SC Lat Lon: -0.374 201.862
Sub Solar Lat Lon: -19.271 36.195
Target Phase Angle: 155.66
Created by ODD (MSS D10.5)
on: Tue May 17 18:33:28 2005


Y
NORTH POLE
MARS DISK
PRIME MERIDIAN
DOPPLER STRIP
SUBRADAR POINT (β,λ)
WEST
APPROACHING LIMB
EAST
X
RECEDING LIMB
EQUATOR
DOPPLER AXIS
RADAR-ECHO POWER
RADAR SPECTRUM
WEST
EAST
+3.5 kHz
0
-3.5 kHz
DOPPLER FREQUENCY


2
1
0
RADAR ALBEDO
SC
OC
EUROPA
TERRESTRIAL
PLANETS
+1
0
-1
+1
0
-1
DOPPLER FREQUENCY

RADAR PROPERTIES



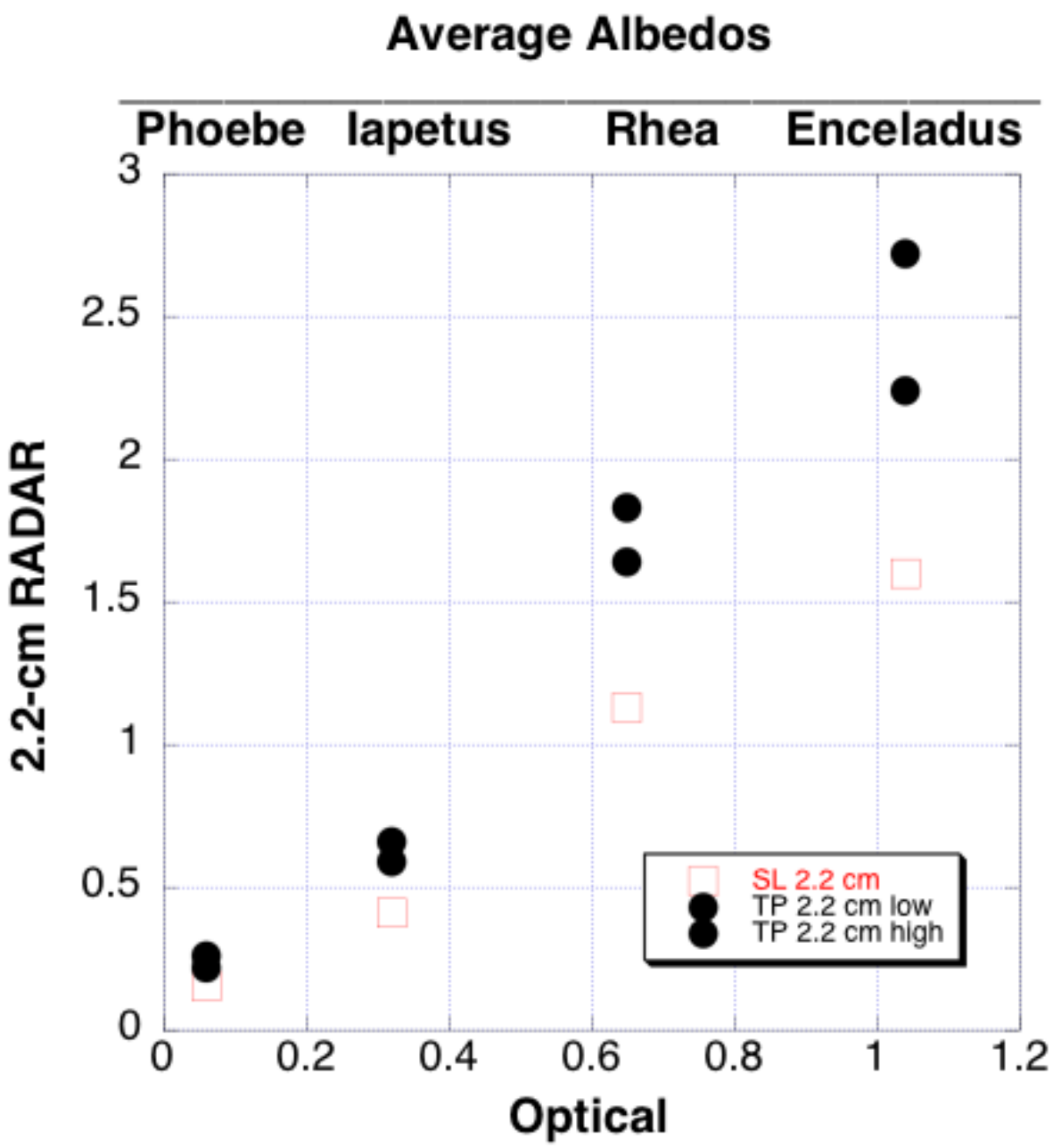
Radar Albedo and Polarization

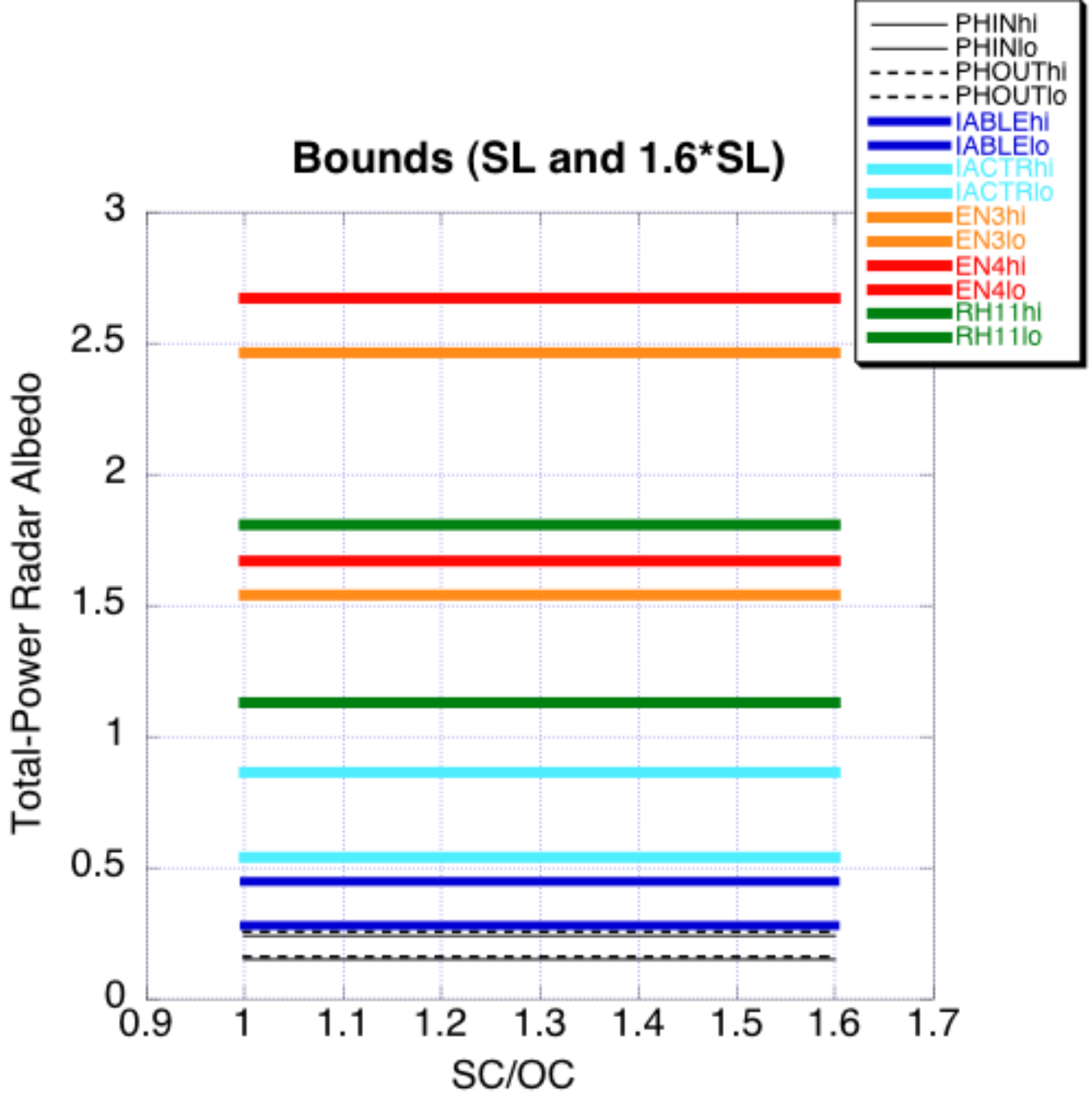
- Total Power = SL + OL = SC + OC
- Smooth mirror: Total Power = SL = OC
- Rough targets: OL/SL ~ (SC/OC)/3

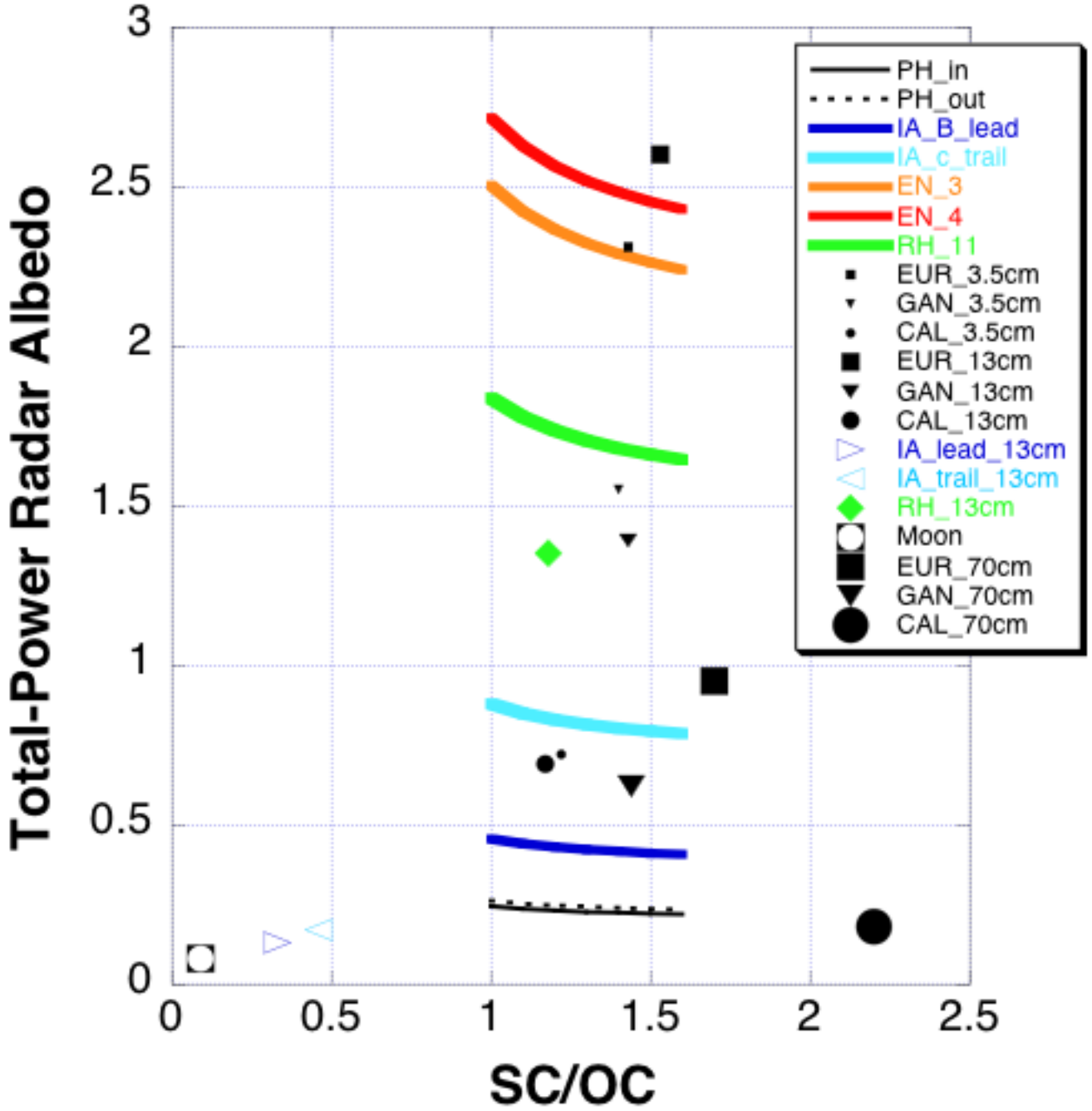
- For all radar-detected solar system targets,

$$SL < SL+OL \leq 1.6*SL$$

So plausible total-power albedos range from SL to 1.6*SL.


Average Albedos
Phoebe
Iapetus
Rhea
Enceladus
2.2-cm RADAR
Optical
0
0.5
1
1.5
2
2.5
3
0
0.2
0.4
0.6
0.8
1
1.2
SL 2.2 cm
TP 2.2 cm low
TP 2.2 cm high


Bounds (SL and 1.6*SL)
PHINhi
PHINlo
PHOUThi
PHOUTlo
IABLEhi
IABLElo
IACTRhi
IACTRlo
EN3hi
EN3lo
EN4hi
EN4lo
RH11hi
RH11lo
Total-Power Radar Albedo
SC/OC
0
0.5
1
1.5
2
2.5
3
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7


Total-Power Radar Albedo
SC/OC
0
0.5
1
1.5
2
2.5
3
PH_in
PH_out
IA_B_lead
IA_c_trail
EN_3
EN_4
RH_11
EUR_3.5cm
GAN_3.5cm
CAL_3.5cm
EUR_13cm
GAN_13cm
CAL_13cm
IA_lead_13cm
IA_trail_13cm
RH_13cm
Moon
EUR_70cm
GAN_70cm
CAL_70cm