

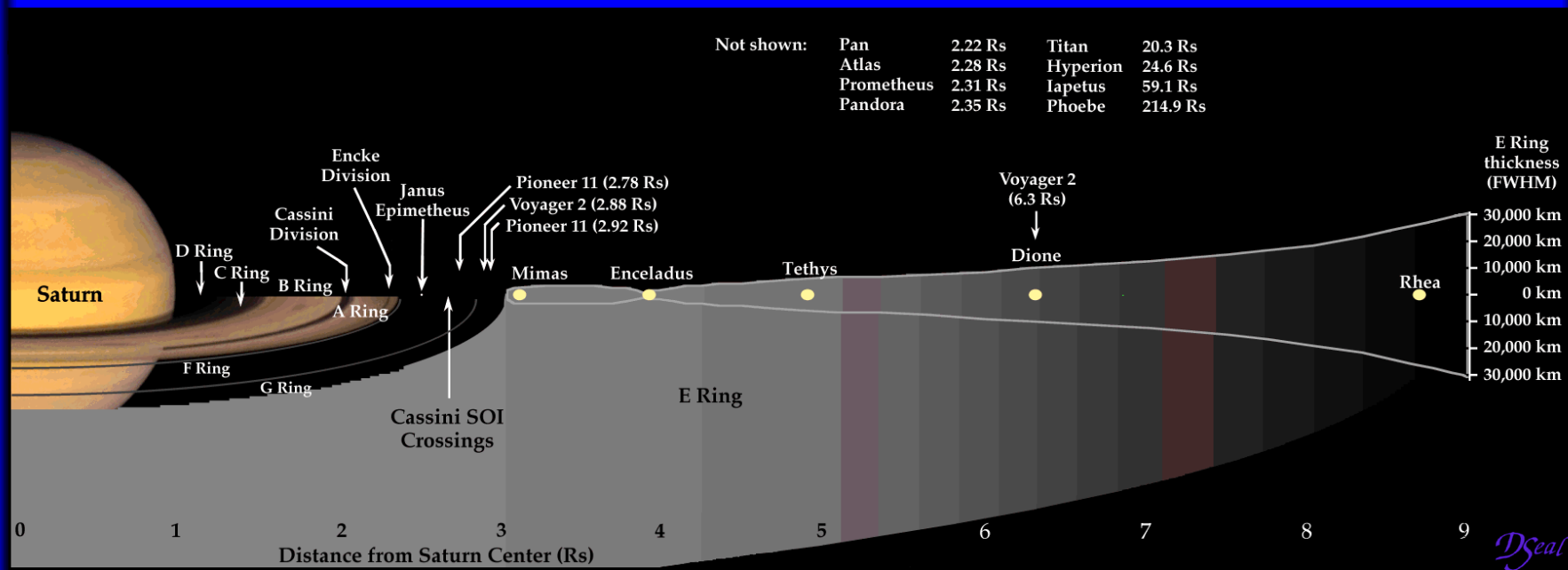
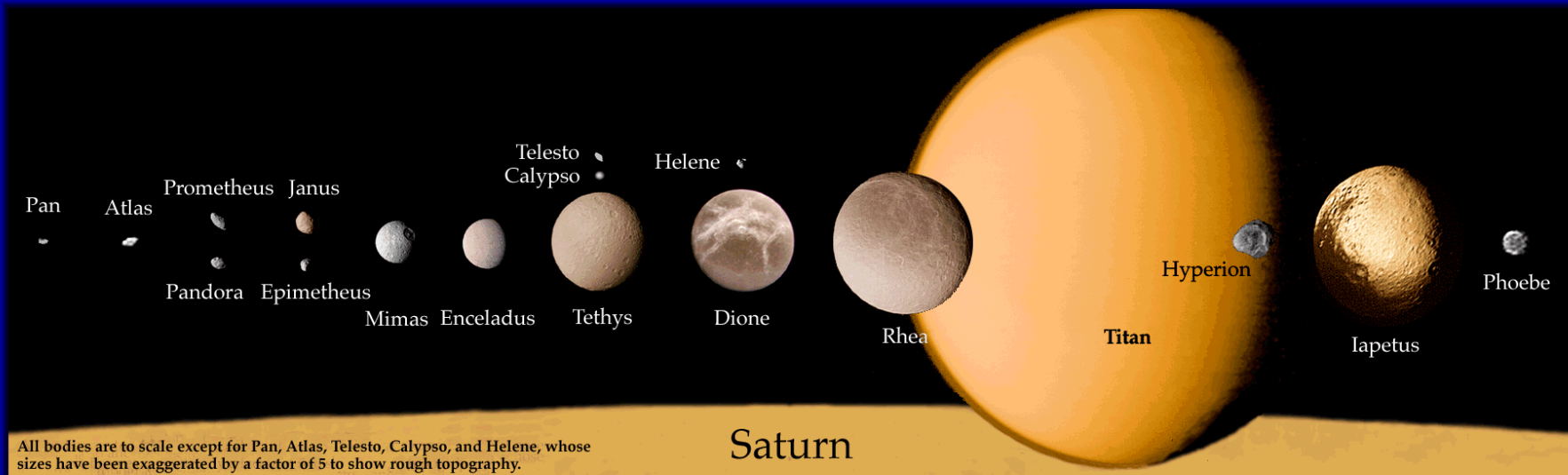
S15 – Dione and Rhea

Dione/Rhea preview

Rosaly Lopes, Bonnie Buratti,
Amanda Hendrix

30 September 2005

Saturn's Satellites and Ring Structure



This graphic is available in color if required.

Main Scientific Goals: The Icy Satellites

- Determine general characteristics, including the bulk compositions, interior structure, and geological histories
- Define the different physical processes that have created the surfaces, crusts or sub-surfaces of the moons.
- Investigate compositions and distributions of surface materials, particularly dark, organic-rich materials and condensed ices with low melting points.
- Determine interaction with rings and with Saturn's magnetosphere

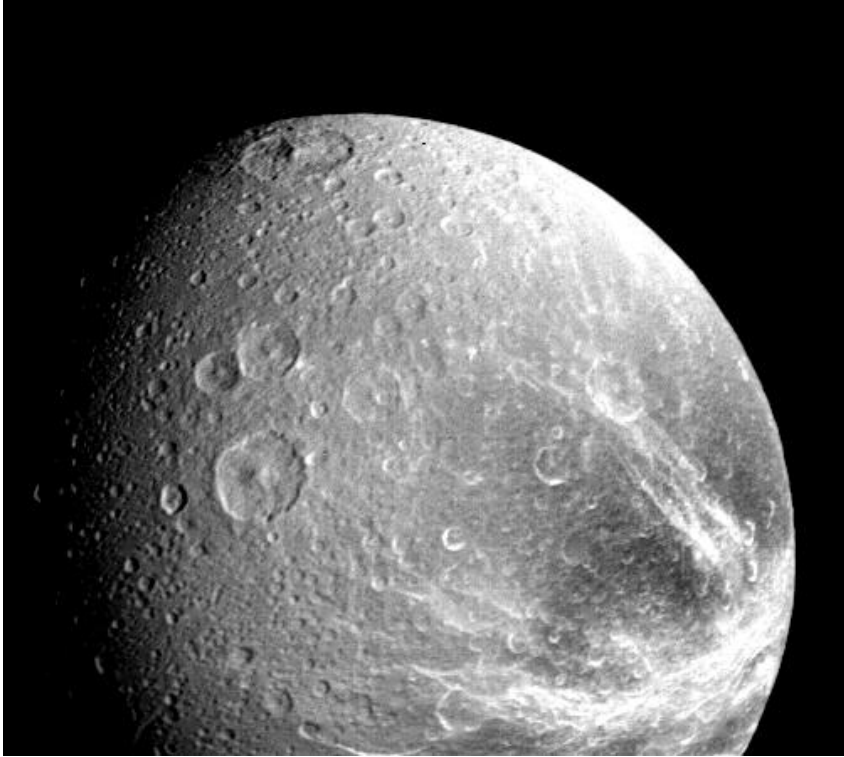
Icy Satellites: Processes

- Orbit within Saturn's magnetosphere: bombardment by charged particles and ring particles (exogenic)
 - Sputtering: rings/tori, tenuous atmospheres
 - Implantation of material
 - Destruction of ice
 - Creation of new species in ice
- Meteorite bombardment (exogenic)
 - Expose fresh material
 - Escape of volatiles (leaving lag deposit)
 - Introduction of new (dark) material
- Geologic processes (endogenic)
 - Due to tidal forces (?)
 - Ice volcanism
 - Resurfacing
 - Creation of rings? Tenuous atmospheres?
 - Tectonism
 - Grooves

Dione:

Targeted flyby on Rev 16 (ORS, RSS, RADAR)

Close flyby on Rev 50



560 km in radius
6.26 R_S orbit

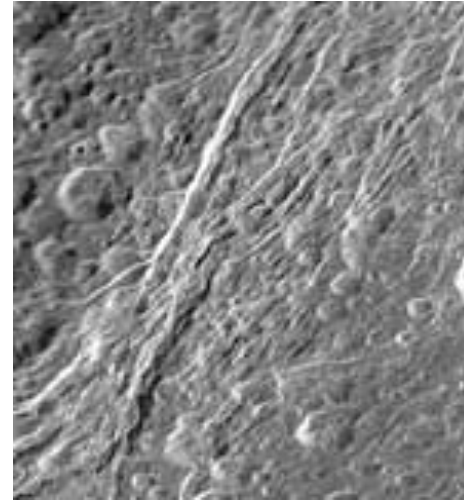


light wispy streaks on trailing hem.

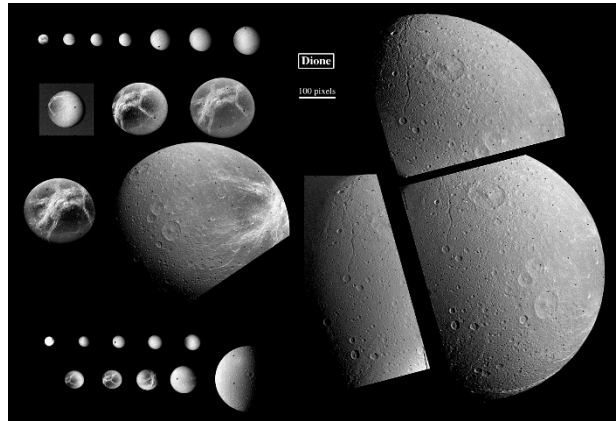
Best of Dione



Best VGR Dione – wispy streaks



Cassini: Wispy streaks = tectonics

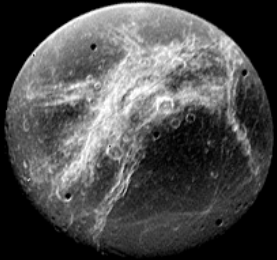
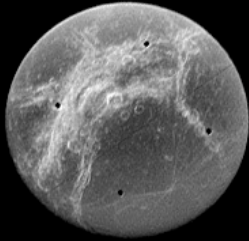
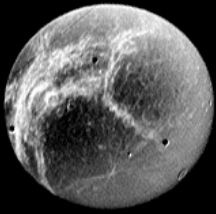


All Voyager



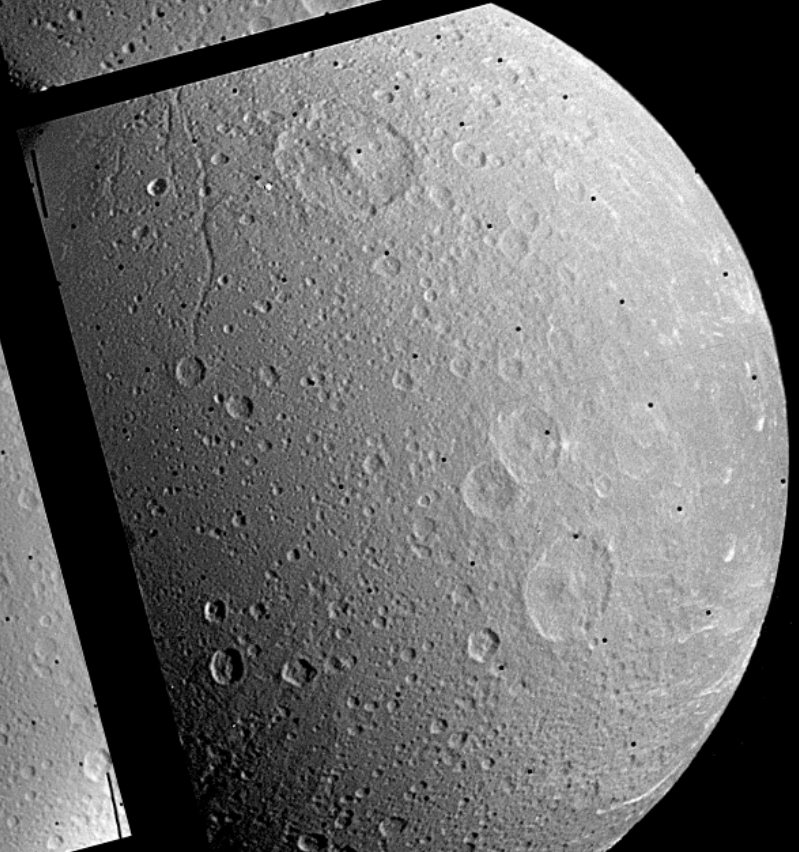
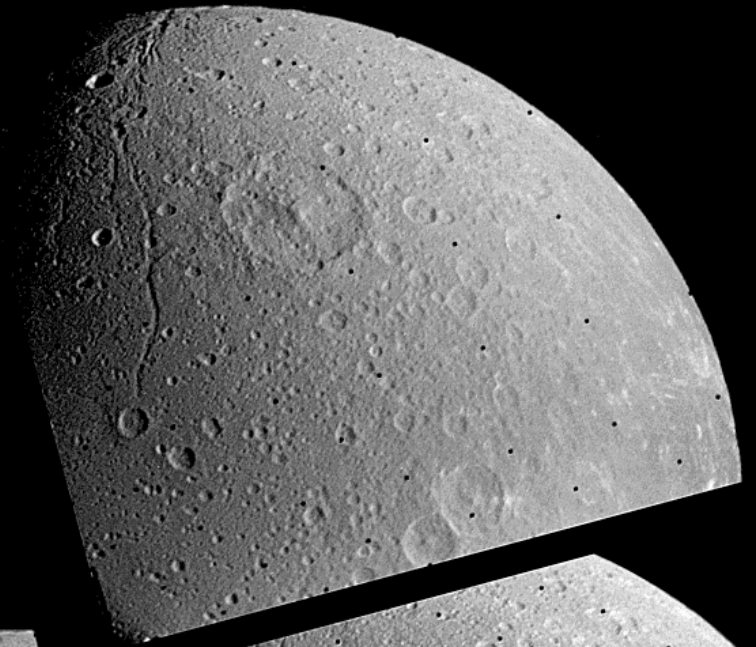
ISS – Dec 4, 2004, 80K away

Tilmann Denk's All Voyager Dione



Dione

100 pixels



Dione: science questions and some preliminary answers

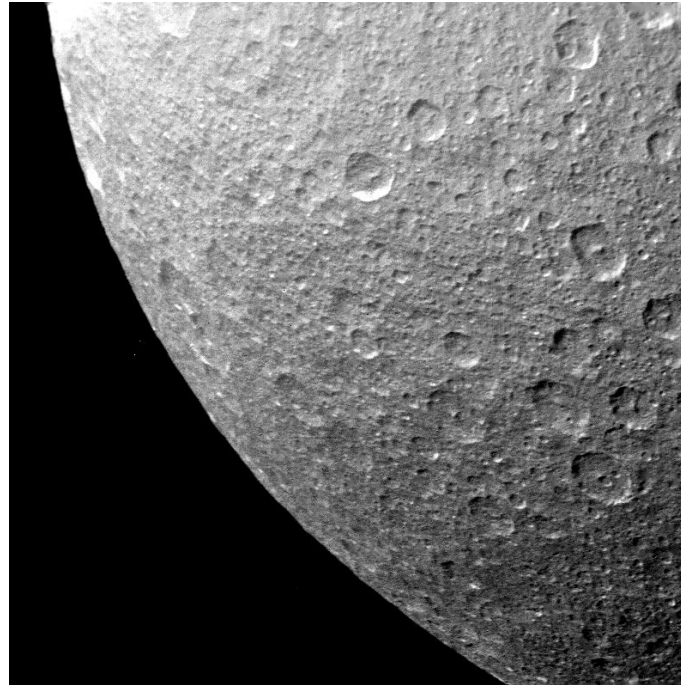
- What is the compositional makeup of Dione, other than water ice? (VIMS CO₂, CN)
- What is the origin of the wispy streaks on Dione's trailing hemisphere? (ISS: tectonic scarps, not erupted materials as suggested from Voyager)
- What is composition of wispy streaks? (water ice of different grain size than surrounding terrain; other?)
- Did resurfacing occur early in Dione's history?
- How does Dione interact with Saturn's rings?
- Some E-ring enhancement due to Dione?
- VIMS: possible detection of particles around Dione

Rhea

Targeted flyby on Rev 18 (ORS+RSS+RADAR);

Quasi-targeted flyby on Rev 49 (ORS+RADAR)

Other good opportunities: Rev C, Rev 20, Rev 22, Rev 45, Rev 52



765 km in radius

8.74 R_S orbit

light wispy streaks on anti-Saturn
hemisphere

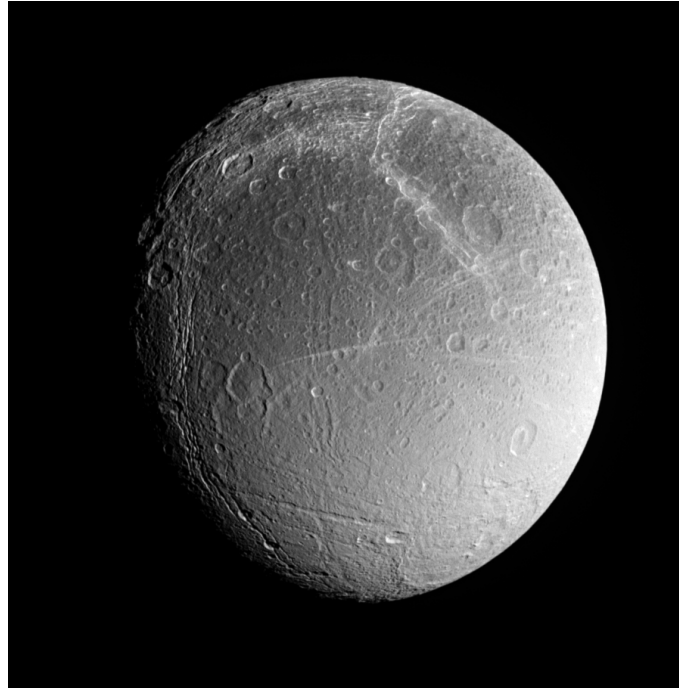
heavily cratered

Rhea: science questions and some preliminary answers

- What is the compositional makeup of Rhea, other than water ice? (VIMS: more ice)
- Does Rhea exhibit any evidence of early geologic activity (not apparent from Voyager or ISS images)
- What is the source of the wispy streaks on Rhea's surface? (tectonic activity, as with Dione?)
- Much better coverage of Rhea is needed!

Dione (016DI) and Rhea (018RH)

Overview



Amanda Hendrix, Bonnie Buratti, Rosaly Lopes

30 September 2005

Dione and Rhea Flybys

- These are the only targeted flybys of these moons
- Another close (non-targeted) flyby of Rhea will happen in Rev 49

Summary: 016DI

- Closest Approach:
 - 500 km altitude
 - Oct. 11 2005 17:52:36 SCET
 - 66.4° phase at C/A (low phase inbound)
- Science Highlights:
 - ORS inbound
 - CAPS/MAPS at C/A
 - ORS + RADAR outbound

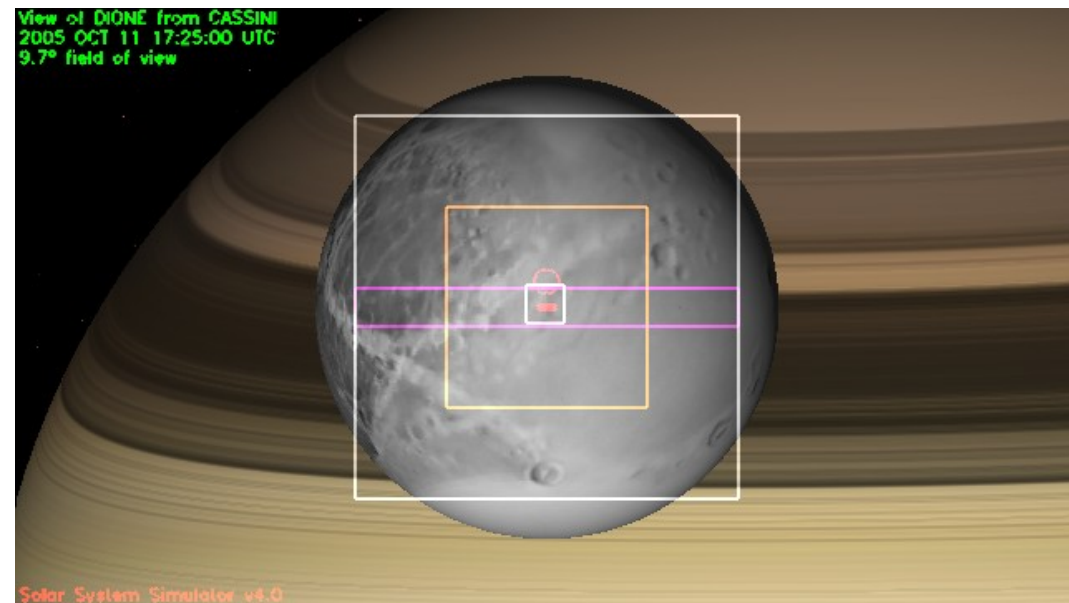
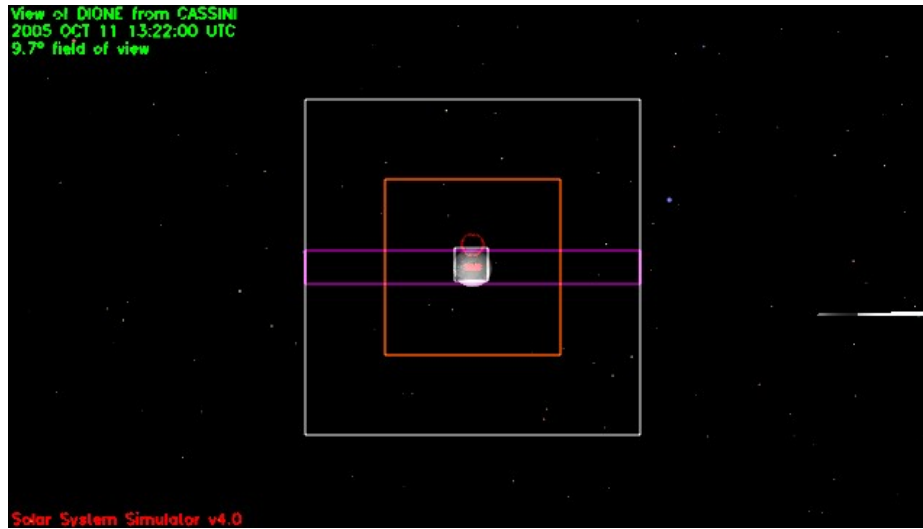
Summary: 018RH

- Closest Approach:
 - 500 km altitude
 - November 26 2005 22:37:36 SCET
 - 86.3° phase at C/A (low phase inbound)
- Science Highlights:
 - RSS + ORS inbound
 - RSS (+ ORS?) at C/A
 - RSS + RADAR + ORS outbound

016DI Attitude Strategy

SOST rev 16 Segment		2005-283T18:27:00		003T01:28:00	2005-286T19:55:00		
NAV_016SK_OPNAV832_PRIME	N	2005-283T18:27:00		000T01:59:00	2005-283T20:28:00	ISS_NAC to Satellites	POS_X to NSP
NAV_016DI_WAYPTTURN832_PRIME		2005-283T20:26:00		000T00:01:00	2005-283T20:27:00	ISS_NAC to Dione	POS_X to NSP
NEW WAYPOINT		2005-283T20:27:00		000T16:55:02	2005-284T19:22:02	ISS_NAC to Dione	POS_X to NSP
UVIS_016SA_EUVFUV001_PRIME	V	2005-283T20:27:00		000T02:33:00	2005-283T23:00:00	ISS_NAC to Saturn	POS_X to NSP
UVIS_016DI_ICYLON001_PRIME	C, I	2005-283T23:00:00		000T02:45:00	2005-284T01:45:00	UVIS_FUV to Dione	POS_X to NSP
VIMS_016DI_DIONE201_PRIME	U	2005-284T01:45:00		000T03:30:00	2005-284T05:15:00	ISS_NAC to Dione	POS_X to NSP
CIRS_016DI_FP3INT001_PRIME	U, V	2005-284T05:15:00		000T00:43:00	2005-284T05:58:00	CIRS_FP3 to Dione	POS_X to NSP
VIMS_016DI_DIONE302_PRIME	C, U	2005-284T05:58:00		000T01:40:00	2005-284T07:38:00	ISS_NAC to Dione	POS_X to NSP
CIRS_016DI_FP3MAP004_PRIME	U, V	2005-284T07:38:00		000T01:00:00	2005-284T08:38:00	CIRS_FP3 to Dione	POS_X to NSP
VIMS_016DI_DIONE002_PRIME	C, R, U	2005-284T08:38:00		000T00:50:00	2005-284T09:28:00	ISS_NAC to Dione	POS_X to NSP
UVIS_016DI_ICYLON003_PRIME	C, R, V	2005-284T09:28:00		000T00:20:00	2005-284T09:48:00	ISS_NAC to Dione	POS_X to NSP
ISS_016DI_GLOOOL001_PRIME	C, R, U, V	2005-284T09:48:00		000T00:20:00	2005-284T10:08:00	ISS_NAC to Dione	POS_X to NSP
CIRS_016DI_FP3MAP005_PRIME	R, U, V	2005-284T10:08:00		000T00:20:00	2005-284T10:28:00	CIRS_FP3 to Dione	POS_X to NSP
SP_016DI_DEADTIME284_PRIME	R	2005-284T10:28:00		000T00:15:06	2005-284T10:43:06	ISS_NAC to Dione	POS_X to NSP
SP_016EA_DLTURN284_PRIME	R	2005-284T10:43:06	GMB_E016_Dione-000T07:08:56	000T00:19:00	2005-284T11:02:06	XBAND to Earth	POS_X to NSP
SP_016EA_G34BWGRSS284_PRIME	R	2005-284T11:02:06	GMB_E016_Dione-000T06:49:56	000T02:01:56	2005-284T13:04:02	XBAND to Earth	POS_X to NSP
SP_016TL_WAYPTTURN284_PRIME		2005-284T13:04:02	GMB_E016_Dione-000T04:48:00	000T00:18:00	2005-284T13:22:02	ISS_NAC to Telesto	POS_X to NSP
NEW WAYPOINT		2005-284T13:22:02		000T07:30:00	2005-284T20:52:02	ISS_NAC to Telesto	POS_X to NSP
Begin Custom		2005-284T13:22:02	GMB_E016_Dione-000T04:30:00	000T00:01:00	2005-284T13:23:02	ISS_NAC to Telesto	POS_X to NSP
CIRS_016DI_FP3MAP006_PRIME	U, V	2005-284T13:22:02	GMB_E016_Dione-000T04:30:00	000T01:00:00	2005-284T14:22:02	CIRS_FP3 to Dione	NEG_Z to NSP
ISS_016DI_REGMAPA001_PRIME	C, U, V	2005-284T14:22:02	GMB_E016_Dione-000T03:30:00	000T00:20:00	2005-284T14:42:02	ISS_NAC to Dione	NEG_Z to NSP
							Pick up at ISS_NAC to Telesto, POS_X to NSP; Hand off at ISS_NAC to Dione, NEG_Z to NSP; Pick up at ISS_NAC to Dione, NEG_Z to NSP; Hand off at ISS_NAC to Dione, NEG_Z to NSP; Pick-up from CIRS at ISS_NAC to Dione, NEG_Z to NSP; Hand-off to UVIS at ISS_NAC to Dione, NEG_Z to NSP
UVIS_016DI_ICYMAP003_PRIME	C, M, V	2005-284T14:42:02	GMB_E016_Dione-000T03:10:00	000T00:45:00	2005-284T15:27:02	ISS_NAC to Dione	NEG_Z to NSP
							Pick up at ISS_NAC to Dione, NEG_Z to NSP; Hand off at ISS_NAC to Dione, NEG_Z to NSP
CIRS_016DI_FP3DISCSC002_PRIME	M, V	2005-284T15:27:02	GMB_E016_Dione-000T02:25:00	000T00:15:00	2005-284T15:42:02	CIRS_FP1 to Dione	NEG_Z to NSP
							Pick up at ISS_NAC to Dione, NEG_Z to NSP; Pick up at ISS_NAC to Dione, NEG_Z to NSP
ISS_016DI_TARGFLYB001_PRIME	C, M, U, V	2005-284T15:42:02	GMB_E016_Dione-000T02:10:00	000T02:02:00	2005-284T17:44:02	ISS_NAC to Dione	NEG_Z to NSP
							Pick up at ISS_NAC to Dione, NEG_Z to NSP; Pick-up from CIRS at ISS_NAC to Dione, NEG_Z to NSP; Hand off at ISS_NAC to Dione, NEG_Z to NSP
CAPS_016DI_DIONEPTG001_PRIME	C, I, M, U, V	2005-284T17:44:02	GMB_E016_Dione-000T00:08:00	000T00:23:20	2005-284T18:07:22	NEG_Y to 126.3/19.7	NEG_Z to NSP
							Pick up at ISS_NAC to Dione, NEG_Z to NSP; Hand off at ISS_NAC to Dione, NEG_Z to NSP
ISS_016DI_CRESCENT001_PRIME	C, M, U, V	2005-284T18:07:22	GMB_E016_Dione+000T00:15:20	000T00:31:40	2005-284T18:39:02	ISS_NAC to Dione (0.0,-50.0,0.0 deg. offset)	POS_X to NSP
							Pick up at ISS_NAC to 225.0/10.0 (0.0,20.0,0.0 deg. offset), NEG_Z to NSP; pick-up attitude is at: Lat/Lon of -10.0,240.0,0.0
CIRS_016DI_FP1DISCSC001_PRIME	I, M, R, V	2005-284T18:39:02	GMB_E016_Dione+000T00:47:00	000T00:43:00	2005-284T19:22:02	CIRS_FP1 to Dione	POS_X to NSP
							Pick up at ISS_NAC to Dione (-0.516,-50.0,-1.203 deg. offset), POS_X to NSP; *Pick-up from CAPS at ISS_NAC to RA/Dec=225.0/10.0 (0.0,20.0,0.0 deg. offset), NEG_Z to NSP; Hand-off:
ISS_016TL_MORPHO001_PRIME	C, M, R, U, V	2005-284T19:22:02	GMB_E016_Dione+000T01:30:00	000T01:00:00	2005-284T20:22:02	ISS_NAC to Telesto	POS_X to NSP
							Pick up at ISS_NAC to Dione, POS_X to NSP; Hand off at ISS_NAC to Telesto, POS_X to NSP; *NAC to Telesto, +X to NSP; pickup:NAC to DI, +X to NSP; Handoff: NAC to TL, +X to NSP
End Custom		2005-284T20:22:02	GMB_E016_Dione+000T02:30:00	000T00:01:00	2005-284T20:23:02		
SP_016DI_WAYPTTURN284_PRIME	M, R	2005-284T20:22:02	GMB_E016_Dione+000T02:30:00	000T00:30:00	2005-284T20:52:02	NEG_Z to Dione (0.0,0.0,13.0 deg. offset)	POS_X to NSP
NEW WAYPOINT		2005-284T20:52:02		000T03:08:54	2005-285T00:00:56	NEG_Z to Dione (0.0,0.0,13.0 deg. offset)	POS_X to NSP
RADAR_016DI_SCATTRAD001_PRIME	M	2005-284T20:52:02	GMB_E016_Dione+000T03:00:00	000T02:44:00	2005-284T23:36:02	NEG_Z to Dione (0.0,0.0,13.0 deg. offset)	POS_X to NSP
SP_016DI_DEADTIME285_PRIME	M	2005-284T23:36:02	GMB_E016_Dione+000T05:44:00	000T00:14:54	2005-284T23:50:56	NEG_Z to Dione (0.0,0.0,13.0 deg. offset)	POS_X to NSP
SP_016EA_DLTURN593_PRIME	M, N	2005-284T23:50:56		000T00:10:00	2005-285T00:00:56	XBAND to Earth (0.0,0.0,60.0 deg. offset)	POS_X to NSP
NEW WAYPOINT		2005-285T00:00:56		000T08:54:04	2005-285T08:55:00	XBAND to Earth (0.0,0.0,60.0 deg. offset)	POS_X to NSP
SP_016EA_C34BWGRSS284_PRIME	M, N, R	2005-285T00:00:56		000T00:13:00	2005-285T00:13:56	XBAND to Earth (0.0,0.0,60.0 deg. offset)	POS_X to NSP
SP_016EA_M34BWGRSS285_PRIME	M, N, R	2005-285T00:13:56		000T08:11:04	2005-285T08:25:00	XBAND to Earth (0.0,0.0,60.0 deg. offset)	POS_X to NSP
Periapse per = 18.7 d, inc ...		2005-285T01:30:57		000T00:00:01	2005-285T01:30:58		
SP_016DR_RAMAVOID285_PRIME	M, N	2005-285T08:25:00		000T00:30:00	2005-285T08:55:00	NEG_Z to Dust_RAM (0.0,0.0,-20.0 deg. offset)	NEG_X to Sun
NEW WAYPOINT		2005-285T08:55:00		000T11:10:00	2005-285T20:05:00	NEG_Z to Dust_RAM (0.0,0.0,-20.0 deg. offset)	NEG_X to Sun
MP_016DR_DUSTHAZRD002_PRIME	M, N	2005-285T08:55:00		000T00:27:00	2005-285T09:22:00	NEG_Z to Dust_RAM	POS_X to NSP
SP_016EA_DLTURN285_PRIME	M	2005-285T09:22:00		000T00:36:00	2005-285T09:58:00	XBAND to Earth (0.0,0.0,-100.0 deg. offset)	POS_Y to NEP
SP_016EA_G70METOTB285_PRIME	M, N	2005-285T09:58:00		000T09:47:00	2005-285T19:45:00	XBAND to Earth (0.0,0.0,-100.0 deg. offset)	5_Hr_Rolling
SP_016SA_WAYPTTURN285_PRIME		2005-285T19:45:00		000T00:20:00	2005-285T20:05:00	ISS_NAC to Saturn	NEG_Z to Sun
NEW WAYPOINT		2005-285T20:05:00		000T02:05:00	2005-286T22:10:00	ISS_NAC to Saturn	NEG_Z to Sun
ISS_016ITE_094W101PH001_PRIME	C, U	2005-285T21:02:00		000T01:05:00	2005-285T22:30:00	UVIS_FUV to Tethys	NEG_Z to Sun
ISS_016EN_310W134PH001_PRIME	C, U	2005-285T22:30:00		000T00:50:00	2005-285T23:20:00	UVIS_FUV to Enceladus	NEG_Z to Sun
ISS_016MI_094W108PH001_PRIME	C, U	2005-285T23:20:00		000T01:20:00	2005-286T00:40:00	UVIS_FUV to Mimas	NEG_Z to Sun
ISS_016DI_094W093PH001_PRIME	C, U	2005-286T00:40:00		000T01:36:00	2005-286T02:16:00	UVIS_FUV to Dione	NEG_Z to Sun
ISS_016PM_MUTUALEVE005_PRIME	C	2005-286T02:16:00		000T00:40:00	2005-286T02:56:00	ISS_NAC to Prometheus	NEG_Z to Sun
ISS_016MI_MUTUALEVE005_PRIME	C	2005-286T02:56:00		000T00:34:00	2005-286T03:30:00	ISS_NAC to Mimas	NEG_Z to Sun
ISS_016MI_166W113PH001_PRIME	C, U	2005-286T03:30:00		000T00:20:00	2005-286T03:50:00	UVIS_FUV to Mimas	NEG_Z to Sun
NAV_016SK_OPNAV861_PRIME	C, N	2005-286T03:50:00		000T01:20:00	2005-286T05:10:00	ISS_NAC to Satellites	NEG_Z to Sun
ISS_016TE_166W110PH001_PRIME	C, U	2005-286T05:10:00		000T00:50:00	2005-286T06:00:00	UVIS_FUV to Tethys	NEG_Z to Sun
ISS_016JA_MUTUALEVE018_PRIME	C	2005-286T06:00:00		000T00:50:00	2005-286T06:50:00	ISS_NAC to Janus	NEG_Z to Sun
ISS_016MI_238W122PH001_PRIME	C, U	2005-286T06:50:00		000T01:20:00	2005-286T08:10:00	UVIS_FUV to Mimas	NEG_Z to Sun
ISS_016EN_022W108PH001_PRIME	C, U	2005-286T08:10:00		000T00:40:00	2005-286T08:50:00	UVIS_FUV to Enceladus	NEG_Z to Sun
SP_016EA_DLTURN286_PRIME		2005-286T08:50:00		000T00:20:00	2005-286T09:10:00	XBAND to Earth	POS_X to NEP
SP_016EA_G34BWGOTB286_PRIME	N	2005-286T09:10:00		000T10:45:00	2005-286T19:55:00	XBAND to Earth	5_Hr_Rolling

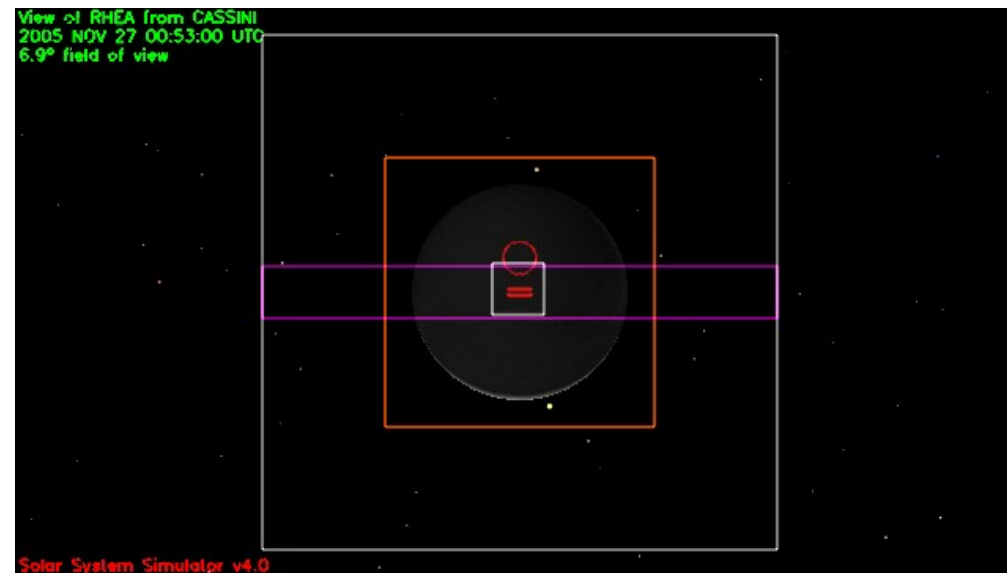
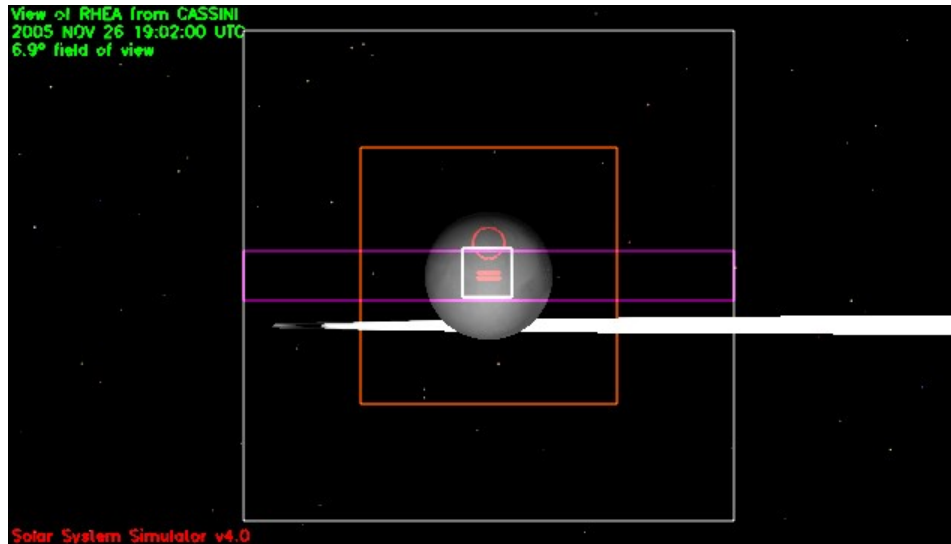
016DI Geometry



018RH Attitude Strategy

SOST rev 18 Segment		2005-329T15:48:00		003T23:45:00	2005-333T15:33:00		
SP_018SA_WAYPTTURN329_PRIME		2005-329T15:48:00		000T00:30:00	2005-329T16:18:00	ISS_NAC to Saturn	POS_X to NSP
NEW WAYPOINT		2005-329T16:18:00		000T12:27:00	2005-330T04:45:00	ISS_NAC to Saturn	POS_X to NSP
CIRS_018SA_FIRMAP011_PRIME	C	2005-329T17:25:00		000T11:00:00	2005-330T04:25:00	CIRS_FP1 to Saturn	POS_X to NSP
SP_018RH_WAYPTTURN330_PRIME		2005-330T04:25:00		000T00:20:00	2005-330T04:45:00	ISS_NAC to Rhea	POS_X to NSP
NEW WAYPOINT		2005-330T04:45:00		000T16:13:39	2005-330T20:58:39	ISS_NAC to Rhea	POS_X to NSP
SP_018NA_DEADTIME330_PRIME		2005-330T04:45:00		000T00:17:39	2005-330T05:02:39	ISS_NAC to Rhea	POS_X to NSP
CIRS_018RH_FP3MAP001_PRIME	R, U, V	2005-330T05:02:39	GMB_E018_Rhea-000T17:35:00	000T01:34:00	2005-330T06:36:39	CIRS_FP3 to Rhea	POS_X to NSP
VIMS_018RH_RHEA001_PRIME	R, U	2005-330T06:36:39	GMB_E018_Rhea-000T16:01:00	000T01:35:00	2005-330T08:11:39	ISS_NAC to Rhea	POS_X to NSP
SP_018EA_DLTURN330_PRIME	R	2005-330T08:11:39	GMB_E018_Rhea-000T14:26:00	000T00:21:00	2005-330T08:32:39	XBAND to Earth	POS_X to NSP
SP_018EA_G34BWGRSS330_PRIME	R	2005-330T08:32:39	GMB_E018_Rhea-000T14:05:00	000T03:18:00	2005-330T11:50:39	XBAND to Earth	POS_X to NSP
SP_018RH_WAYPTTURN430_PRIME	R	2005-330T11:50:39	GMB_E018_Rhea-000T10:47:00	000T00:21:00	2005-330T12:11:39	ISS_NAC to Rhea	POS_X to NSP
ISS_018RH_GLOCOL001_PRIME	C, R, U, V	2005-330T12:11:39	GMB_E018_Rhea-000T10:26:00	000T00:22:00	2005-330T12:33:39	ISS_NAC to Rhea	POS_X to NSP
SP_018EA_DLTURN430_PRIME	R	2005-330T12:33:39	GMB_E018_Rhea-000T10:04:00	000T00:21:00	2005-330T12:54:39	XBAND to Earth	POS_X to NSP
SP_018EA_G34BWGRSS430_PRIME	R	2005-330T12:54:39	GMB_E018_Rhea-000T09:43:00	000T02:48:00	2005-330T15:42:39	XBAND to Earth	POS_X to NSP
SP_018RH_WAYPTTURN530_PRIME		2005-330T15:42:39	GMB_E018_Rhea-000T06:55:00	000T00:21:00	2005-330T16:03:39	ISS_NAC to Rhea	POS_X to NSP
ISS_018RH_REGCOL001_PRIME	C, U, V	2005-330T16:03:39	GMB_E018_Rhea-000T06:34:00	000T01:30:00	2005-330T17:33:39	ISS_NAC to Rhea	POS_X to NSP
VIMS_018RH_RHEA002_PRIME	C, R, U	2005-330T17:33:39	GMB_E018_Rhea-000T05:04:00	000T01:30:00	2005-330T19:03:39	ISS_NAC to Rhea	POS_X to NSP
CIRS_018RH_FP3MAP002_PRIME	R, U, V	2005-330T19:03:39	GMB_E018_Rhea-000T03:34:00	000T00:30:00	2005-330T19:33:39	CIRS_FP3 to Rhea	POS_X to NSP
ISS_018RH_REGMAP001_PRIME	C, R, U, V	2005-330T19:33:39	GMB_E018_Rhea-000T03:04:00	000T01:00:00	2005-330T20:33:39	ISS_NAC to Rhea	POS_X to NSP
SP_018EA_DLTURNS24_PRIME	R	2005-330T20:33:39	GMB_E018_Rhea-000T02:04:00	000T00:25:00	2005-330T20:58:39	XBAND to Earth	NEG_Y to 226.0/15.0
NEW WAYPOINT		2005-330T20:58:39		000T03:55:00	2005-331T00:53:39	XBAND to Earth	NEG_Y to 226.0/15.0
SP_018EA_C34BWGRSS330_PRIME	R	2005-330T20:58:39	GMB_E018_Rhea-000T01:39:00	000T00:49:21	2005-330T21:48:00	XBAND to Earth	NEG_Y to 226.0/15.0
SP_018EA_M34BWG2ND330_PRIME	M, R	2005-330T21:48:00		000T00:34:39	2005-330T22:22:39	XBAND to Earth	NEG_Y to 226.0/15.0
SP_018EA_RHEAORS330_PRIME	C, I, M, R, U, V	2005-330T22:22:39	GMB_E018_Rhea-000T00:15:00	000T00:30:00	2005-330T22:52:39	XBAND to Earth	NEG_Y to 226.0/15.0
SP_018EA_M34BWGRSS330_PRIME	M, R	2005-330T22:52:39	GMB_E018_Rhea-000T00:15:00	000T01:39:00	2005-331T00:31:39	XBAND to Earth	NEG_Y to 226.0/15.0
SP_018RH_WAYPTTURN331_PRIME	M, R	2005-331T00:31:39	GMB_E018_Rhea-000T01:54:00	000T00:22:00	2005-331T00:53:39	ISS_NAC to Rhea	POS_X to NSP
NEW WAYPOINT		2005-331T00:53:39		000T07:43:21	2005-331T08:37:00	ISS_NAC to Rhea	POS_X to NSP
CIRS_018RH_FP3MAP003_PRIME	M, R, U, V	2005-331T00:53:39	GMB_E018_Rhea+000T02:16:00	000T00:50:00	2005-331T01:43:39	CIRS_FP1 to Rhea	POS_X to NSP
VIMS_018RH_RHEA003_PRIME	C, M, R, U	2005-331T01:43:39	GMB_E018_Rhea+000T03:06:00	000T00:50:00	2005-331T02:33:39	ISS_NAC to Rhea	POS_X to NSP
Begin Custom		2005-331T02:33:39	GMB_E018_Rhea+000T03:56:00	000T00:01:00	2005-331T02:34:39	ISS_NAC to Rhea	POS_X to NSP
RADAR_018RH_SCATTRAD001_PRIME	M, R	2005-331T02:33:39	GMB_E018_Rhea+000T03:56:00	000T03:00:00	2005-331T05:33:39	NEG_Z to Rhea	POS_X to NSP
SP_018EA_DLTURN431_PRIME	M, R	2005-331T05:33:39	GMB_E018_Rhea+000T06:56:00	000T00:08:00	2005-331T05:41:39	XBAND to Earth	POS_X to NSP
SP_018EA_M70METNON331_PRIME	M, R	2005-331T05:41:39	GMB_E018_Rhea+000T07:04:00	000T01:57:00	2005-331T07:38:39	XBAND to Earth	POS_X to NSP
SP_018RH_WAYPTTURN431_PRIME	M	2005-331T07:38:39	GMB_E018_Rhea+000T09:01:00	000T00:20:00	2005-331T07:58:39	ISS_NAC to Rhea	POS_X to NSP
End Custom		2005-331T07:58:39		000T00:01:00	2005-331T07:59:39	ISS_NAC to Rhea	POS_X to NSP
SP_018NA_DEADTIME331_PRIME	M	2005-331T07:58:39	GMB_E018_Rhea+000T09:21:00	000T00:13:21	2005-331T08:12:00	ISS_NAC to Rhea	POS_X to NSP
SP_018EN_WAYPTTURN331_PRIME	M	2005-331T08:12:00		000T00:25:00	2005-331T08:37:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
NEW WAYPOINT		2005-331T08:37:00		000T23:13:00	2005-332T07:50:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
UVIS_018SA_LIMBSKIM003_PRIME	M	2005-331T08:37:00		000T01:10:00	2005-331T09:47:00	UVIS_FUV to Saturn	POS_X to Saturn
UVIS_018EN_ICYLON001_PRIME	C, I, M, V	2005-331T09:47:00		000T03:13:00	2005-331T13:00:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
Periapse per = 27.6 d, inc ...		2005-331T11:21:19		000T00:00:01	2005-331T11:21:20		
UVIS_018SA_LIMBSKIM004_PRIME	M	2005-331T13:00:00		000T01:10:00	2005-331T14:10:00	UVIS_FUV to Saturn	POS_X to Saturn
CIRS_018EN_FP1FAZ0P5061_PRIME	I, M, U, V	2005-331T14:10:00		000T01:50:00	2005-331T16:00:00	CIRS_FP1 to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
UVIS_018EN_ICYLON003_PRIME	C, I, M, V	2005-331T16:00:00		000T00:20:00	2005-331T16:20:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
VIMS_018EN_ENCL001_PRIME	C, I, M, U	2005-331T16:20:00		000T00:40:00	2005-331T17:00:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
ISS_018EN_HIPHAS001_PRIME	C, M, U, V	2005-331T17:00:00		000T01:00:00	2005-331T18:00:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
UVIS_018EN_ICYLON006_PRIME	C, I, M, V	2005-331T18:00:00		000T00:20:00	2005-331T18:20:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
CIRS_018EN_FP1FAZ0P5002_PRIME	I, M, U, V	2005-331T18:20:00		000T00:40:00	2005-331T19:00:00	CIRS_FP1 to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
ISS_018EN_PLUMES001_PRIME	C, M, U, V	2005-331T19:00:00		000T01:00:00	2005-331T20:00:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
VIMS_018EN_ENCL002_PRIME	C, I, M, U	2005-331T20:00:00		000T01:35:00	2005-331T21:35:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
UVIS_018EN_ICYLON010_PRIME	C, I, M	2005-331T21:35:00		000T00:20:00	2005-331T21:55:00	ISS_NAC to Enceladus (0.0,5.0,0.0 deg. offset)	POS_X to NSP
SP_018EA_DLTURN331_PRIME	M	2005-331T21:55:00		000T00:20:00	2005-331T22:15:00	XBAND to Earth	POS_X to NSP
SP_018EA_M70METOTP331_PRIME	M, N	2005-331T22:15:00		000T09:10:00	2005-332T07:25:00	XBAND to Earth	Rolling
SP_018SA_WAYPTTURN332_PRIME		2005-332T07:25:00		000T00:25:00	2005-332T07:50:00	ISS_NAC to Saturn	POS_X to NSP
NEW WAYPOINT		2005-332T07:50:00		001T08:13:00	2005-333T16:03:00	ISS_NAC to Saturn	POS_X to NSP
VIMS_018SA_CYLMAP001_PRIME		2005-332T07:50:00		000T11:00:00	2005-332T18:50:00	ISS_NAC to Saturn	POS_X to NSP
ISS_018EN_MUTUALEVE028_PRIME		2005-332T20:04:51		000T00:35:09	2005-332T20:40:00	ISS_NAC to Enceladus	POS_X to NSP
VIMS_018TE_TETH001_PRIME	I, U	2005-332T20:40:00		000T00:30:00	2005-332T21:10:00	ISS_NAC to Tethys	POS_X to NSP
ISS_018EP_MUTUALEVE012_PRIME		2005-333T01:08:00		000T00:32:00	2005-333T01:40:00	ISS_NAC to Epimetheus	POS_X to NSP
VIMS_018TE_TETH002_PRIME	I, U	2005-333T01:40:00		000T02:07:00	2005-333T03:47:00	ISS_NAC to Tethys	POS_X to NSP
ISS_018TE_MUTUALEVE001_PRIME	V	2005-333T03:47:00		000T00:33:00	2005-333T04:20:00	ISS_NAC to Tethys	POS_X to NSP
VIMS_018TE_TETH003_PRIME	I, U	2005-333T04:20:00		000T01:48:00	2005-333T06:08:00	ISS_NAC to Tethys	POS_X to NSP
SP_018EA_DLTURN333_PRIME		2005-333T06:08:00		000T00:25:00	2005-333T06:33:00	XBAND to Earth	NEG_Y to NSP
SP_018EA_G70METOTB333_PRIME	N	2005-333T06:33:00		000T09:00:00	2005-333T15:33:00	XBAND to Earth	Rolling

018RH Geometry



016DI Data Playback Schedule

016DI (D1) Playback Timeline

Created Sept. 29, 2005

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 016SA SURVEY005 RIDER	INMS 1498	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
RSS 016DI KADOWN001 RSS	RSS Activity	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
CAPS 016SA SURVEY001 RIDER	CAPS 16000	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
MAG 016OT SURVEY002 PRIME	MAG 1976	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
MAG 016OT SURVEY004 PRIME	MAG 1976	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
CAPS 016SA SURVEY003 RIDER	CAPS 16000	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
RPWS 016SA OUTSURVEY005 PRIME	RPWS 30464	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
INMS 016SA SURVEY002 RIDER	INMS 1498	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
MIMI 016CO SURVEY001 RIDER	MIMI 8000	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
RPWS 016SA OUTSURVEY003 PRIME	RPWS 30464	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
UVIS 016SW IPHSURVEY014 RIDER	UVIS 5032	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
CDA 016RI 1600RINGM011 RIDER	CDA 524	2005-283T18:27:00	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
CDA 016DR 1500DUST074 RIDER	CDA 524	2005-283T18:27:01	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
MIMI 016CO SURVEY004 RIDER	MIMI 8000	2005-283T18:27:01	-00T23:25	11-Oct Tue 12:47 PM	Tue 12:48 PM	11-Oct Tue 05:47 AM	Tue 05:48 AM
VIMS 016SA EUVFUV001 UVIS	VIMS 18432	2005-283T20:27:00	-00T21:25	11-Oct Tue 01:12 PM	Tue 01:16 PM	11-Oct Tue 06:12 AM	Tue 06:16 AM
UVIS 016SA EUVFUV001 PRIME	UVIS 5032	2005-283T20:27:00	-00T21:25	11-Oct Tue 01:12 PM	Tue 01:16 PM	11-Oct Tue 06:12 AM	Tue 06:16 AM
RPWS 016SA INSURVEY001 PRIME	RPWS 30464	2005-283T22:45:00	-00T19:07	11-Oct Tue 02:13 PM	Wed 02:19 AM	11-Oct Tue 07:13 AM	Tue 07:19 PM
UVIS 016DI ICYLN001 PRIME	UVIS 5032	2005-283T23:00:00	-00T18:52	11-Oct Tue 02:19 PM	Wed 02:34 AM	11-Oct Tue 07:19 AM	Tue 07:34 PM
ISS 016DI ICYLN001 UVIS	ISS Phot 1 by 1	2005-283T23:00:00	-00T18:52	11-Oct Tue 02:19 PM	Wed 02:34 AM	11-Oct Tue 07:19 AM	Tue 07:34 PM
CDA 016RI 1400RINGM009 RIDER	CDA 524	2005-283T23:07:56	-00T18:44	12-Oct Wed 01:26 AM	Wed 02:38 AM	11-Oct Tue 06:26 PM	Tue 07:38 PM
CIRS 016DI ICYLN001 UVIS	CIRS 4000	2005-284T00:00:00	-00T17:52	12-Oct Wed 01:57 AM	Wed 03:08 AM	11-Oct Tue 06:57 PM	Tue 08:08 PM
CDA 016DR 1300DUST075 RIDER	CDA 524	2005-284T01:08:56	-00T16:43	12-Oct Wed 02:37 AM	Wed 03:44 AM	11-Oct Tue 07:37 PM	Tue 08:44 PM
VIMS 016DI DIONE201 PRIME	VIMS 18432	2005-284T01:45:00	-00T16:07	12-Oct Wed 02:57 AM	Wed 04:01 AM	11-Oct Tue 07:57 PM	Tue 09:01 PM
UVIS 016DI ICYLN003 VIMS	UVIS 5032	2005-284T01:45:00	-00T16:07	12-Oct Wed 02:57 AM	Wed 04:01 AM	11-Oct Tue 07:57 PM	Tue 09:01 PM
CDA 016RI 1200RINGM009 RIDER	CDA 524	2005-284T04:07:25	-00T13:44	12-Oct Wed 03:44 AM	Wed 05:10 AM	11-Oct Tue 08:44 PM	Tue 10:10 PM
VIMS 016DI DIONE313 CIRS	VIMS 18432	2005-284T05:15:00	-00T12:37	12-Oct Wed 04:06 AM	Wed 05:42 AM	11-Oct Tue 09:06 PM	Tue 10:42 PM
UVIS 016DI ICYLN004 CIRS	UVIS 5032	2005-284T05:15:00	-00T12:37	12-Oct Wed 04:06 AM	Wed 05:42 AM	11-Oct Tue 09:06 PM	Tue 10:42 PM
CIRS 016DI FP3INT001 PRIME	CIRS 4000	2005-284T05:15:00	-00T12:37	12-Oct Wed 04:06 AM	Wed 05:42 AM	11-Oct Tue 09:06 PM	Tue 10:42 PM
INMS 016DI DIIBNSURV001 RIDER	INMS 1498	2005-284T05:51:58	-00T12:00	12-Oct Wed 04:20 AM	Wed 06:02 AM	11-Oct Tue 09:20 PM	Tue 11:02 PM
CIRS 016DI DIONE302 VIMS	CIRS 4000	2005-284T05:58:00	-00T11:54	12-Oct Wed 04:23 AM	Wed 06:06 AM	11-Oct Tue 09:23 PM	Tue 11:06 PM
UVIS 016DI ICYLN005 VIMS	UVIS 5032	2005-284T05:58:00	-00T11:54	12-Oct Wed 04:23 AM	Wed 06:06 AM	11-Oct Tue 09:23 PM	Tue 11:06 PM
VIMS 016DI DIONE302 PRIME	VIMS 18432	2005-284T05:58:00	-00T11:54	12-Oct Wed 04:23 AM	Wed 06:06 AM	11-Oct Tue 09:23 PM	Tue 11:06 PM
CDA 016DR 1100DUST076 RIDER	CDA 524	2005-284T06:08:24	-00T11:43	12-Oct Wed 04:28 AM	Wed 06:13 AM	11-Oct Tue 09:28 PM	Tue 11:13 PM
VIMS 016DI DIONE101 CIRS	VIMS 18432	2005-284T07:38:00	-00T10:14	12-Oct Wed 05:10 AM	Wed 07:16 AM	11-Oct Tue 10:10 PM	Wed 12:16 AM
UVIS 016DI ICYLN006 CIRS	UVIS 5032	2005-284T07:38:00	-00T10:14	12-Oct Wed 05:10 AM	Wed 07:16 AM	11-Oct Tue 10:10 PM	Wed 12:16 AM
CIRS 016DI FP3MAP004 PRIME	CIRS 4000	2005-284T07:38:00	-00T10:14	12-Oct Wed 05:10 AM	Wed 07:16 AM	11-Oct Tue 10:10 PM	Wed 12:16 AM
VIMS 016DI DIONE002 PRIME	VIMS 18432	2005-284T08:38:00	-00T09:14	12-Oct Wed 05:38 AM	Wed 07:58 AM	11-Oct Tue 10:38 PM	Wed 12:58 AM
UVIS 016DI ICYLN007 VIMS	UVIS 5032	2005-284T08:38:00	-00T09:14	12-Oct Wed 05:38 AM	Wed 07:58 AM	11-Oct Tue 10:38 PM	Wed 12:58 AM
CIRS 016DI ORS001 RIDER	CIRS 4000	2005-284T08:38:00	-00T09:14	12-Oct Wed 05:38 AM	Wed 07:58 AM	11-Oct Tue 10:38 PM	Wed 12:58 AM
RSS 016DI THERMAL001 RSS	RSS Activity	2005-284T09:02:06	-00T08:49	12-Oct Wed 05:50 AM	Wed 08:16 AM	11-Oct Tue 10:50 PM	Wed 01:16 AM

018RH Data Playback Schedule

018RH (RH1) Playback Timeline

Created Sept. 29, 2005

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
CAPS 018OT MAGBNDNL013 PRIME	CAPS 16000	2005-329T15:48:00	-01T06:49	26-Nov Sat 09:49 AM	Sat 09:49 AM	26-Nov Sat 01:49 AM	Sat 01:49 AM
CAPS 018SA SURVEY001 RIDER	CAPS 16000	2005-329T15:48:00	-01T06:49	26-Nov Sat 09:49 AM	Sat 09:49 AM	26-Nov Sat 01:49 AM	Sat 01:49 AM
MIMI 018CO MAGBOUND009 RIDER	MIMI 8000	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
MAG 018CO MAGBOUND009 MAPS	MAG 1976	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
RSS 018RH KADOWN001 RSS	RSS Activity	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
UVIS 018SW IPHSURVEY013 RIDER	UVIS 5032	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:11 AM	Sat 09:49 AM	27-Nov Sun 07:11 PM	Sat 01:49 AM
CDA 018TI 2000TORX014 RIDER	CDA 524	2005-329T15:48:00	-01T06:49	28-Nov Mon 12:52 AM	Sat 09:49 AM	27-Nov Sun 04:52 PM	Sat 01:49 AM
MIMI 018CO SURVEY001 RIDER	MIMI 8000	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
RSS 018RH GRAVORT003 RSS	RSS Activity	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
MAG 018OT SURVEY001 PRIME	MAG 1976	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
INMS 018SA SURVEY001 RIDER	INMS 1498	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
RPWS 018CO MAGBOUND003 CAPS	RPWS 30464	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
INMS 018SA SURVEY002 RIDER	INMS 1498	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
RPWS 018SA OUTSURVEY001 PRIME	RPWS 30464	2005-329T15:48:00	-01T06:49	28-Nov Mon 03:02 AM	Sat 09:49 AM	27-Nov Sun 07:02 PM	Sat 01:49 AM
CDA 018DR 1900DUST101 RIDER	CDA 524	2005-329T17:00:45	-01T05:36	26-Nov Sat 10:00 AM	Sat 10:01 AM	26-Nov Sat 02:00 AM	Sat 02:01 AM
CIRS 018SA FIRMAP011 SI	ISS SUPPORT IMAGING	2005-329T17:25:00	-01T05:12	28-Nov Mon 03:02 AM	Sat 10:05 AM	27-Nov Sun 07:02 PM	Sat 02:05 AM
CIRS 018SA FIRMAP011 PRIME	CIRS 4000	2005-329T17:25:00	-01T05:12	28-Nov Mon 03:02 AM	Sat 10:05 AM	27-Nov Sun 07:02 PM	Sat 02:05 AM
CDA 018RI 1800RINGM013 RIDER	CDA 524	2005-329T20:25:13	-01T02:12	28-Nov Mon 12:52 AM	Sat 11:02 AM	27-Nov Sun 04:52 PM	Sat 03:02 AM
CDA 018DR 1700DUST100 RIDER	CDA 524	2005-329T22:26:13	-01T00:11	26-Nov Sat 09:49 AM	Sat 11:40 AM	26-Nov Sat 01:49 AM	Sat 03:40 AM
CDA 018RI 1600RINGM015 RIDER	CDA 524	2005-330T02:15:07	-00T20:22	28-Nov Mon 12:52 AM	Sat 12:53 PM	27-Nov Sun 04:52 PM	Sat 04:53 AM
CDA 018DR 1500DUST101 RIDER	CDA 524	2005-330T04:16:06	-00T18:21	26-Nov Sat 09:49 AM	Sat 02:41 PM	26-Nov Sat 01:49 AM	Sat 06:41 AM
UVIS 018RH ICYLOM001 CIRS	UVIS 5032	2005-330T05:02:39	-00T17:34	28-Nov Mon 03:11 AM	Sat 02:51 PM	27-Nov Sun 07:11 PM	Sat 06:51 AM
VIMS 018RH RHEA099 CIRS	VIMS 18432	2005-330T05:02:39	-00T17:34	29-Nov Tue 09:13 AM	Sat 02:51 PM	28-Nov Tue 01:13 AM	Sat 06:51 AM
CIRS 018RH FP3MAP001 PRIME	CIRS 4000	2005-330T05:02:39	-00T17:34	28-Nov Mon 12:52 AM	Sat 02:51 PM	27-Nov Sun 04:52 PM	Sat 06:51 AM
RSS 018RH THERMAL004 RSS	RSS Activity	2005-330T06:32:39	-00T16:04	28-Nov Mon 03:02 AM	Sat 03:30 PM	27-Nov Sun 07:02 PM	Sat 07:30 AM
UVIS 018RH ICYLOM002 VIMS	UVIS 5032	2005-330T06:36:39	-00T16:00	28-Nov Mon 03:11 AM	Sat 03:32 PM	27-Nov Sun 07:11 PM	Sat 07:32 AM
VIMS 018RH RHEA001 PRIME	VIMS 18432	2005-330T06:36:39	-00T16:00	29-Nov Tue 09:13 AM	Sat 03:32 PM	29-Nov Tue 01:13 AM	Sat 07:32 AM
RPWS 018SA INSURVEY001 PRIME	RPWS 30464	2005-330T07:20:00	-00T15:17	28-Nov Mon 03:02 AM	Sat 03:56 PM	27-Nov Sun 07:02 PM	Sat 07:56 AM
CDA 018RI 1400RINGM013 RIDER	CDA 524	2005-330T07:42:44	-00T14:54	28-Nov Mon 12:52 AM	Sat 04:08 PM	27-Nov Sun 04:52 PM	Sat 08:08 AM
CDA 018RI 1400RINGM013 RIDER	CDA 524	2005-330T08:32:39	-00T14:04	28-Nov Mon 12:52 AM	Sat 04:28 PM	27-Nov Sun 04:52 PM	Sat 08:28 AM
RSS 018RH GRAVITY004 PRIME	RSS Activity	2005-330T08:32:39	-00T14:04	28-Nov Mon 03:02 AM	Sat 04:28 PM	27-Nov Sun 07:02 PM	Sat 08:28 AM
CDA 018DR 1300DUST102 RIDER	CDA 524	2005-330T09:42:39	-00T12:54	26-Nov Sat 09:49 AM	Sat 04:45 PM	26-Nov Sat 01:49 AM	Sat 08:45 AM
INMS 018RH INBIC002 RIDER	INMS 1498	2005-330T10:37:39	-00T11:59	28-Nov Mon 03:02 AM	Sat 10:26 PM	27-Nov Sun 07:02 PM	Sat 02:26 PM
RSS 018RH THERMAL001 RSS	RSS Activity	2005-330T10:54:39	-00T11:42	28-Nov Mon 03:02 AM	Sat 10:36 PM	27-Nov Sun 07:02 PM	Sat 02:36 PM
UVIS 018RH ICYLOM003 ISS	UVIS 5032	2005-330T12:11:39	-00T10:25	28-Nov Mon 03:11 AM	Sat 11:12 PM	27-Nov Sun 07:11 PM	Sat 03:12 PM
VIMS 018RH RHEA109 ISS	VIMS 18432	2005-330T12:11:39	-00T10:25	29-Nov Tue 09:13 AM	Sat 11:12 PM	29-Nov Tue 01:13 AM	Sat 03:12 PM
ISS 018RH GLOCOL001 PRIME	ISS Phot 1 by 1	2005-330T12:11:39	-00T10:25	28-Nov Mon 03:02 AM	Sat 11:12 PM	27-Nov Sun 07:02 PM	Sat 03:12 PM
CIRS 018RH ISS002 RIDER	CIRS 4000	2005-330T12:11:39	-00T10:25	28-Nov Mon 12:52 AM	Sat 11:12 PM	27-Nov Sun 04:52 PM	Sat 03:12 PM
CDA 018RI 1200RINGM013 RIDER	CDA 524	2005-330T12:52:17	-00T09:45	28-Nov Mon 12:52 AM	Sun 01:20 AM	27-Nov Sun 04:52 PM	Sat 05:20 PM
RSS 018RH GRAVITY001 PRIME	RSS Activity	2005-330T12:54:39	-00T09:42	28-Nov Mon 03:02 AM	Sun 01:20 AM	27-Nov Sun 07:02 PM	Sat 05:20 PM

Rev. 16 Dione and Rev. 18 Rhea: CIRS Preview

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

Goals

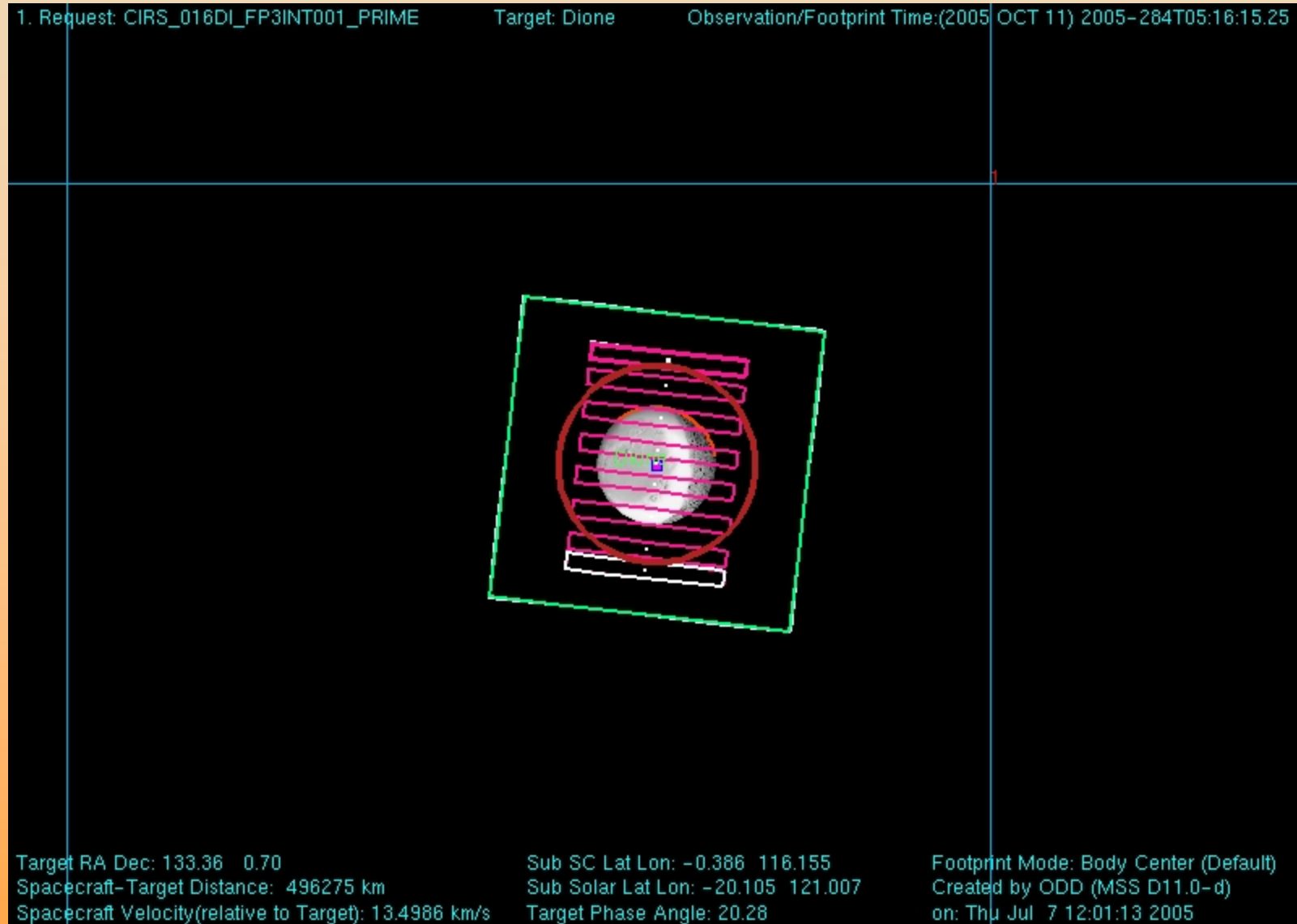
- Daytime and nighttime temperatures of Dione and Rhea to constrain:
 - Thermal inertia
 - Bolometric albedo
 - Volatile stability
 - Etc
- 10 - ~500 μm thermal emission spectra of Dione and Rhea to search for compositionally diagnostic spectral features
- Look for endogenic emission from Dione
 - Not impossible, given the fresh fractures...

Instrument

Detectors

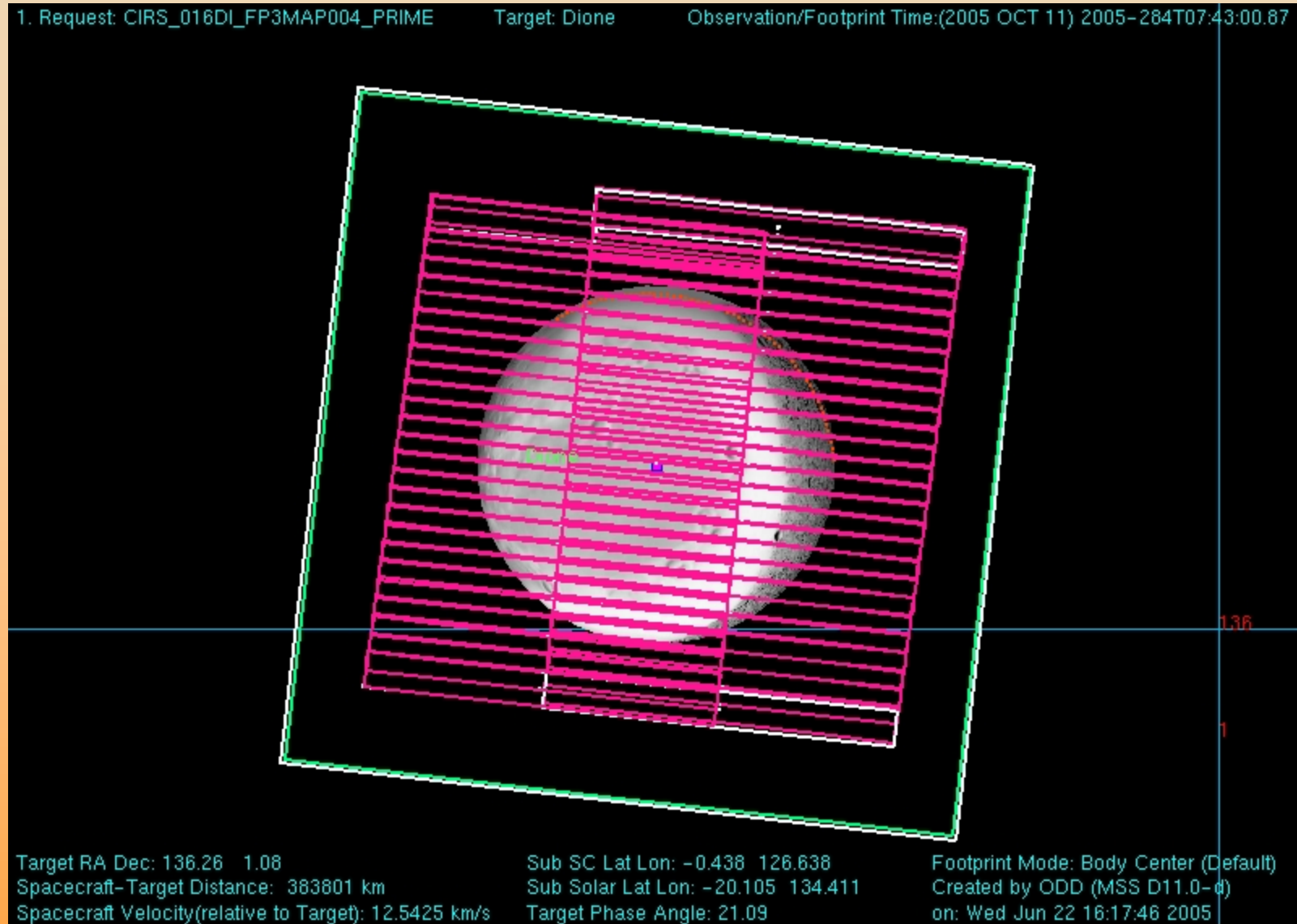
- FP1: 16 – 500 microns, 4 mrad resolution, single pixel
 - Low spatial resolution, day and night temperatures
- FP3: 9 – 16 microns, 0.3 mrad resolution, 1 x 10 pixels
 - High spatial resolution, daytime temperatures only
- FP4: 7 – 9 microns, 0.3 mrad resolution, 1 x 10 pixels
 - No signal except on the hottest targets

016DI_FP3INT001



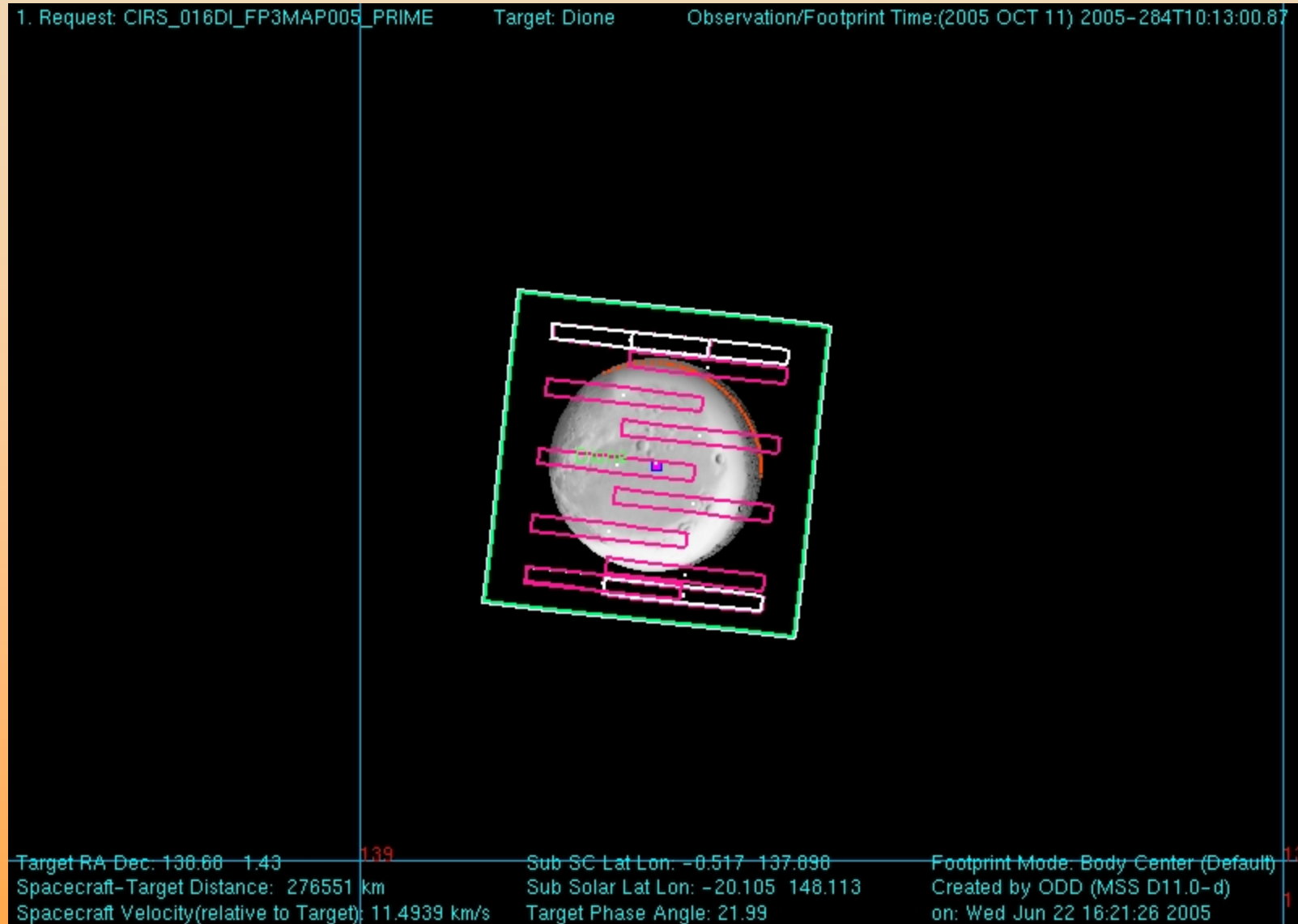
Dione dayside: 20 degree phase

016DI_FP3MAP004



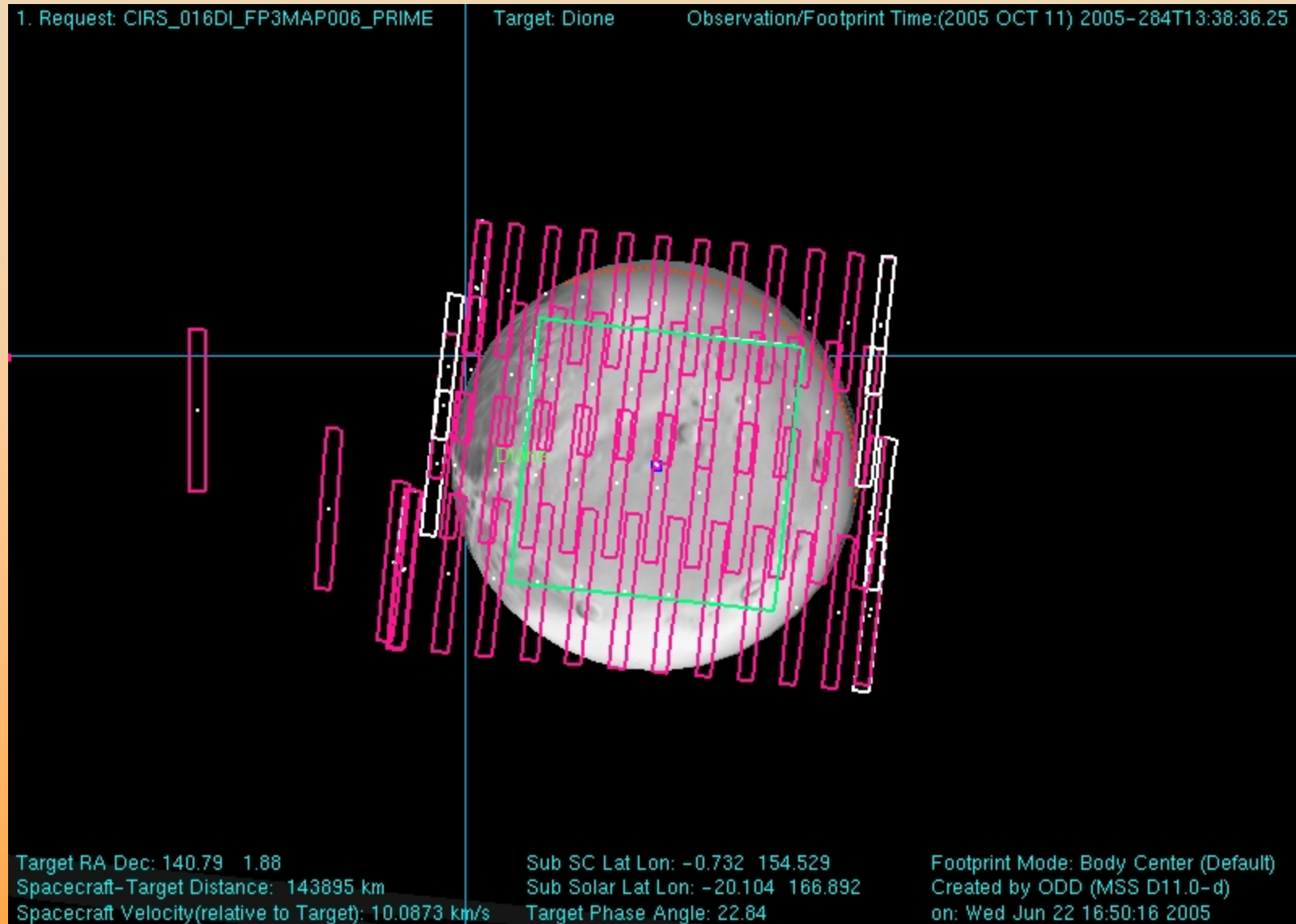
Dione dayside: 21 degree phase (1 hour scan).

016DI_FP3MAP005



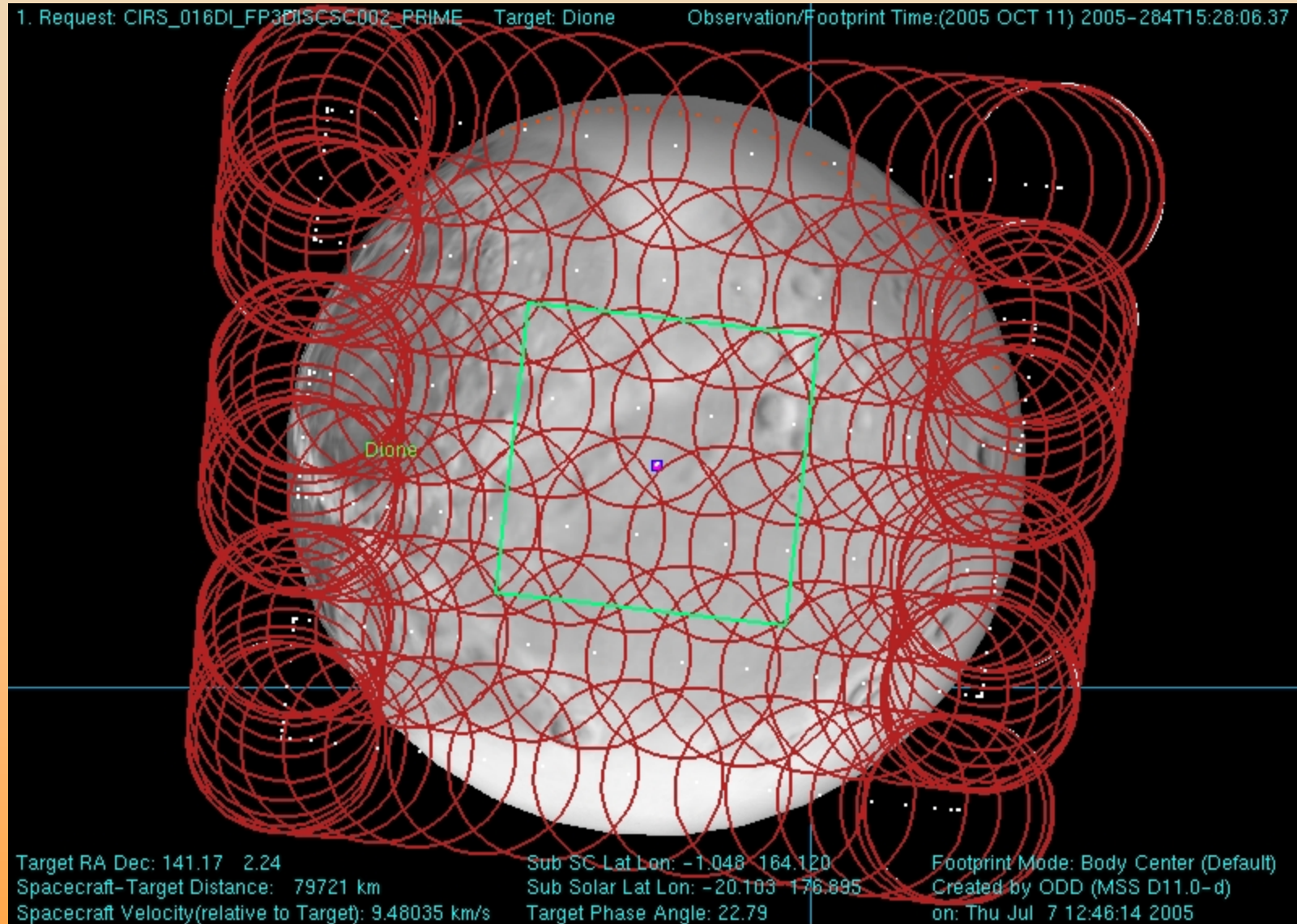
Dione FP3 dayside: 22 degree phase (quick 20 minute scan).

016DI_FP3MAP006



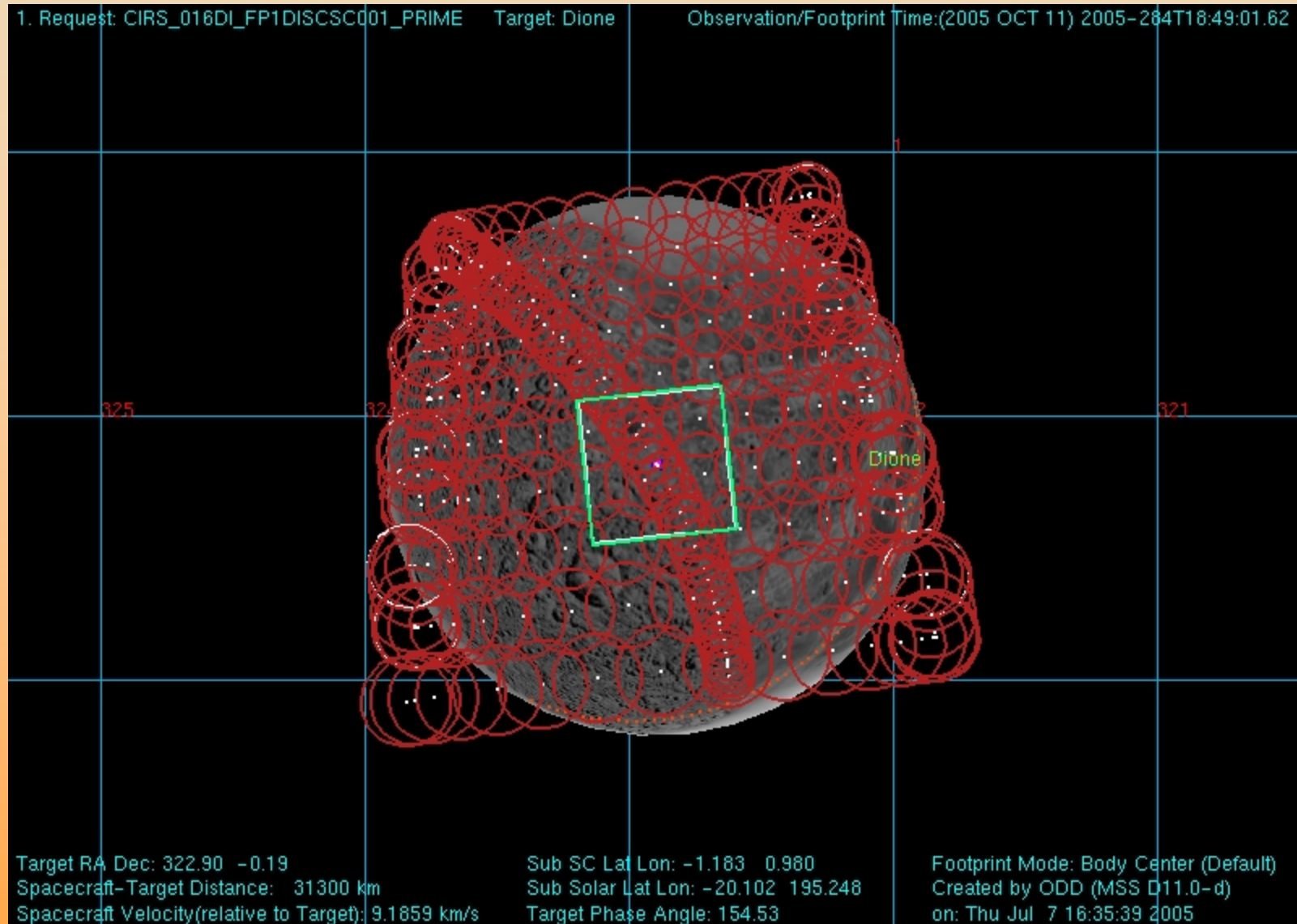
Dione FP3 dayside: 22 degree phase (1 hour scan).

016DI_FP3DISCSC002



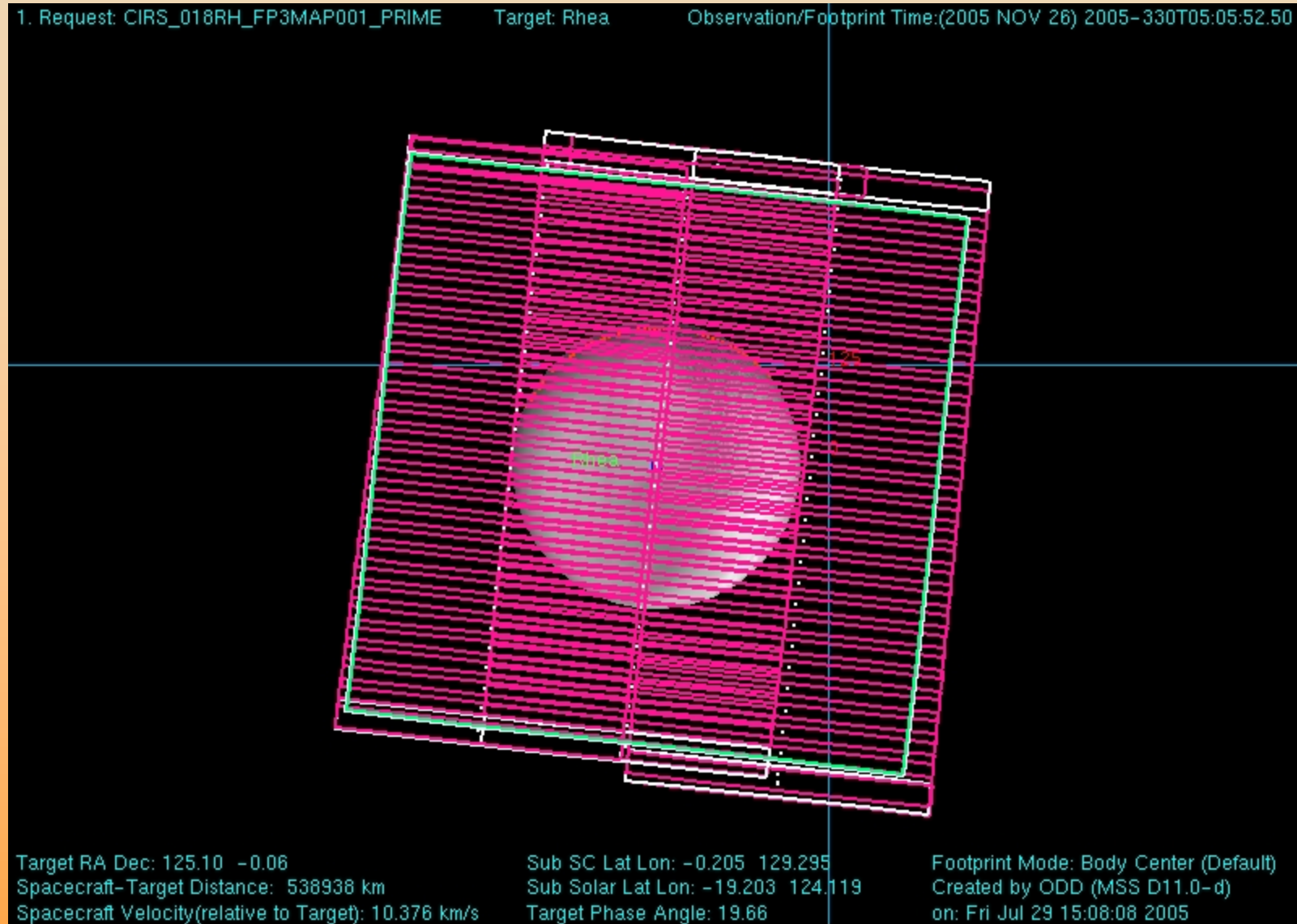
Dione FP1 dayside: 23 degree phase.

016DI_FP3DISCSC001



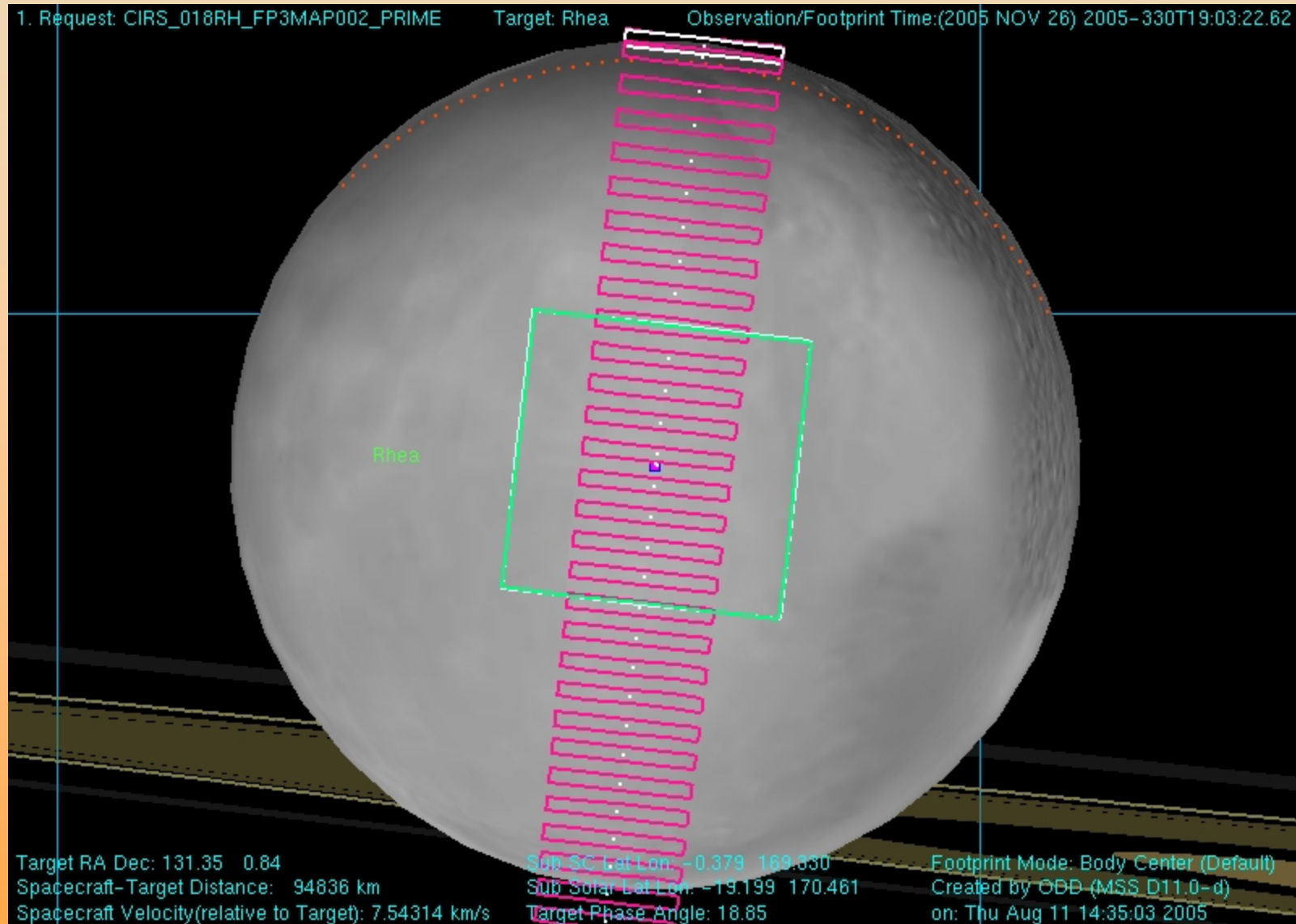
Dione FP1 nightside: 154 degree phase.

018RH_FP3MAP001



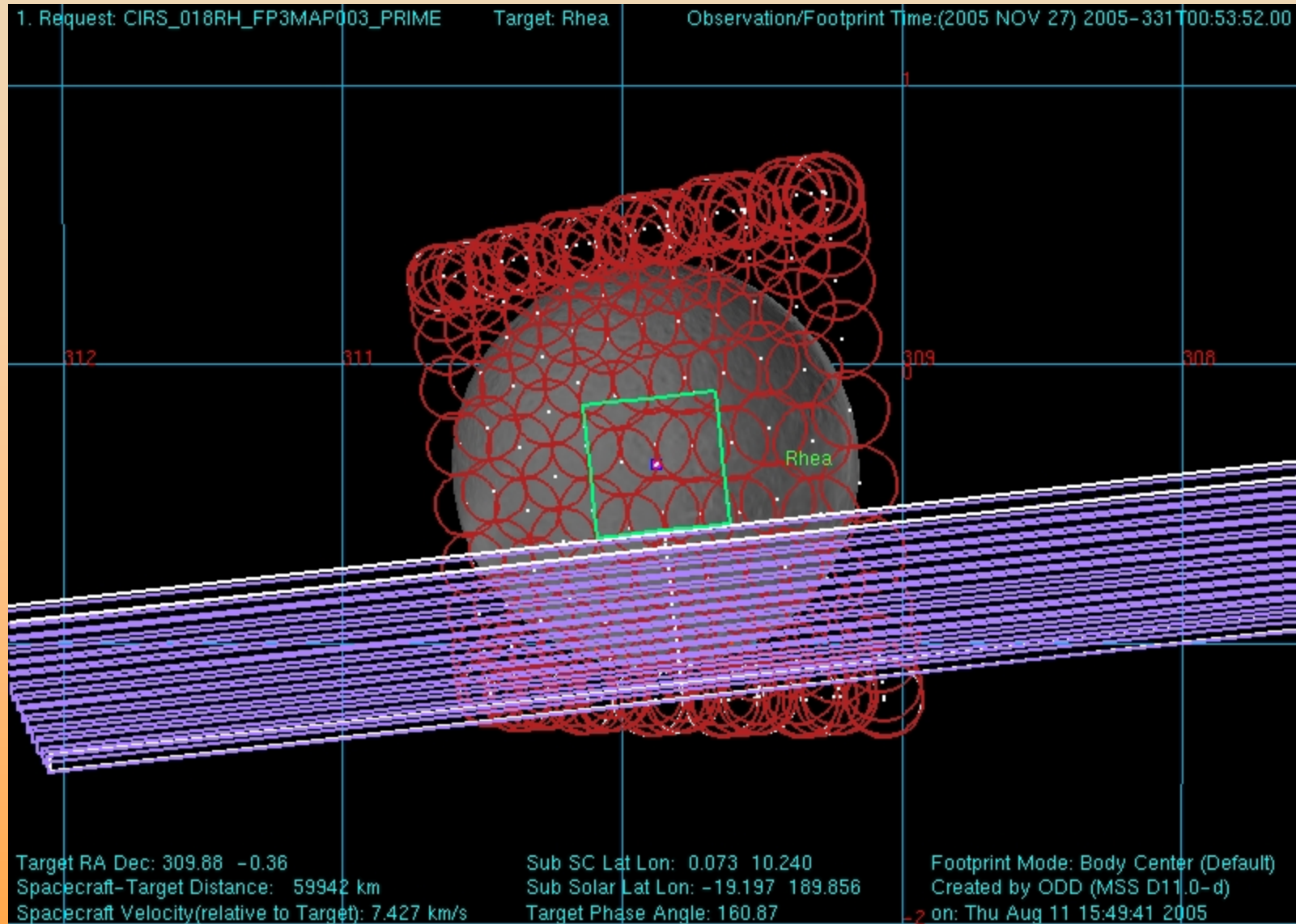
Rhea FP3 dayside: 20 degree phase.

018RH_FP3MAP002



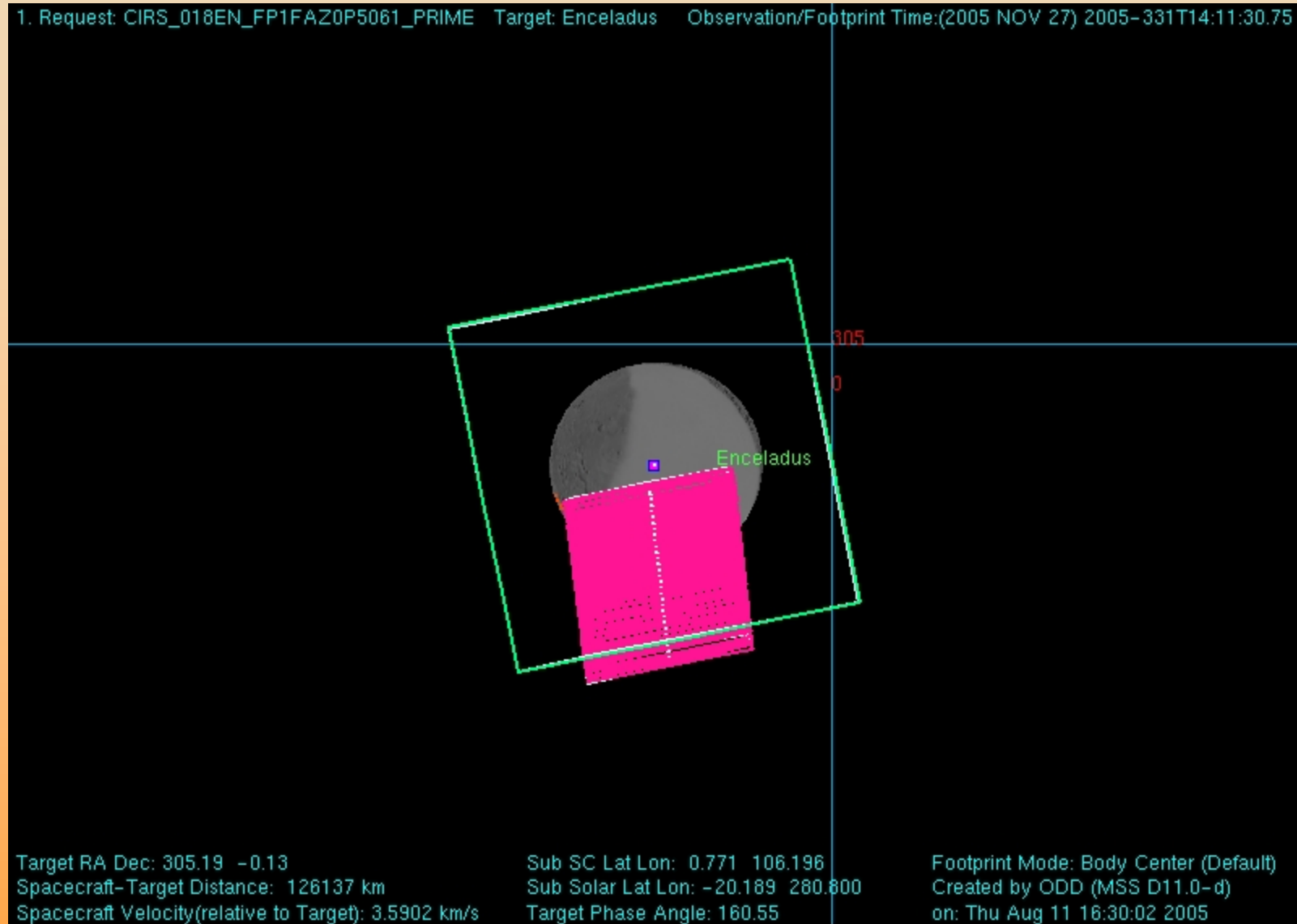
Rhea FP3 dayside N/S scan: 20 degree phase.

018RH_FP3MAP003



Rhea FP1 nightside: 160 degree phase.

018EN_FP1FAZ0P5061



Enceladus FP3/FP4 S. pole scans

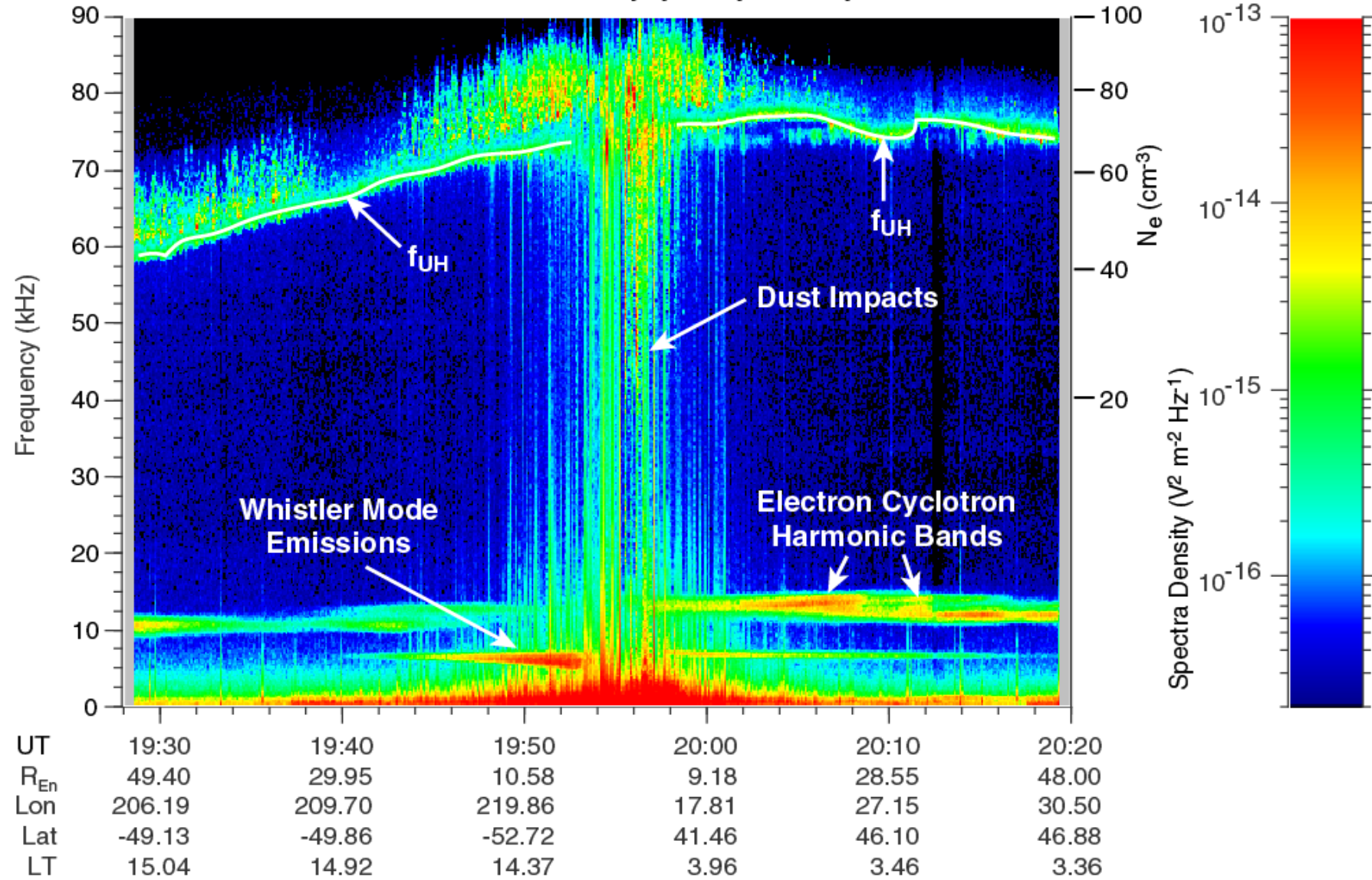
Dione/Rhea Previews RPWS

W. Kurth, G. Hospodarsky
30 September 2005

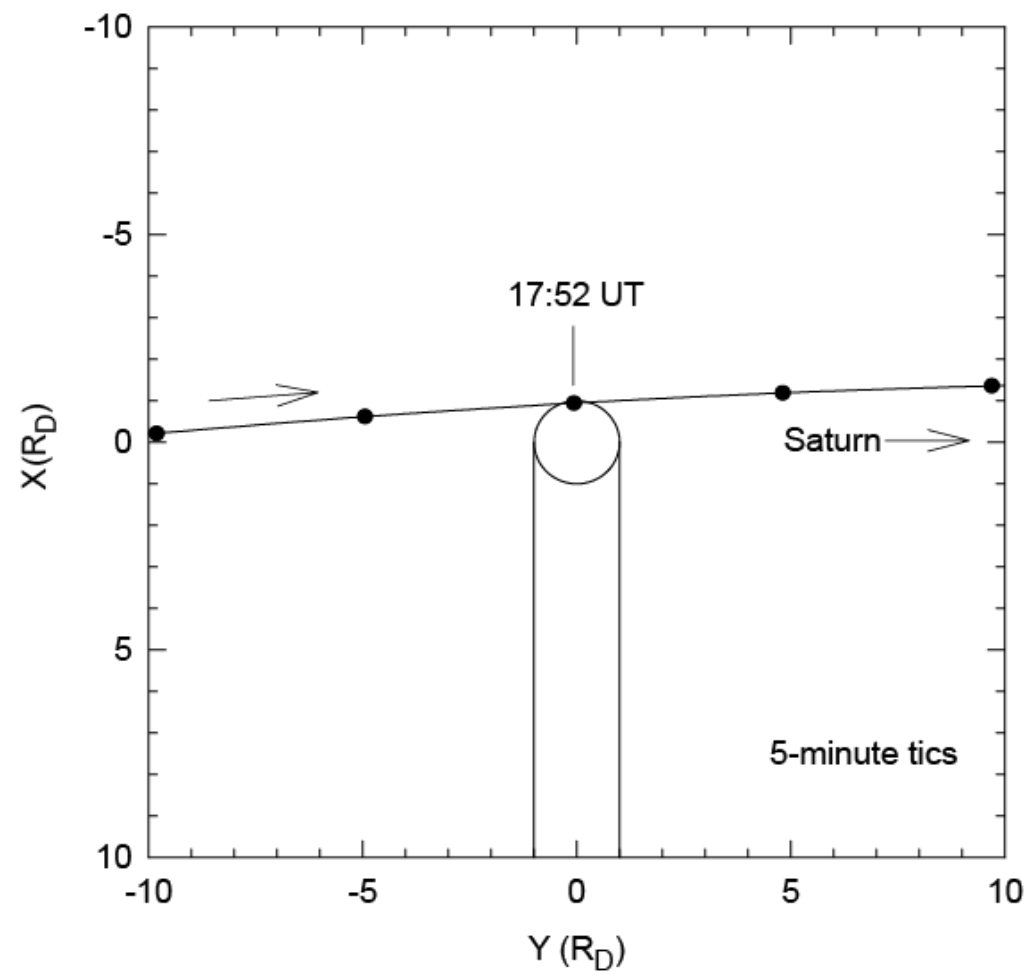
RPWS Science Objectives

- Look for evidence of a plasma source at both Dione and Rhea using the upper hybrid band, LP, etc.
- Examine plasma wave spectrum for evidence of magnetosphere – moon interactions for both Dione and Rhea.
- Look for signatures of dust impacts.

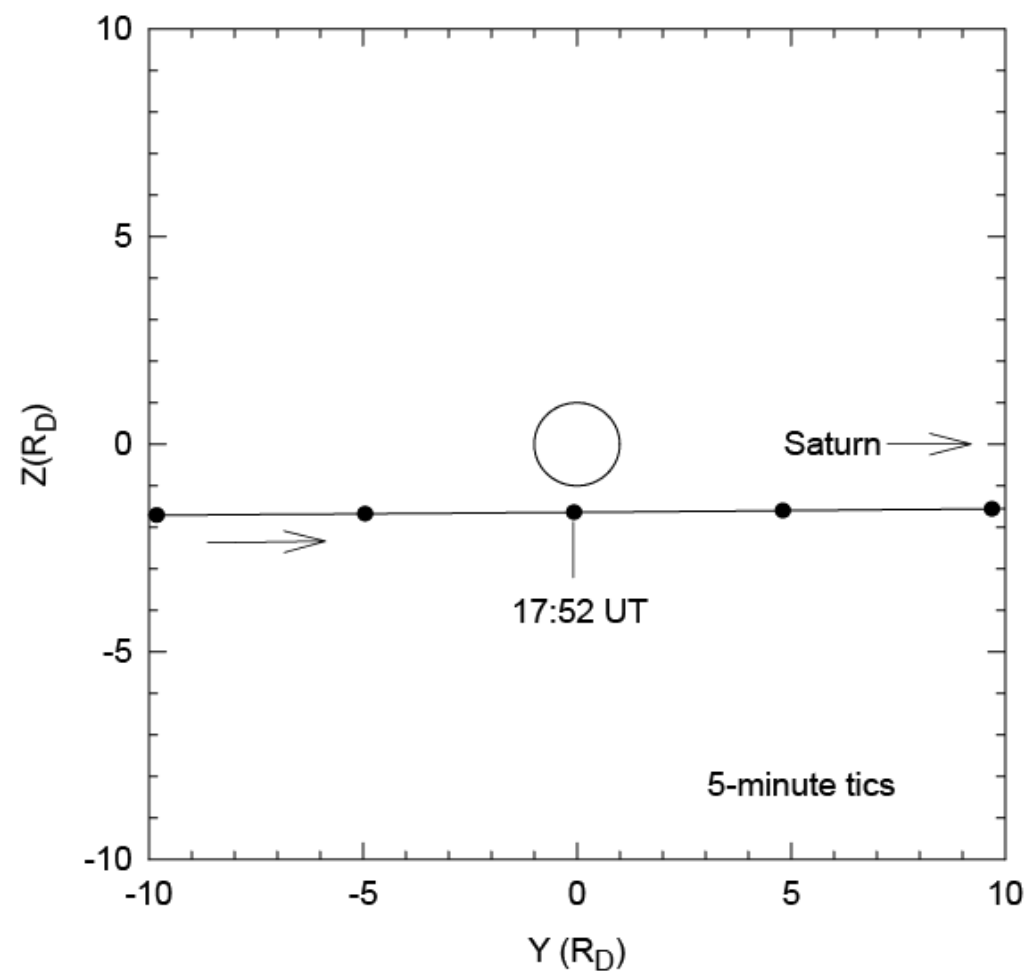
Orbit 11 Enceladus-2 Flyby July 14, Day 195, 2005



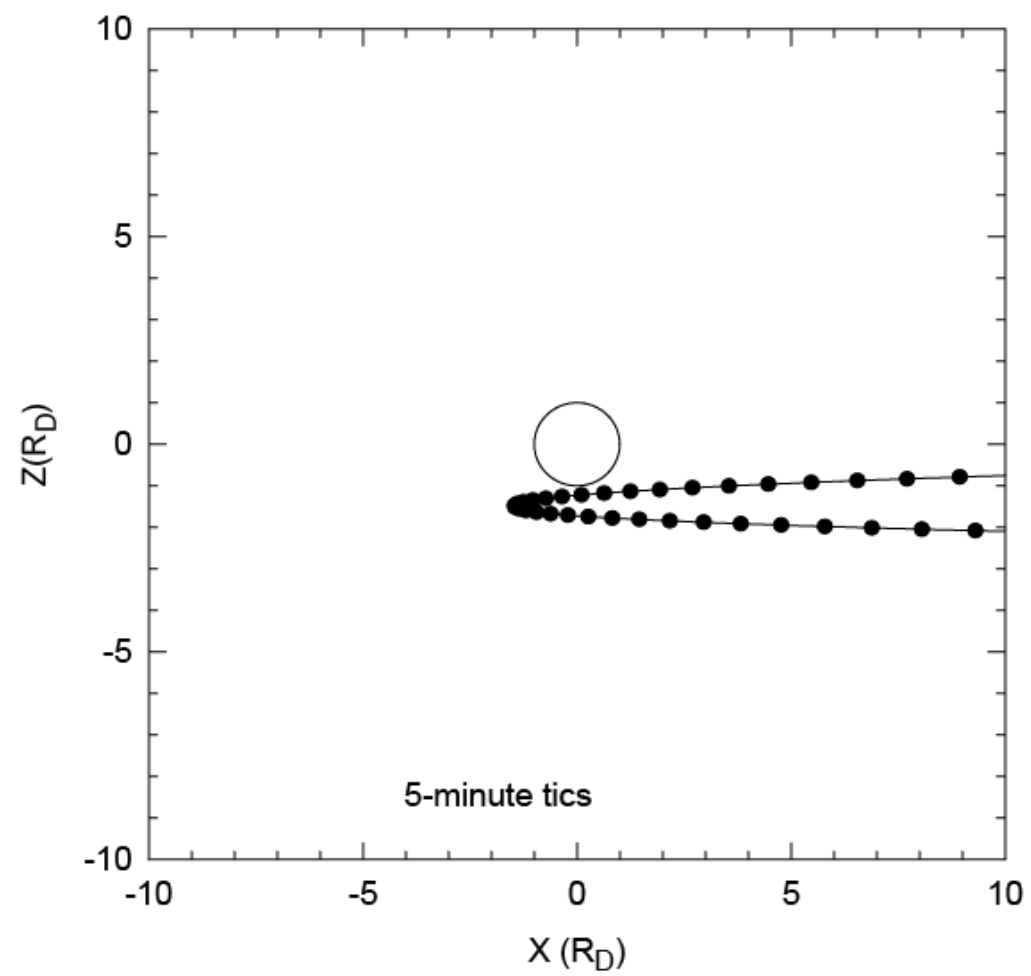
Orbit 16 Dione Flyby
October 11, Day 284, 2005



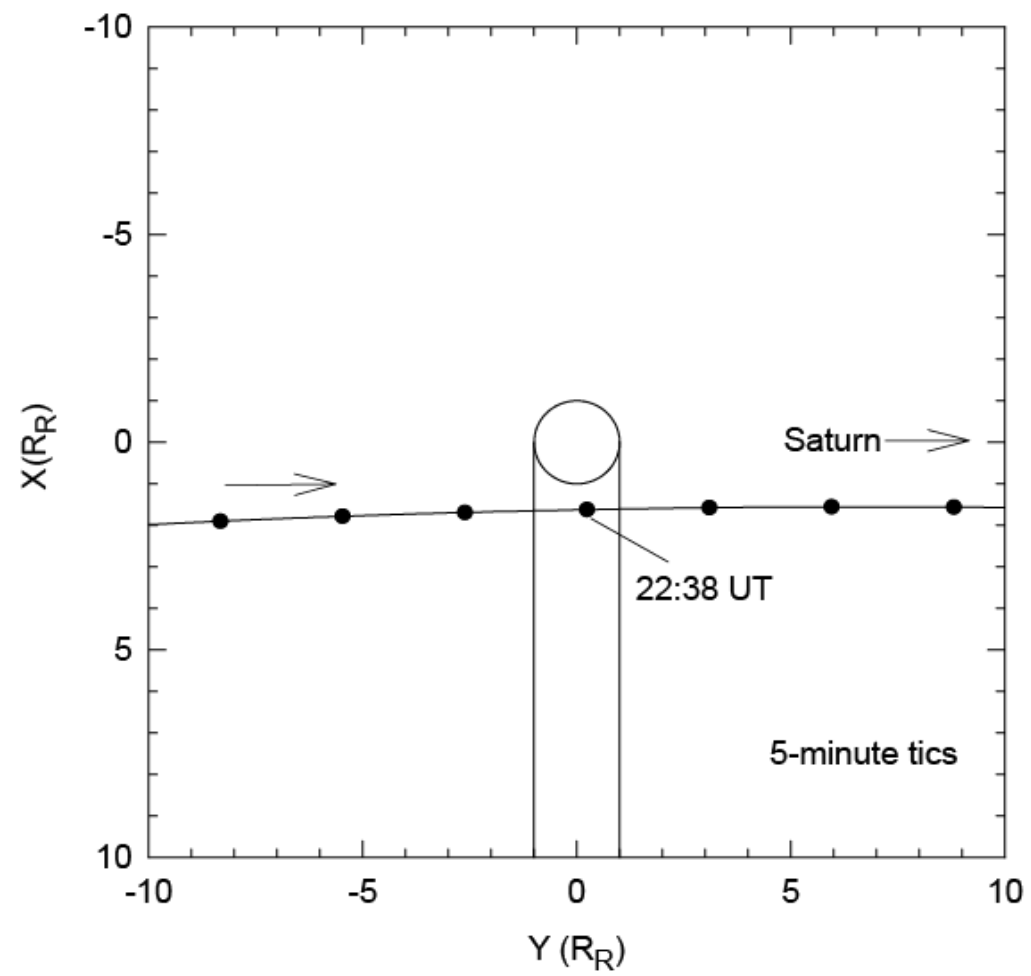
Orbit 16 Dione Flyby
October 11, Day 284, 2005



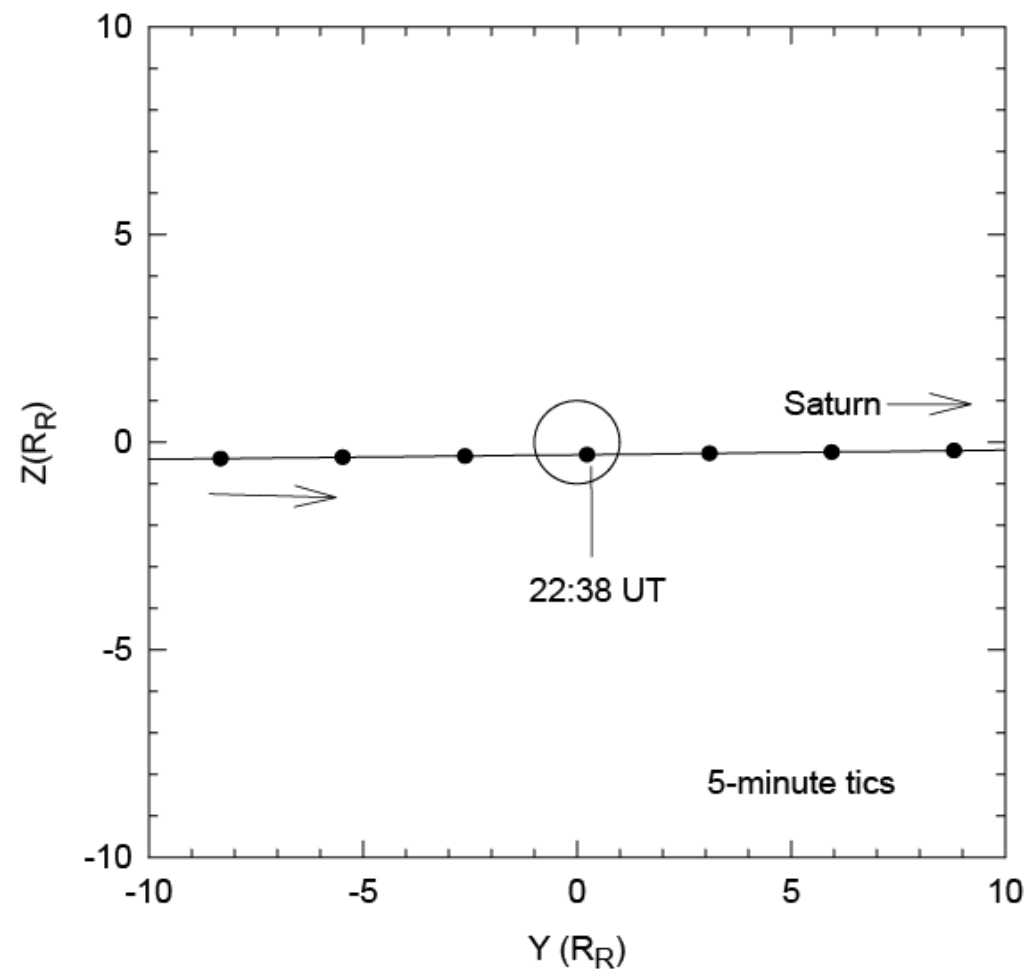
Orbit 16 Dione Flyby
October 11, Day 284, 2005



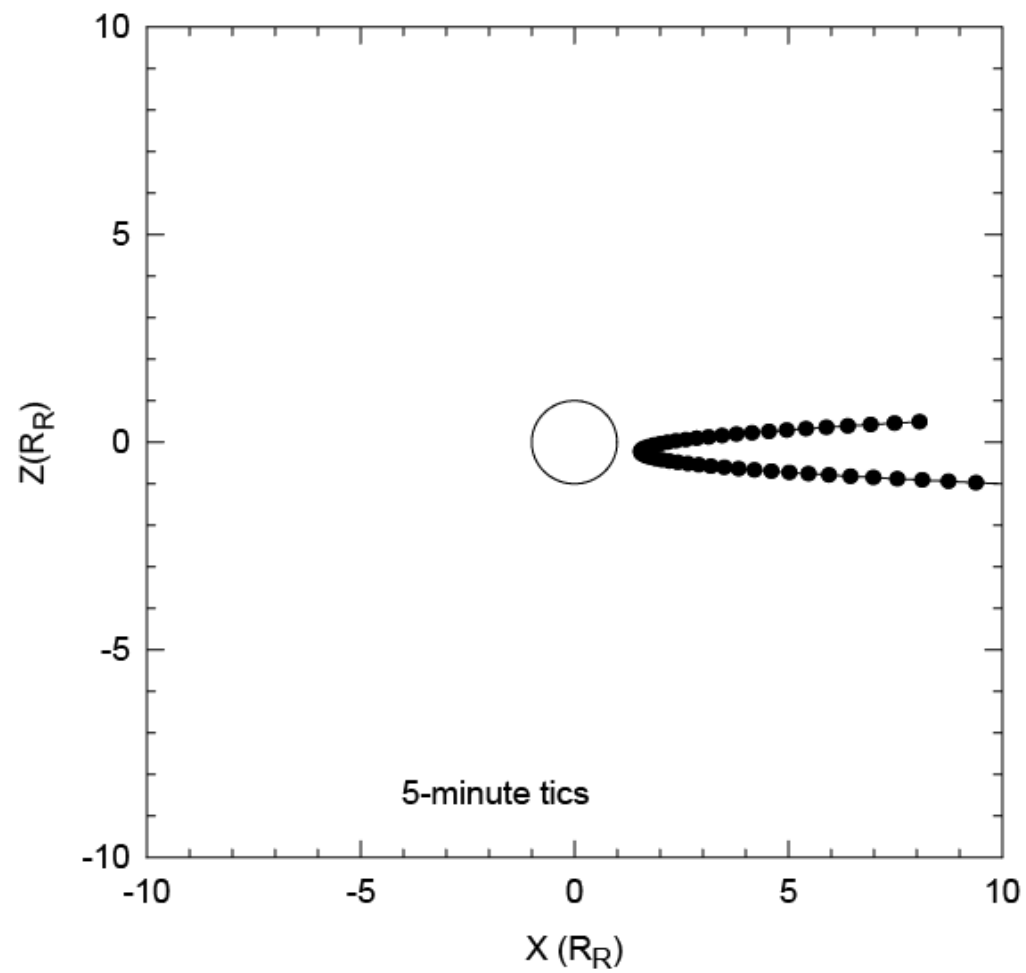
Orbit 18 Rhea Flyby
November 26, Day 330, 2005



Orbit 18 Rhea Flyby
November 26, Day 330, 2005



Orbit 18 Rhea Flyby
November 26, Day 330, 2005



UVIS Science at Dione and Rhea

C. J. Hansen, A. Hendrix

30 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:

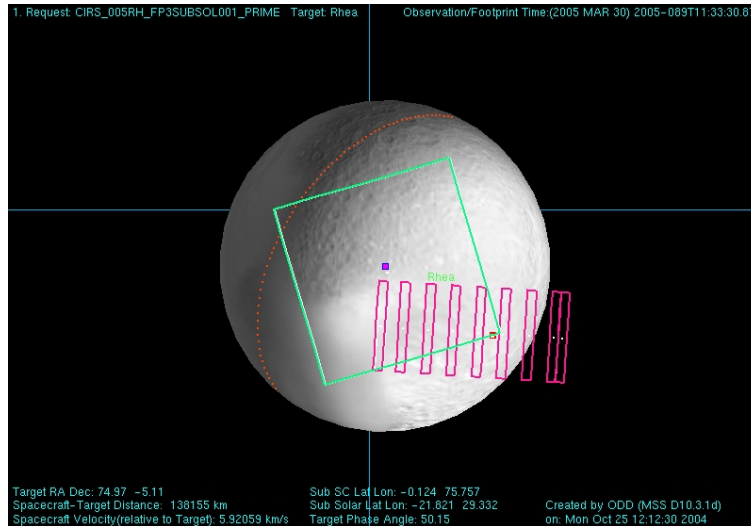
- Surface composition, grain size
 - Reflection spectra
- Surface age and evolution
 - UV albedo maps, phase function
- Tenuous atmospheres / exospheres
 - Emission spectra, occultations
 - Oxygen (1304, 1356), Nitrogen (1493)

Surface Composition and Chemistry

Dione and Rhea

- Surface composition and the existence of an atmosphere are affected by sputtering processes. Hydrogen peroxide was identified in the surface ice of Europa. Condensed O₂ has been detected at Ganymede. Spectral absorption suggestive of ozone has been detected by the Galileo UVS on Ganymede, and by HST on Ganymede, [Rhea](#), and [Dione](#).
- At UVIS wavelengths we will look for the presence of CO₂ and NH₃ in addition to water ice

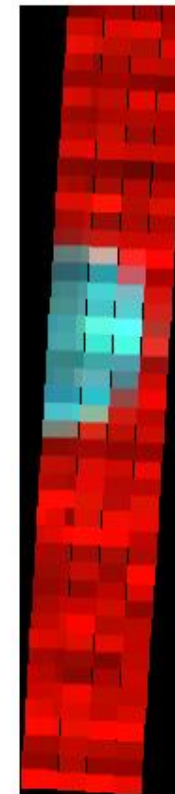
005RH_fp3subsol001



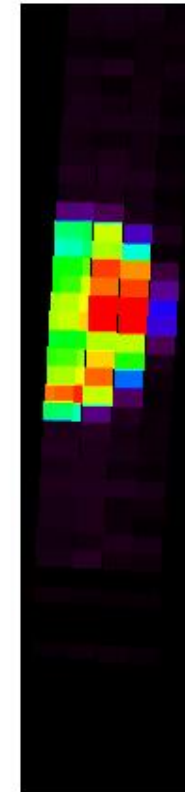
R= 138,092 km
Longitude= 76°W
Phase= 50.7°

Icylon013_cirs
089T11:35

Brightness variations??



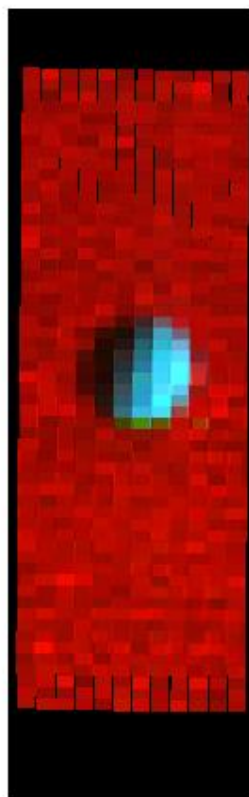
“true” UV color



long- λ

sun

Rhea UV image gallery...



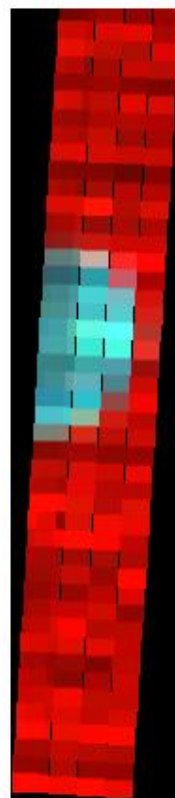
00CRH_icylon013_cirs

69°W



00CRH_icylon015_cirs

109°W



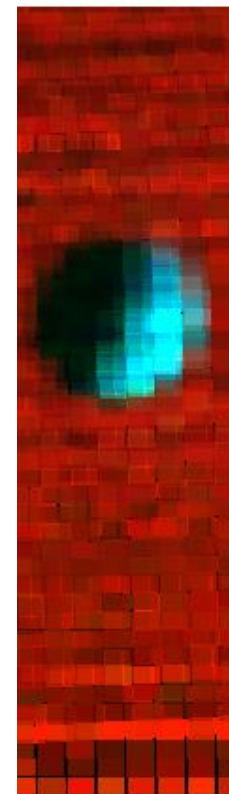
005RH_icylon013_cirs

76°W



005RH_icylon014_cirs

117°W



005RH_icylon016_cirs

135°W

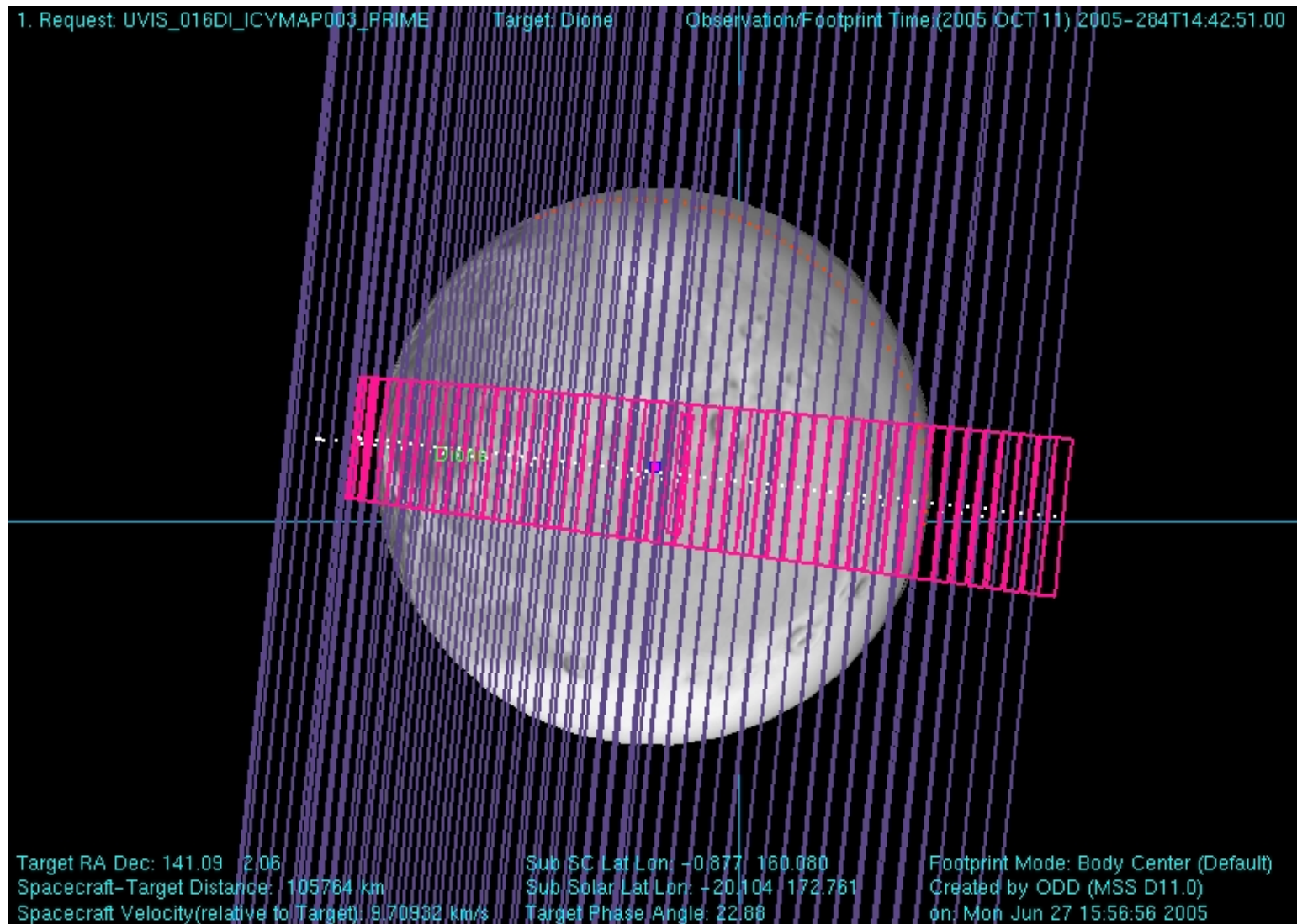
Surface Age and Evolution

Dione and Rhea

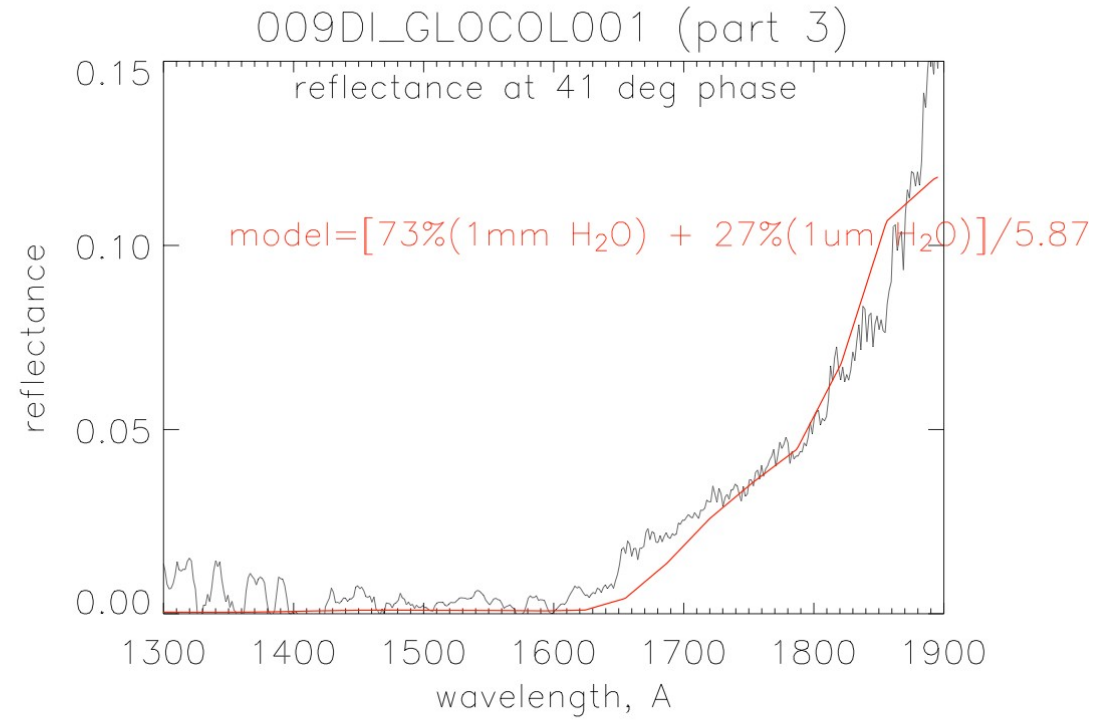
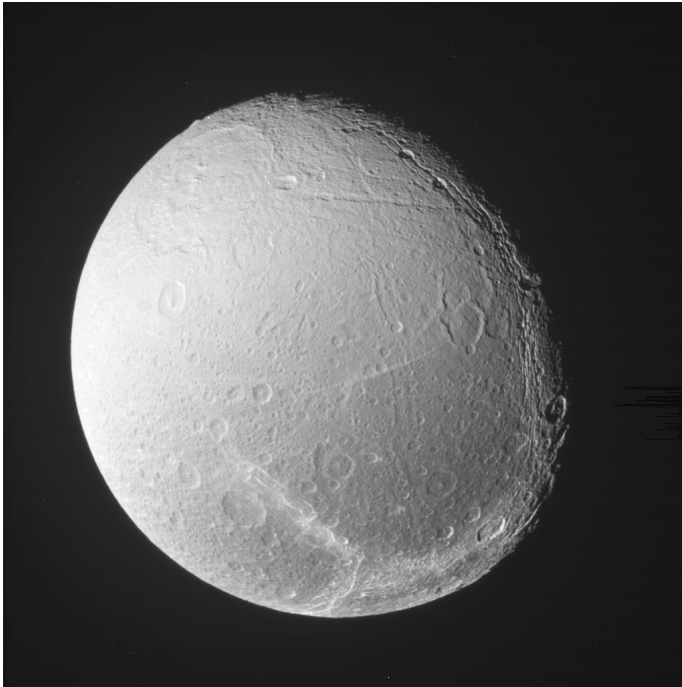
- Dione and Rhea orbit within Saturn's E ring
- Presumably the upper layer of their surfaces has been modified by E ring particles
- Since the spectrum of water has a distinct upturn at FUV wavelengths, at a wavelength determined by the ice grain size, we can use that diagnostic wavelength to determine the predominant size
- Images of Dione suggest a moderate level of surface modification. Both Rhea and Dione have heavily cratered terrains and “wispy terrain” that turned out to be fine cracks – do these regions look different at ultraviolet wavelengths?

UVIS [uv albedo](#) maps will be produced. We will look for uv albedo differences that correlate to geologic ages derived from the imaging data, then look for deviations that give us insight into Dione's interaction with Saturn's magnetosphere.

Dione ICYMAP



009DI_GLOCOL001_ISS



R= 224,347 km
Longitude= 254°W
Phase= 41.4 °

Preliminary Results: 2-grain-size-H₂O model

Relative Amounts of Model Components

Icy Satellites

$$\text{Model}=[X*500 \text{ um H}_2\text{O} + (1-X)*1 \text{ um H}_2\text{O}]/Y$$

	%500 um H₂O	%1 um H₂O
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?

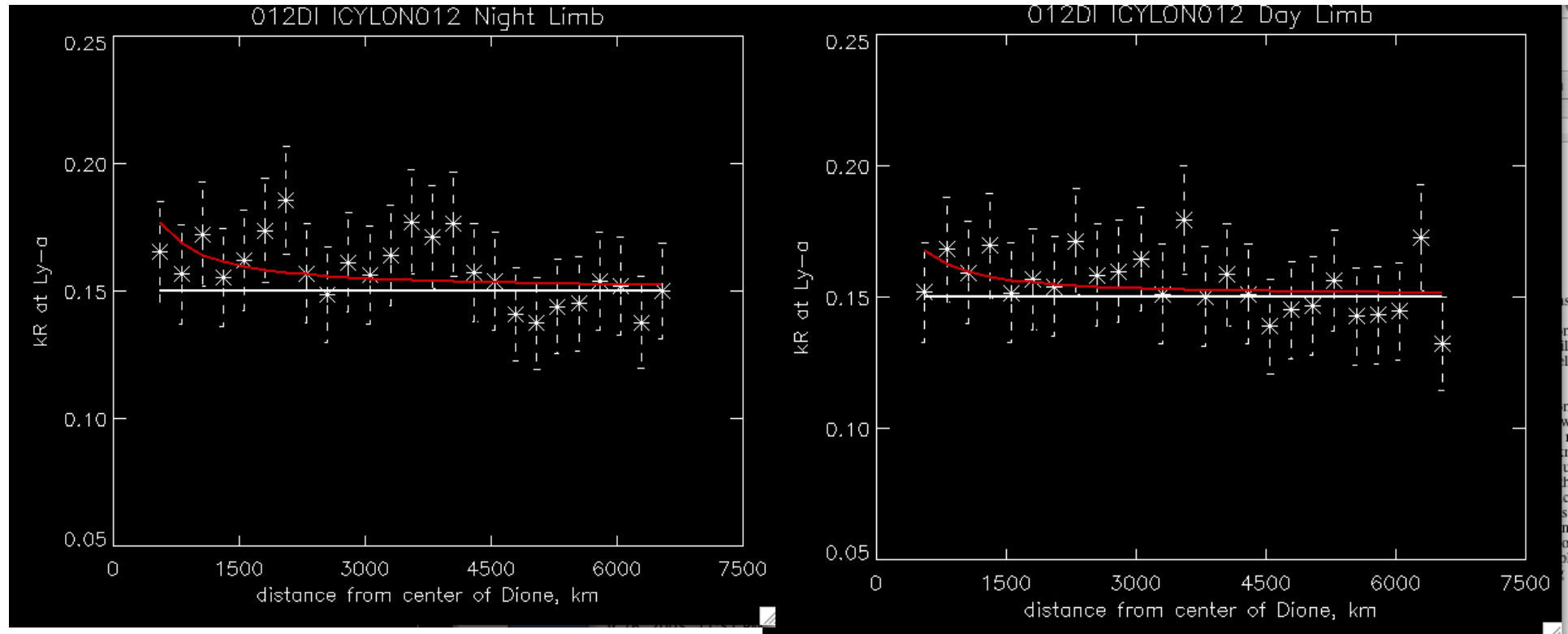
This table is based on ~1 reflectance spectrum per satellite, on a particular region. Spatial resolutions may not be similar.

Tenuous Atmospheres / Exospheres

Dione and Rhea

- Sputtering is a likely source for an oxygen atmosphere. Theoretical yields suggest that this process is sufficient to be an important source of volatiles. Voyager PWS data suggest that something strange is happening at Dione's L shell so indications of interaction with Saturn's magnetosphere are particularly intriguing at Dione.
- Rhea is the only satellite with enough of a gravitational field to hold onto any sputtered atmosphere
- 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

Dione



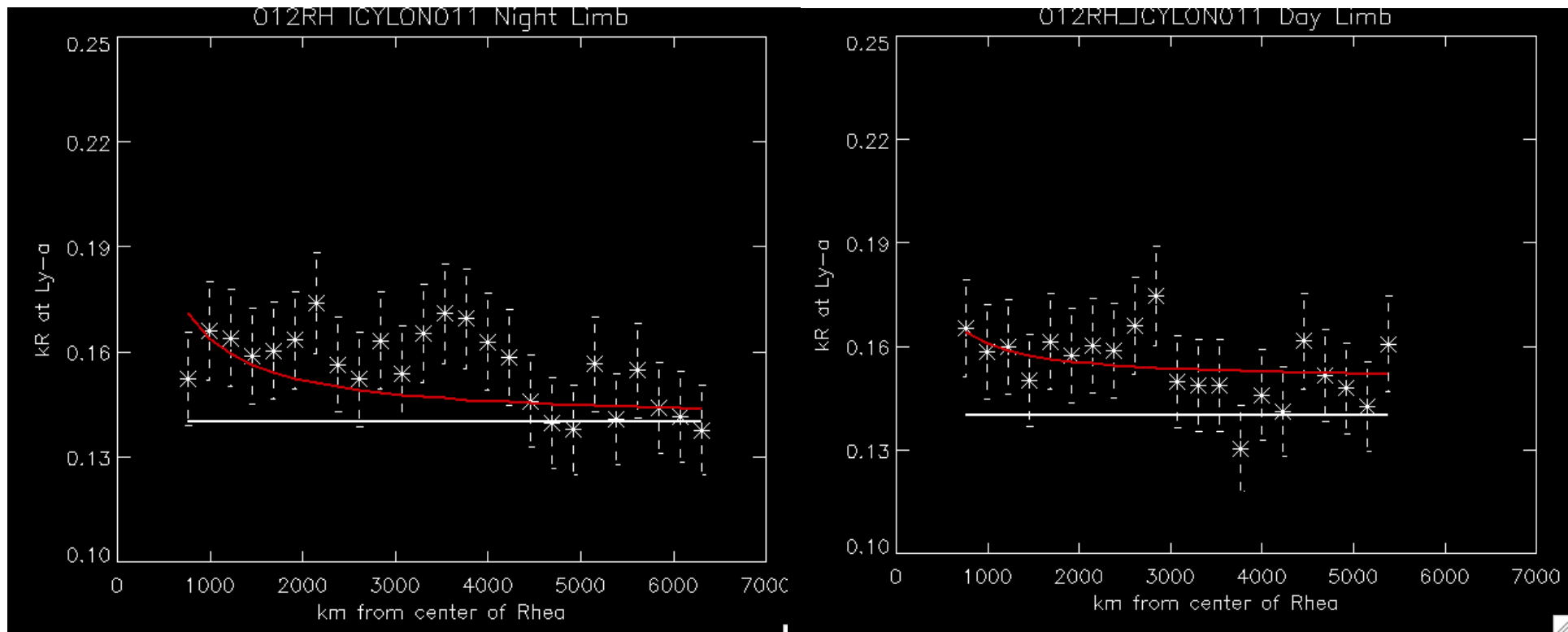
Night/Sub-Sat

Day/Anti-Sat

column emission rate = 0.0267 kR
 slant column density = 1.32603×10^{12} atoms/cm²
 volume density = 11839.5 atoms/cm³
 escape flux = 3.97×10^8 atoms/cm²-sec

column emission rate = 0.0179 kR
 slant column density = 8.84017×10^{11} atoms/cm²
 volume density = 7893.01 atoms/cm³
 escape flux = 2.6×10^8 atoms/cm²-sec

Rhea



Night/LH

Day/TH

column emission rate = 0.0411111 kR
 slant column density = 2.03520×10^{12} atoms/cm²
 volume density = 13302.0 atoms/cm³
 escape flux = 4.5×10^8 atoms/cm²-sec

column emission rate = 0.034 kR
 slant column density = 1.68899×10^{12} atoms/cm²
 volume density = 11039.2 atoms/cm³
 escape flux = 3.7×10^8 atoms/cm²-sec

Possible Sources of H

- Sputtering of H₂O ice by ions
 - $\text{H}_2\text{O} + \text{H}^+ (\text{O}^+) \rightarrow \text{H}_2\text{O vapor, H, H}_2$
 - *Fraction of sputtered particles that are H atoms?*
- Photodesorption of H₂O ice
 - $\text{H}_2\text{O} + h\nu \rightarrow \text{H}_2\text{O vapor, H, H}_2$
 - 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 H₂O vapor
 - From sputtering, sublimation or photodesorption
 - $\text{H}_2\text{O} + h\nu \rightarrow \text{H} + \text{OH}$
 - Too cold for sublimation ($T < 110\text{K}$)
- E-ring particle bombardment
- Micrometeoroid bombardment

Dione – Rhea rev 15

A VIMS Preview

R. N. Clark and D. Cruikshank,
Sept. 30, 2005

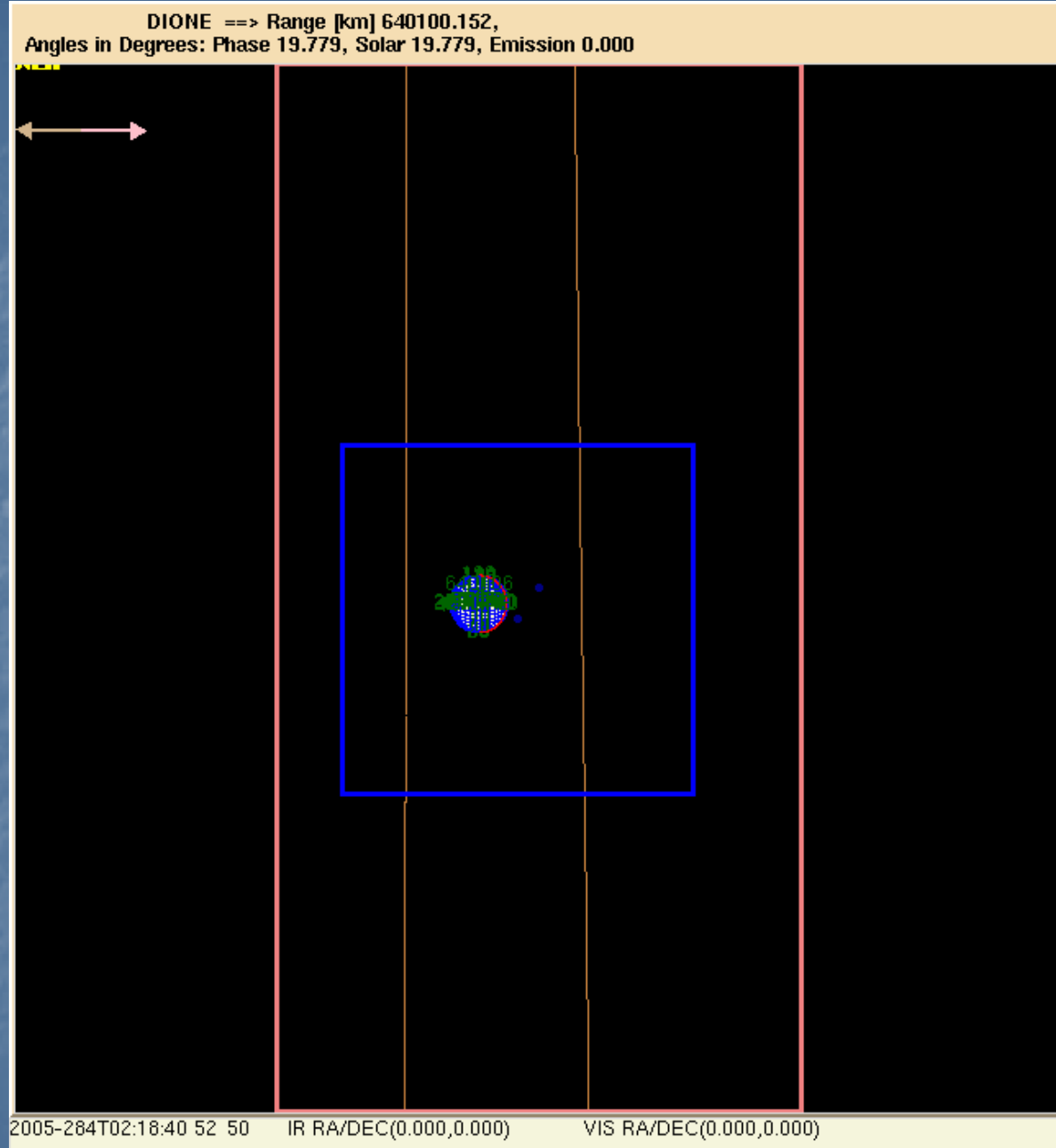
VIMS

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 Dione and Rhea

- 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
- Search for scattering due to extended atmospheres



vims_016di_dione201_prime

DIONE ==> Range [km] 390562.319,
Angles in Degrees: Phase 21.034, Solar 21.034, Emission 0.000

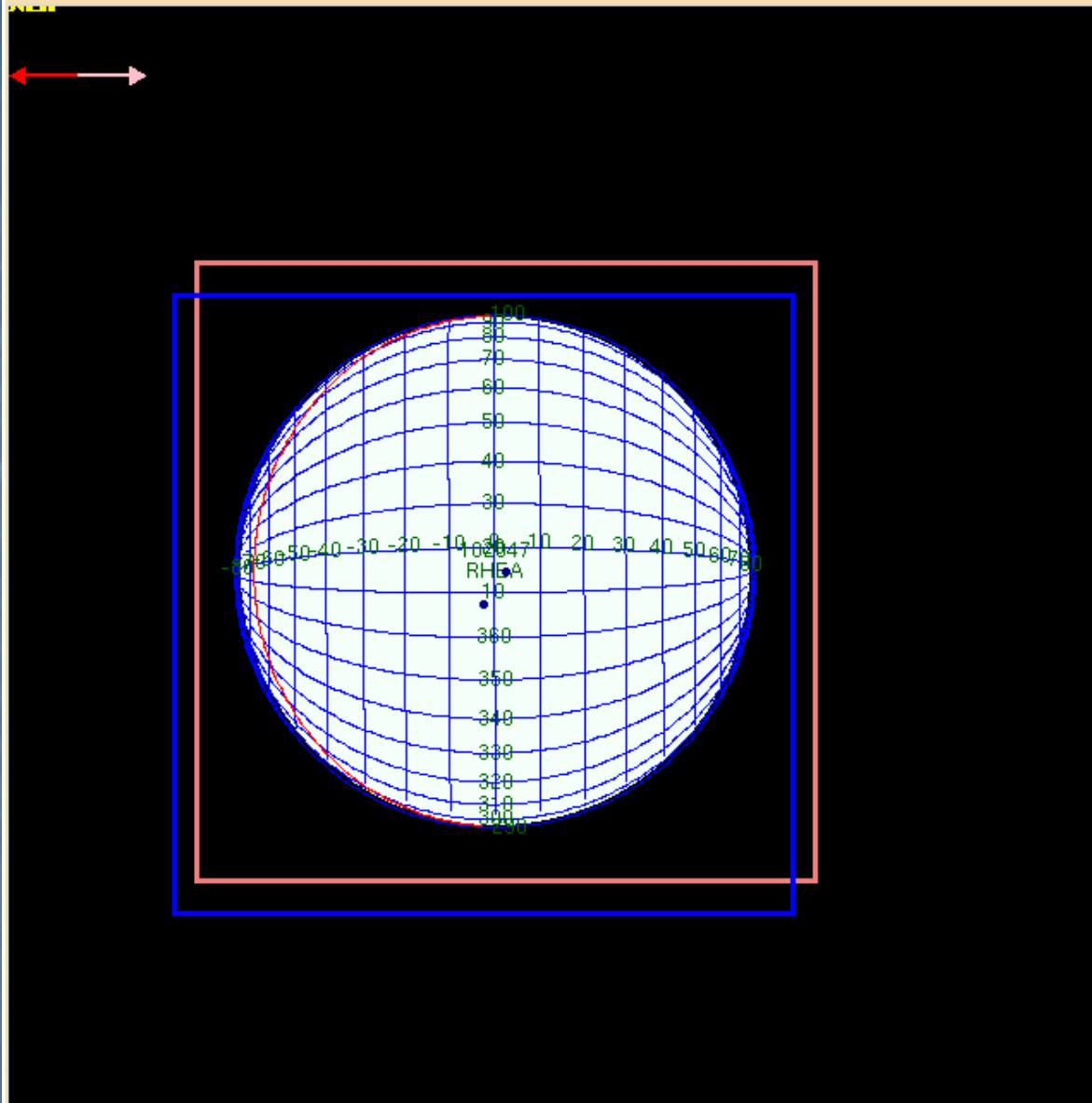


vims_016di_dione302_prime



vims_016di_dione002_prime

RHEA ==> Range [km] 102842.498,
Angles in Degrees: Phase 160.963, Solar 160.963, Emission 0.000

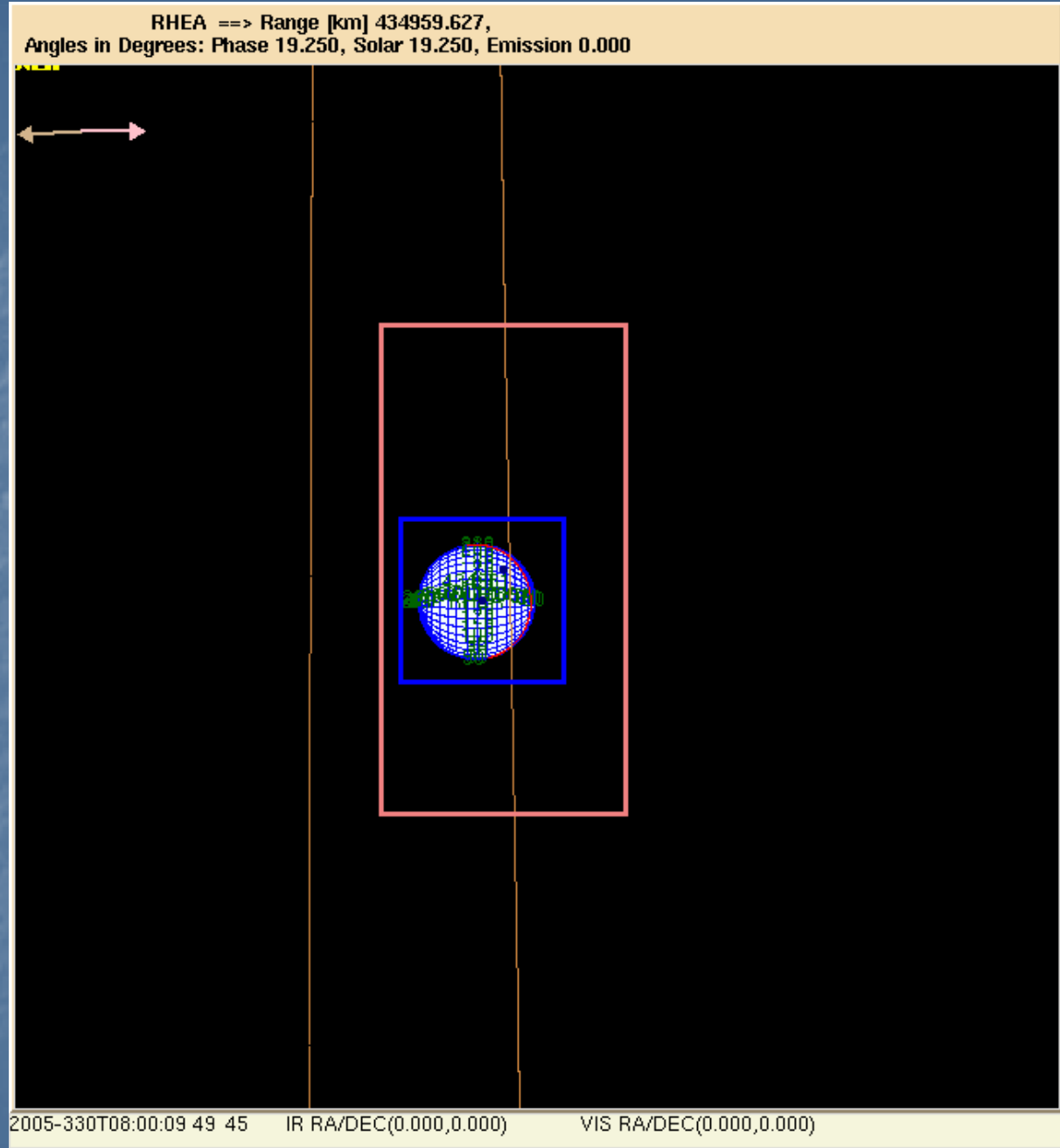


2005-331T02:28:29 61 44 IR RA/DEC(0.000,0.000) VIS RA/DEC(0.000,0.000)

vims_016di_dione003_prime

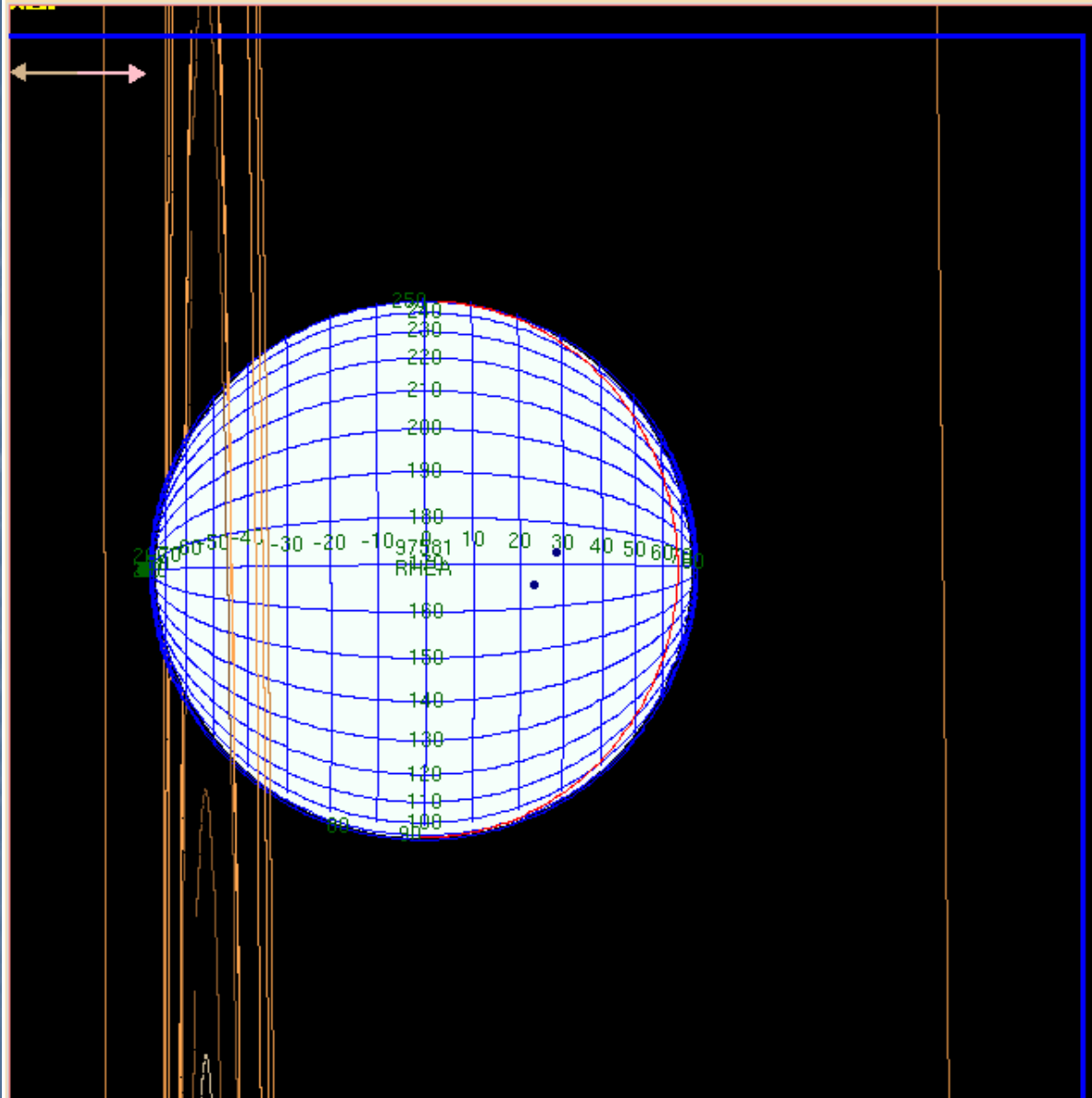
Dione closest approach

- Vims gets poor, smeared and torn images
 - CIRS moving too fast
 - ISS dwell times down around 10 sec for all but two frames
 - Major science lost!



vims_018rh_rhea_001_prime

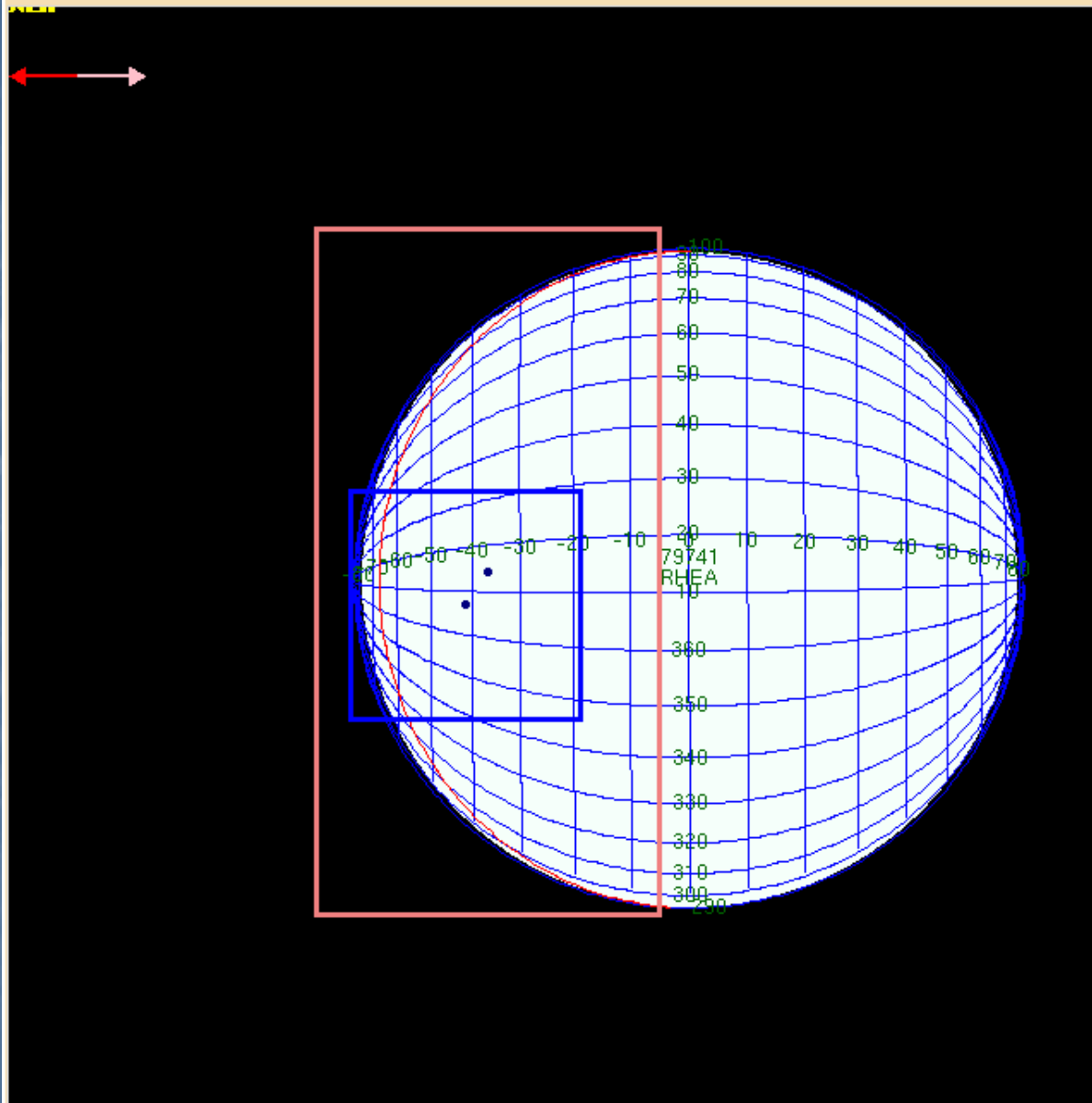
RHEA ==> Range [km] 97583.064,
Angles in Degrees: Phase 18.856, Solar 18.856, Emission 0.000



2005-330T18:57:19 62 42 IR RA/DEC(0.000,0.000) VIS RA/DEC(0.000,0.000)

vims_018rh_rhea_002_prime

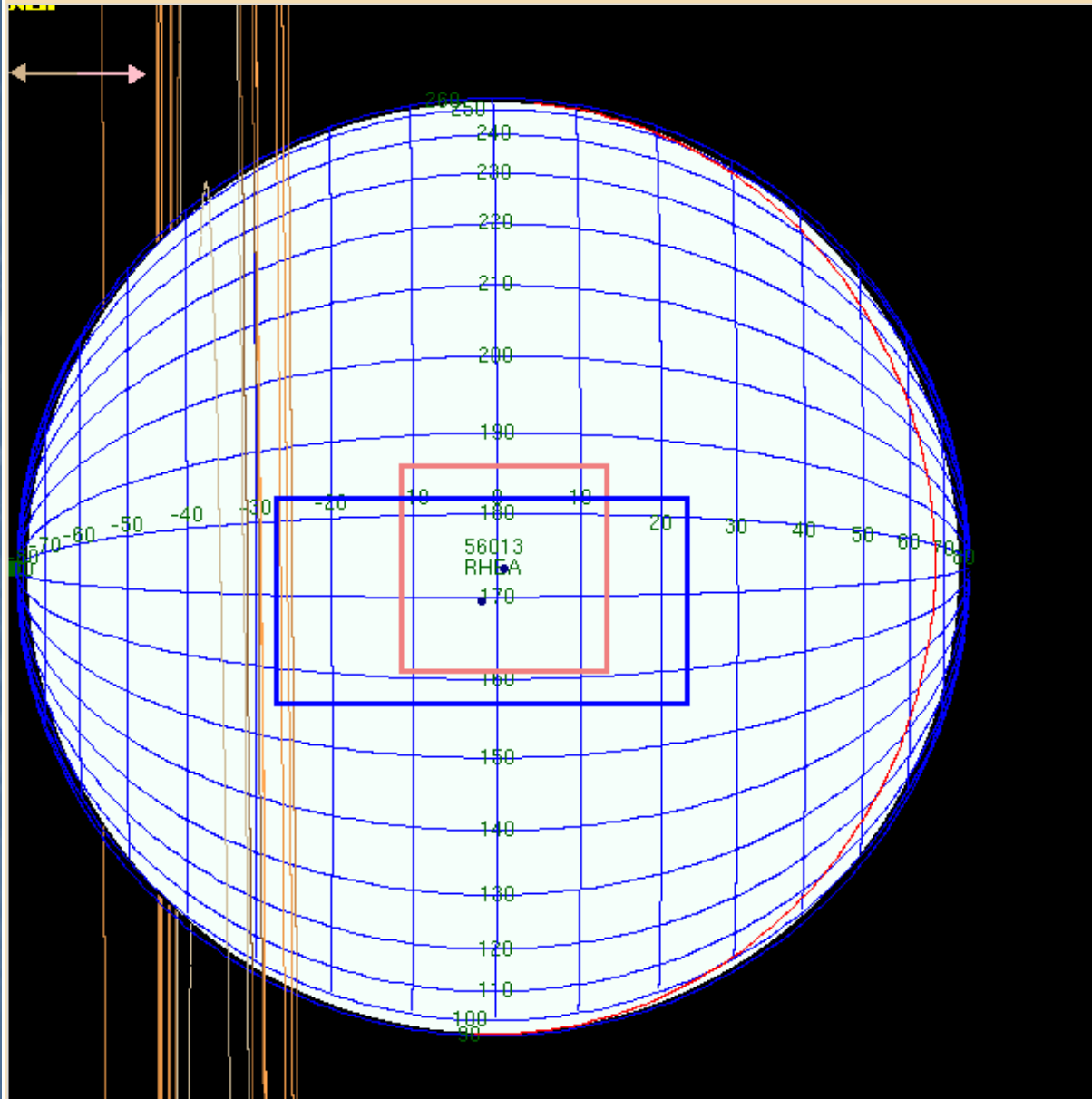
RHEA ==> Range [km] 79737.406,
Angles in Degrees: Phase 160.930, Solar 160.930, Emission 0.000



2005-331T01:37:59 53 61 IR RA/DEC(0.000,0.000) VIS RA/DEC(0.000,0.000)

vims_018rh_rhea_110_cirs

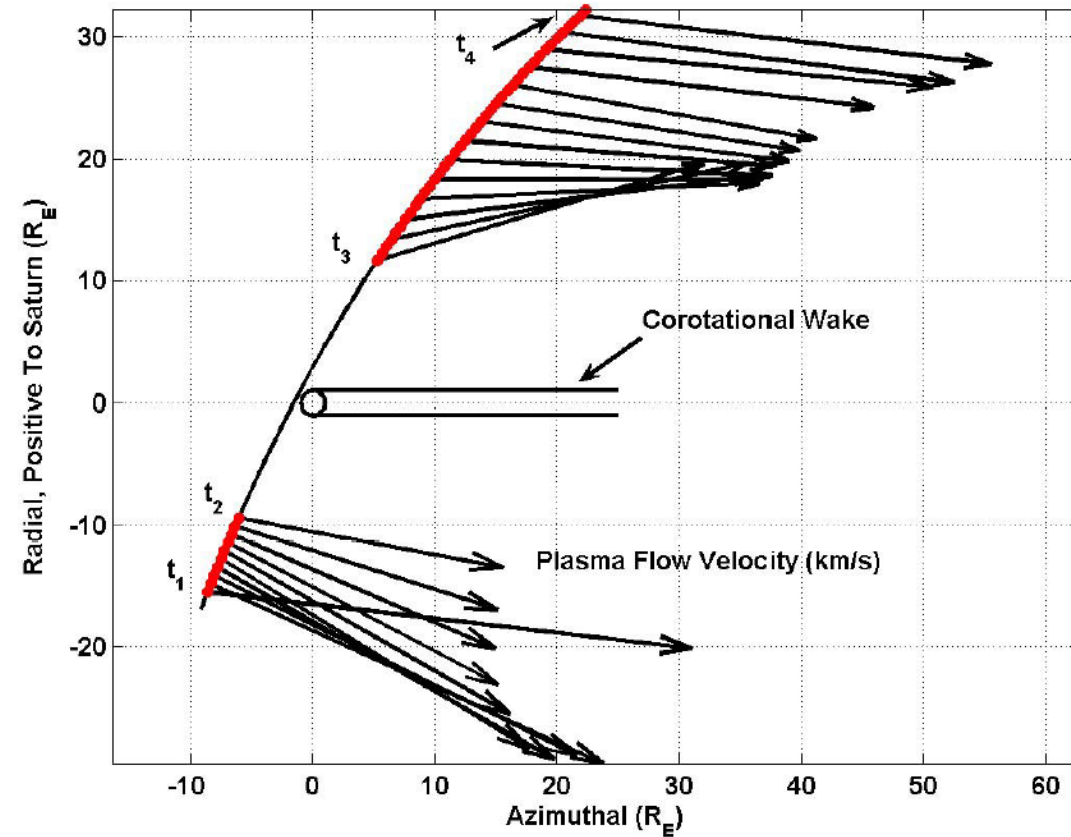
RHEA ==> Range [km] 56014.213,
Angles in Degrees: Phase 18.798, Solar 18.798, Emission 0.000



2005-330T20:30:09 61 53 IR RA/DEC(0.000,0.000) VIS RA/DEC(0.000,0.000)

vims_018rh_rhea_112_iss (last frame)

CAPS Enceladus (11EN) Flow Velocity

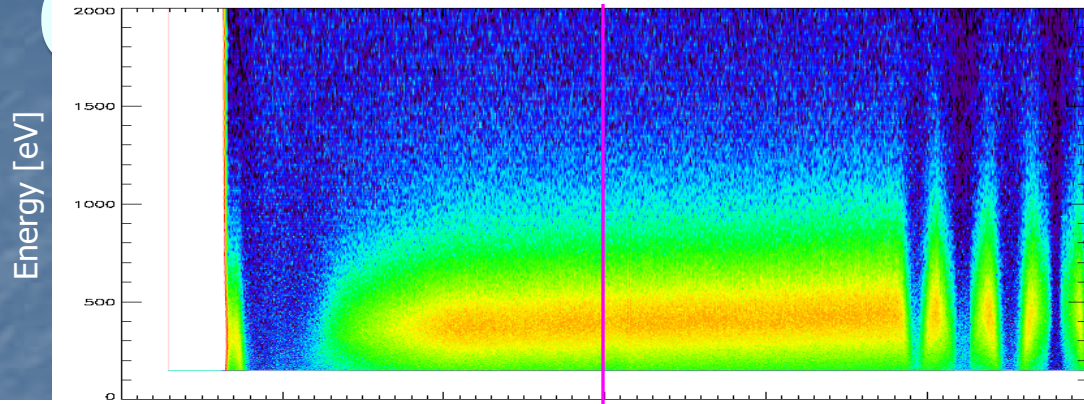


PRELIMINARY

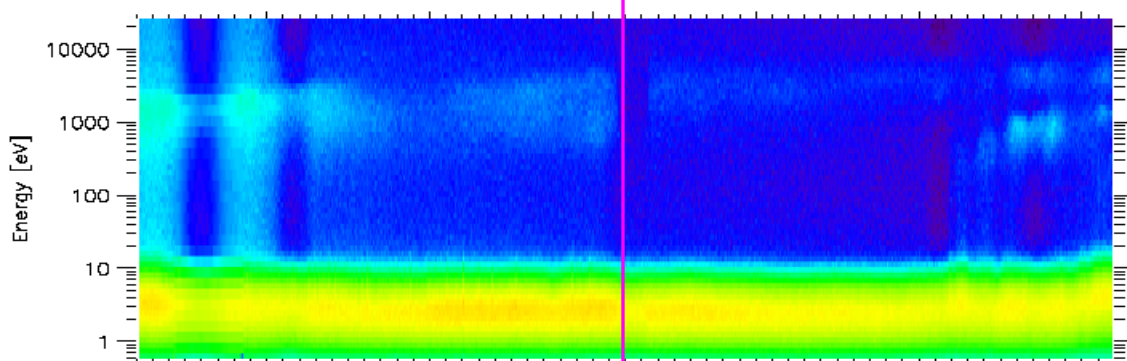
CAROT (1.5TF)

Spectra

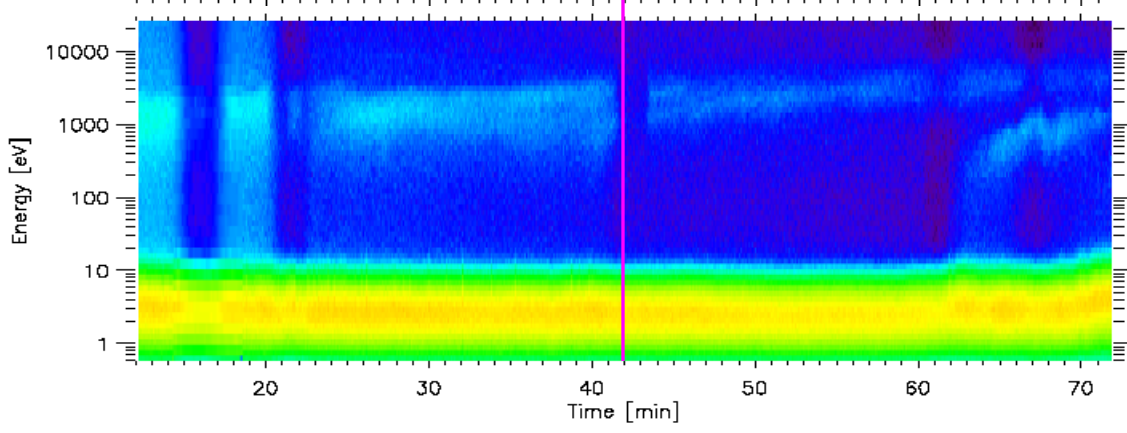
Ion beam
spectrometer



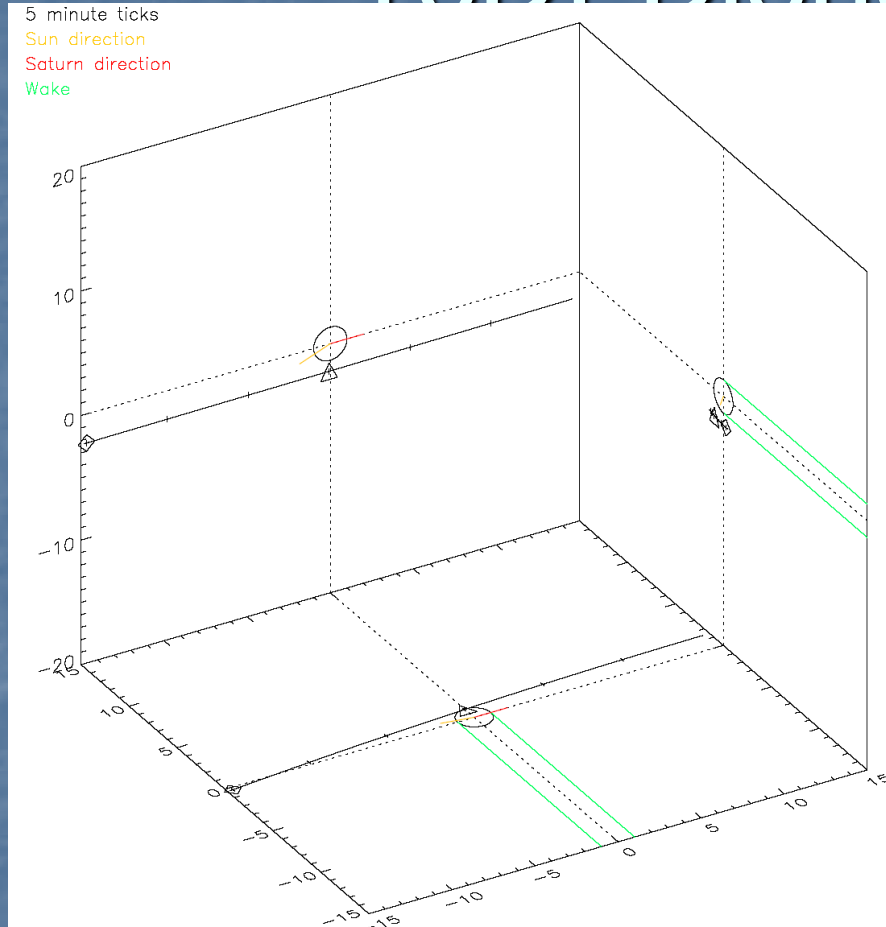
Electron
Spectrometer
 $\sim 20^\circ$ pitch angle



Electron
Spectrometer
 $\sim 90^\circ$ pitch angle



16DT Dione encounter

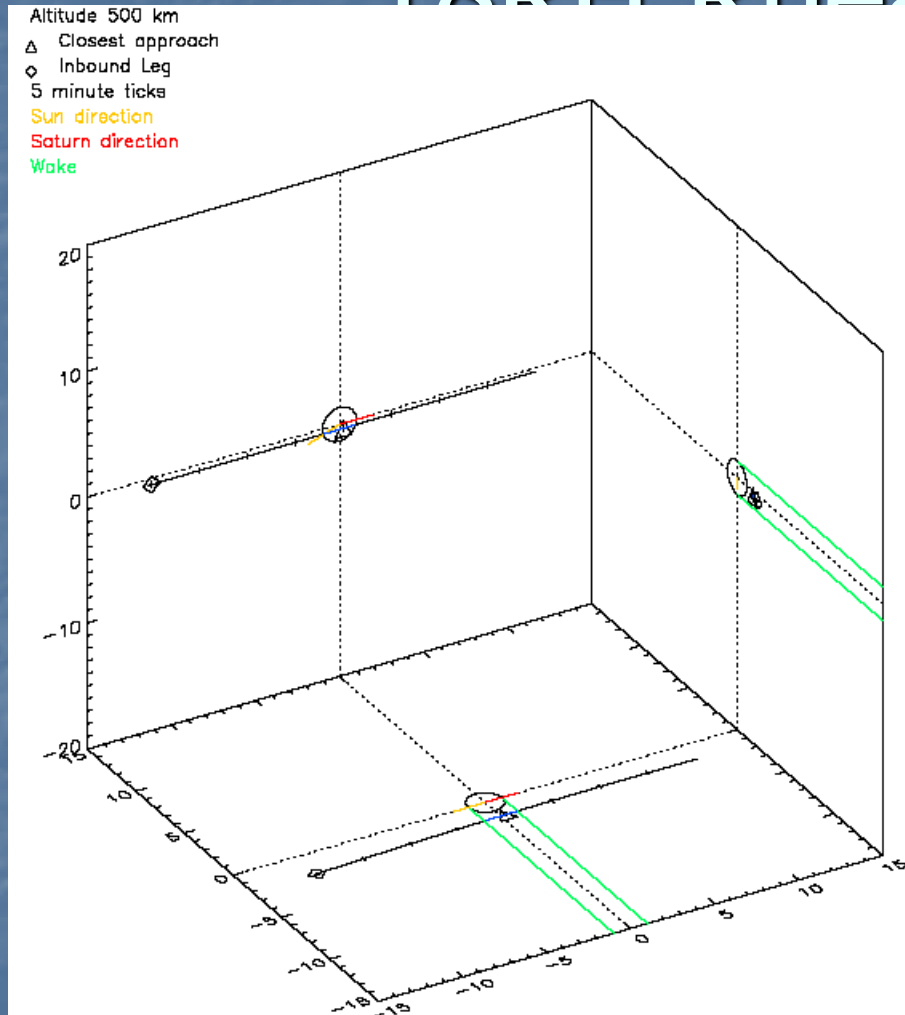


- 2005-2841753 (Oct. 11)
- 500 km altitude
 - 1.89 R_D from body center
 - -60° latitude
 - Low altitude upstream/polar
 - Alfvén wing crossing
 - Whatever that means at 500 km
 - Near dawn, Dione LT
 - Near noon, Saturn LT
- 16 kbps data ± 30 minutes
- Very fast encounter
 - $v_{sc} = 5.6 \text{ km/s} = \mathbf{0.98 R_H/min}$

16DI Dione pointing

- ISS and CAPS pointing during encounter
 - CAPS from -00:08:00 to +00:15:20
 - -Y to Dione, -Z to northward inbound to -00:08:00
 - Corotation near -X (+90° ACT angle), B close to Z axis
 - Fixed pointing -00:08:00 to +00:05:00
 - Corotation in the -X (+90° ACT angle), B close to Z axis
 - Big 180° turn back to Dione, +00:05:00 to +00:15:20
 - Corotation moves towards +X, out of CAPS FOV at +20 min.
 - B moves towards X axis
- Encounter is too fast for actuation ($61 \text{ s}/R_D$)
 - Full ACT sweep=204 s, minimum (28°) sweep=52 s
- Full actuation outside -36 to +9 minutes
- Actuator rammed at +90° for -30 to +9 minutes
 - Contains v_{CR} and is near the v_{CR} -B plane

18RH Rhea encounter



- 2005-030 22:38 (Nov. 26)
- 500 km altitude
 - 1.65 R_R from body center, -10° lat
 - Downstream/wake crossing
 - **1st icy satellite wake crossing**
 - Near dusk, Dione LT
 - Near noon, Saturn LT
- Largest (?) gyroradius effects
 - r_L (OH^+ pickup) $\sim 0.5\text{--}1 R_R$
 - All others are $r_L \ll R$ or $r_L \gg R$
- Complementary to 49RH
 - 5126 km wake encounter
- 16 kbps data ± 30 minutes
- Very fast encounter

18RH Rhea pointing

- Radio science pointing during encounter
 - Fixed pointing, ± 1.5 hrs
 - Corotation at ACT angle $\sim +10^\circ$, elevation $+0-10^\circ$
 - B at ACT angle -80° , elevation $+20^\circ$
- Encounter may be too fast for actuation ($105 \text{ s}/R_R$)
 - Full ACT sweep = 204 s, minimum (28°) sweep = 52 s
- Actuator rammed at $+10^\circ$ for TBD period
 - Ram at $+10^\circ$ covers gyroplane ($v_\perp$) at 4s resolution

Preview of Cassini RADAR Observations:

Dione 16

Iapetus 17

Rhea 18

Steve Ostro
(for the Cassini RADAR Team)

JPL, Sep. 30, 2005

Cassini RADAR Observations of “Icy Satellites”

Rhea	7 (RH11 successful)
Enceladus	6 (E3,E4 successful)
Dione	5 (D0 failed)
Mimas	4 (M0 failed)
Iapetus	3 (IAP 0B/C successful)
Tethys	2 (TE15 successful)
Hyperion	2 (HY15 successful)
Phoebe	1 (P0 successful)
30 (“seven for nine” so far)	

Dione 16

Oct. 11, 2005

Five-point stare

Scatterometry (Detection time < 0.1 min)

<u>Seq</u>	<u>start</u>	<u>duration</u>	<u>target</u>	<u>distance</u>	<u>beam/diam</u>
f	01:54:36	00:04:18	center	109,977 km	0.64
h	02:01:00	00:04:18	corner	113,940 km	0.66
j	02:08:00	00:04:18	corner	118,314 km	0.69
l	02:16:00	00:04:18	corner	123,367 km	0.71
n	02:23:00	00:04:18	corner	127,837 km	0.74

lapetus 17

Nov. 12, 2005

Center stare

Scat. Start

21:53

Scat. Duration

03:00

Detect. Time

4 minutes

Distance, km

420,000 km

Beam/Diameter

2

Rhea 18

Nov. 27, 2005

Five-point stare

02:52

03:00

0.1 minute

114,000 km

0.5

2. C-Kernels Reconstruction

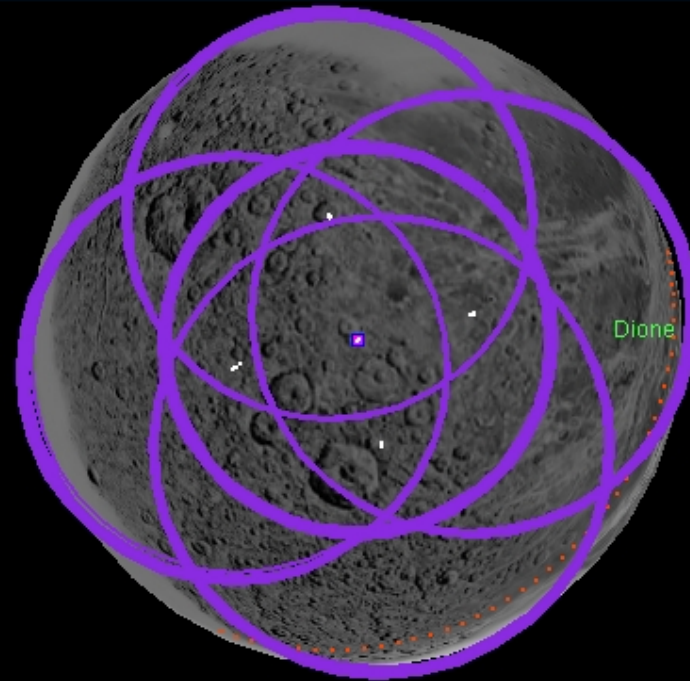
Target: Dione

Observation/Footprint Time:(2005 OCT 11) 2005-284T20:58:12.00

323

322

-1



Target RA Dec: 322.41 -1.32

Spacecraft-Target Distance: 105458 km

Spacecraft Velocity(relative to Target): 10.1676 km/s

Sub SC Lat Lon: -0.005 13.141

Sub Solar Lat Lon: -20.101 207.047

Target Phase Angle: 155.72

Footprint Mode: Body Center (Default)

Created by ODD (MSS D11.0)

on: Thu Jul 7 22:18:58 2005

DIONE/RHEA PREVIEW MEETING

Friday September 30, 2005

Radio Science Team

Prepared by Nicole Rappaport

DIONE/RHEA PREVIEW MEETING

Friday September 30, 2005

Radio Science Team

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RHEA AND ITS FLYBY BY CASSINI: DATA AND ORDERS OF MAGNITUDE

- THE SATELLITE

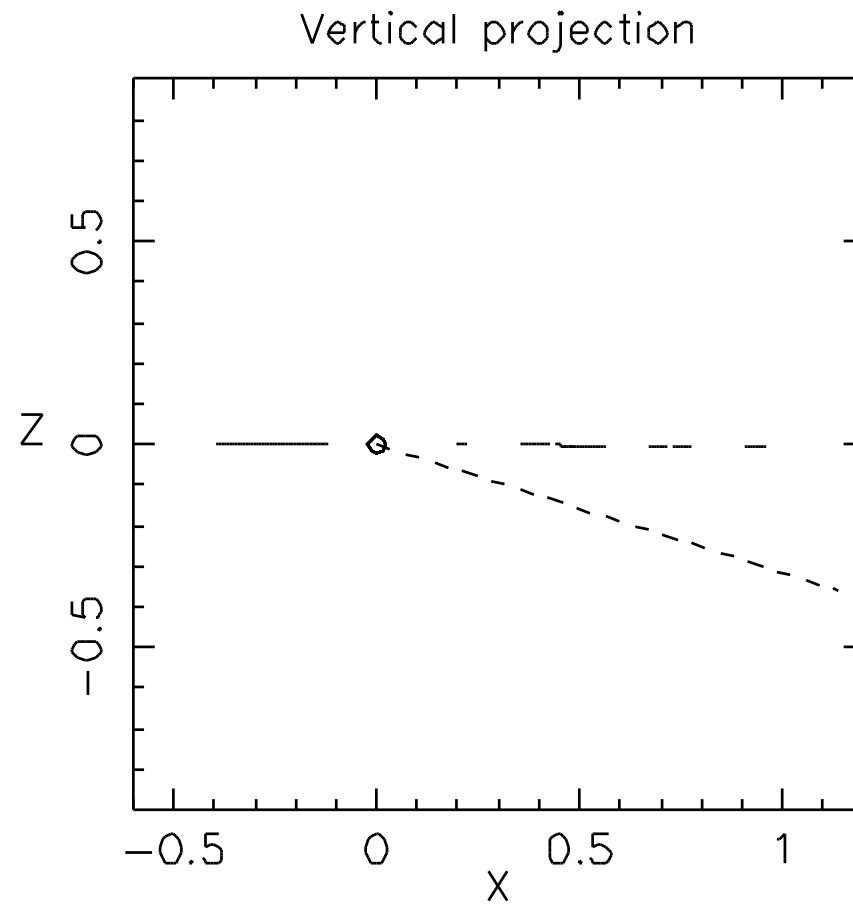
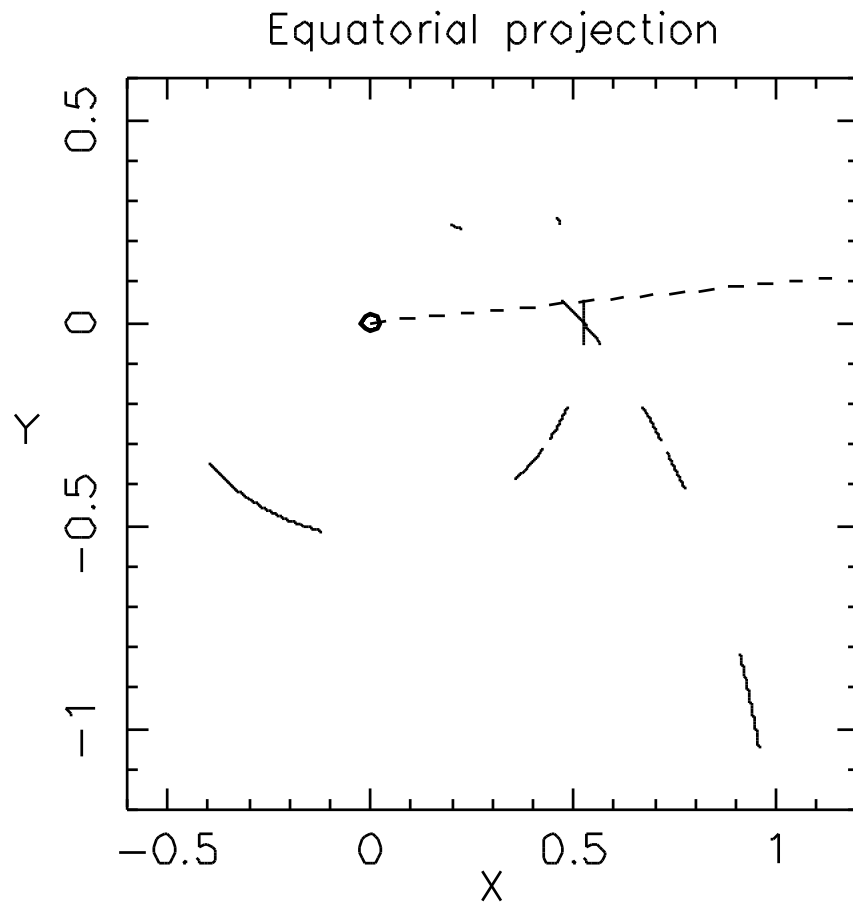
- $a \sim 5.271 \times 10^5 \text{ km}$
- $e \sim 0.0009$
- $i \sim 0.327^\circ$
- $R \sim 764 \text{ km}$
- $GM \sim 154 \text{ km}^3/\text{s}^2$
- $J_2 = ???$
- $C_{22} = ???$

- THE FLYBY

- TCA = 2005 NOV 26
22:38:43 (SCET)
- $b = 640 \text{ km}$
- $v = 7.3 \text{ km/s}$
- $\Rightarrow \Delta t = 2b/v \sim 6 \text{ minutes}$
- $\Rightarrow \Delta v = (GM/b^2) \times \Delta t \sim 33 \text{ m/s.}$
- $SEP = 113^\circ$
- $\Rightarrow \sigma_{\Delta v} \sim 0.06 \text{ mm/s @ 100 sec. integration time.}$
- $\Rightarrow \sigma_{GM} / GM \sim 1.8 \times 10^{-6}$

GEOMETRY OF RHEA FLYBY AND TRACKING SEGMENTS

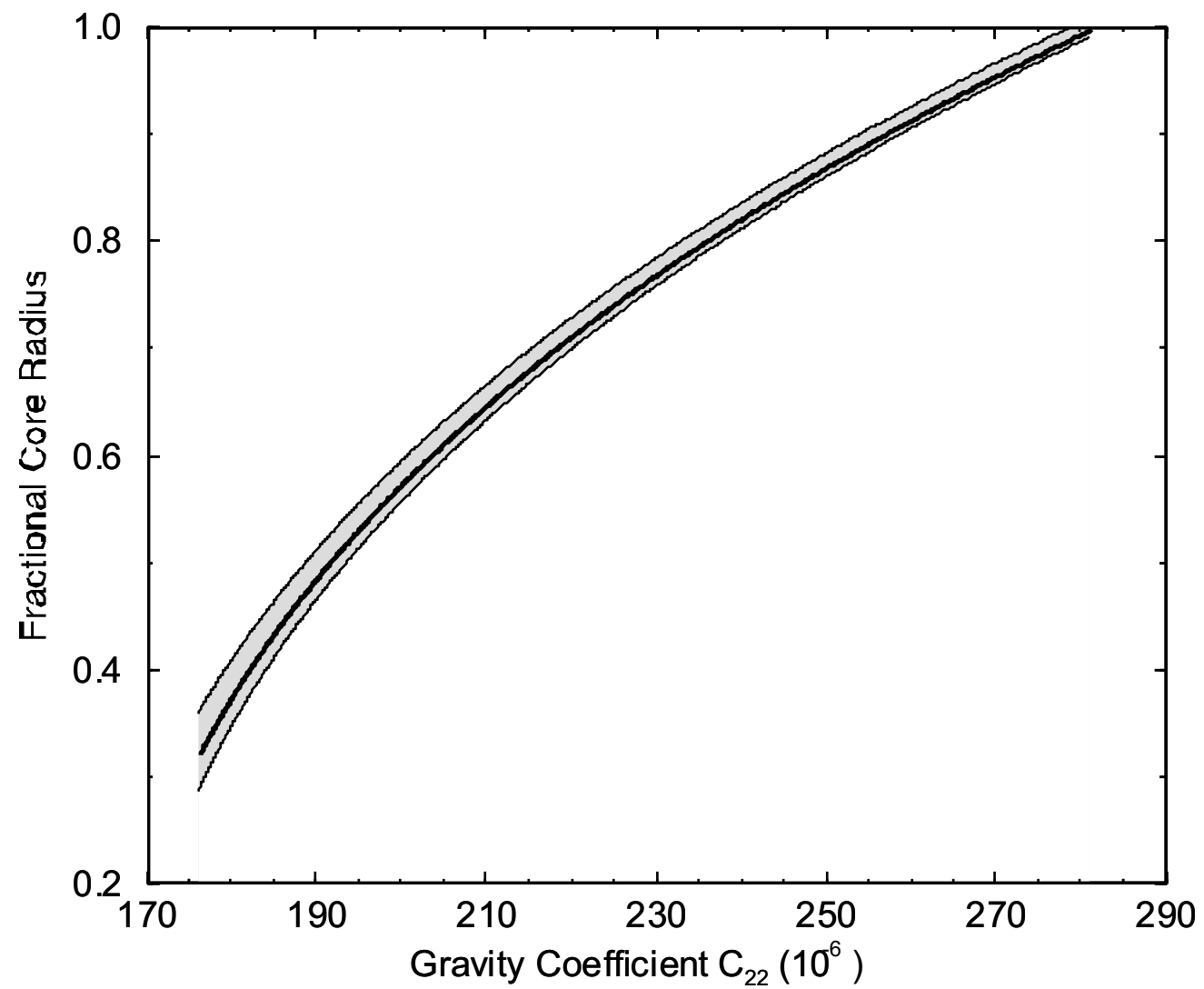
Unit of distance = 1 million km



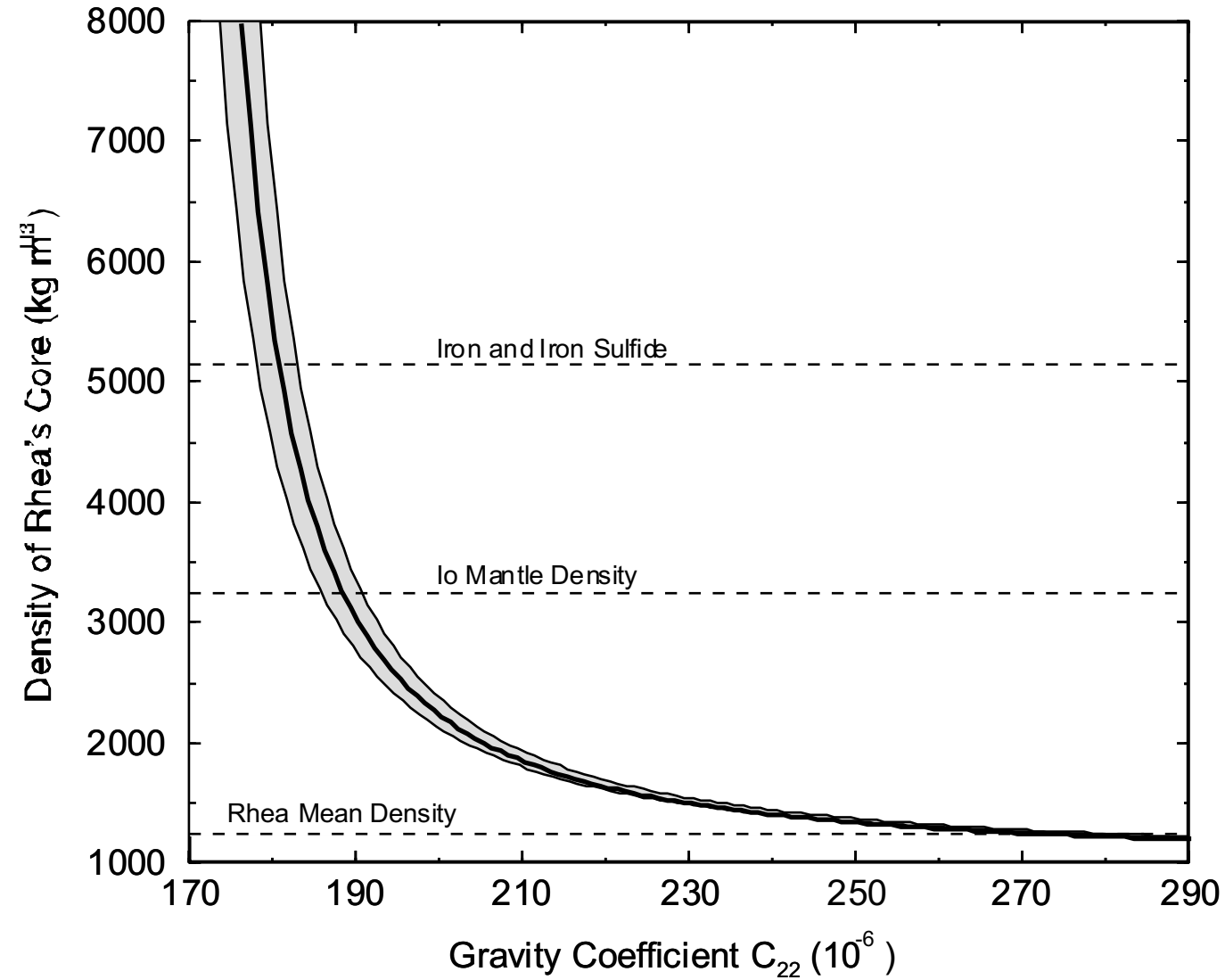
RSS SCIENTIFIC OBJECTIVES AT RHEA

- Determine the mass of Rhea as well as J_2 and C_{22} .
- Constrain models of interior (see Anderson, J., N.J. Rappaport, G. Giampieri, G. Schubert, and W.B. Moore 2003: "Gravity field and interior structure of Rhea," *Physics of the Earth and Planetary Interiors* **136**, 201-213).
 - Rhea is in synchronous rotation.
 - Rhea is assumed to be in hydrostatic equilibrium.
 - ⇒ $J_2 = (10/3) * C_{22}$, C/MR^2 from Radau relationship.
 - Two-layer models can be constructed.
 - ⇒ Core radius and core density as a function of C_{22} .
- Compare Rhea with other satellites (Galilean satellites)

RESULT OF TWO-LAYER MODEL: CORE RADIUS



RESULT OF TWO-LAYER MODEL: CORE DENSITY



SIMULATION OF RHEA FLYBY

- **APPROACH**

- New program COVA
- Short arc of data
- Doppler data only
- Fit variables:
 - Initial state of spacecraft
 - GM, J_2 , C_{22}

- **RESULTS**

- $\sigma_{GM} / GM \sim 1.8 \times 10^{-6}$
- $\sigma_{J_2} \sim 3.3 \times 10^{-5}$
- $\sigma_{C_{22}} \sim 4.0 \times 10^{-6}$
- Low correlations

DIONE AND ITS FLYBY BY CASSINI: DATA AND ORDERS OF MAGNITUDE

- THE SATELLITE

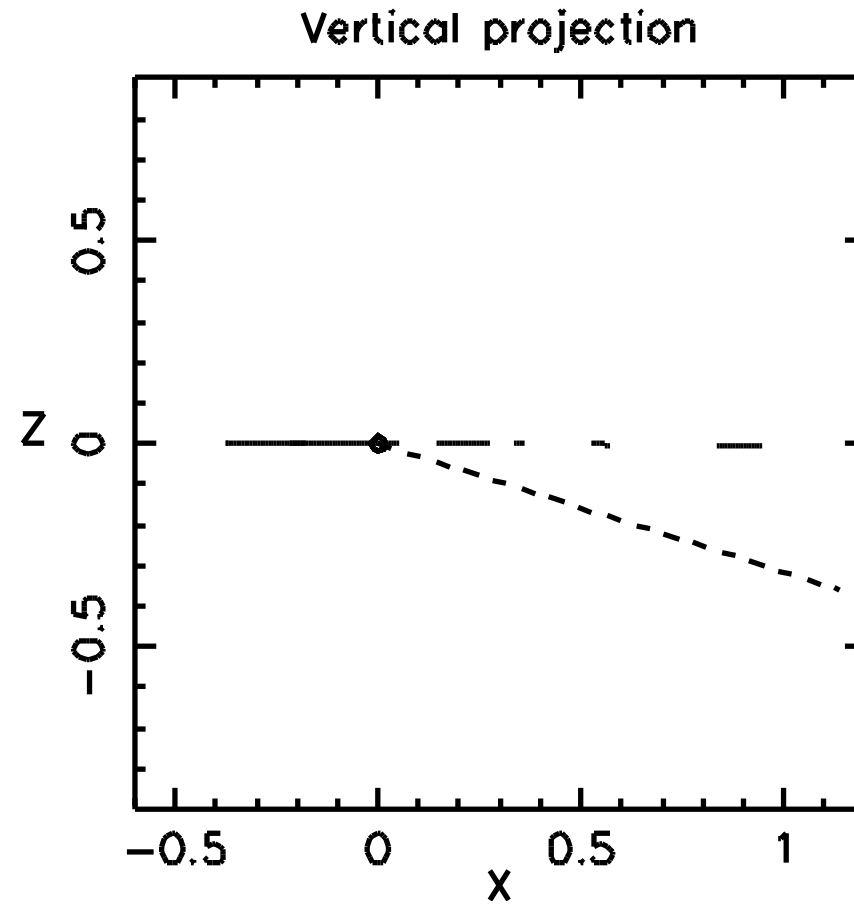
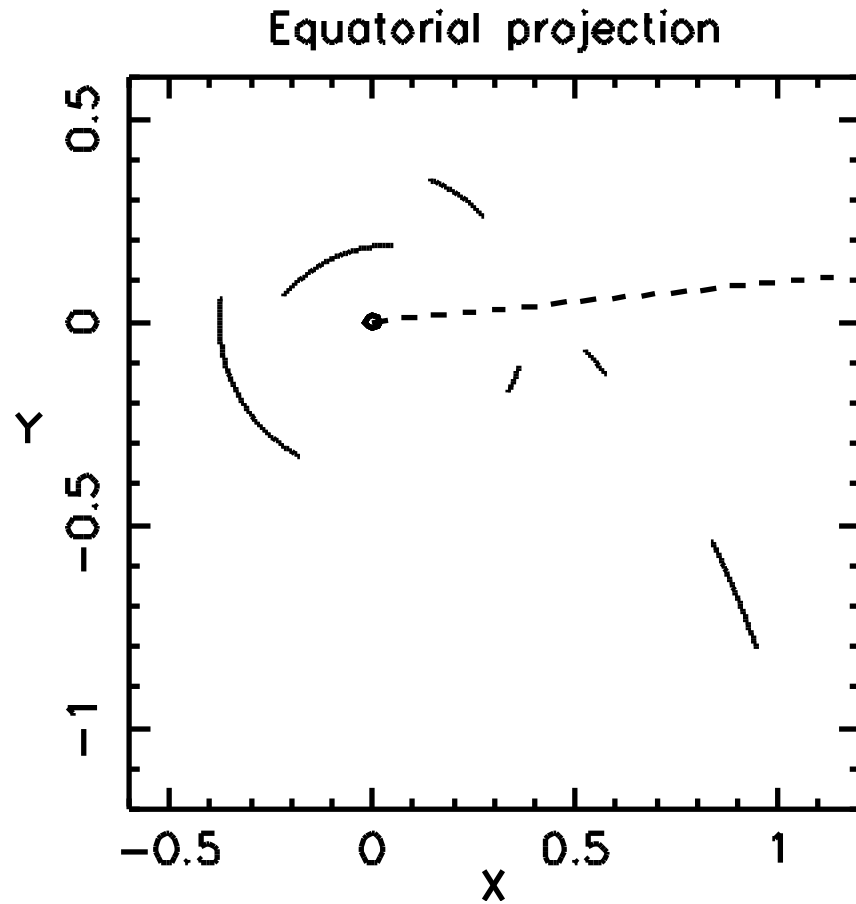
- $a \sim 3.774 \times 10^5 \text{ km}$
- $e \sim 0.0002$
- $i \sim 0.002^\circ$
- $R \sim 560 \text{ km}$
- $GM \sim 73 \text{ km}^3/\text{s}^2$

- THE FLYBY

- TCA = 2005 OCT 11
17:53:06 (SCET)
- $b = 1060 \text{ km}$
- $v = 9.1 \text{ km/s}$
- $\Rightarrow \Delta t = 2b/v \sim 4 \text{ minutes}$
- $\Rightarrow \Delta v = (GM/b^2) \times \Delta t \sim 15 \text{ m/s.}$
- $SEP = 69^\circ$
- $\Rightarrow \sigma_{\Delta v} \sim 0.18 \text{ mm/s @ 100 sec. integration time.}$
- $\Rightarrow \sigma_{GM} / GM \sim 1.2 \times 10^{-5}$

GEOMETRY OF DIONE FLYBY AND TRACKING SEGMENTS

Unit of distance = 1 million km



RSS SCIENTIFIC OBJECTIVES AT DIONE

- Determine the mass of Dione.
- Compare Dione with other satellites of Saturn.

SIMULATION OF RHEA FLYBY

- **APPROACH**

- New program COVA
- Short arc of data
- Doppler data only
- Fit variables:
 - Initial state of spacecraft
 - GM

- **RESULTS**

- $\sigma_{\text{GM}} / \text{GM} \sim 1.6 \times 10^{-5}$
- Moderate correlations