

Cassini and the Madrid DSN

Jo Pitesky
Jet Propulsion Laboratory
California Institute of Technology

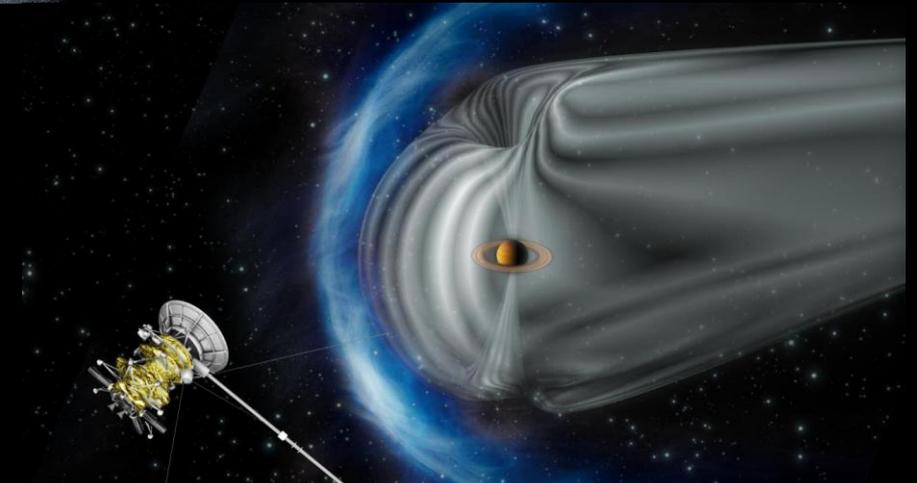
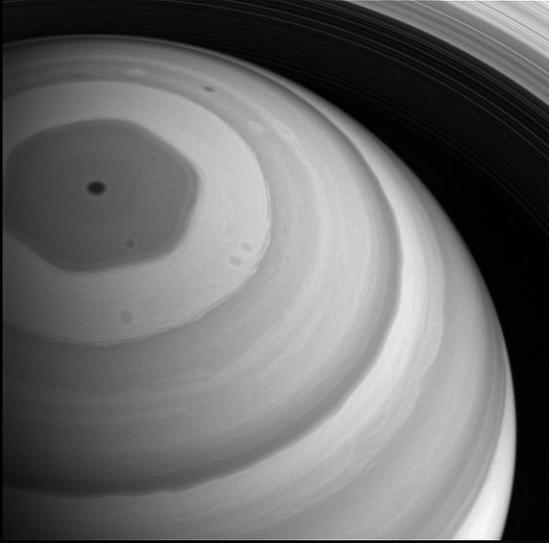
Why are we here?

MUCHAS
GRACIAS!

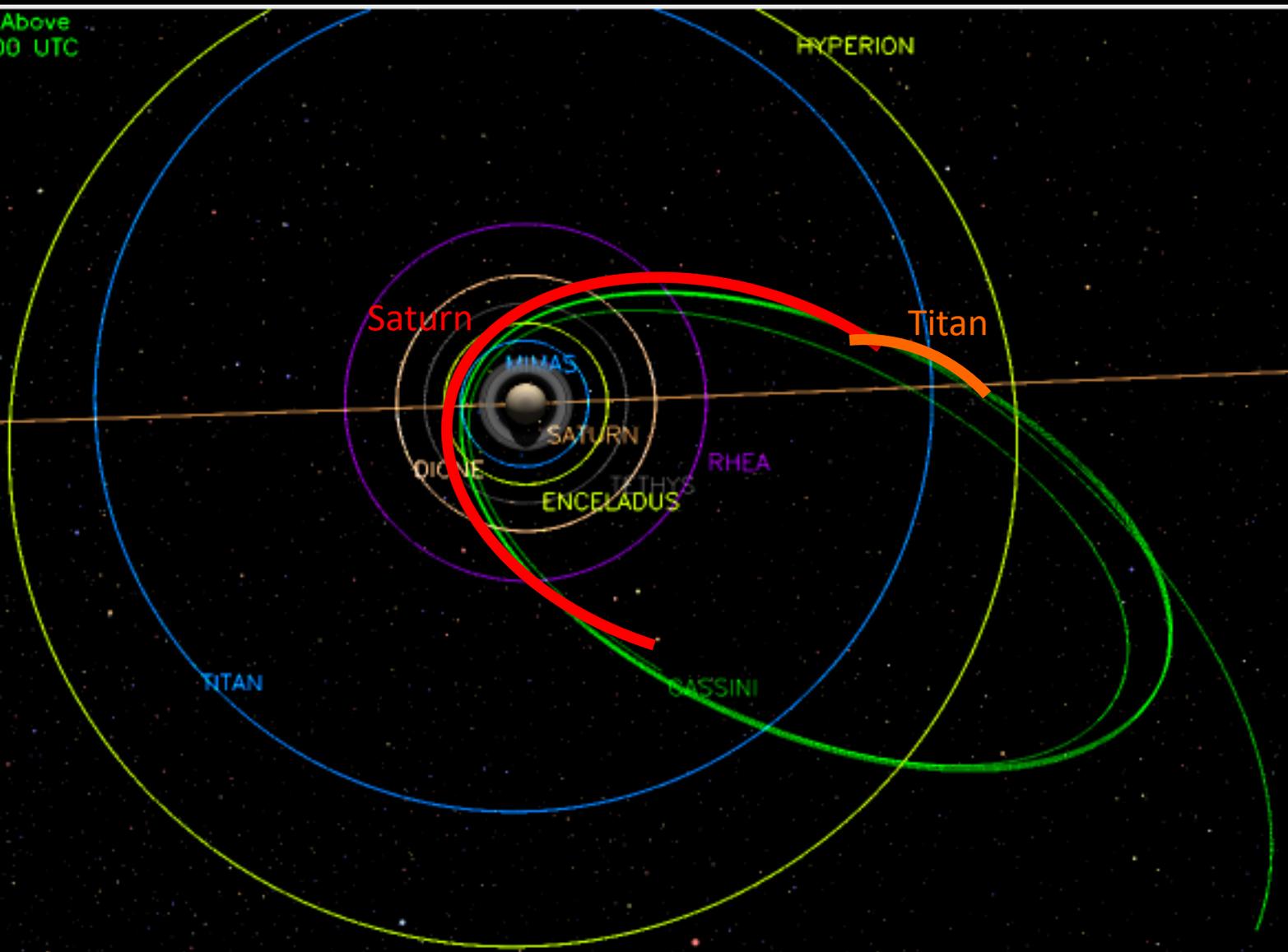
Planning a vacation...



...is like planning a mission to Saturn



View of Cassini from Above
2015 NOV 25 06:08:00 UTC
42.4° field of view







Deep Space Network



Jet Propulsion Laboratory | California Institute of Technology

DEEP SPACE NETWORK *NOW*

LAST UPDATED: MAY 25 4:40 AM (UTC)

[DSN home](#)



TARGET

CASSINI



[VIEW ANTENNA](#)

[VIEW SPACECRAFT](#)

[VIEW WORLD MAP](#)

CAS

SPACECRAFT

NAME

Cassini

RANGE

1.36 billion km

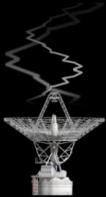
ROUND-TRIP LIGHT TIME

2.53 hours

[+ more detail](#)

[credits](#) [contact](#)

CAS



63

MMS4



65



54

CAS



55

CAS



14

VGR1



15



24



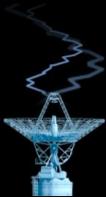
25

VGR1



26

MOM M01O MRO



43

MVN



35



36

MADRID

MAY 25
6:40 AM

GOLDSTONE

MAY 24
9:40 PM

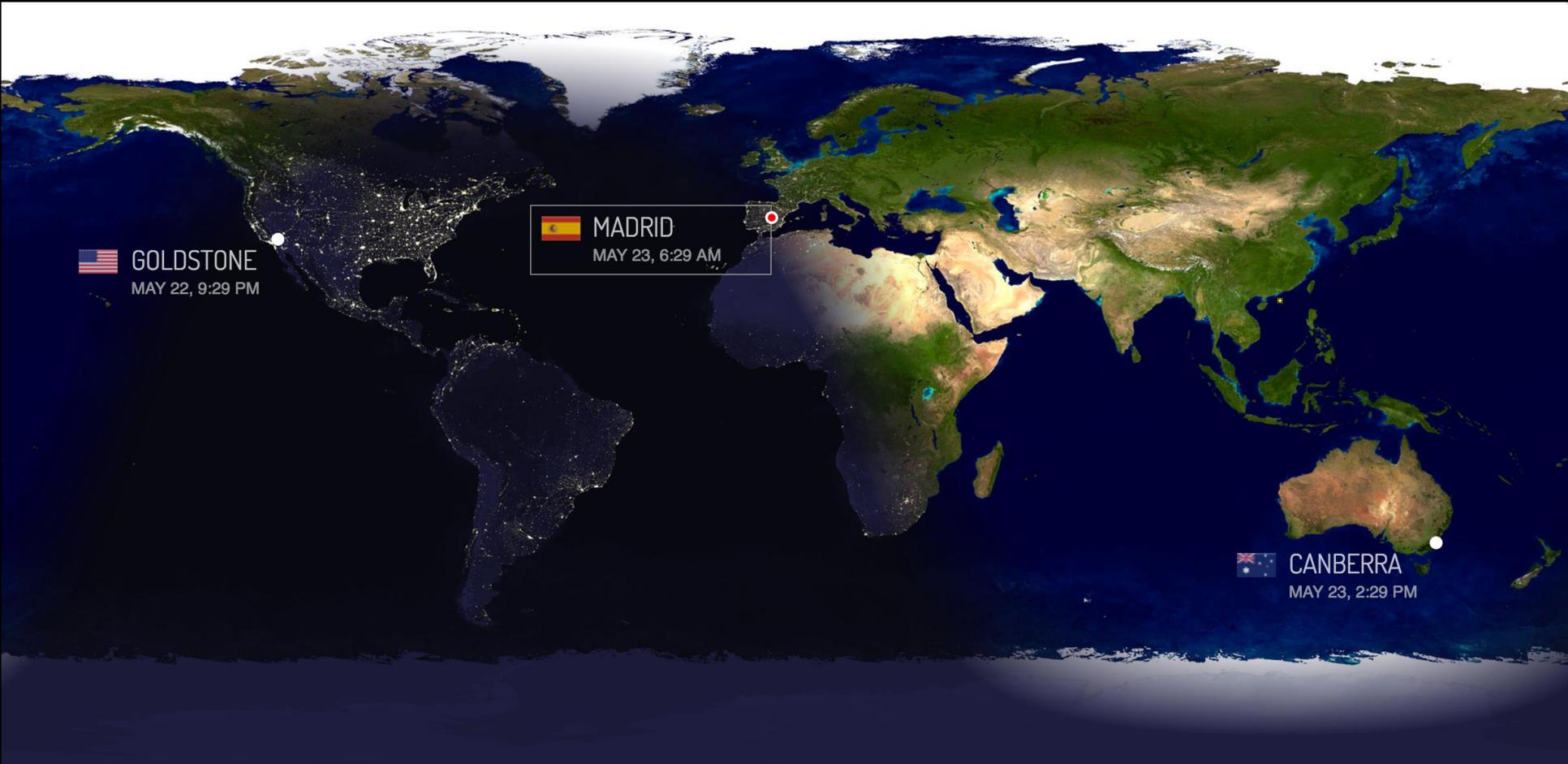
CANBERRA

MAY 25
2:40 PM

Need DSN for

- Sending data from the spacecraft to us
- Sending instructions from us to the spacecraft
- Tracking the spacecraft's position for navigation
- Radio Science experiments (an instrument in two pieces, separated by a billion miles)

Deep Space Network



 GOLDSTONE
MAY 22, 9:29 PM

 MADRID
MAY 23, 6:29 AM

 CANBERRA
MAY 23, 2:29 PM

DEEP SPACE NETWORK SFOF DATA FLOW

EQUIPMENT AREAS



COMMUNICATIONS



SIMULATION



CENTRAL COMPUTER



BUFFER DISPLAY



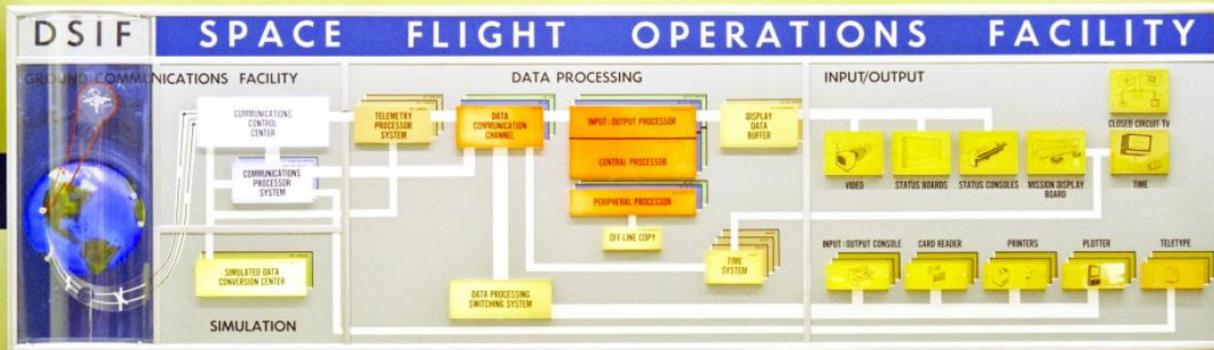
TIME



CLOSED CIRCUIT TV



REPRODUCTION



MISSION DIRECTOR



FPAA



SPAA



SSAA



DSN MONITOR



DPCA

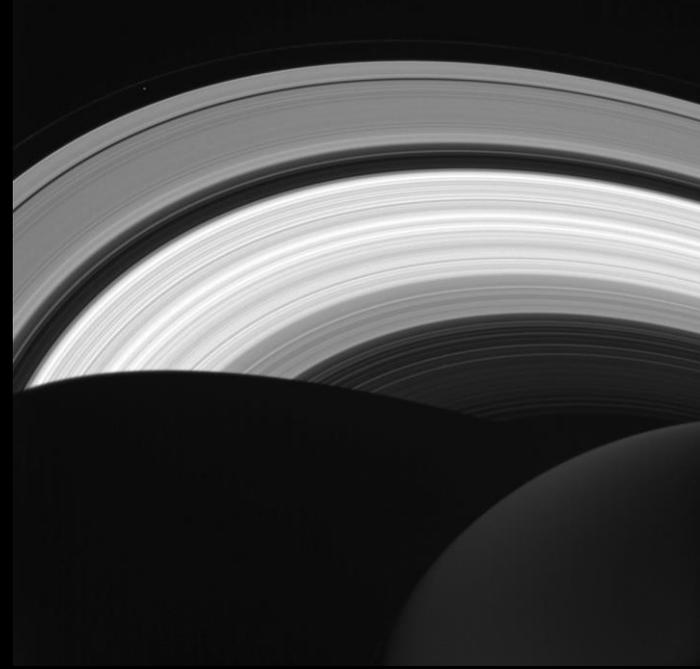
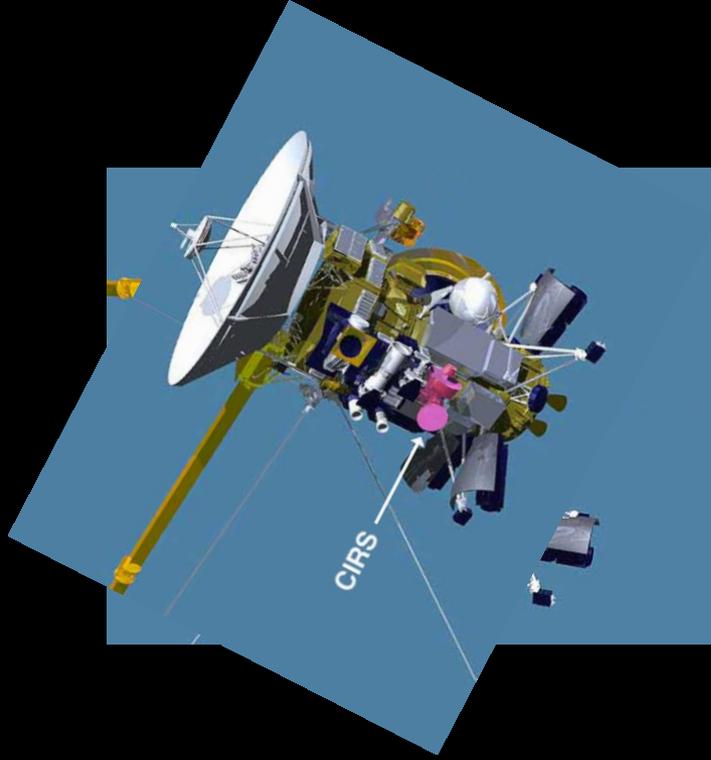


COMMUNICATIONS



CONTROL (USER) AREAS

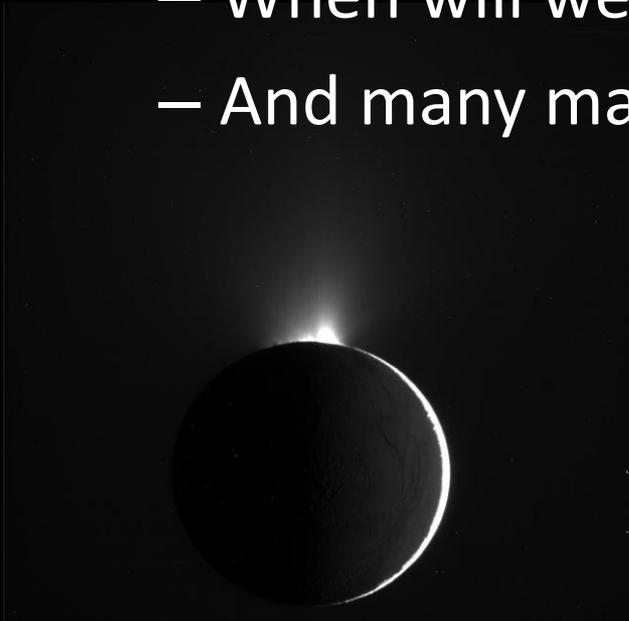




Integrating the DSN with Cassini

Find the observations that **MUST** occur at certain times

- When can we see Enceladus backlit?
- When will we be flying over the rings?
- And many many more...



Saturday, September 9, 2017

all day

6 am

7 am

8 am

9 am

10 am

11 am

Noon

1 pm

2 pm

3 pm

4 pm

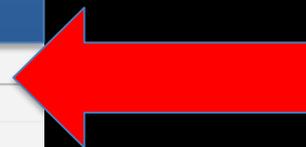
5 pm

6 pm

7 pm

8 pm

Fly over Saturn's
rings

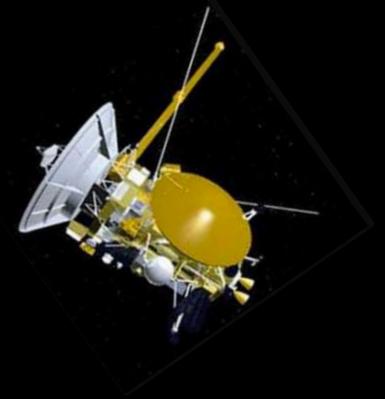


Good time to
send data from
Cassini to Earth

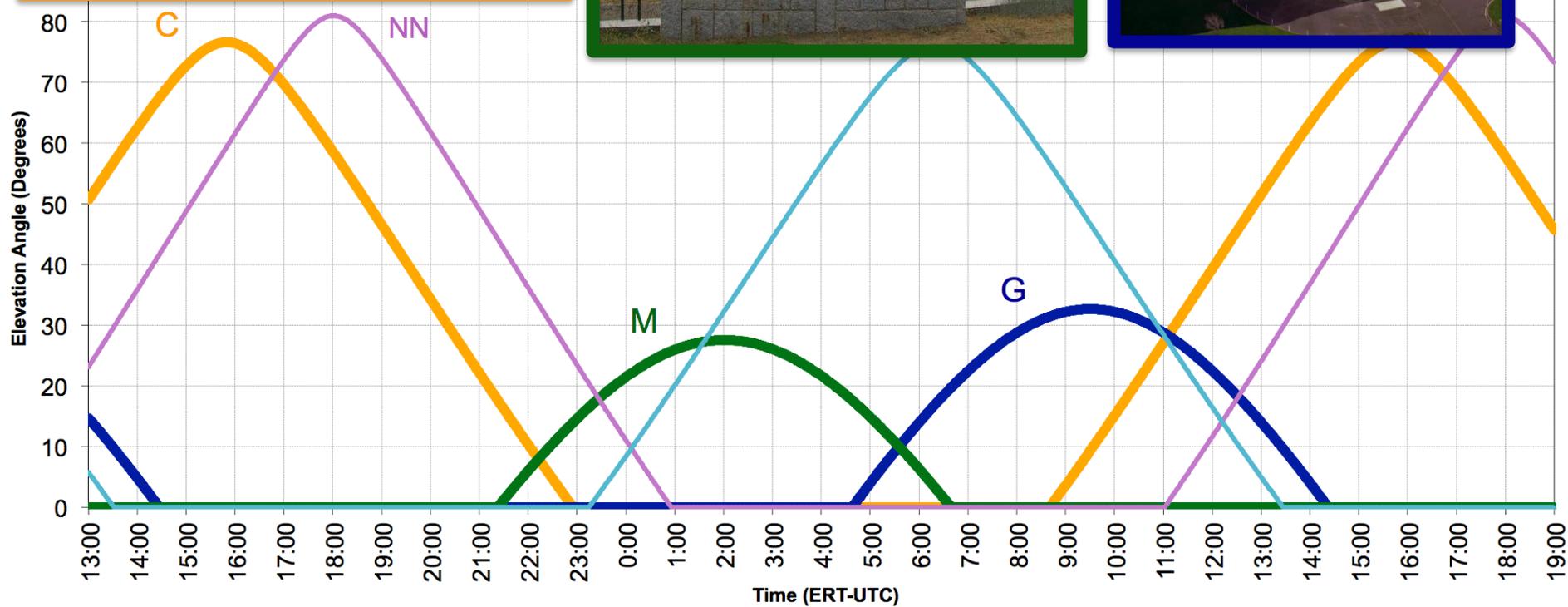
Which DSN stations will be able to “see” Cassini at that time?

Goldstone

Madrid



Which station can get the most data?





Even antennas need a day off

NASA Jet Propulsion Laboratory | California Institute of Technology
DEEP SPACE NETWORK NOW

TELETYPE: MAY 25 4:40 AM (UTC)
[DSN home](#) [i](#)

Location	Antenna ID	Target	Status
MADRID	63	CAS	Operational
	65	MMS4	Operational
	54	CAS	Offline
	55	CAS	Operational
GOLDSTONE	14	CAS	Operational
	15	VGR1	Operational
	24	CAS	Offline
	25	CAS	Offline
	26	VGR1	Operational
CANBERRA	43	MOM M01O MRO	Operational
	34	MOM M01O MRO	Offline
	35	MVN	Operational
	36	MVN	Offline

ZONA DE OBRAS

TARGET
CASSINI



[VIEW ANTENNA](#) [VIEW SPACECRAFT](#) [VIEW WORLD MAP](#)

CAS

SPACECRAFT

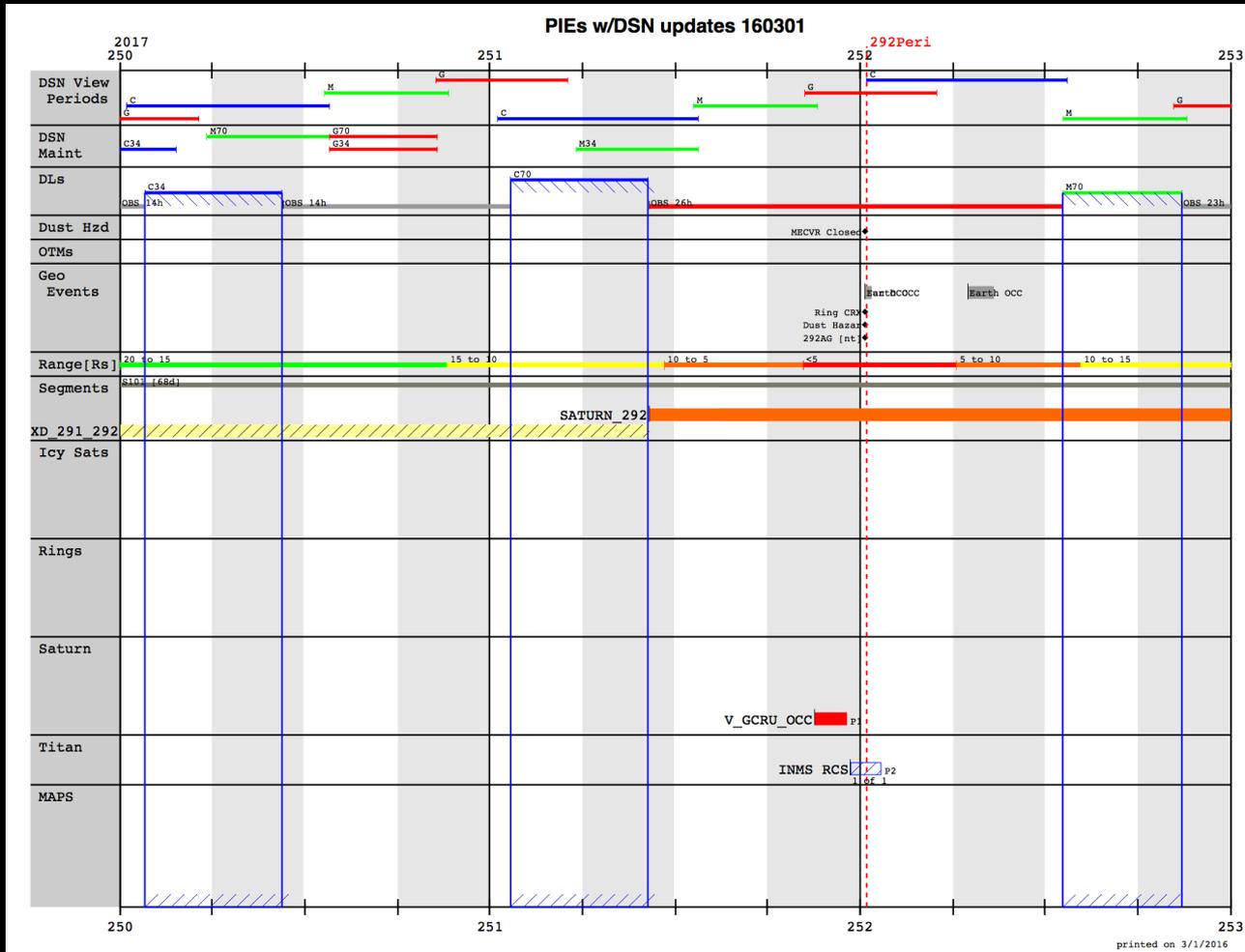
NAME
Cassini

RANGE
1.36 billion km

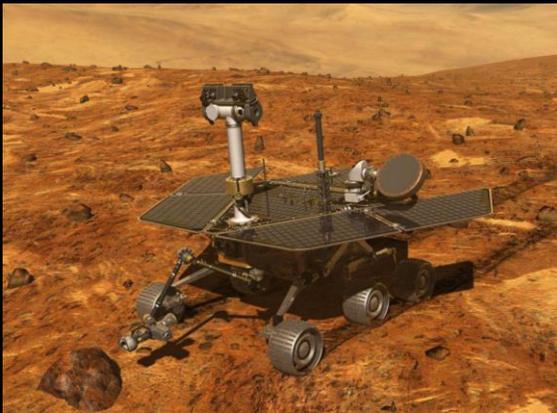
ROUND-TRIP LIGHT TIME
2.53 hours

[+ more detail](#) [credits](#) [contact](#)

Here's what the schedule looks like from Cassini's point of view:



Other spacecraft also want to talk to Earth...



...so we have to share.



CHARLES ELACHI MISSION CONTROL CENTER

UTC
153:10:42:49
CASSINI PLUNGE
-104:10:24:11
JUNO JOI
+331:13:24:30

Jet Propulsion Laboratory
California Institute of Technology

DATA CONTROLLER

MISSION SUPPORT SPECIALIST

DEEP SPACE NETWORK

DATA CONTROLLER

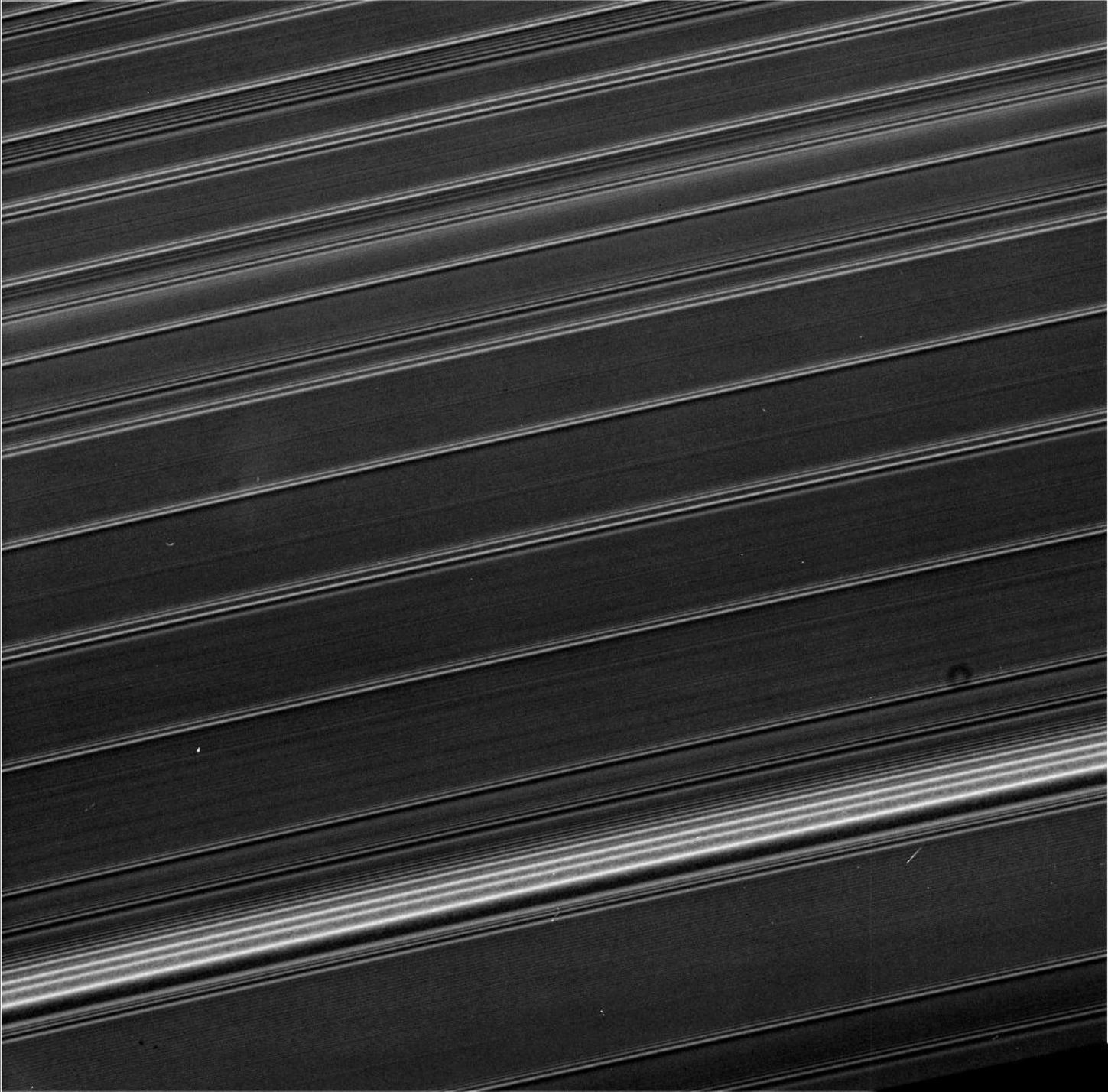
MISSION

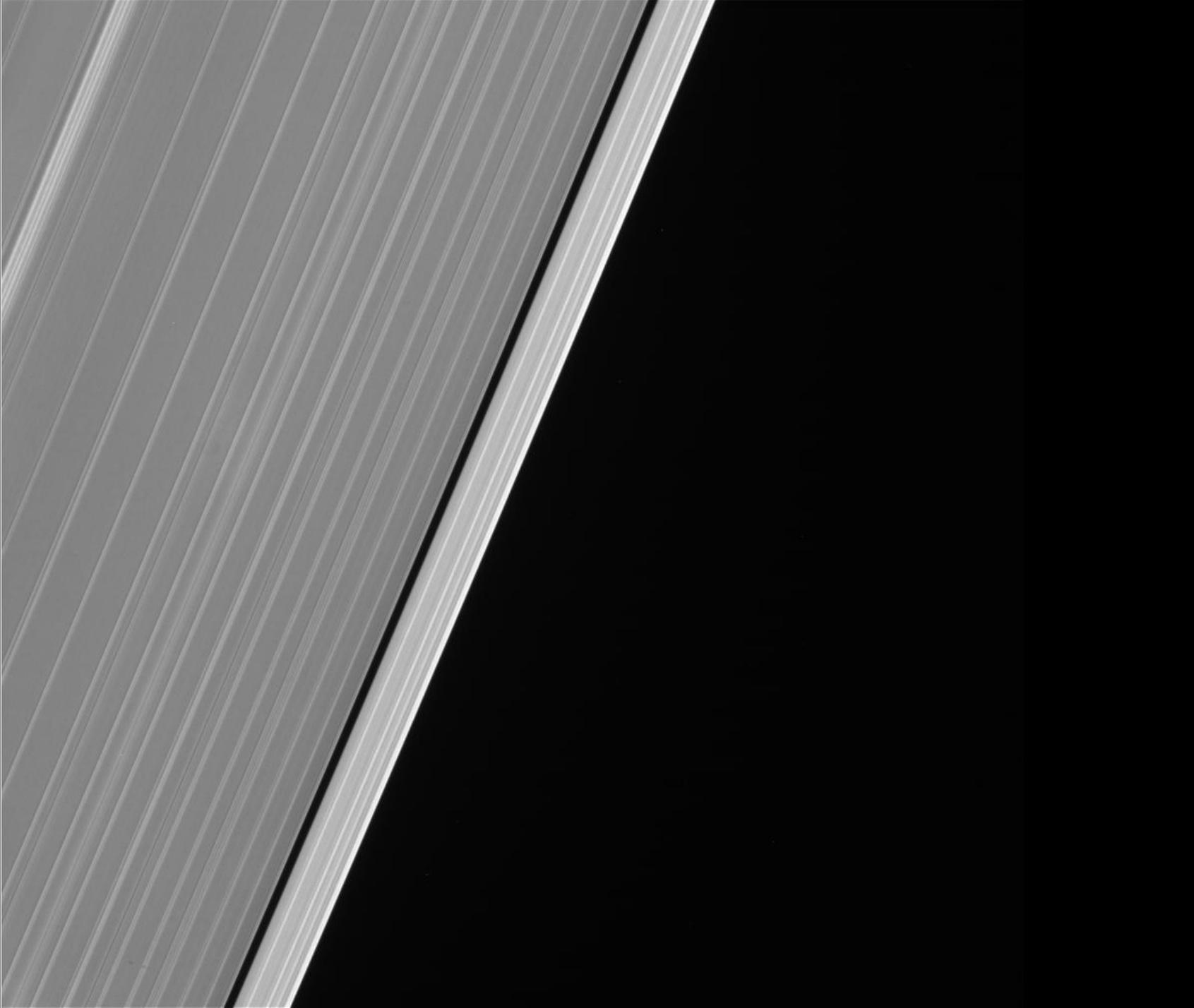
CASSINI MISSION ACE

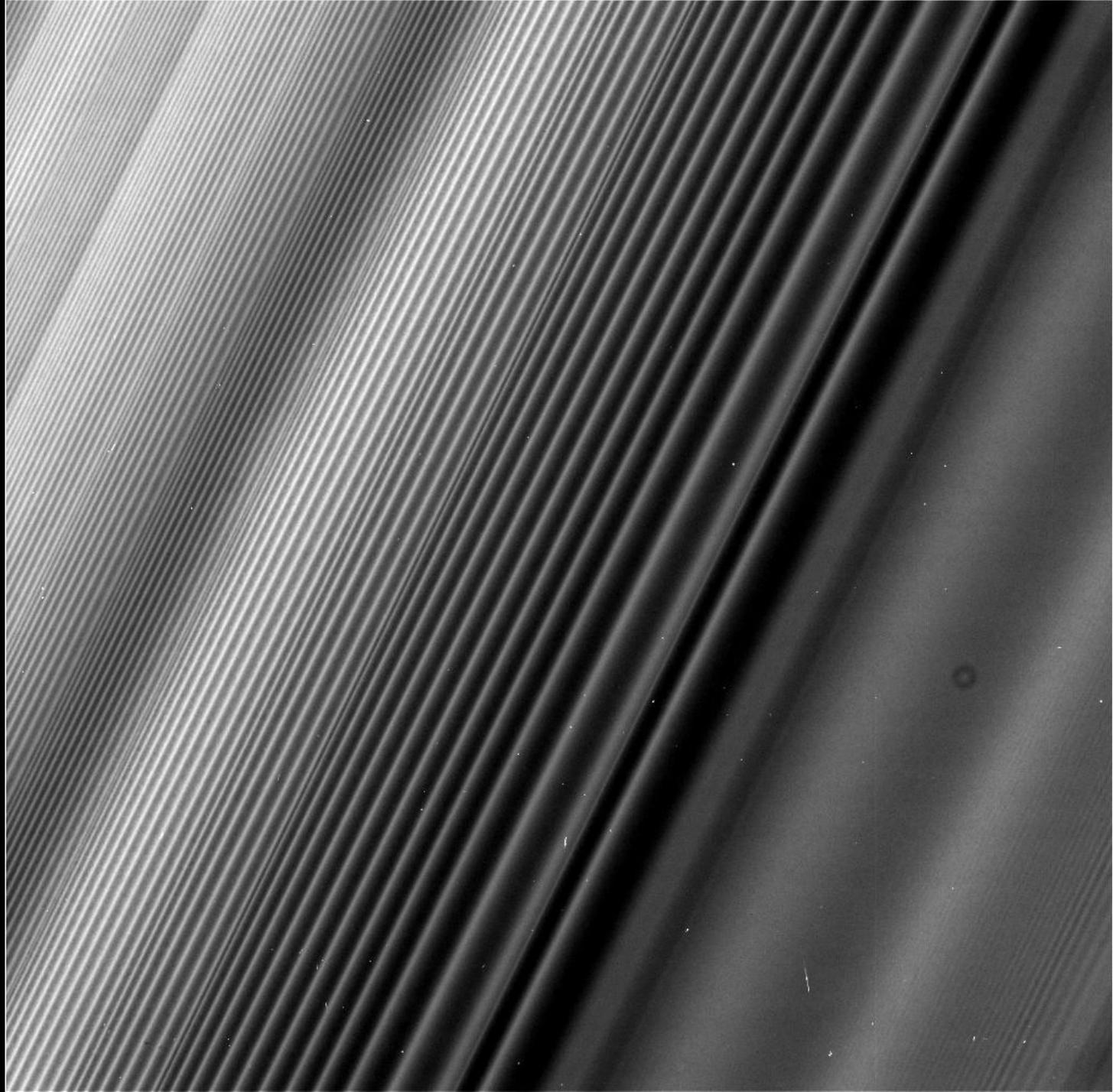
Next DSN 7

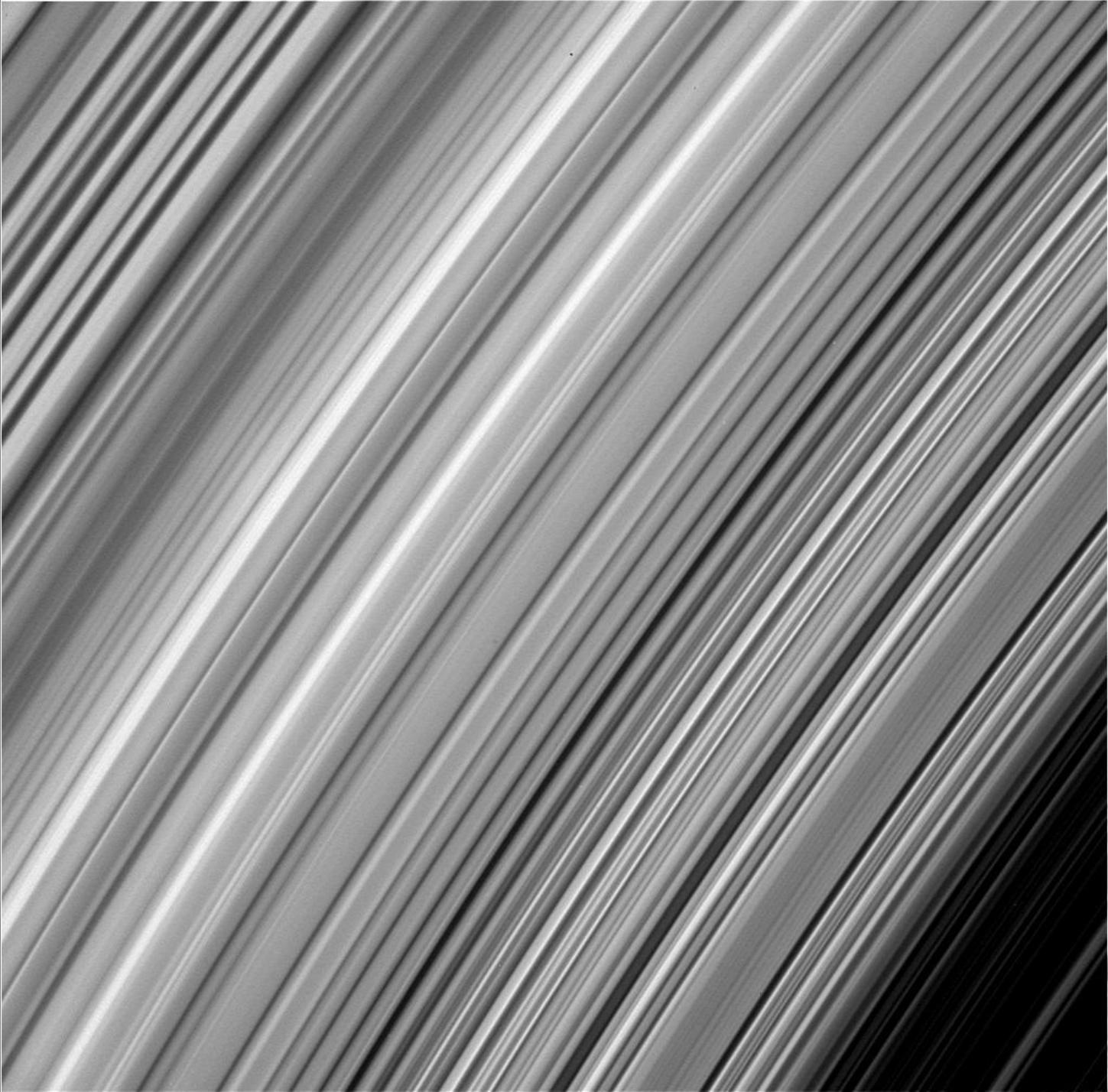


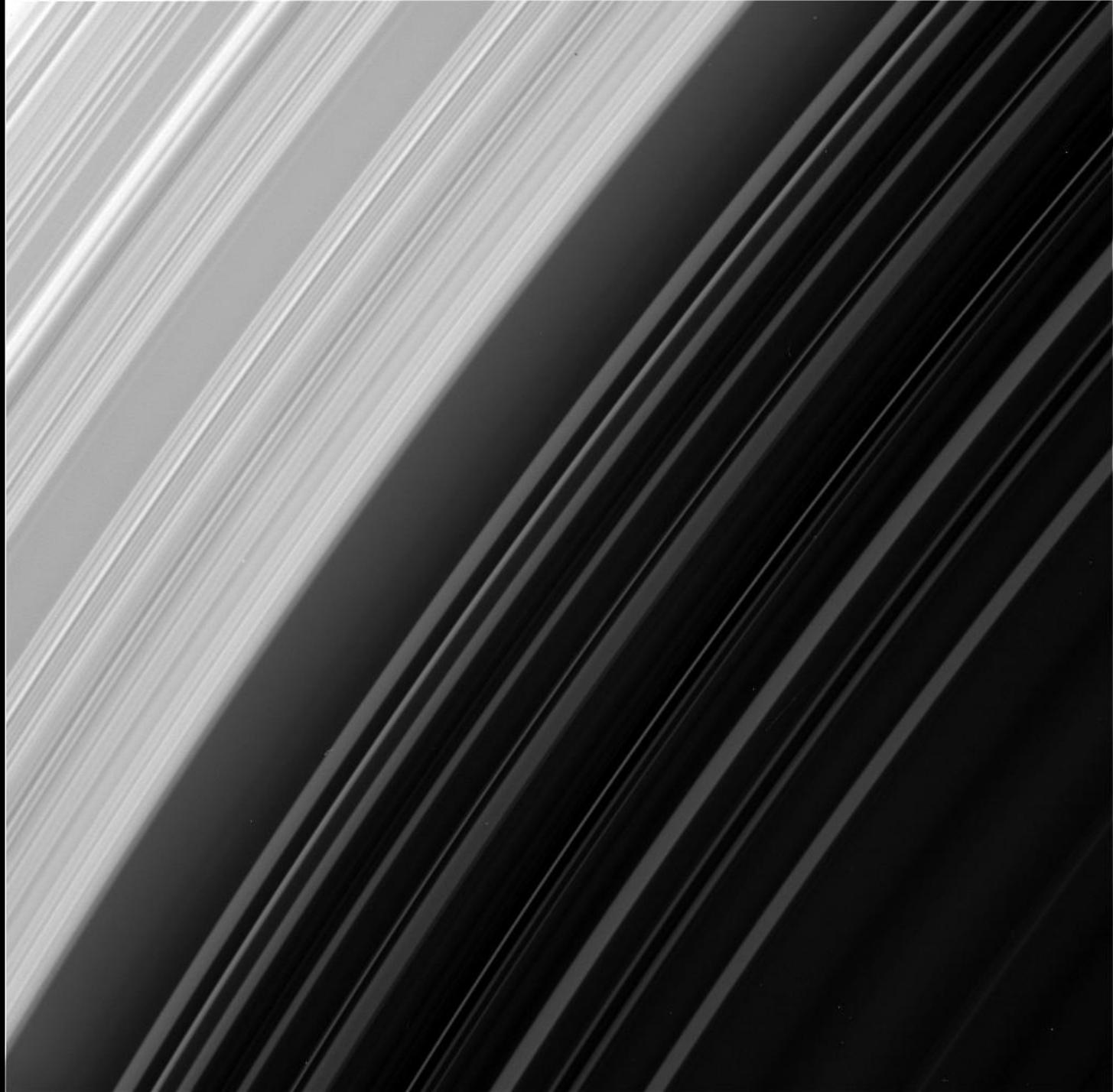












Final goodbye from Madrid to CAS

- Saturday, September 9 (six days before the end of the mission)
 - Next-to-last sampling of Saturn's upper atmosphere
 - RADAR "image" of weather in and below Saturn's ammonia clouds
 - View of rings as if you were "standing" on Saturn (an "inside-out" ring view)

MUCHAS GRACIAS, MADRID DSN

“The DSN is just amazing, they really are. A spacecraft HAS to have low mass and low power, but any spacecraft is useless without the thousands of tons of concrete and steel that make up its other half. With that, the sensitivity is mind-blowingly magic.”

When is Madrid Receiving Cassini Data?

Date	Antenna Size	Madrid receiving data during:
June 17	70 meter	2017-168T22:05-168T23:45
June 22	34 meter	2017-173T23:25-174T05:35
June 23	34 meter	2017-174T21:40-175T04:00
June 23	70 meter	2017-174T21:40-175T04:00
June 25	70 meter	2017-176T21:45-177T05:30
July 3	34 meter	2017-184T21:00-185T04:45
July 6	34 meter	2017-187T20:45-188T02:30
July 6	70 meter	2017-187T20:45-188T02:30
July 9	70 meter	2017-190T20:35-191T04:30

Follow along at

<https://saturn.jpl.nasa.gov/galleries/raw-images/>

<http://eyes.nasa.gov/dsn/dsn.html>

