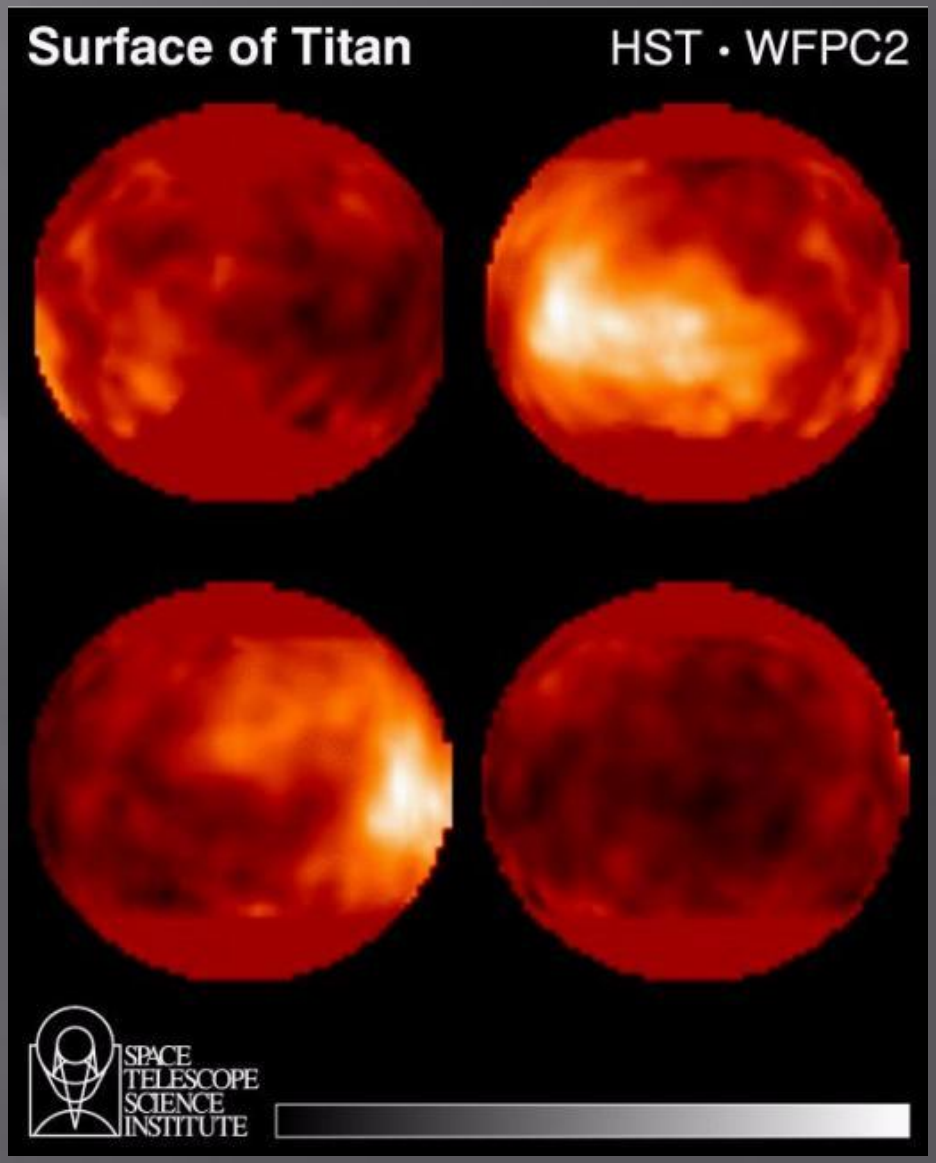
TITAN

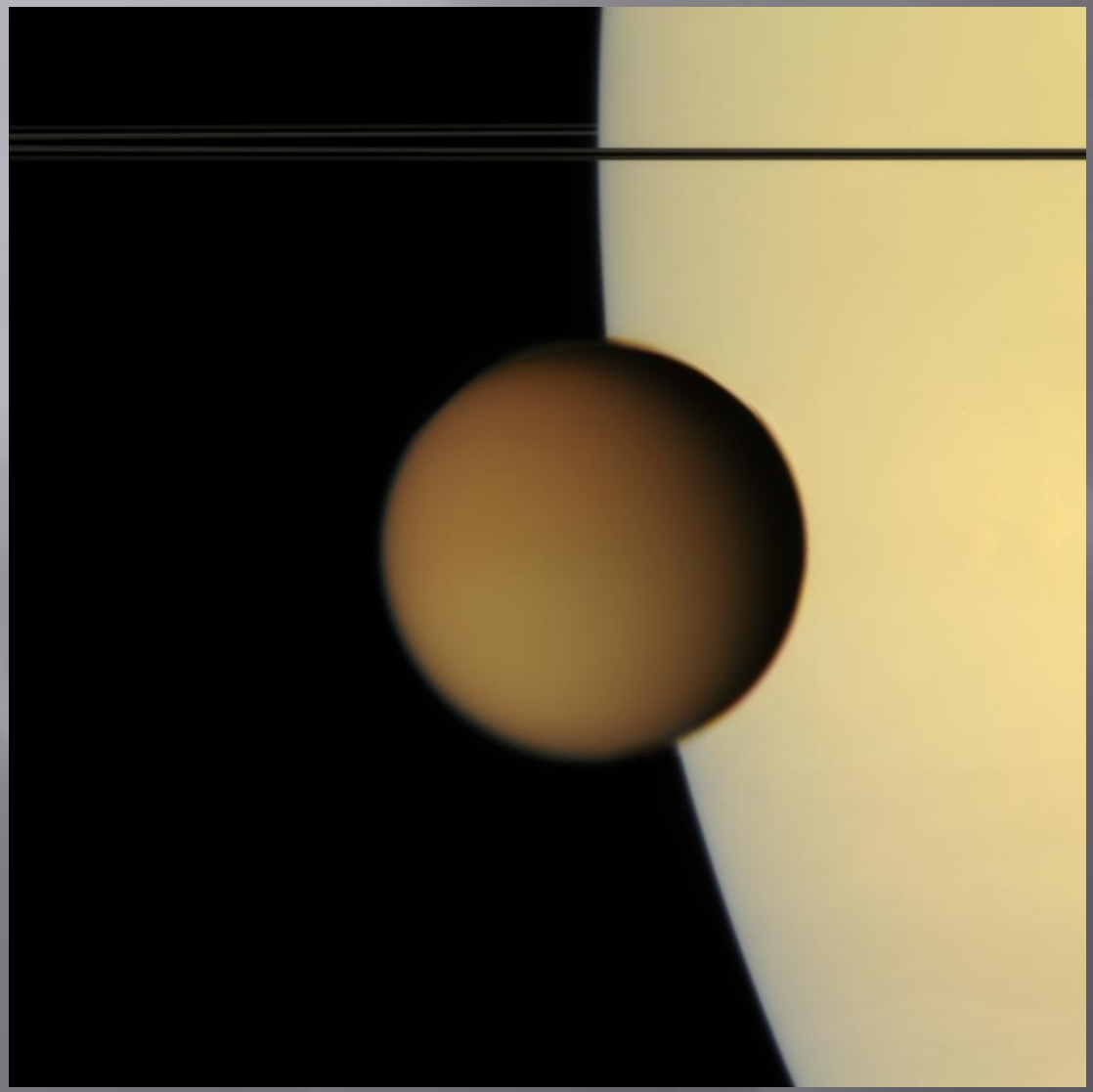
Un univers à découvrir

Le mystère de Titan

Christian Huygens

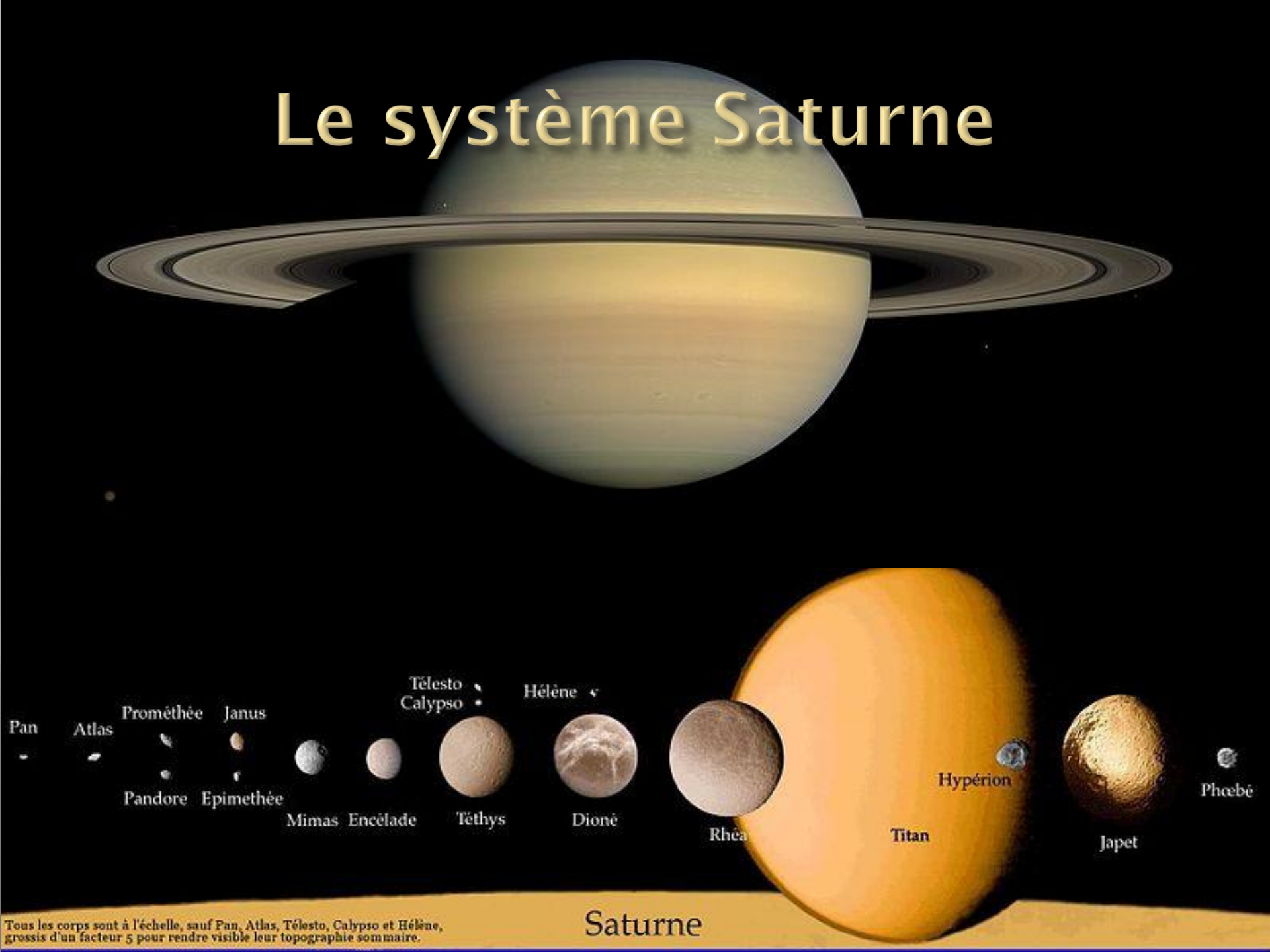


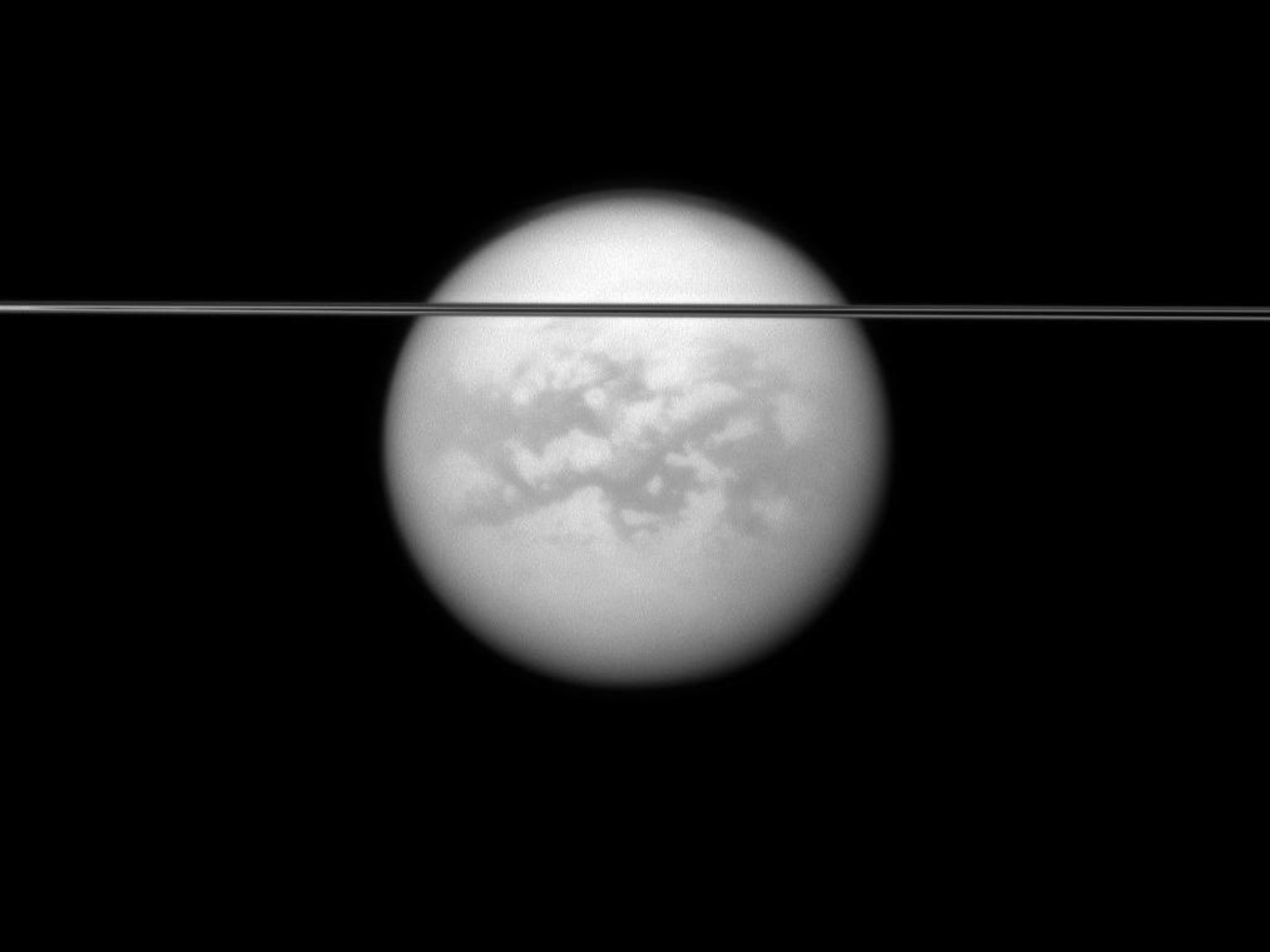
Le mystère de Titan



Même avec les caméras de Cassini dans les longueurs d'ondes visible, il est difficile d'observer la surface de Titan

Le système Saturne

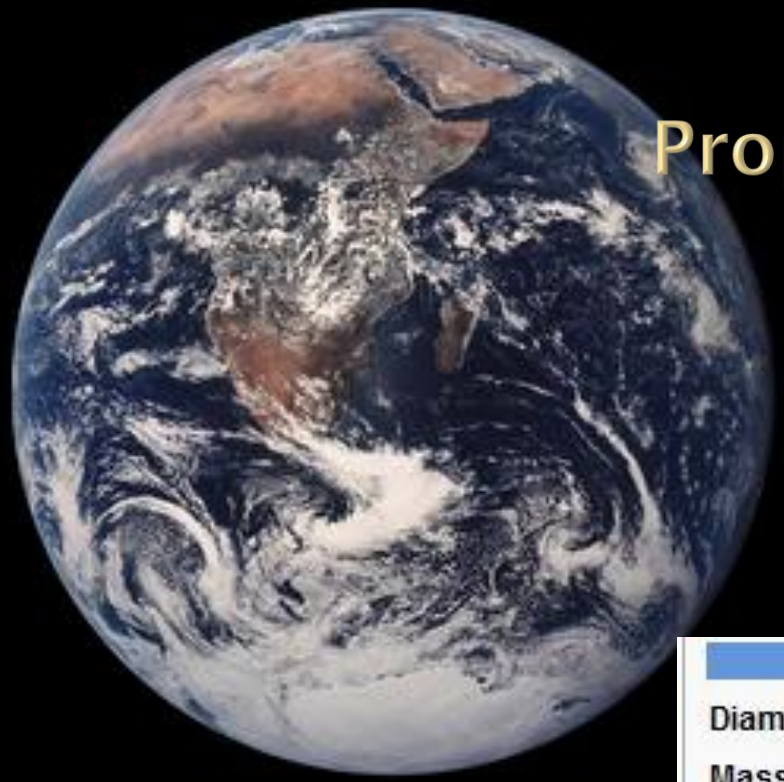




Titan
Propriétés physiques

Rayon: 1737 km

Rayon: 2575 km



Rayon: 6378 km

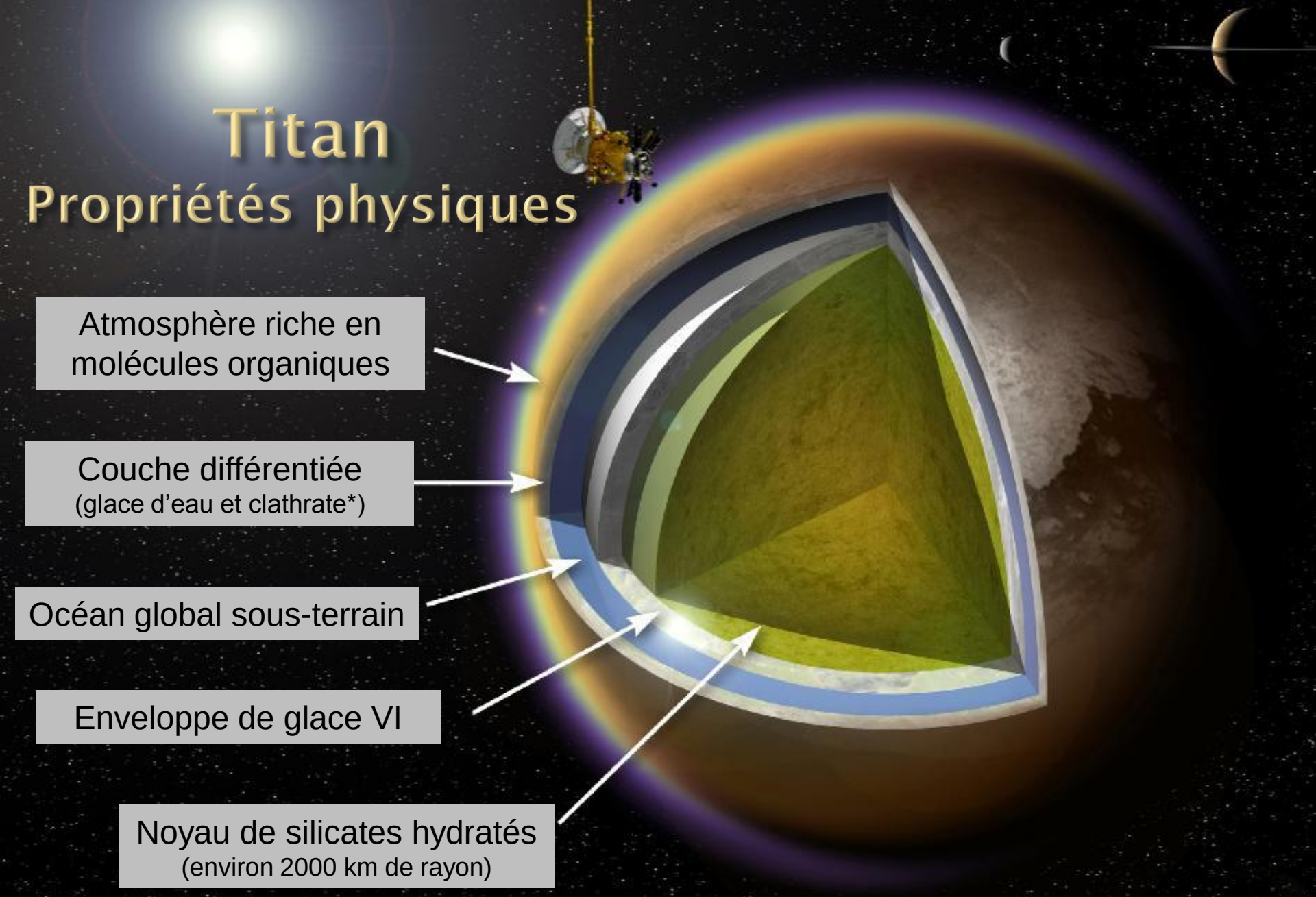
Diamètre	
Lune:	3474 km
Mercure:	4879 km
Titan:	**5151 km**
Mars:	6779 km
Terre:	12 742 km

Caractéristiques physiques	
Diamètre	5 151,0±4,0 km[3]
Masse	$1{,}3452 \pm 0{,}0002 \times 10^{23}$ kg[4]
Masse volumique moyenne	$1{,}880 \pm 0{,}004 \times 10^{3}$ kg/m³[3]
Gravité à la surface	1,428 m/s^2
Période de rotation	15,95 d (Synchrone)
Albédo moyen	0,2[3]
Température de surface	93,7 K[5]
Caractéristiques de l'atmosphère	
Pression atmosphérique	146,7 kPa 98,4 % N_2 1,6 % CH_4[6]

Titan
Propriétés physiques

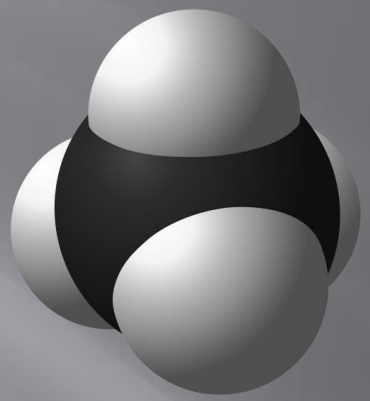
Propriété	TERRE	TITAN
Atmosphère	Azote + Oxygène	Azote + Hydrocarbures
Nuages et précipitations	Oui	Oui
Pression atmosphérique	Environ 1013 hPa	Environ 1467 hPa
Cycle météo	Eau solide, liquide, gaseuse	Méthane solide, liquide gazeux
Surface	Solide et liquide	Solide et liquide
Cratères	Quelques uns	Quelques uns
Déserts	Oui , 4% de la surface	Oui, 12-20% de la surface
Lacs / océans	Oui, environ 71% de la surface	Oui, environ ??% de la surface
Température moyenne	Environ 10 °C	Environ -169 °C
Géologiquement active ?	Oui	Peut-être ?
Vie	Oui	Peut-être ?

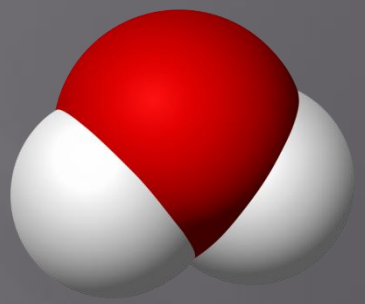
Titan
Propriétés physiques



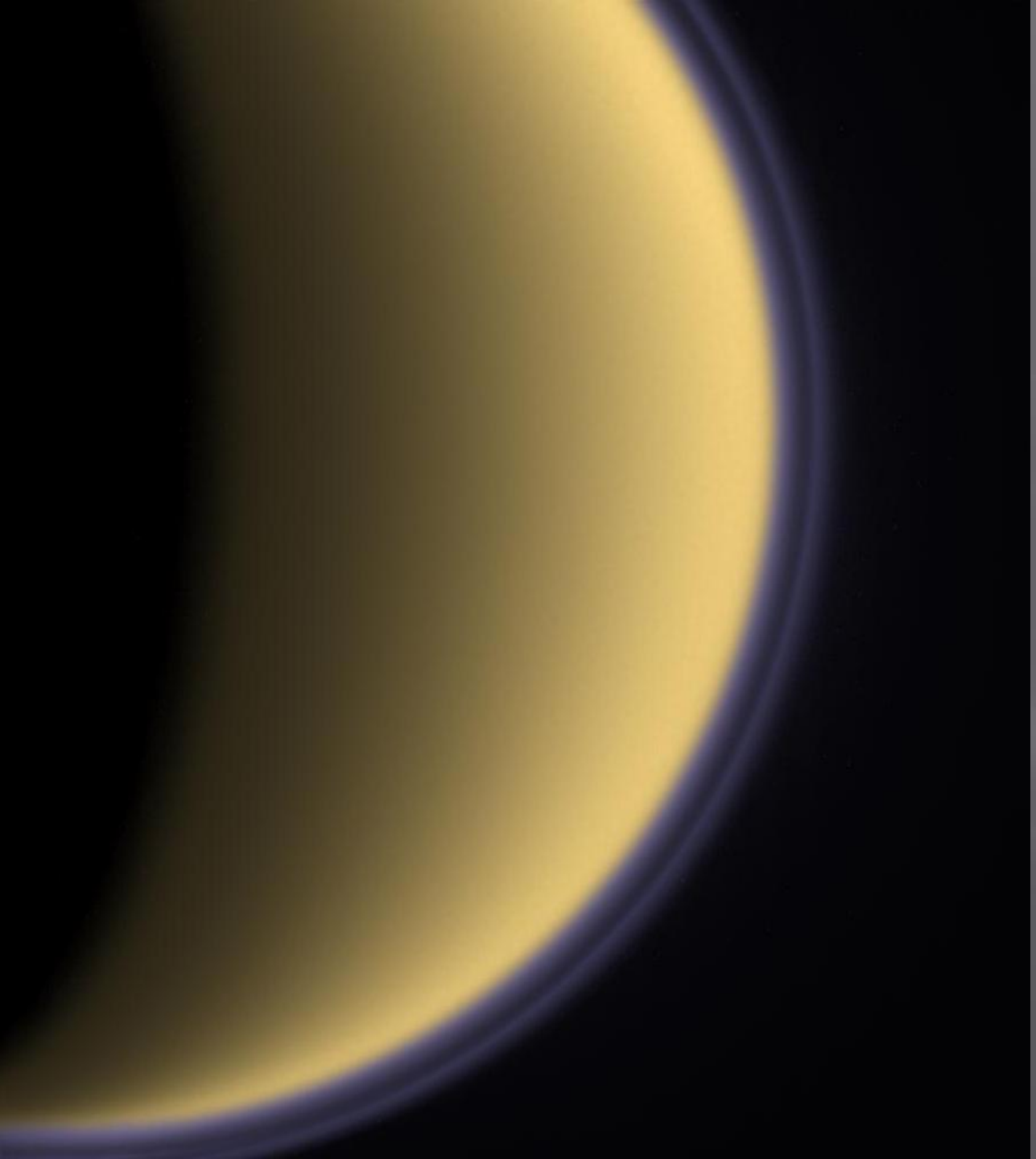
* Hydrate de méthane

Méthane et Eau…





	Méthane	**Eau**
Formule	CH_4	H_2O
Fusion	-182 °C	0 °C
Ébullition	-160 °C	100 °C

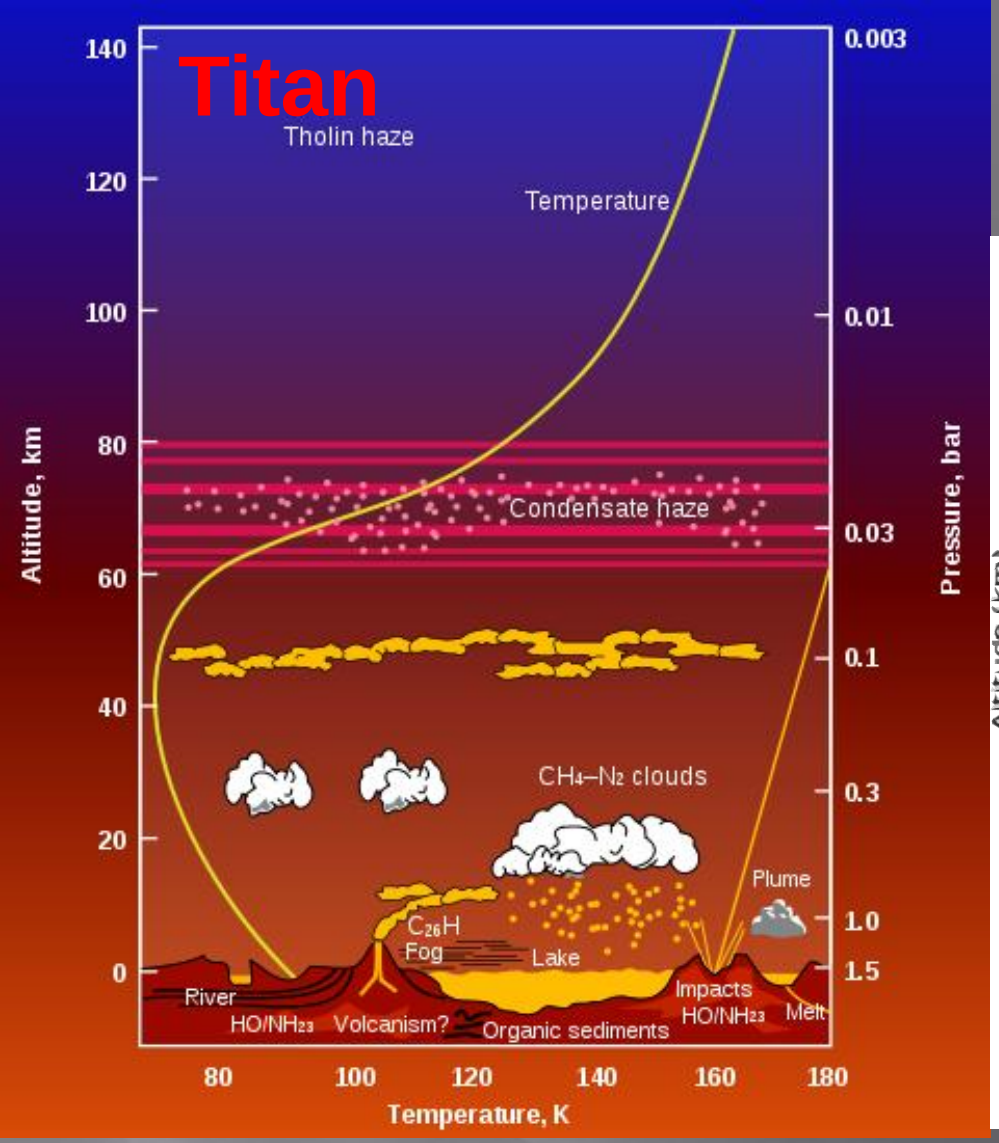


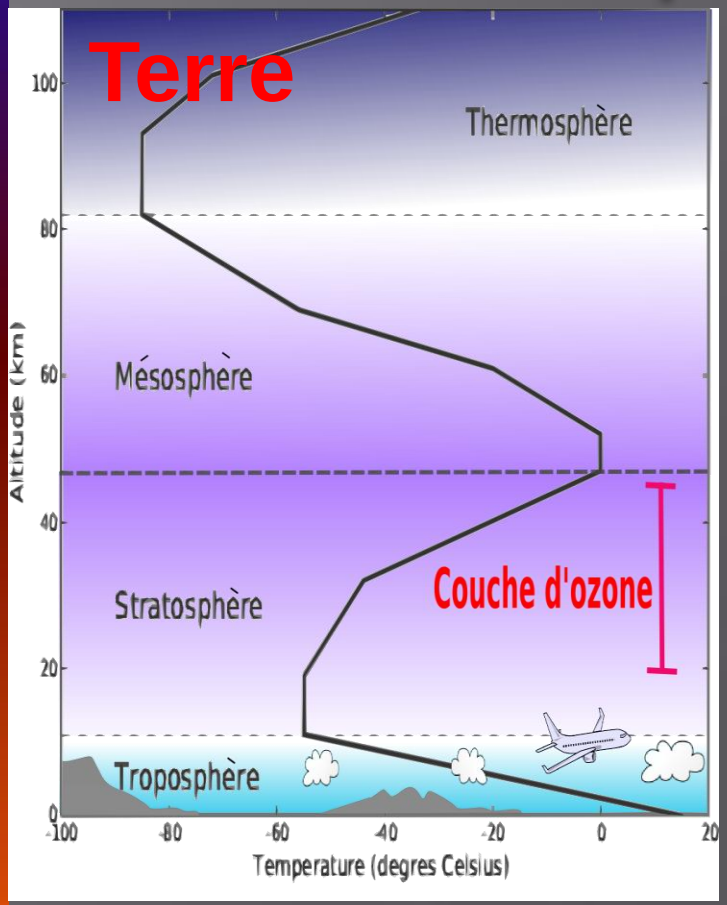
Titan
L'atmosphère

98,4% d'azote (N_2)
1,6% d'hydrocarbures
(méthane + éthane + propane)

Pression de surface: 146,7 KPa
soit 1,5 fois la pression à la
Surface de la Terre

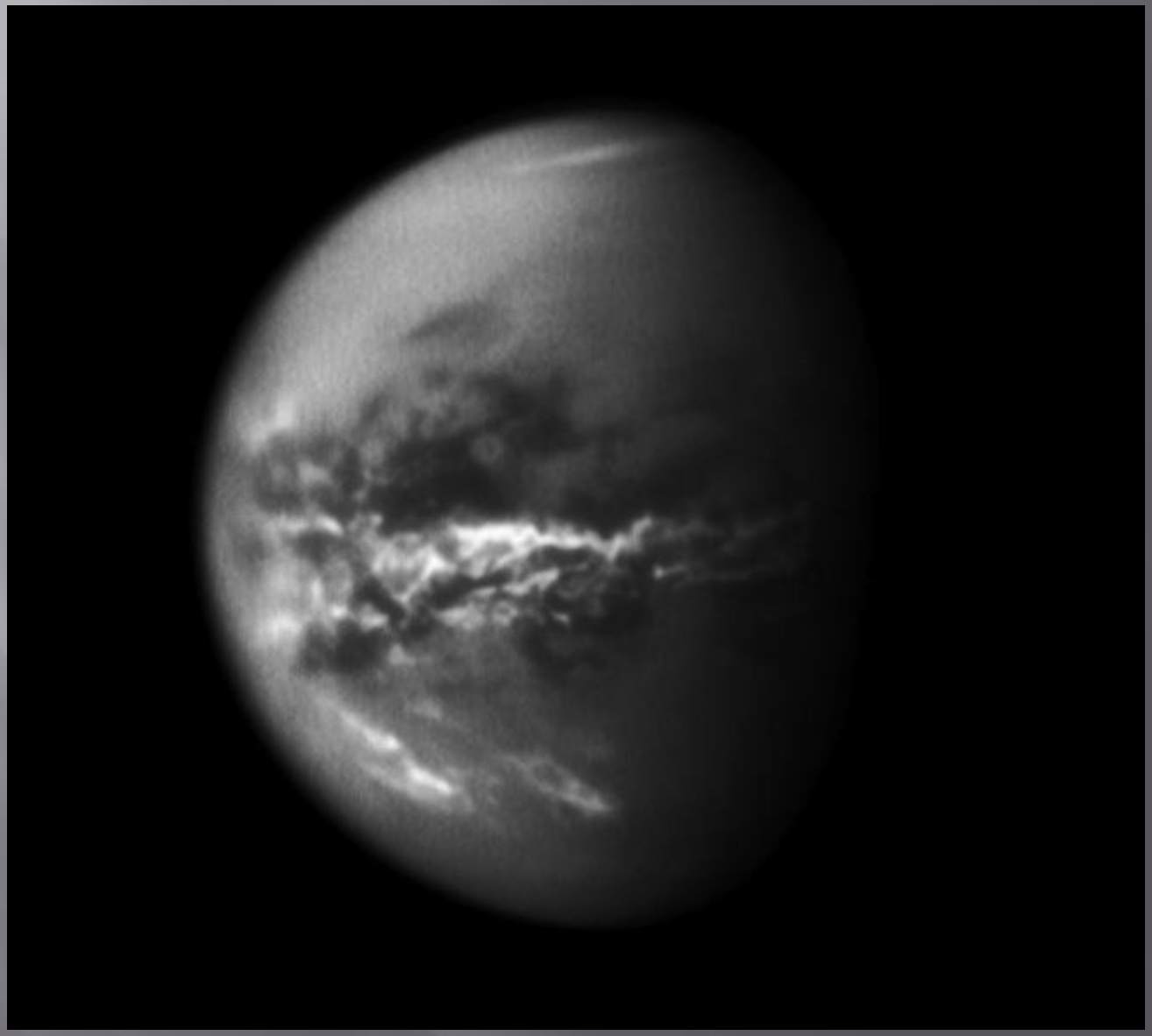
Titan
L'atmosphère



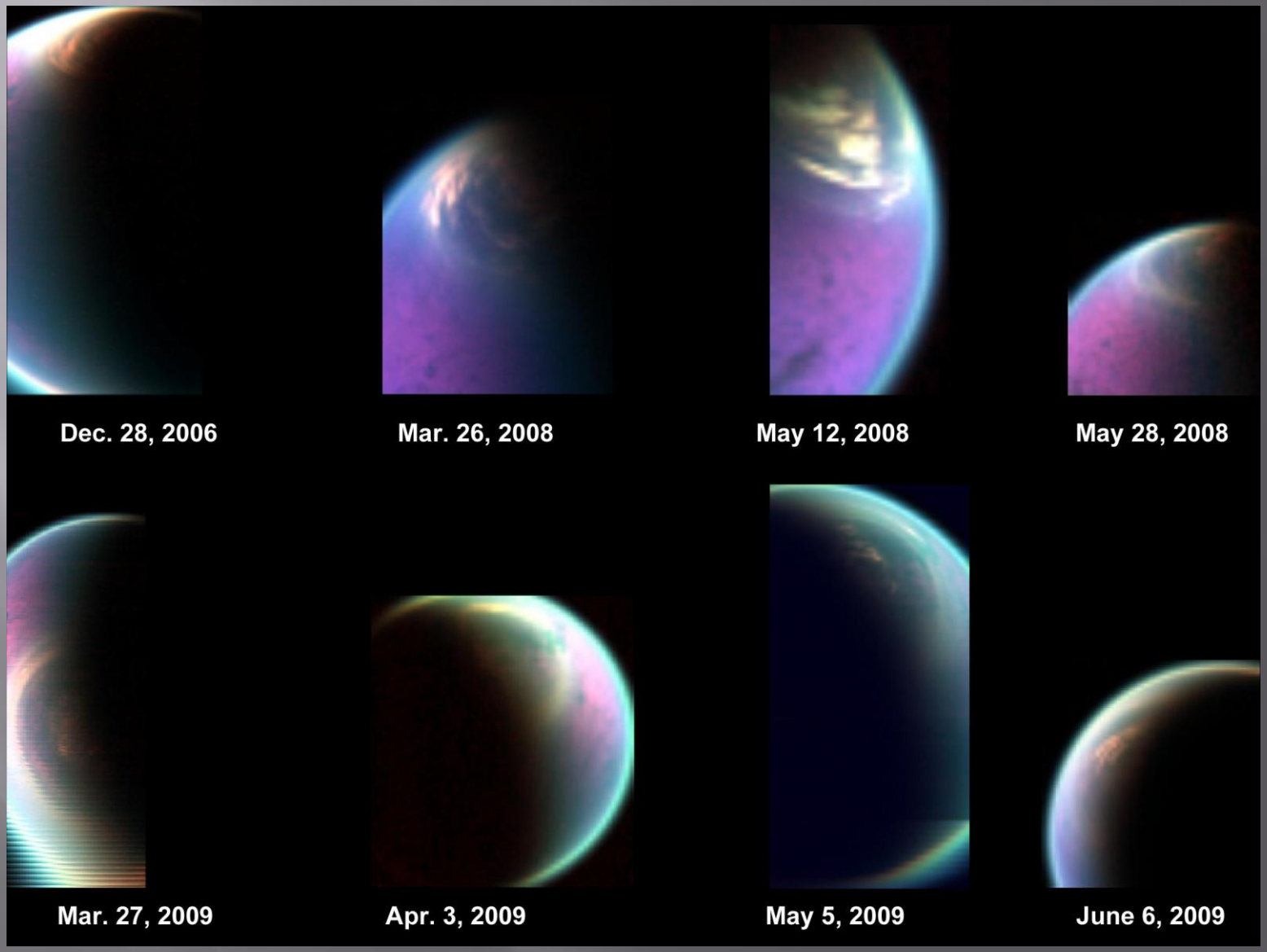


- Beaucoup plus épaisse que l'atmosphère terrestre
- L'atmosphère de Titan comporte des couches opaques de brouillard qui bloquent la plus grande partie de la lumière du Soleil.

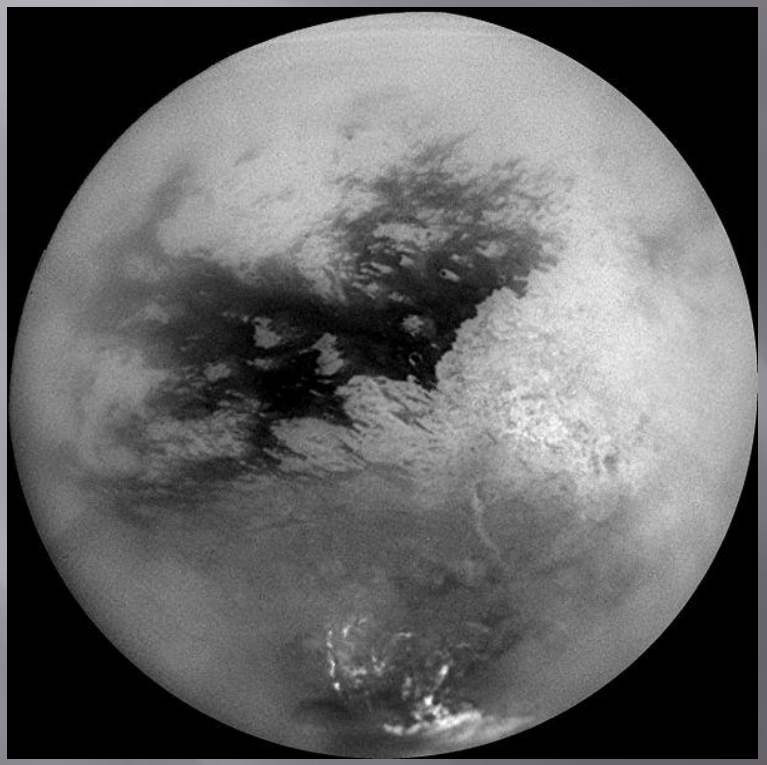
Nuages d'orage



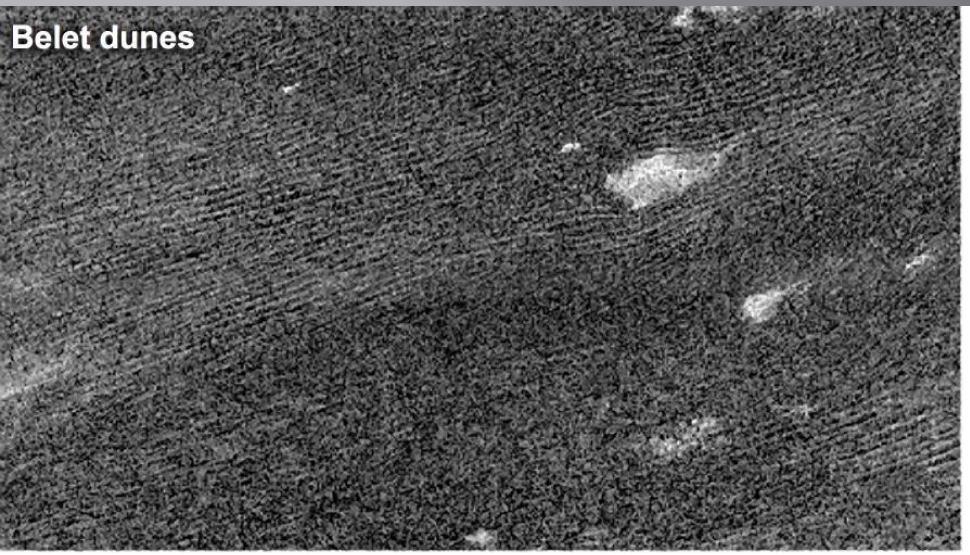
Les saisons de Titan

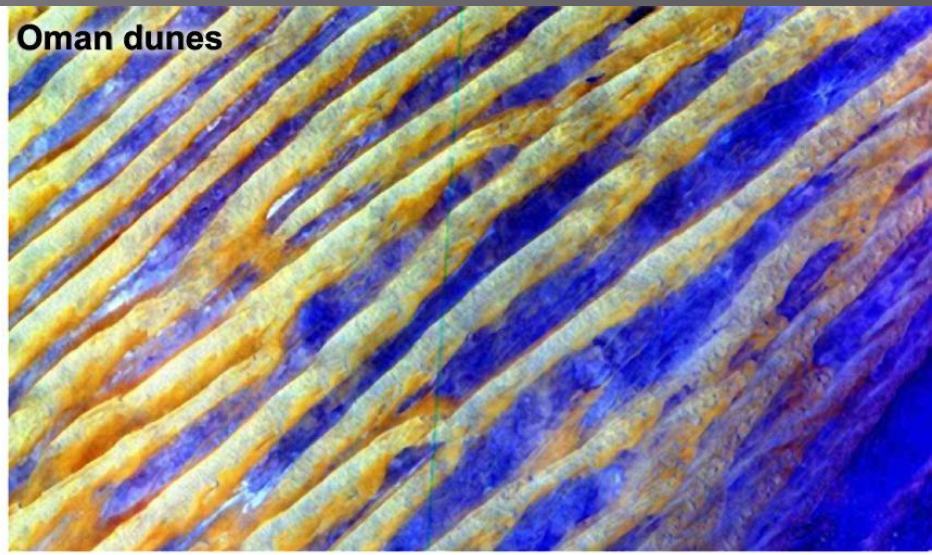


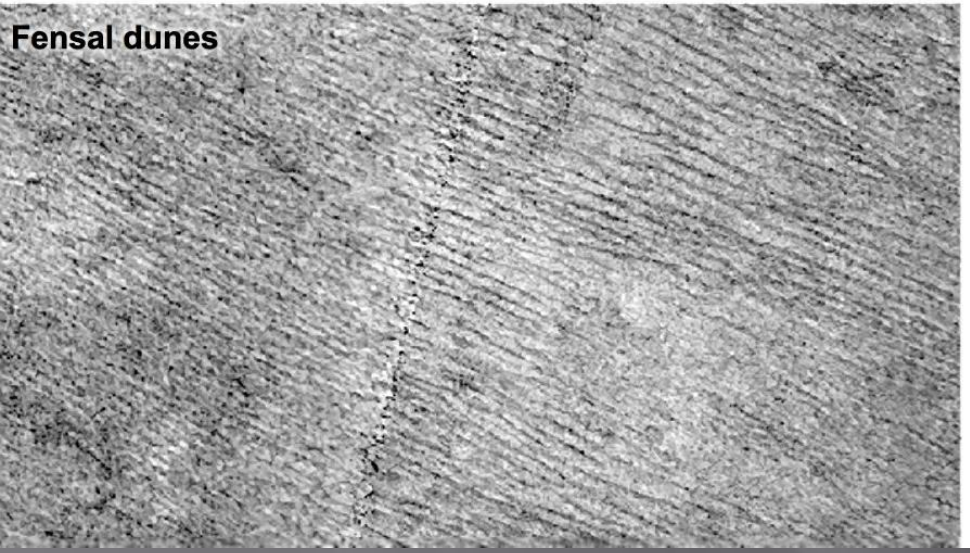
Titan
La surface solide



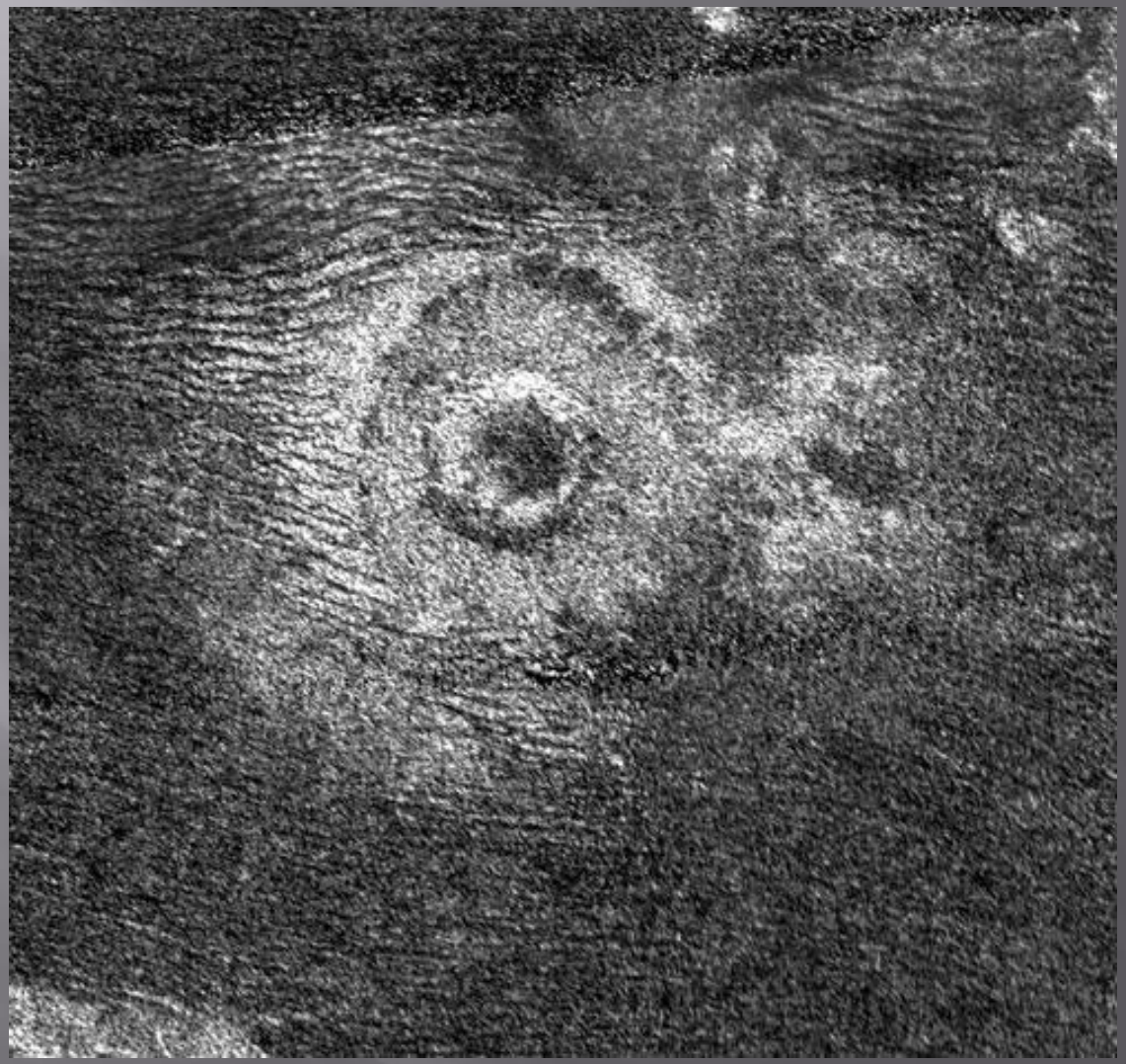
Les dunes





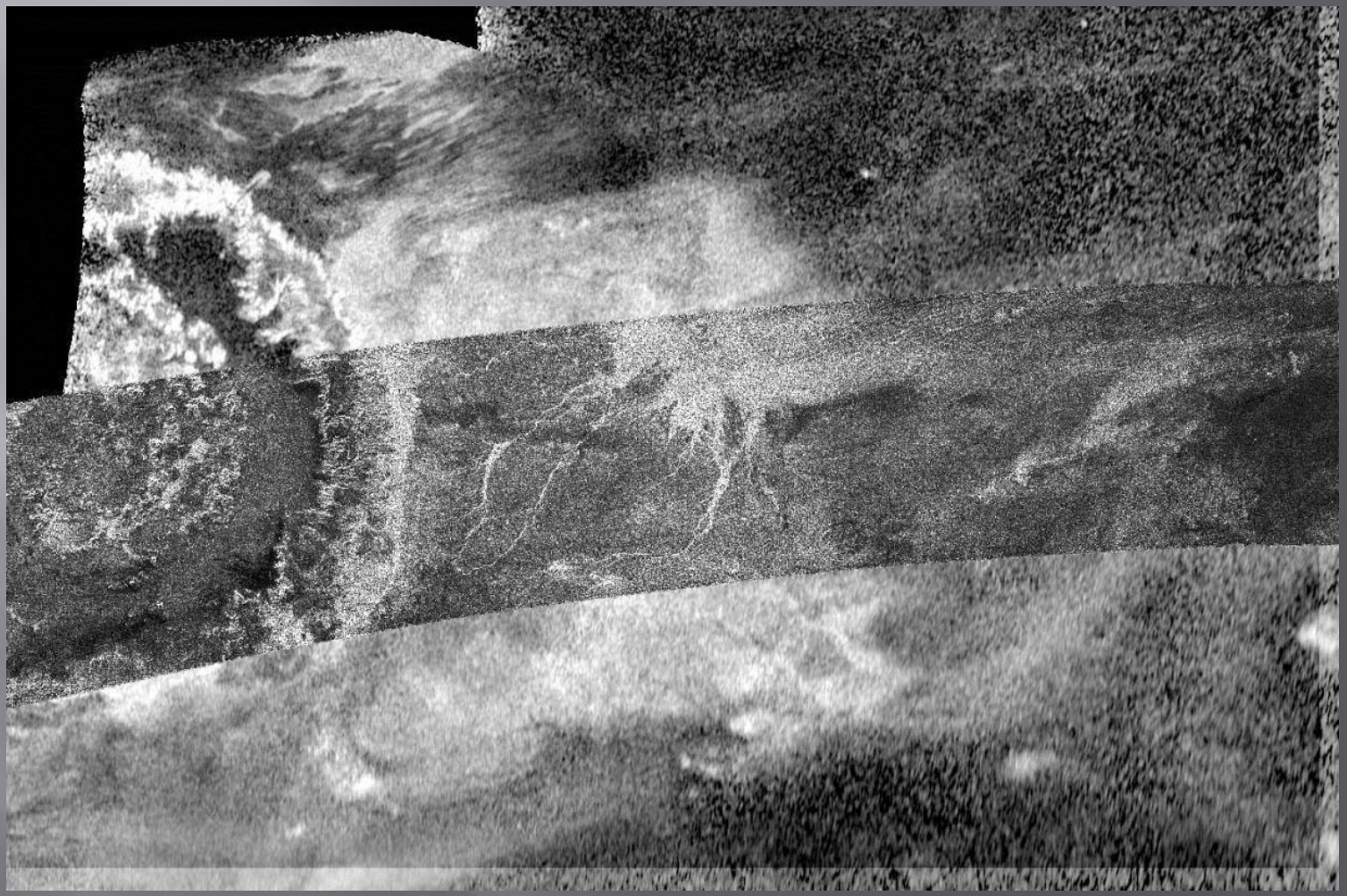


De rares cratères…

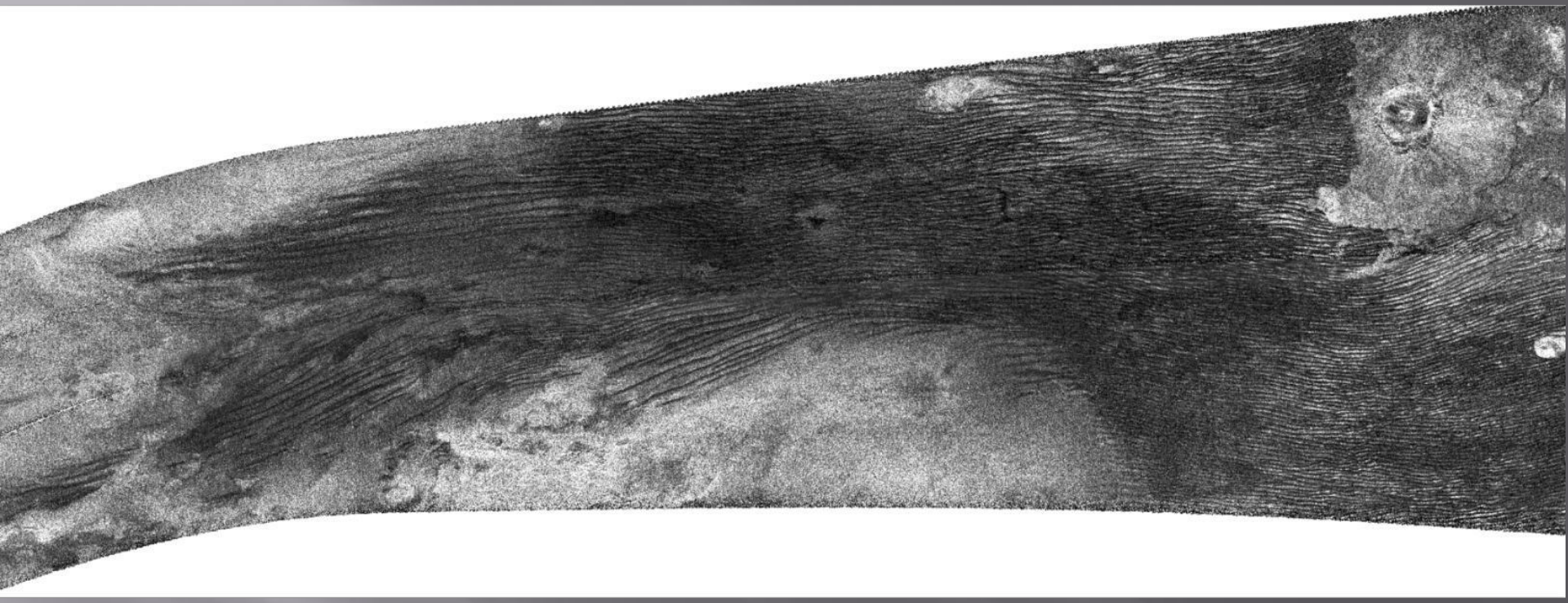


Diamètre : ~ 40 km

Menrva

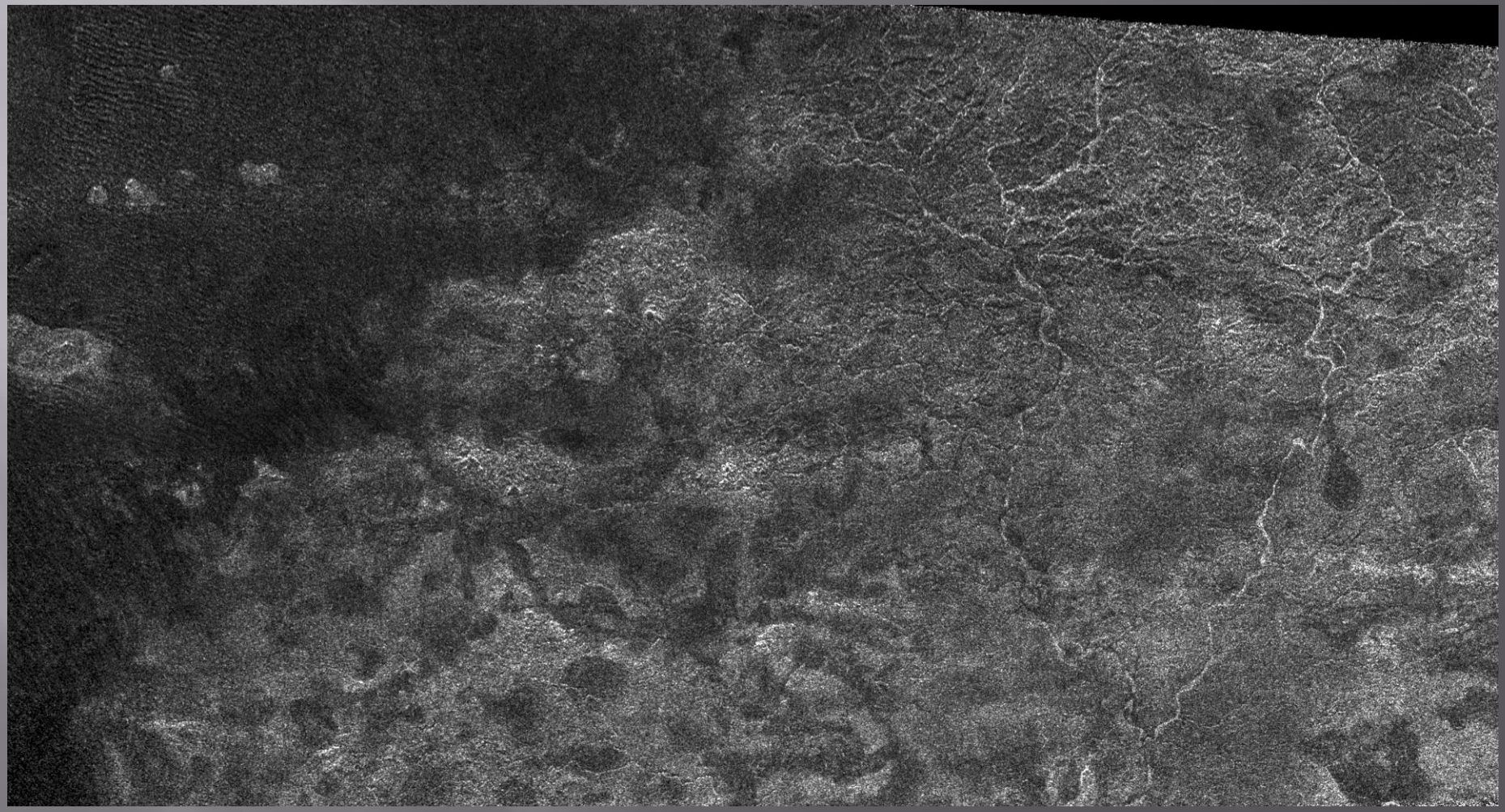


Pourquoi aussi peu de cratères ?

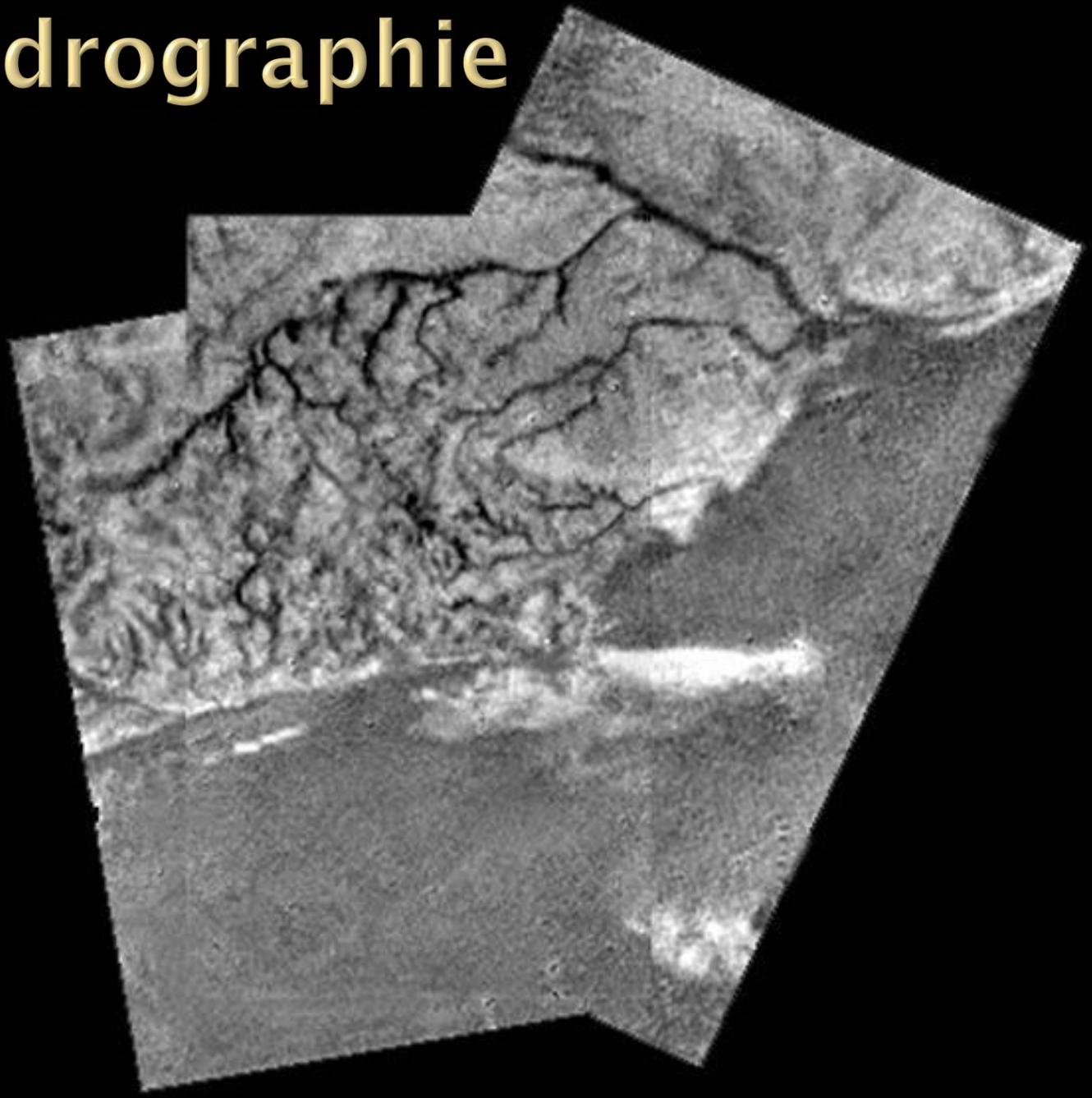


1) L'atmosphère de Titan protège la surface des impacts
2) L'érosion de la surface par les vents, le sable, etc.
3) Peut-être du cryo-volcanisme ?

Hydrographie



Hydrographie

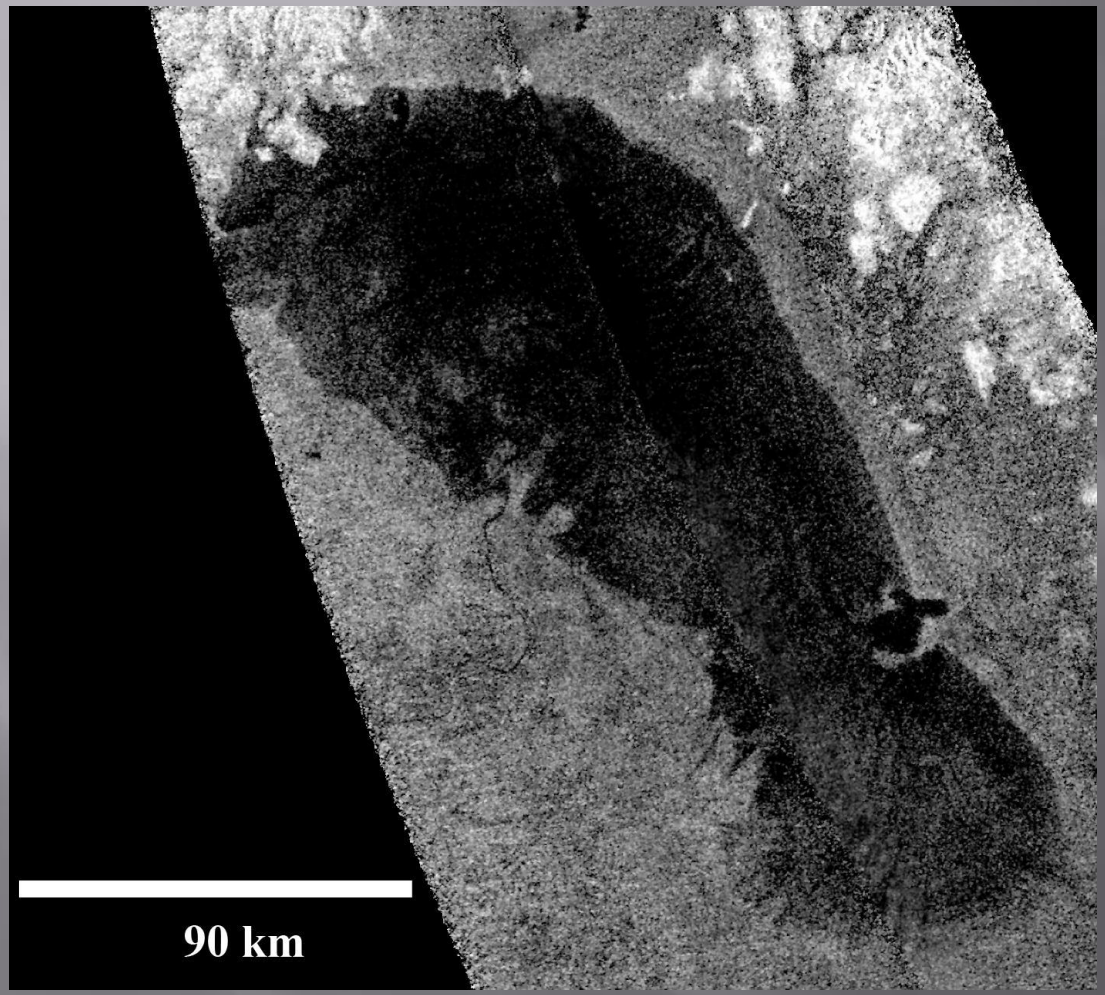


Titan
La surface liquide

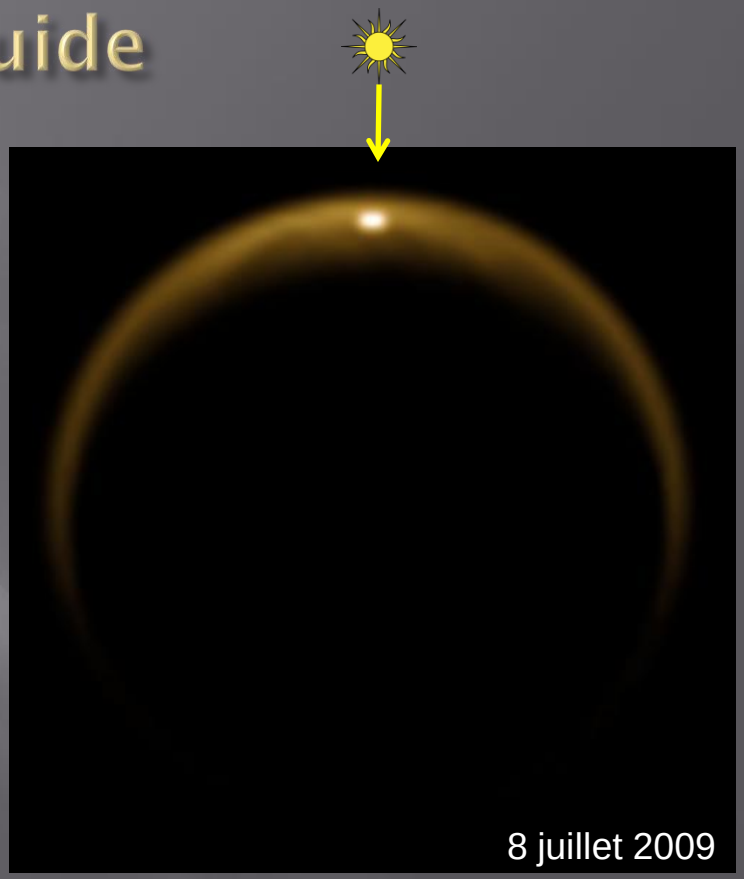
Une image de la surface de Titan d'une altitude d'environ 8000m.

Huygens
14 janvier 2005

Titan
La surface liquide

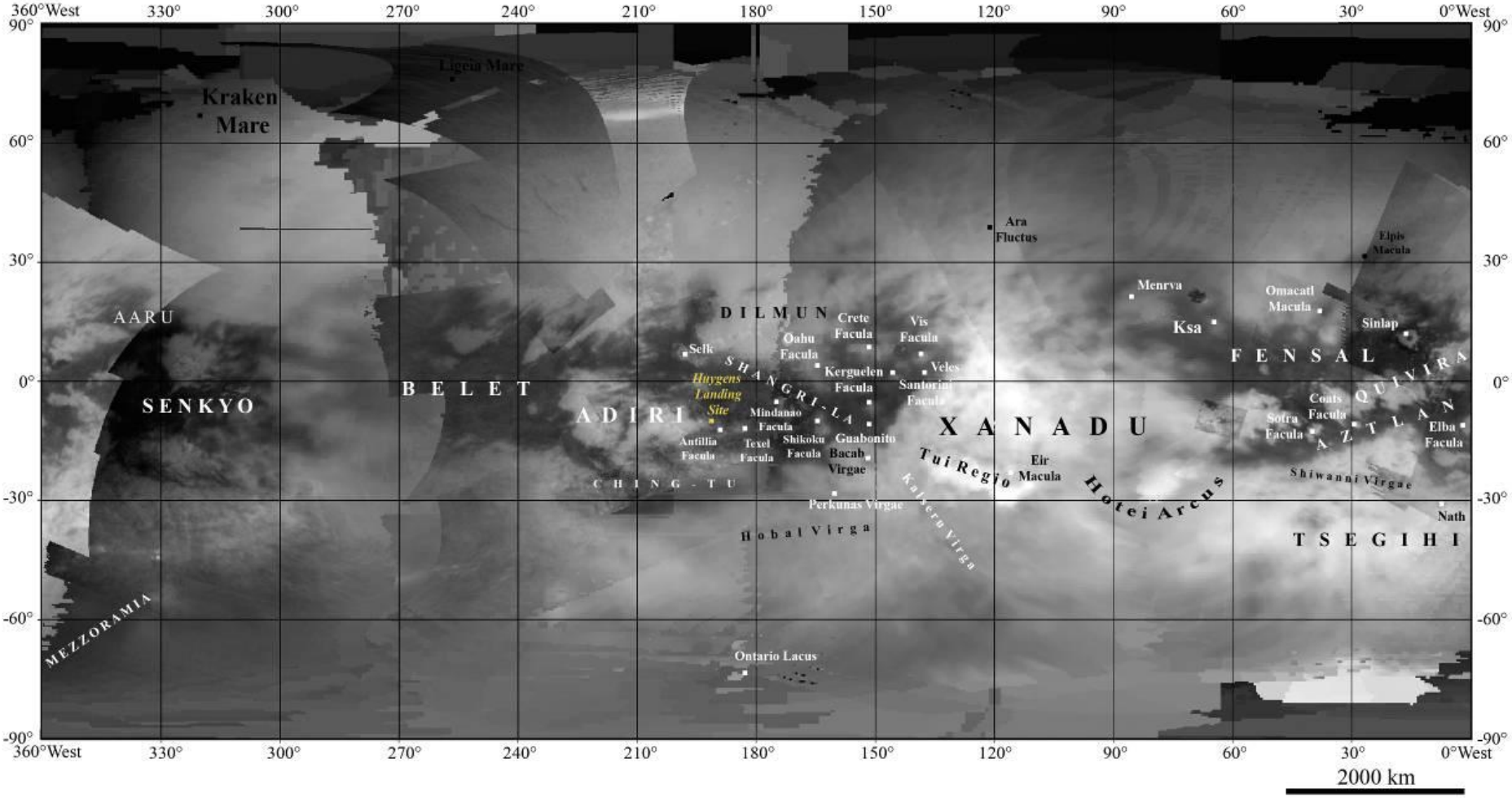


Lacus Ontario 12 janvier 2010

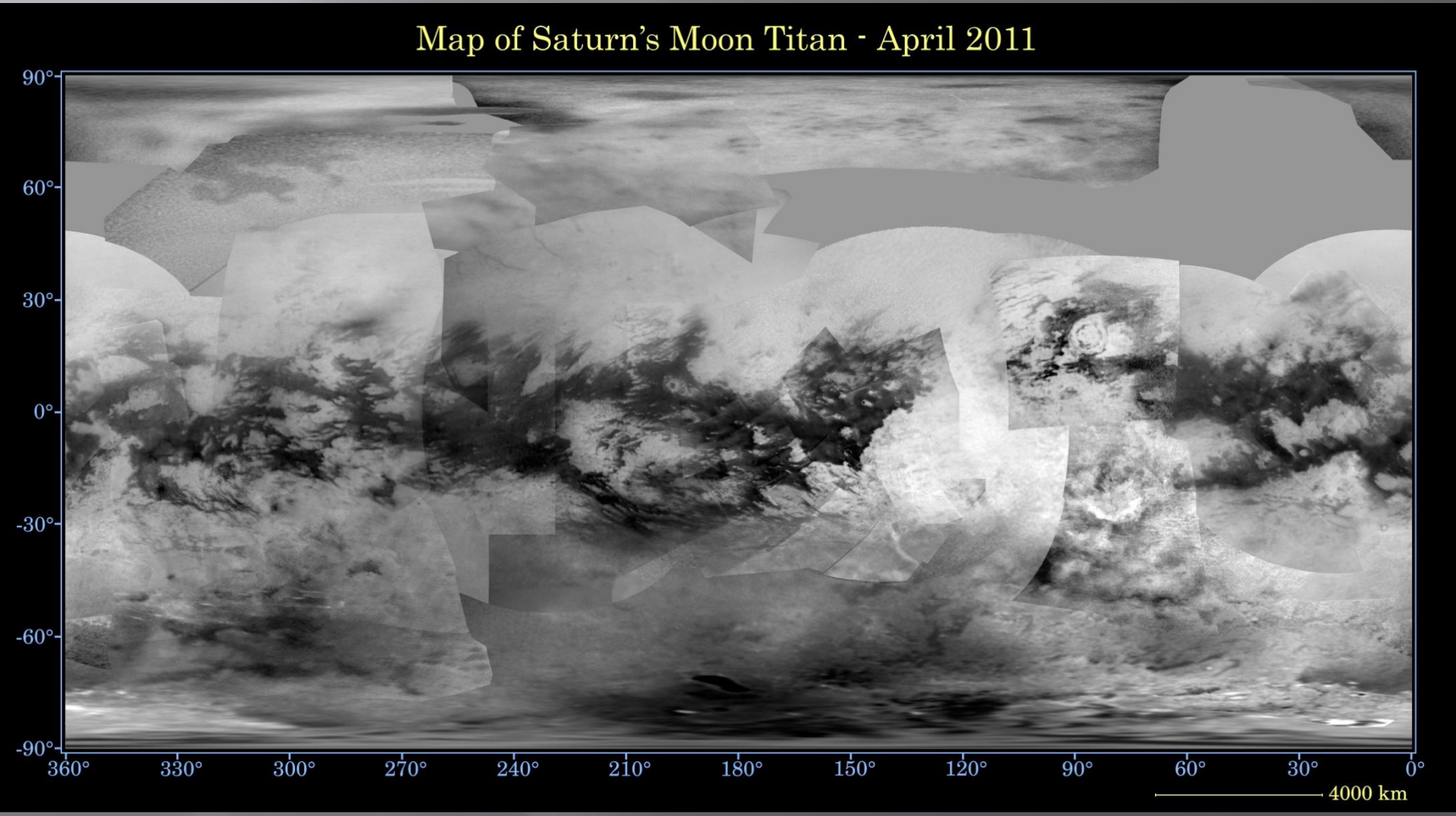


Réflexion du Soleil sur Kraken Mare

Carte de Titan



Carte de Titan



Vidéo #1

- ‘Ring World’’ en français
- Environ 30 minutes

Vidéo #2

- ‘’The view from Huygens’’
- 4m 40s

The View from Huygens on January 14, 2005

A Simulation Made Possible by the **D**escent **I**mager / **S**pectral **R**adiometer

Erich Karkoschka, the DISR Team, NASA, ESA

Version 2

© 2006 University of Arizona

Vidéo #3

- ‘’Descent Images / Spectral Radiometer’’
- 4m 39s

The Descent Imager / Spectral Radiometer During the Descent of Huygens onto Titan on January 14, 2005

Erich Karkoschka, University of Arizona,
the DISR Team, NASA, ESA

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TITAN

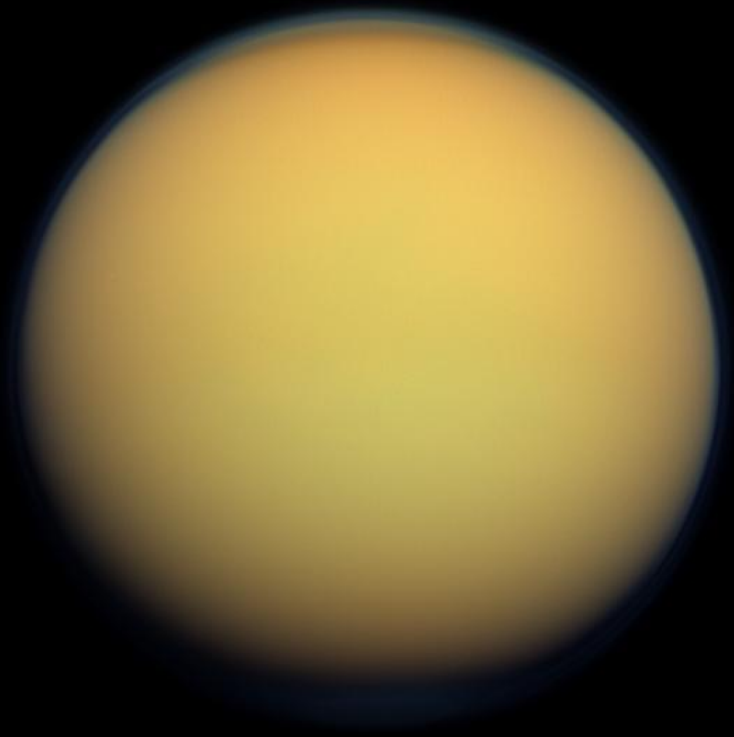
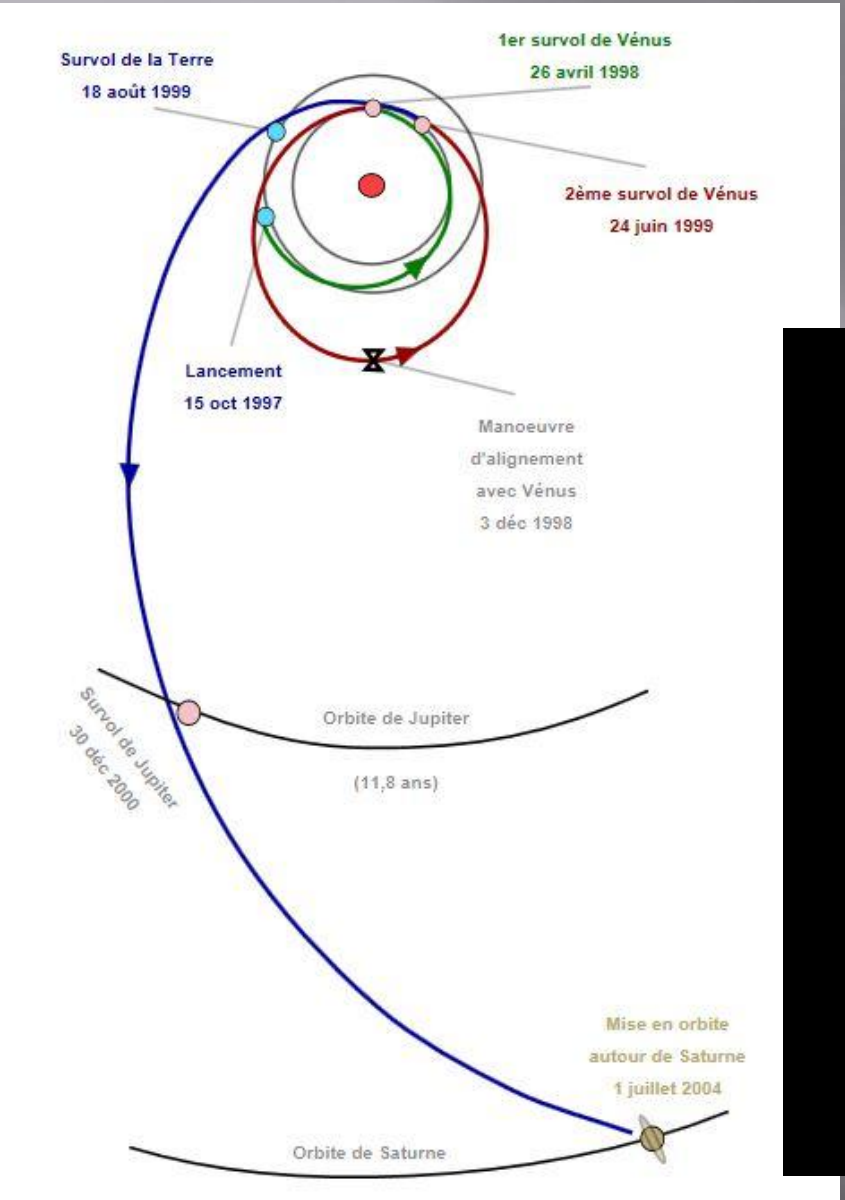


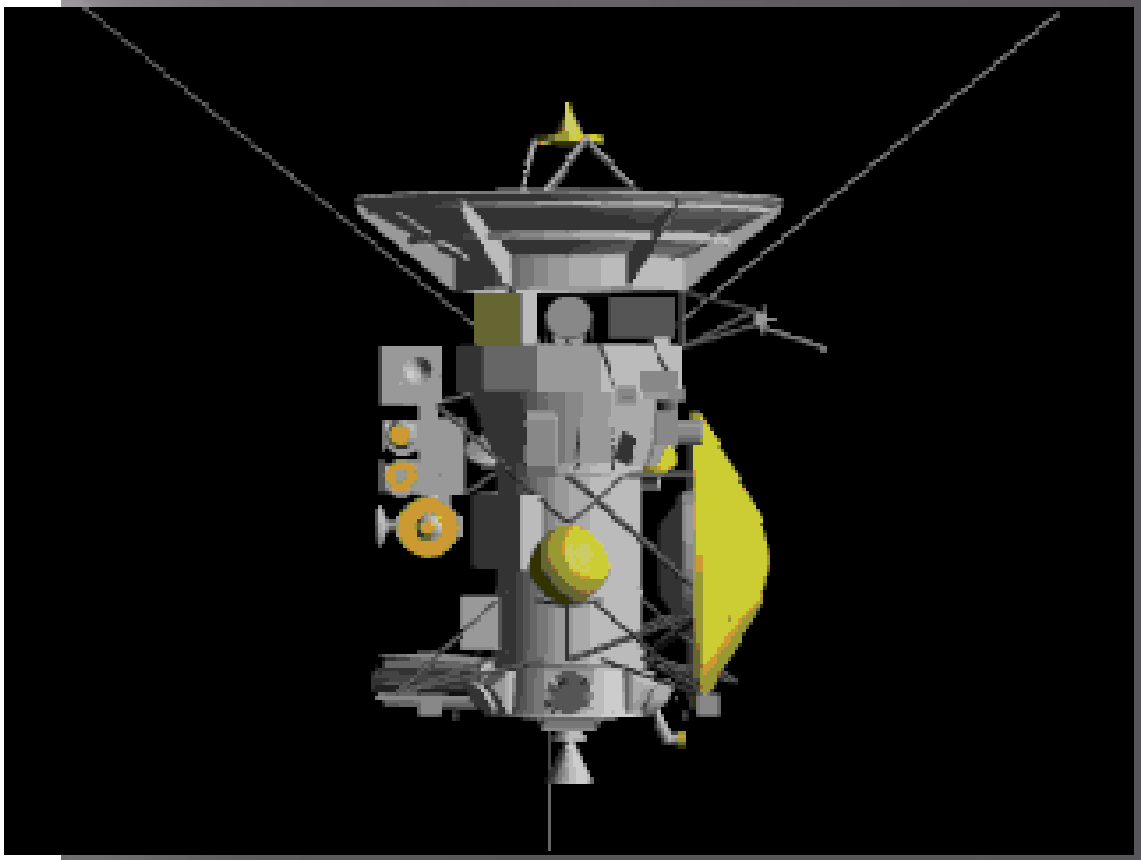
Image de Cassini
Le 30 janvier 2012

La mission Cassini

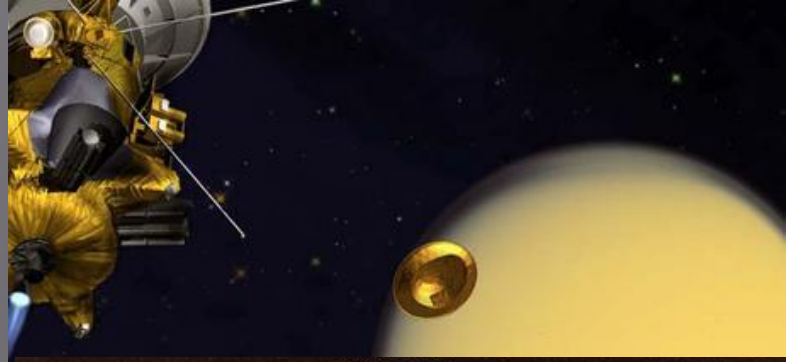
- Lancement en 1997
- Arrivée à Saturne en 2004

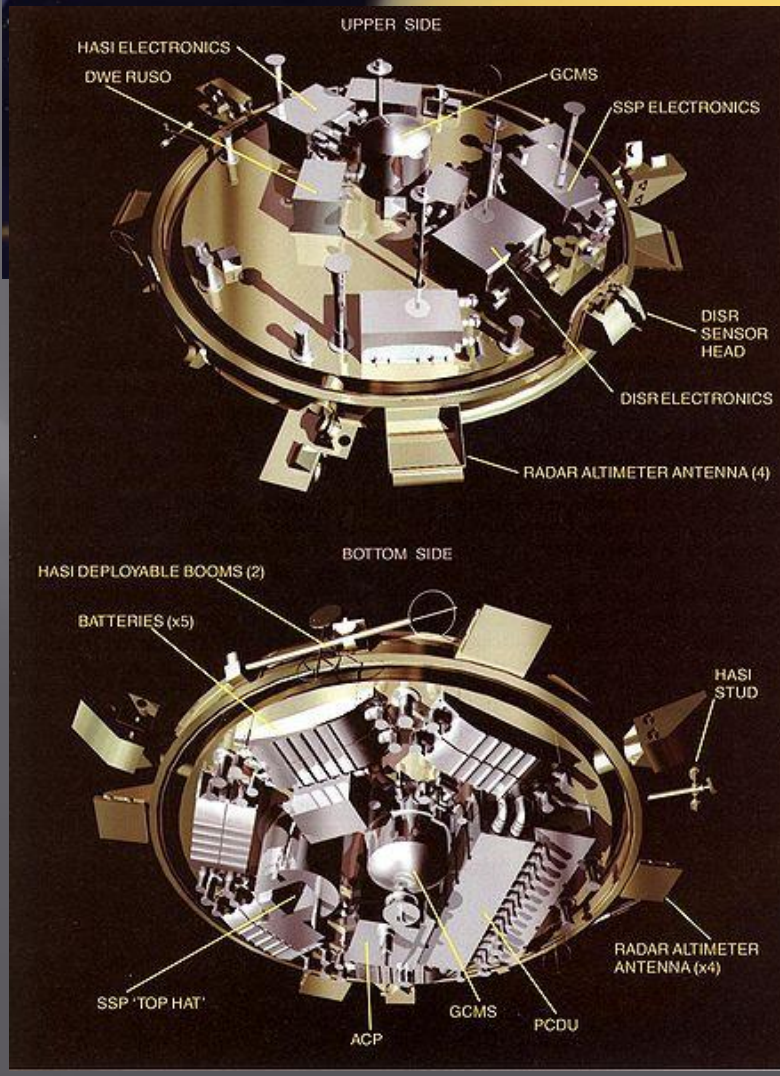


- 12 instruments scientifiques
- 6000 kg
- Pas de panneaux solaires - RTG



La sonde Hugens





- 1,3 m de diamètre, 318 kg
- Munis de 6 instruments scientifiques
- Atteint Titan le 14 janvier 2005

Cassini-Huygens
Les instruments

Cassini Orbiter Instruments

They survey and sniff, analyze and scrutinize. And of course, they take stunning images in various visible spectra. The 12 science instruments onboard the Cassini spacecraft are seemingly capable of doing it all. Each instrument is designed to carry out sophisticated scientific studies of Saturn, from collecting data in multiple regions of the electromagnetic spectrum, to studying dust particles, to characterizing Saturn's plasma environment and magnetosphere.

The instruments gather data for 27 diverse science investigations, providing scientists with an enormous amount of information on the most beautiful planet in our Solar System.

Optical Remote Sensing
Mounted on the remote sensing pallet, these instruments study Saturn and its rings and moons in the electromagnetic spectrum.

- Composite Infrared Spectrometer (CIRS)
- Imaging Science Subsystem (ISS)
- Ultraviolet Imaging Spectrograph (UVIS)
- Visible and Infrared Mapping Spectrometer (VIMS)

Fields, Particles and Waves
These instruments study the dust, plasma and magnetic fields around Saturn. While most don't produce actual "pictures," the information they collect is critical to scientists' understanding of this rich environment.

- Cassini Plasma Spectrometer (CAPS)
- Cosmic Dust Analyzer (CDA)
- Ion and Neutral Mass Spectrometer (INMS)
- Magnetometer (MAG)
- Magnetospheric Imaging Instrument (MIMI)
- Radio and Plasma Wave Science (RPWS)

Microwave Remote Sensing
Using radio waves, these instruments map atmospheres, determine the mass of moons, collect data on ring particle size, and unveil the surface of Titan.

- Radar
- Radio Science (RSS)

Huygens Instruments

ACP	**A**erosol **C**ollector and **P**yrolyser
DISR	**D**escent **I**mager and **S**pectral **R**adiometer
DWE	**D**oppler **W**ind **E**xperiment
GCMS	**G**as **C**hromatograph and **M**ass **S**pectrometer
HASI	**H**uygens **A**tmospheric **S**tructure **I**nstrument
SSP	**S**urface **S**cience **P**ackage