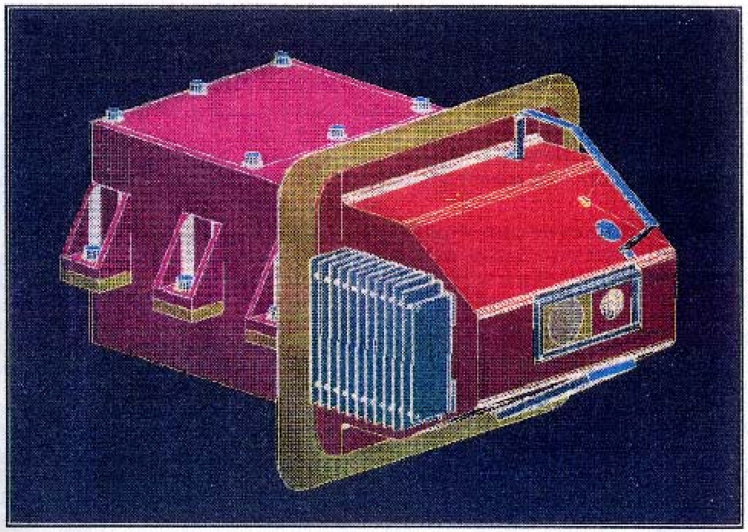
Michel Combes et la filière instrumentale infrarouge spatiale au DESPA
Cassini/VIMS et DISR et Rosetta/VIRTIS

Pierre Drossart

Huygens/DISR



Proposal to E S A for the Titan Huygens Probe

Descent Imager/Spectral Radiometer

by the Lunar and Planetary Laboratory[1]

Volume 1: Science /Technical Plan

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Nature, 2005

Rain, winds and haze during the Huygens probe's descent to Titan's surface ()

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Tomasko, M. G.; Archinal, B.; Becker, T.; Bézard, B.; Bushroe, M.; Combes, M.; Cook, D.; Coustenis, A.; de Bergh, C.; Dafoe, L. E.; Doose, L.; Douté, S.; Eibl, A.; Engel, S.; Gliem, F.; Grieger, B.; Holso, K.; Howington-Kraus, E.; Karkoschka, E.; Keller, H. U. ; ...

Cassini/VIMS

CASSINI
VIMS
USA • ITALY • FRANCE • GERMANY
SCIENCE TEAM

NASA/ADS

Earth, Moon & Planets 2005

The Atmospheres of Saturn and Titan in the Near-Infrared First Results of Cassini/vims ()

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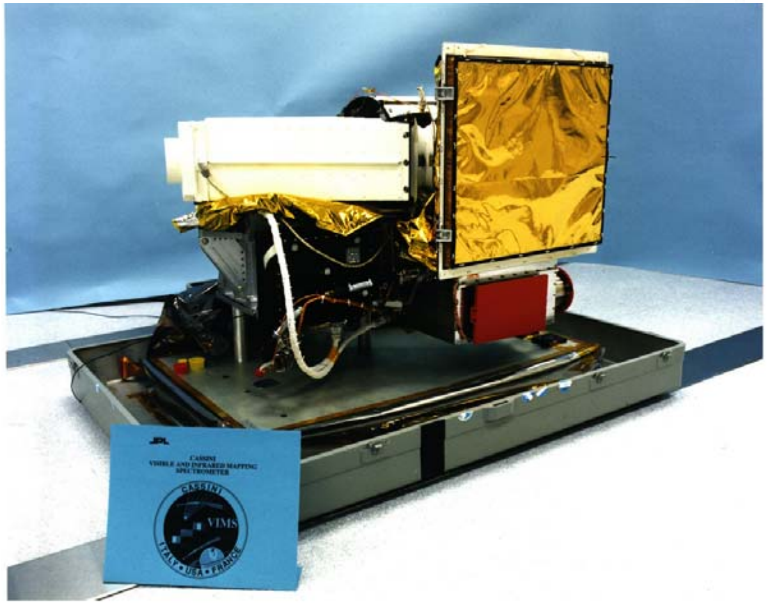
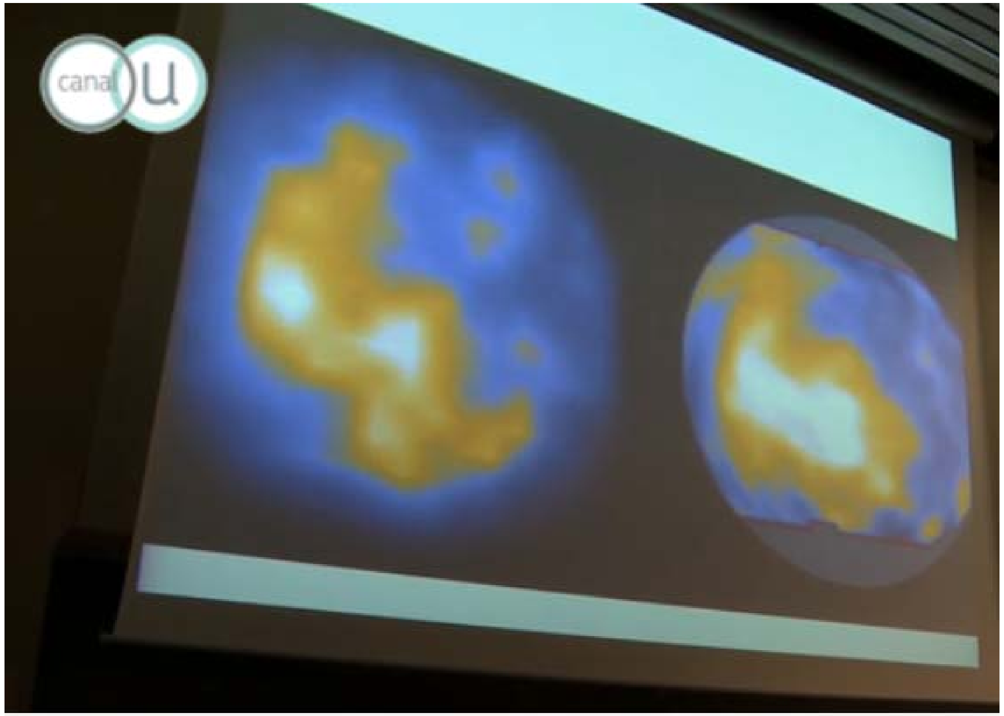
Baines, K. H.; Drossart, P.; Momary, T. W.; Formisano, V.; Griffith, C.; Bellucci, G.; Bibring, J. P.; Brown, R. H.; Buratti, B. J.; Capaccioni, F.; Cerroni, P.; Clark, R. N.; Coradini, A.; Combes, M.; Cruikshank, D. P.; Jaumann, R.; Langevin, Y.; Matson, D. L.; McCord, T. B.; Mennella, V. ; ...



Photojournal: PIA16633

Editorial
PSS, 2006 - Titan



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Editorial

This special issue of PSS is devoted to the presentation of results from observations of Titan obtained by the Visible and Infrared Mapping Spectrometer (VIMS) of the Cassini-Huygens mission, during the first fly-bys of the Cassini orbiter.

The Cassini/VIMS instrument is a spectro-imaging device (R.H. Brown et al., 2004, Space Sci. Rev.) covering the spectral range of 0.35–5.1 μm (352 spectroscopic channels) with a spatial resolution ranging from 0.17 mrad in the visible to 0.25 mrad in the infrared.

Titan is a very unique planetary satellite, the only one to possess a thick atmosphere. This atmosphere is mainly composed of molecular nitrogen, some percents of methane and various minor components. It has been suggested that Titan's surface is covered by large areas of liquid hydrocarbons or even by a global ocean. The complex chemistry induced in Titan's atmosphere by solar radiation and incoming charged particles results in the formation of a dense haze of complex molecules and organic compounds precipitating and probably accumulating onto the surface.

This planet-like moon, similar in size to Mercury and not much smaller than Mars, with a dense and thick atmosphere dominated by N_2, exhibiting organics and a complex chemistry presents some similarities with the Earth, justifying the strong interest of the scientific community in detailed observations of Titan.

The atmosphere of Titan strongly affects the visibility of its surface due to the light scattering by haze particles and gaseous absorption by methane. The scattering effect is slowly decreasing with increasing wavelength. Atmospheric transparency windows exist in the near-infrared between the main methane absorption bands near 0.94, 1.07, 1.28, 1.6, 2.0, 2.9 μm, but the solar incoming flux is rapidly decreasing with increasing wavelength. A tradeoff around 2 μm is a good choice, when feasible.

Spatial resolving capabilities must also be considered. Obviously the best spatial resolution is achievable only from a dedicated space-probe. Prior to the Cassini–Huygens mission, Voyager images were the only one obtained during a close space-probe flyby. Unfortunately, the Voyager's cameras operated in the visible spectral range and, as a consequence, Titan's surface could not be seen.

From Earth distance, the apparent diameter of Titan is less than 1 arc-sec, comparable to the seeing limit in a very good observing site at ground. Thus, recording spatially resolved images of Titan's surface implied the use of the Hubble Space Telescope with associations of convenient near-infrared filters, as available on the Wide-Field Planetary-Camera. An alternative solution was the use, on large ground-based telescopes, of Adaptive Optics techniques, just becoming fully operational and efficient at that time.

The first spatially resolved images of the surface were published 10 years ago, for HST observations (P.H. Smith et al., 1996, Icarus 119, 336) and for Adaptive Optics images (M. Combes et al., 1997, Icarus, 129, 482).

These first results were followed by an important set of articles. It may be quoted here the first published among these papers: S.G. Gibbard et al., 1999, Icarus, 139, 189; R. Meier et al., 2000, Icarus, 145, 463; Coustenis et al., 2001, Icarus, 154, 510; H.G. Roe et al., 2002, Icarus, 157, 254; M.E. Brown et al., 2002, Nature, 420, 795.

In spite of these positive results, it remains that, obviously, the observations expected to be made by the instruments onboard the Cassini orbiter, and specifically concerning the surface by VIMS, would be much better than any Titan's image obtained from a ground-based or Earth-orbiting telescope. Moreover, the Huygens probe should provide some ground-truth to the analysis of VIMS data, reinforcing the deduced conclusions.

Since the Saturn orbit injection on June 30, 2004, VIMS produced an impressive amount of successful observations. The articles presented in this PSS Special Issue by B.J. Buratti et al., S. Rodriguez et al., T.B. McCord et al., and R.M. Nelson et al. discuss VIMS results from the early Titan flybys. They are mainly related to surface properties deduced from significantly different methods of data reduction and analysis. It is of major interest to compare the conclusions deduced from such independent approaches. The paper by Rodriguez et al. is focused on the Huygens landing site and included comparisons with DISR/Huygens results. The last paper by Baines et al. is mainly devoted to the discovery by VIMS of CO in the atmosphere of Titan on the night side and to its geological implications.

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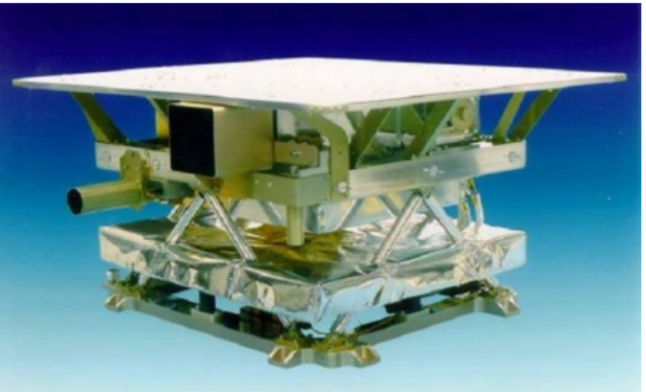
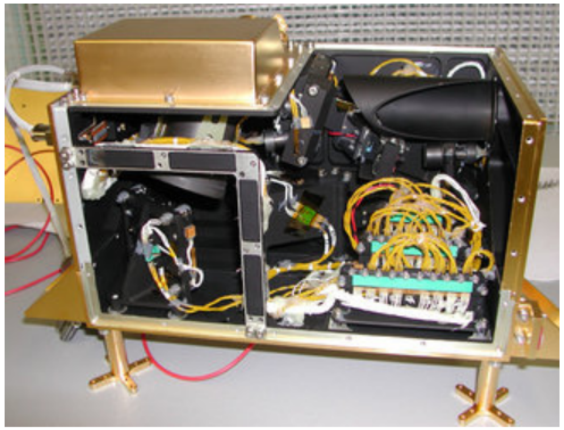
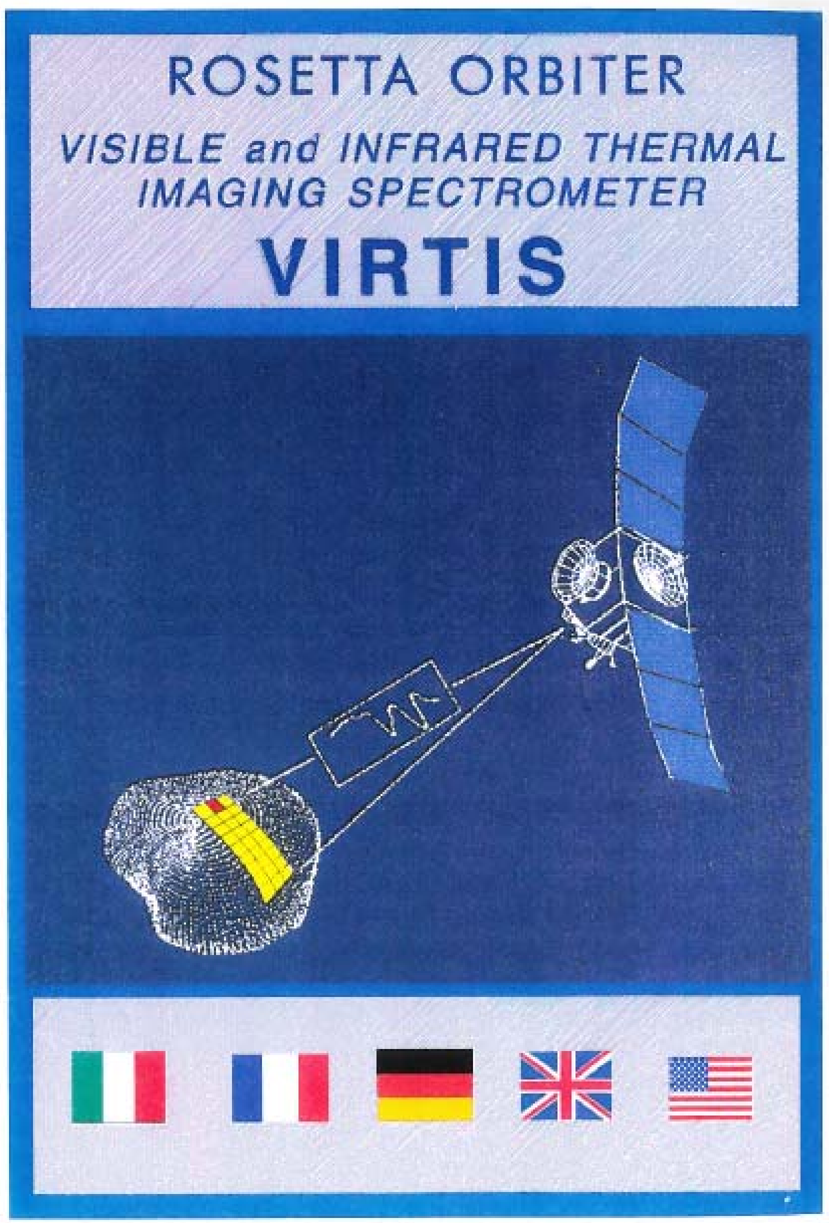
VIRTIS

VIRTIS : une aventure qui a mené le LESIA de la Terre aux comètes, en passant par Mars, Vénus et les astéroïdes

Montage de la collaboration : dès 1994, à l'Observatoire de Paris. Axe Paris-Rome-Berlin-Oxford







Rosetta

PSS 1998

Comet 67P outbursts and quiescent coma at 1.3 au from the Sun: dust properties from Rosetta/VIRTIS-H observations

MNRAS 2017

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Bockelée-Morvan, D.; Rinaldi, G.; Erard, S.; Leyrat, C.; Capaccioni, F.; Drossart, P.; Filacchione, G.; Migliorini, A.; Quirico, E.; Mottola, S.; Tozzi, G.; Arnold, G.; Biver, N.; Combes, M.; Crovisier, J.; Longobardo, A.; Blecka, M.; Capria, M. -T.

We present 2-5 μm spectroscopic observations of the dust coma of 67P/Churyumov-Gerasimenko obtained with the VIRTIS-H instrument onboard Rosetta during two outbursts that occurred on 2015, 13 September 13.6 h ut and 14 September 18.8 h ut at 1.3 au from the Sun. Scattering and thermal properties measured before the outburst are in the mean of values measured for moderately active comets. The colour temperature excess (or superheat factor) can be attributed to submicrometre-sized particles composed of absorbing material or to porous fractal-like aggregates such as those collected by the Rosetta in situ dust

NASA/ADS

Virtis : an imaging spectrometer for the rosetta mission ()

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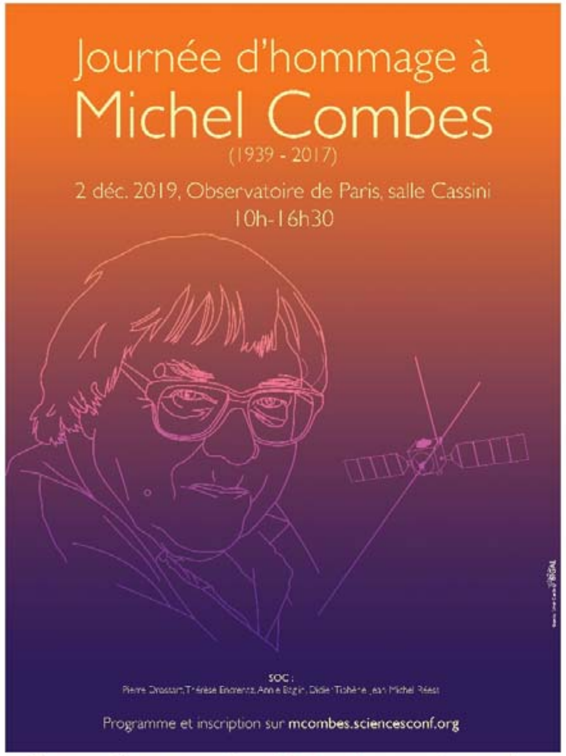
Journée d'hommage à
Michel Combes
(1939 - 2017)
2 déc. 2019, Observatoire de Paris, salle Cassini
10h-16h30
SOC :
Programme et inscription sur mcombes.sciencesconf.org