DISR Bibliography
5th January 2014

TI: Titan: evidence for seasonal change-a comparison of Hubble Space Telescope and Voyager images
AU: Caldwell,-J.; Cunningham,-C.-C.; Anthony,-D.; White,-H.-P.; Groth,-E.-J.; Hasan,-H.; Noll,-K.; Smith,-P.-H.; Tomasko,-M.-G.; Weaver,-H.-A.
SO: Icarus-. May 1992; 97(1): 1-9

TI: Fused fiber image guides for planetary exploration
AU: Espitallier-D
SO: Proceedings-of-the-SPIE-The-International-Society-for-Optical-Engineering. 1996; 2611: 14-22
PB: SPIE-Int. Soc. Opt. Eng

TI: "The Descent Imager/Spectral Radiometer (DISR) instrument aboard the Huygens Probe of Titan",
AU: M.G. Tomasko, L.R. Doose, P.H. Smith, C. Fellows, B. Rizk, C. See, M. Bushroe, E. McFarlane, E. Wegryn, E. Frans, R. Clark, M. Prout and S. Clapp, Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ, 85721, USA.
SO: SPIE Proceedings Series, Vol. 2803, p. 64 - 74, 1996.

TI: The Descent Imager/Spectral Radiometer (DISR) aboard Huygens.
AU: M.G. Tomasko, L.R. Doose, P.H. Smith, R.A. West, L.A. Soderblom, M. Combes, B. Bezard, A. Coustenis, C. deBergh, E. Lellouch, J. Rosenqvist, O. Saint-Pe, B. Schmitt, Hu. U. Keller, N. Thomas & F. Gliem. In A. Wilson, editor,
SO: Huygens -- Science, Payload and Mission, volume SP-1177:109-138, 1997.
PB: ESA Publications Division, ESTEC, Noordwijk, The Netherlands, August 1997.

TI: Private life of an integrating sphere: the radiant homogeneity of the Descent Imager-Spectral Radiometer calibration sphere
AU: Rizk,Bashar.
SO: Applied-Optics. 1 May 2001; 40(13): 2095-101
PB: Opt. Soc. America

TI: Inverse radiation modeling of Titan's atmosphere to assimilate solar aureole imager data of the Huygens probe.
AU: Grieger, B.; Lemmon, M.T.; Markiewicz, W.J.; Keller, H.U..
SO: Planetary & Space Science, (Feb 2003), Vol. 51 Issue 2, p147, 12p
PB: Elsevier
Abstract: During the descent of the Huygens probe through Titan's atmosphere in January 2005, the Descent Imager/Spectral Radiometer (DISR) will perform upward and downward looking measurements at various spectral ranges and spatial resolutions. This internal radiation density could be estimated by radiative transfer calculations for Titan's atmosphere. However, to do this, the optical properties (i.e. volume extinction coefficient, single scattering albedo and scattering phase function) have to be prescribed at every altitude, and these are apriori not known. Herein, an inverse approach is investigated, which retrieves the single scattering albedo and the phase function of the aerosols from DISR observations. The method uses data from a DISR subinstrument, the Solar Aureole imager (SA), to estimate the optical properties of the atmospheric layer between two successive observation altitudes. A unique solution for one layer can in principle be calculated directly from a linear system of equations, but due to the sparseness of the data and the unavoidable noise in the measurements, the inverse problem is ill-posed. The problem is stabilized by the regularization method requiring smoothness of the resultant solution. A consistent set of solutions for all layers is obtained by iterating several times downward and upward through the layers. The method is tested in a simulated radiation density scenario for Titan, which is based on a microphysical aerosol model for the haze layer. Within this scenario, the expected coverage of SA data allows a reconstruction of the angular dependence of the scattering phase 90%. [ABSTRACT FROM AUTHOR; Copyright 2003 Elsevier]

TI: The Descent Imager/Spectral Radiometer (DISR) instrument aboard the Huygens

Probe of Titan
AU: M. G. Tomasko, D. Buchhauser, M. Bushroe, L. E. Dafoe, L. R. Doose, A. Eibl , C. Fellows,. E. McFarlane, G. M. Prout, M. J. Pringle, B. Rizk, C. See, P. H. Smith and K. Tsetsenekos. Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ, 85721, USA.
SO: Space Science Reviews. 104 (1-4): 469-551, Annual 2002
PB: 2003 Kluwer Academic Publishers

TI: Titan Zonal Wind Corroboration via the Huygens DISR Solar Zenith Angle Measurement
AU: Michael Allison, David H. Atkinson, Michael K. Bird, Martin G. Tomasko
SO: Planetary Probe Entry Workshop, ESA SP-544, October 2003, pp. 125-130
PB: ESA Publications Division, ESTEC. Noordwijk, The Netherlands

TI: Simultaneous retrieval of optical depths and scattering phase functions in Titan's atmosphere from Huygens/DISR data.
AU: Grieger, B.; Rodin, A.V.; Salinas, S.V.; Keller, H.U..
SO: Planetary & Space Science, (Dec. 2003), Vol. 51 Issue 14/15, p991, 11p
PB: Elsevier
Abstract: In January 2005, the Huygens probe will descent through Titan's atmosphere and the Descent Imager/Spectral Radiometer (DISR) will perform upward and downward looking observations at various spectral ranges and spatial resolutions. One of the subinstruments, the Upward Looking Visible Spectrometer (ULVS), measures the total downward radiation flux including the direct solar beam and also, with a shadow bar over the Sun, the diffuse downward flux. The intensity of the direct solar beam and thus the optical depth can be calculated from the difference of these two measurements. But <f>10°</f> wide shadow bar also obscures the Solar Aureole Imager (SA) and therefore removes a considerable fraction of the diffuse downward radiation. This fraction can be estimated taking into account the brightness distribution of the SA which is estimated with the Titan Inverse Radiation Model (TIRM). Input to the model are a first guess of the optical depth in dependence on the altitude calculated directly from ULVS measurements and data from another DISR subinstrument, the Solar Aureole Imager SA imager. By assimilating the sparse SA data, TIRM yields a consistent estimate of the scattering phase function and the complete radiance field in dependence on the altitude. By iteratively correcting the initial optical depth estimation using the resultant radiance field and passing it again to TIRM, the model is used to simultaneously solve for optical depths and scattering phase functions. [ABSTRACT FROM AUTHOR; Copyright 2003 Elsevier]

TI: A spherical model for computing polarized radiation in Titan's atmosphere.
AU: Salinas, Santo V.; Grieger, Björn; Markiewicz, Wojtek J.; Keller, Horst U..
SO: Planetary & Space Science, (Dec 2003), Vol. 51 Issue 14/15, p977, 13p
PB: Elsevier
Abstract: The Huygens descent through Titan's atmosphere in January 2005 will provide invaluable information about Titan's atmospheric composition and aerosol properties. The Descent Imager/Spectral Radiometer (DISR) will perform upward and downward looking radiation observations at various spectral ranges and spatial resolutions. To prepare the DISR data interpretation we have developed a new model for radiation transfer in Titan's atmosphere. The model solves for the full three-dimensional polarized radiation field in spherical geometry. However, the atmosphere itself is assumed to be spherically symmetric. The model is initialized with a fast-to-compute plane-parallel solution based on the doubling and adding algorithm that incorporates a spherical correction for the incoming direct solar beam. The full three-dimensional problem is then solved using the characteristics method combined with the Picard iterative approximation as described in Rozanov et al. (J. Quant. Spectrosc. Radiat. Transfer 69 (2001) 491). Aerosol scattering properties are calculated with a new microphysical model. In this formulation, aerosols are assumed to be fractal aggregates and include methane gas absorption embedded into the extinction coefficient. The resulting radiance of the model atmosphere's internal field is presented for two prescribed DISR wavelengths. [ABSTRACT FROM AUTHOR; Copyright 2003 Elsevier]

TI: Simulating Titan's tropospheric circulation with the Portable University Model

of the Atmosphere
AU: B. Grieger, J. Segschneider, H. U. Keller, A. V. Rodin, F. Lunkeit, E. Kirk, and K. Fraedrich
SO: Advanced Space Research, 34(8), 1650--1654, doi:10.1016/j.asr.2003.08.079, 2004.
PB: Advanced Space Research

TI: "Recovering the Attitude of the Huygens Descent Module Using the DISR Data",
AU: B. Rizk, M.G. Tomasko, M.W. Bushroe, E. A. McFarlane and C. See.
SO: Proc. Int. Workshop 'Planetary Probe Atmospheric Entry and Descent Trajectory Analysis and Science'
PB: ESA SP-544: 183-189, 2004.

TI: SATURN AT LAST!
AU: Lunine, Jonathan I..
SO: Scientific American, (Jun 2004), Vol. 290 Issue 6, p56-63, 8p, 3 diagrams, 1c;
Abstract: Focuses on the journey of the Cassini-Huygens spacecraft to explore the solar system's second-largest planet, Saturn and its giant moon, Titan. Launch of the robotic spacecraft, the Cassini orbiter and the attached Huygens probe, from Cape Canaveral, Florida in 1997; Expectation for the spacecraft to go into orbit around Saturn in July 2004; Background on the mission and what is already known about Saturn and Titan; How the probe will investigate the planet's atmosphere, moons, rings and magnetic field during its four-year orbit; Indication that the Huygens probe will be sent toward Titan in December to study the surface for liquid hydrocarbons; How Cassini gained velocity through gravity assists after its launch; The probe's Descent Imager and Spectral Radiometer to take photos of the methane clouds; Interest in whether complex organic chemicals have evolved on Titan; Question of whether seas exist on Titan.

TI: Image data compressor for Huygens' DISR instrument compared to state of the art compression schemes
AU: Rueffer-P; Michalik-H; Gliem-F; Rabe-F
SO:
IGARSS-2004.-2004-IEEE-International-Geoscience-and-Remote-Sensing-IEEE-Cat.-No.04CH37612. 2004: 2518-21 vol.4
PB: IEEE, Piscataway, NJ, USA

2005...

TI: Huygens Mission: Score a Big Win For International Effort.
SO:Aviation Week & Space Technology, 1/24/2005, Vol. 162 Issue 4, p58-58, 1/2p
Abstract: The article reports on the success of the European Space Agency (ESA) team in dropping the plucky Huygens probe down on the surface of Titan. It isn't surprising that the French engineers from Alcatel Space, the probe's prime contractor, found the early images from the Descent Imager/Spectral Radiometer strangely familiar. The team rallied when it realized that the initial mission plan wouldn't work because Cassini orbiter of National Aeronautics and Space Administration, would be moving away from the descending probe too fast for an effective radio link. Under the steady leadership of ESA's Jean-Pierre Lebreton, the mission manager and project scientist, the truly international team that put the probe together and made it work has started reaping its rewards.

TI: Shading under Titan's sky.
AU: Grieger, B..
SO: Planetary & Space Science, (Apr 2005), Vol. 53 Issue 5, p577-585, 9p
PB: Elsevier
Abstract: During the descent of the Huygens probe in January 2005, its Descent Imager/Spectral Radiometer (DISR) will take the first close up images of Titan's surface. The shading imposed by the illumination of a planetary surface contains information on its topography. For planetary bodies without an optically thick atmosphere, the light can be assumed to stem from a point source. In this case, methods are available in order to estimate the shape of surface features from shading. The situation is quite different for Titan, as its atmosphere is optically thick at optical wavelengths. The sun is visible from the surface, but the

illumination is dominated by diffuse radiance. In order to investigate the characteristics of shading under Titan's sky and to assess methods to retrieve the shape, different digital terrain models (DTMs) are used to simulate images according to different types of illumination. For an idealized DTM, the shape is retrieved from the shading in the simulated images. Deriving the shape from shading under Titan's sky using existing methods is only possible if the topography is relatively flat, i.e. in the absence of steep slopes. [ABSTRACT FROM AUTHOR; Copyright 2005 Elsevier];

TI: Huygens probe entry and descent trajectory analysis and reconstruction techniques.
AU: Atkinson, D.H.; Kazeminejad, B.; Gaborit, V.; Ferri, F.; Lebreton, J.-P..
SO: Planetary & Space Science, (Apr 2005), Vol. 53 Issue 5, p586-593, 8p
PB: Elsevier
Abstract: Cassini/Huygens is a joint National Aeronautics and Space Administration (NASA)/European Space Agency (ESA)/Agenzia Spaziale Italiana (ASI) mission on its way to explore the Saturnian system. The ESA Huygens Probe is scheduled to be released from the Orbiter on 25 December 2004 and enter the atmosphere of Titan on 14 January 2005. Probe delivery to Titan, arbitrarily defined to occur at a reference altitude of 1270km above the surface of Titan, is the responsibility of the NASA Jet Propulsion Laboratory (JPL). ESA is then responsible for safely delivering the probe from the reference altitude to the surface. The task of reconstructing the probe trajectory and attitude from the entry point to the surface has been assigned to the Huygens Descent Trajectory Working Group (DTWG), a subgroup of the Huygens Science Working Team. The DTWG will use data provided by the Huygens Probe engineering subsystems and selected data sets acquired by the scientific payload. To correctly interpret and correlate results from the probe science experiments and to provide a reference set of data for possible 'ground-truthing' Orbiter remote sensing measurements, it is essential that the trajectory reconstruction be performed as early as possible in the post-flight data analysis phase. The reconstruction of the Huygens entry and descent trajectory will be based primarily on the probe entry state vector provided by the Cassini Navigation Team, and measurements of acceleration, pressure, and temperature made by the Huygens Atmospheric Structure Instrument (HASI). Other data sets contributing to the entry and descent trajectory reconstruction include the mean molecular weight of the atmosphere measured by the probe Gas Chromatograph/Mass Spectrometer (GCMS) in the upper atmosphere and the Surface Science Package (SSP) speed of sound measurement in the lower atmosphere, accelerations measured by the Central and Radial Accelerometer Sensor Units (CASU/RASU), and the ... [ABSTRACT FROM AUTHOR; Copyright 2005 Elsevier];

TI: Power and Propulsion for the Cassini Mission.
AU: Johnson, Kevin S.; Cockfield, Robert D..
SO: AIP Conference Proceedings, 2005, Vol. 746 Issue 1, p232-239, 8p
PB: AIP
Abstract: Lockheed Martin contributions to the Cassini mission included power and propulsion for the spacecraft, the Descent Imager / Spectral Radiometer, DISR instrument for the Huygens Probe, as well as the Titan IVB launch vehicle. Cassini is currently in orbit around Saturn performing its primary science mission, investigating Saturn, its many moons, and its complex and beautiful ring system. The Space Power Programs organization in King of Prussia, Pennsylvania, an offsite of Lockheed Martin Space Systems Company, provided the three General Purpose Heat Source - Radioisotope Thermoelectric Generators (GPHS-RTGs) used to provide electric power to the spacecraft during its mission to Saturn and its moons. The RTGs were the same design as those used to power the Galileo spacecraft on its mission to Jupiter and its moons, and the ESA Ulysses spacecraft on its mission to explore the Sun. Three RTGS provided 880 Watts of electrical power to the spacecraft at the beginning of mission, shortly after launch, 50% more than the power available for the Galileo mission. Other papers will describe the extensive science instrumentation made possible by the abundance of continuous, reliable, and long-lived power, unprecedented for a deep space planetary mission. The Cassini Propulsion Module Subsystem is the largest interplanetary propulsion system ever to successfully enter orbit around another planet. The propulsion system was designed

to be fully redundant for this critical, 11-year scientific mission to Saturn. The system was designed, assembled and tested at Lockheed Martin's Space Exploration Systems Company in Littleton, Colorado, before being delivered to the Jet Propulsion Laboratory, JPL in Pasadena California for integration and testing with the spacecraft. The bi-propellant system design holds 3,000 kg of Monomethyl Hydrazine, MMH and Nitrogen Tetroxide, NTO and uses 132 kg of High Purity Grade Hydrazine for 3-axis attitude control and Reaction Wheel...[ABSTRACT FROM AUTHOR];

TI: Topographic Mapping of the Huygens Landing Site on Titan,
AU: Brent A. Archinal, Martin G. Tomasko, Bashar Rizk, Larry A. Soderblom, Randolph L. Kirk, Debbie A. Cook, Elpitha Howington-Kraus, Tammy L. Becker, Mark R. Rosiek, and the DISR Science Team
SO: Asia Oceania Geosciences Society's 2nd Annual Meeting, Singapore, 2005 June 20-24. Abstact only.
PB: Asia Oceania Geosciences Society
Abstract: The Huygens probe successfully accomplished the first descent and landing on Saturn's moon Titan on 2005 January 14. The onboard Descent Imager-Spectral Radiometer (DISR) experiment1 included three imaging cameras: high resolution (HRI), medium resolution (MRI), and side looking (SLI), which returned the first ever high resolution (~60 m/pixel to a few mm/pixel) images of the surface of Titan. Approximately 596 separate images were returned. Many of these images were taken above ~40 km and showed no surface detail due to haze, or were repeated images of the same scene from the surface. Still, about 40% of the images show surface features of Titan (e.g. Figure 1). Although not possible in some areas due to lost images, we plan to photogrammetrically derive topographic information from these images, from which detailed geologic studies can proceed. As part of this process we expect to recover a history of spacecraft pointing and position, constrained in part by altimetry and Earth-based VLBI tracking, thus providing a trajectory estimate with which other (e.g. atmospheric) data can be associated. Planned products consist of a series of image mosaics, digital elevation models, and orthomosaics, at multiple resolutions and nested within each other as appropriate. We plan to present early versions of such products. Later efforts will also concentrate on analyzing and merging the imaging and topographic information of these images with that of the Cassini RADAR, ISS, and VIMS imaging experiments, to develop a consistent global (horizontal and vertical) reference system for Titan to which these and future data sets can be referred. Reference: [1] M. Tomasko et al. Spc. Sci. Rev. 104, 469-551 (2002). Figure 1: A mosaic of 3 DISR HRI images (http://photojournal.jpl.nasa.gov/catalog/PIA07236)

TI: Temperature variations in Titan's upper atmosphere: Impact on Cassini/Huygens.
AU: Kazeminejad, B., H. Lammer, A. Coustenis, O. Witasse, G. Fischer, K. Schwingenschuh, A. J. Ball, and H. O. Rucker.
SO: Annales Geophysicae, vol. 23, no. 4, pp. 1183-1189. June 2005.
PB:

TI: Observations of Titan's Surface and Atmosphere from the Descent Imager/Spectral Radiometer (DISR) on the Huygens Probe
AU: L. Soderblom, M. Tomasko, B. Archinal, T. Becker, B. Bézard, M. Bushroe, M. Combes, D. Cook, A. Coustenis, C. de Bergh, L. Dafoe, L. Doose, S. Douté, A. Eibl, S. Engel, F. Gliem, B. Grieger, T. Hare, K. Holso, A. Howington-Kraus, E. Karkoschka, H. Keller, R. Kirk, R. Kramm, M. Küppers, P. Lanagan, E. Lellouch, M. Lemmon, J. Lunine, E. McFarlane, J. Moores, M. Prout, B. Rizk, M. Rosiek, P. Rüffer, S. Schröder, B. Schmitt, C. See, P. Smith, N. Thomas, R. West
SO: AAS Division of Planetary Sciences meeting, 2005 September 4-9, Cambridge, UK. Abstract only. Number 2.06.
PB: AAS
Abstract: DISR characterized atmospheric radiation (350-1600 nm) and returned images and spectra of the surface of Titan. Linear polarization of the aerosol haze extending to the surface is i~50% at visible wavelengths. Monomers making up the aerosol particles are modeled at ~0.1 microns, several 100 monomers making up a haze particle. The extinction optical depth at the surface is ~4.5 at 531 nm, ~2 at 939 nm and ~0.5 at 1500 nm. The near-surface methane mole fraction is ~5% (relative humidity ~50%); methane fog or rain at the landing site is currently unlikely. Below

~8 km the eastward zonal wind dropped to <1m/s and reversed back to the west indicative of a boundary layer. Surface reflectance is ~0.13 at 531 nm, ~0.18 at 830 nm, decreasing to ~0.06 at 1500 nm consistent with dirty water ice. DISR images show brighter, higher terrains with stubby and higher-order drainage systems that border darker, lower-lying plains scoured by flow. Surface images show rounded gravels in a dry river bed. DISR-derived topography for the drainages in the bright terrain show extremely rugged terrain with slopes as high as 30 degrees. This suggests relatively rapid erosion by flows in the river beds resulting in the deeply incised valleys.

TI: Topographic Mapping of the Huygens Landing Site on Titan
AU: Randolph L. Kirk, Brent A. Archinal, Martin G. Tomasko, Bashar Rizk, Larry A.Soderblom, Debbie A. Cook, Elpitha Howington-Kraus, Tammy L. Becker, Mark R. Rosiek, and the DISR Science Team
SO: AAS Division of Planetary Sciences meeting, 2005 September 4-9, Cambridge, UK. Abstract only. Number 46.08.
PB: AAS
Abstract: The Huygens probe successfully accomplished the first descent and landing on Saturn's moon Titan on 2005 January 14. The onboard Descent Imager-Spectral Radiometer (DISR) experiment[1] included three imaging cameras: high resolution (HRI), medium resolution (MRI), and side looking (SLI), which returned the first ever high resolution (~ 60 m/pixel to a few mm/pixel) images of the surface of Titan. Approximately 596 separate images were returned. Many images, taken above ~40 km, showed no surface detail due to haze; others were repeated images of the same scene from the surface. Still, about 40% of the images show surface features of Titan. We are analyzing these images photogrammetrically to derive topographic information for as much of the landing area as possible, from which detailed geologic studies can proceed. As part of this process we expect to recover a history of spacecraft pointing and position, constrained in part by altimetry and Earth-based VLBI tracking, thus providing a trajectory estimate with which other (e.g. atmospheric) data can be associated. Planned products consist of a series of image mosaics, digital elevation models, and orthomosaics, at multiple resolutions and nested within each other as appropriate. The first such products will be shown; they indicate total relief of ~250 m in the higher albedo "highlands" near the landing point, with dark dendritic channels confined to the floors of canyons with side slopes up to 30 deg, indicating extremely active erosion. Later efforts will also concentrate on analyzing and merging the imaging and topographic information of these images with that of the Cassini RADAR, ISS, and VIMS imaging experiments, to develop a consistent global (horizontal and vertical) reference system for Titan to which these and future data sets can be referred. Reference: [1] M. Tomasko et al. Spc. Sci. Rev. 104, 469-551 (2002).

TI: First Analysis of the Infrared Spectra of Titan's Atmosphere and Surface from the Huygens/DISR Instrument
AU: B. Bézard, E. Lellouch, B. Schmitt, S. Douté, M. Tomasko, S. Engel
SO: AAS Division of Planetary Sciences meeting, 2005 September 4-9, Cambridge, UK. Abstract only. Number 51.11.
PB: AAS
Abstract: Throughout the descent and at the surface, the downward-looking (DLIS) and upward-looking (ULIS) infrared spectrometers from the DISR/Huygens instrument recorded spectra of the atmospheric radiation and of the surface at the landing site. These spectrometers cover the range 850--1700 nm with a resolution of 15--20 nm. ULIS measurements of the downward flux in the stratosphere are consistent with the 1.6 \% methane mole fraction inferred by Cassini/CIRS and Huygens/GCMS. ULIS spectra recorded in the lowest km of the atmosphere strogly vary in intensity depending whether the Sun is within the instrument field of view or not. The contrast in the methane windows, increasing from 4 at 940 nm up to 18 at 1600 nm, is strongly sensitive to the total aerosol optical depth. Using an aggregate haze particle model derived from visible spectra and solar aureole data from DISR, we derived optical depths of about 2 at 940 nm decreasing to 0.5 at 1600 nm. The set of ULIS spectra recorded during the descent provides constraints on the vertical profile of the aerosols in the range 150-40 km, using the residual intensity in the core of the methane bands. A constant-with-height particule concentration provides a good fit of the spectra whereas a cutoff in the lower stratosphere is at odds with

the data. A spectrum at an altitude of 20 m with the DISR 20-W lamp turned on indicates a methane mole fraction of 5$\pm$1 \%, corresponding to a relative humidity of 50 \% near the surface. The reflectivity of the dark terrain at the landing site decreases from about 0.18 near 830 nm to 0.06 near 1500 nm and is relatively low and flat from 1500 to 1600 nm. This spectrum is consistent with water ice mixed with an unidentified dark material showing a featureless``blue slope'' in the infrared.

TI: Titan's surface and atmosphere observed by the DISR/Huygens instrument
AU: B. Bézard, and the DISR investigation team
SO: SF2A Scientific Highlights 2005, pp. 125-128
PB: EDP Sciences, Les Ulis, France
Abstract: The Descent Imager / Spectral Radiometer (DISR) aboard the Huygens probe measured solar radiation in the atmosphere of Titan and took images and spectra of its surface. A summary of the early data analysis is presented. The images taken by DISR show brighter highland regions with channel and river systems draining into relatively flat, dark lowland terrain. The reflectivity of the dark terrain at the landing site reaches a maximum near 830 nm and decreases gradually at longer wavelengths. The infrared portion of the spectrum is consistent with dirty water ice but the nature and composition of the dark material forming the ``dirt'' is unknown. Several haze properties were determined. The haze extends from the highest measured altitude (150 km) down to the surface. Its optical depth is about 2 at 940 nm and decreases with wavelength. The particles are irregular and can be modelled as aggregates of several hundreds of 0.05-micron radius monomers. A methane mixing ratio of 5% +/-1% was inferred near the surface using a downward-looking spectrum at an altitude of 20 m with the DISR lamp turned on.

TI: Titan's Surface as Viewed from the Huygens Probe by the Descent Imager/Spectral Radiometer
AU: L. Soderblom, M. Tomasko, B. Archinal, T. Becker, B. Bézard, M. Bushroe, M. Combes, D. Cook, A. Coustenis, C. de Bergh, L. Dafoe, L. Doose, S. Douté, A. Eibl, S. Engel, F. Gliem, B. Grieger, T. Hare, K. Holso, A. Howington-Kraus, E. Karkoschka, H. Keller, R. Kirk, R. Kramm, M. Küppers, P. Lanagan, E. Lellouch, M. Lemmon, J. Lunine, E. McFarlane, J. Moores, M. Prout, B. Rizk, M. Rosiek, P. Rüffer, S. Schröder, B. Schmitt, C. See, P. Smith, N. Thomas, R. West
SO: Geological Society of America, 2005 October 16-19, Salt Lake City, UT. Abstract only. Number 102-9.
PB: Geological Society of America
Abstract: The Descent Imager/Spectral Radiometer (DISR) aboard the Huygens Probe characterized atmospheric radiation (350-1600 nm) and returned images and spectra of Titan's surface. The near-surface methane mole fraction is ~5% (relative humidity ~50%); making methane fog or rain at the landing site unlikely at present. Below ~8 km the eastward zonal wind dropped to <1m/s and reversed back to the west indicative of a boundary layer. Surface reflectance is ~0.08 at 531 nm, ~0.13 at 830 nm, decreasing to ~0.1 at 1500 nm consistent with dirty water ice. DISR images show brighter, higher terrains with stubby and higher-order drainage systems that border darker, lower-lying plains scoured by flow. Surface images show rounded cobbles in a dry river bed. DISR-derived topography for the drainages in the bright terrain show extremely rugged terrain with slopes as high as 30 degrees. This suggests relatively rapid erosion by flows in the river beds resulting in the deeply incised valleys.

TI: The Character of the Surface of Titan as viewed from the Cassini Orbiter and the Huygens Probe
AU: Soderblom, L. A.
SO: AGU, Fall Meeting 2005, abstract #U23A-04,12/2005
PB: American Geophysical Union [2005AGUFM.U23A..04S]
Abstract: Images of the surface of Titan continue to be acquired by three instruments aboard the NASA Cassini Orbiter (ISS or Imaging Science Subsystem, the Cassini RADAR, and VIMS or Visible and Infrared Mapping Spectrometer) and were acquired by one instrument (DISR or Descent Imager/Spectral Radiometer) aboard the ESA Huygens Probe during its descent to the surface in January 2005. ISS can image the surface globally and temporally down to about 1 km resolution. RADAR, unhampered by the atmosphere, acquires synthetic aperture images down to about 300 m but will

cover only about 0.2 of the surface during the nominal mission. VIMS acquires spectral images the surface to about 1 km resolution through several atmospheric windows but with limited coverage at the highest resolution. The ISS, RADAR, and VIMS images reveal a surface rich in geological diversity. The images show ample evidence for volcanic, fluvial, lacustrine, eolian, and tectonic processes. DISR results reveal that the near-surface methane relative humidity is about 0.5, making methane fog or rain at the landing site unlikely at present. Below about 8 km the eastward zonal wind dropped to <1m/s and reversed back to the west indicative of a boundary layer. Visible and near-infrared surface reflectance is consistent with dirty water ice. DISR images show brighter, higher terrains with stubby and higher-order drainage systems that border darker, lower-lying plains scoured by flow. Surface images show rounded gravels in a dry river bed. DISR-derived topography for the drainages in the bright terrain show extremely rugged terrain with slopes as high as 30 degrees. This suggests relatively rapid erosion by flows in the river beds resulting in the deeply incised valleys.

TI: Rain, winds and haze during the Huygens probe's descent to Titan's surface.
AU: Tomasko-MG; Archinal-B; Becker-T; Bézard-B; Bushroe-M; Combes-M; Cook-D; Coustenis-A; de-Bergh-C; Dafoe-LE; Doose-L; Doute-S; Eibl-A; Engel-S; Gliem-F; Grieger-B; Holso-K; Howington-Kraus-E; Karkoschka-E; Keller-HU; Kirk-R; Kramm-R; Kuppers-M; Lanagan-P; Lellouch-E; Lemmon-M; Lunine-J; McFarlane-E; Moores-J; Prout-GM; Rizk-B; Rosiek-M; Rueffer-P; Schroder-SE; Schmitt-B; See-C; Smith-P; Soderblom-L; Thomas-N; West-R
SO: Nature, (8 Dec. 2005), Vol. 438 Issue 7069, p765-778, 14p, 13 graphs, 3c, 6bw
PB: Nature Publishing Group
Abstract: The irreversible conversion of methane into higher hydrocarbons in Titan's stratosphere implies a surface or subsurface methane reservoir. Recent measurements from the cameras aboard the Cassini orbiter fail to see a global reservoir, but the methane and smog in Titan's atmosphere impedes the search for hydrocarbons on the surface. Here we report spectra and high-resolution images obtained by the Huygens Probe Descent Imager/Spectral Radiometer instrument in Titan's atmosphere. Although these images do not show liquid hydrocarbon pools on the surface, they do reveal the traces of once flowing liquid. Surprisingly like Earth, the brighter highland regions show complex systems draining into flat, dark lowlands. Images taken after landing are of a dry riverbed. The infrared reflectance spectrum measured for the surface is unlike any other in the Solar System; there is a red slope in the optical range that is consistent with an organic material such as tholins, and absorption from water ice is seen. However, a blue slope in the near-infrared suggests another, unknown constituent. The number density of haze particles increases by a factor of just a few from an altitude of 150 km to the surface, with no clear space below the tropopause. The methane relative humidity near the surface is 50 per cent. [ABSTRACT FROM AUTHOR];

TI: Temperatures, winds, and composition in the Saturnian system.
AU: Flasar, F. M., et al.
SO: Science 307.5713 (2005): 1247-1251.
PB:

TI: Titan's atmospheric temperatures, winds, and composition.
AU: Flasar, F. M., et al.
SO: Science 308.5724 (2005): 975-978.
PB:

TI: Imaging technique of the DISR camera on the Huygens lander
AU: J. R. Kramm, H. U. Keller, R. Bredthauer, and M. Tomasko
SO: Scientific Detectors for Astronomy 2005, (edited by J. E. Beletic, J. W. Beletic, and P. Amico), pp. 199-204
PB: Springer, Dordrecht, The Netherlands, 2006.

2006...

TI: Topographic Mapping of the Huygens Landing Site on Titan: New Results and Error Analyses

AU: B. A. Archinal, M. G. Tomasko, B. Rizk, L. A. Soderblom, R. L. Kirk, E. Howington-Kraus, D. A. Cook, T. L. Becker, M. R. Rosiek, D. Galuszka, B. L. Redding, T. L. Hare, and the DISR Science Team
SO: Proceedings of the 37th Lunar and Planetary Science Conference, 2006 March 13-17, Houston, Texas), abstract no. 2089.
PB: Lunar and Planetary Science Institute, Houston, TX.
Abstract Summary: A new DTM of the hills near the Huygens landing site on Titan is presented, as generated from 5 DISR images. We describe our investigation of possible error sources, such as from the merging of DTMs from stereo pairs and from camera calibration.

TI: Charging and coagulation processes in Titan tholin haze as inferred from Huygens/DISR spectrophotometry data
AU: A.V. Rodin, Yu.V. Skorov, B. Grieger, S. Schroeder, H.U. Keller and M.G. Tomasko
SO: EGU 3rd General Assembly, April 02-07, Vienna, 1607-7962/gra/EGU06-A-09899
PB: European Geosciences Union, Geophysical Research Abstracts, Vol. 8, 09899
Abstract: We present a 1-D microphysical model of the aerosols in Titan atmosphere taking into account photochemical production, collisional and photoelectric charging, coagulation, sedimentation and eddy mixing on the tholin particles...

TI: Recent Results on Titan's Surface from the Cassini Orbiter and Huygens Probe
AU: Soderblom, L.
SO: EGU 3rd General Assembly, April 02-07, Vienna, EGU06-A-01683, 2006
PB: European Geosciences Union, Geophysical Research Abstracts, Vol. 8, 01683
Abstract: Spectra and images of the surface of Titan continue to be acquired by the Cassini Radar and Cassini VIMS (Visible and Infrared Mapping Spectrometer) aboard the NASA Cassini Orbiter. Images and spectra were also acquired by DISR (Descent Imager/Spectral Radiometer) aboard the ESA Huygens Probe during its descent to thes urface in January 2005. Radar, unhampered by the atmosphere, acquires synthetic aperture images down to about 300 m and will cover about 0.2 of the surface during the nominal mission. VIMS acquires spectral images from 0.35 to 5.1 microns and can see clearly to the surface through several atmospheric windows in the near IR with a best resolution of 1-to-2 km. The RADAR and VIMS images reveal a surface rich in geological diversity: including evidence for volcanic, fluvial, lacustrine, eolian, and tectonic processes. The Radar images reveal vast regions pervaded by radar-dark longitudinal sand dunes. Correlation of the Radar and DISR images reveal the landing site to be about 40 km south of a region laced by these long, dark, longitudinal dunes; they are seen in both Radar and DISR SLI (side-looking) images. DISR images of regions near the landing site show brighter, higher terrains with stubby and higher order drainage systems that border darker, lower-lying plains scoured by flow. Surface images show rounded gravels in a dry river bed. Six new photogrammetric models using DISR stereo pairs reveal extremely rugged topography for the drainages in the bright terrain with slopes as high as 30 degrees. This suggests relatively rapid erosion by flows in the river beds resulting in the deeply incised valleys.

TI: Microphysical transition of tholin aerosols in Titan atmosphere.
AU: H.U. Keller, A.V. Rodin, Yu.V. Skorov, B. Grieger, and M.G. Tomasko
SO: American Geophysical Union, December 2006 (abstract #P21B-0)
Abstract: A rapid transition of the tholin particles scattering properties below approximately 80 km was observed by DISR during the descent of the Huygens probe. Single scattering albedo and volume extinction also show a stepwise increase. A self-consistent 1D microphysical model of the Titan tholin haze has been developed...

TI: Saturn's Titan reveals earthlike surprises
AU: Rizk, Bashar
SO: Astronomy magazine (May 2006)

TI: By the Light of a Coppery Moon.
SO: Science, (19 May 2006), Vol. 312 Issue 5776, p977-977, 1/4p;
Abstract: The article reports that the U.S. National Aeronautics and Space

Administration, the European Space Agency and the University of Arizona have released two videos showing the space satellite Huygens probing onto the surface of planet Saturn's moon Titan. The videos captured the landing, condensed several hours of data taken by the spacecraft's Descent Imager/Spectral Radiometer. One of the videos discloses a readout of the craft's trajectory and other data.

2007...

TI: A new image of Titan Titan as seen from Huygens
AU: F. Raulina, M.-C. Gazeaua and J.-P. Lebreton
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1843-1844
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: On January 14, 2005, the Huygens atmospheric probe, after a 7-year journey attached to the Cassini Orbiter and 3 weeks of free flying on a ballistic trajectory, entered into the Titan's atmosphere. It carried six scientific instruments...

TI: Huygens' entry and descent through Titan's atmosphere-Methodology and results of the trajectory reconstruction
AU: Bobby Kazeminejad, David H. Atkinson, Miguel Pérez-Ayúcar, Jean-Pierre Lebreton and Claudio Sollazzo
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1845-1876
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The European Space Agency's Huygens probe separated from the NASA Cassini spacecraft on 25 December 2004, after having been attached for a 7-year interplanetary journey and three orbits around Saturn. The probe reached the predefined NASA/ESA interface point on 14 January 2005 at 09:05:52.523 (UTC) and performed a successful entry and descent sequence. The probe softly impacted on Titan's surface on the same day at 11:38:10.77 (UTC) with a speed of about 4.54 m/s. The probe entry and descent trajectory was reconstructed from the estimated initial state vector provided by the Cassini Navigation team, the probe housekeeping data, and measurements from the scientific payload. This paper presents the methodology and discuss the results of the reconstruction effort. Furthermore the probe roll rate was reconstructed prior to the main entry phase deceleration pulse and throughout the entire descent phase under the main and drogue parachute.

TI: The Huygens Probe Descent Trajectory Working Group: Organizational framework, goals, and implementation
AU: David H. Atkinson, Bobby Kazeminejad, Jean-Pierre Lebreton, Olivier Witasse, Miguel Pérez-Ayúcar and Dennis L. Matson
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1877-1885
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: ...This paper presents an overview of the Descent Trajectory Working Group, including the history, rationale, goals and objectives, organizational framework, rules and procedures, and implementation.

TI: Huygens Probe descent dynamics inferred from Channel B signal level measurements
AU: Y. Dzierma, M.K. Bird, R. Dutta-Roy, Miguel Pérez-Ayúcar, D. Plettemeier and P. Edenhofer
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1886-1895
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The signal strength of the Huygens Probe Channel B transmission to the Cassini Orbiter was monitored during the Probe descent through Titan's atmosphere on 14 January 2005. A model of the Probe motion during the mission was constructed to include Probe spin, coning motion and tilt caused by varying wind speeds. This simple model is sufficient to reproduce the most prominent features seen in the signal level measurements. It provides estimates of the coning and tilt angles as well as the direction of the Huygens coordinate axes over extended time intervals in the mission.

TI: DISR imaging and the geometry of the descent of the Huygens probe within Titan's atmosphere
AU: Erich Karkoschka, Martin G. Tomasko, Lyn R. Doose, Chuck See, Elisabeth A.

McFarlane, Stefan E. Schröder and Bashar Rizk
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1896-1935
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The Descent Imager/Spectral Radiometer (DISR) provided 376 images during the descent to Titan and 224 images after landing. Images of the surface had scales between 150 m/pixel and 0.4 mm/pixel, all of which we assembled into a mosaic. The analysis of the surface and haze features in these images and of other data gave tight constraints on the geometry of the descent, particularly the trajectory, the tip and tilt, and the rotation of the Huygens probe...

TI: Descent motions of the Huygens probe as measured by the Surface Science Package (SSP): Turbulent evidence for a cloud layer
AU: Ralph D. Lorenz, John C. Zarnecki, Martin C. Towner, Mark R. Leese, Andrew J. Ball, Brijen Hathi, Axel Hagermann and Nadeem A.L. Ghafoor
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1936-1948

PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The Huygens probe underwent vigorous short-period motions during its parachute descent through the atmosphere of Saturn's moon Titan in January 2005, at least some of which were excited by the Titan environment. Several sensors in the Huygens Surface Science Package (SSP) detect these motions, indicating the transition to the smaller stabilizer parachute, the changing probe spin rate, aerodynamic buffeting, and pendulum motions. Notably, in an altitude range of about 20-30 km where methane drops will freeze, the frequency content and statistical kurtosis of the tilt data indicate excitation by turbulent air motions like those observed in freezing clouds on Earth...

TI: Near-surface winds at the Huygens site on Titan: Interpretation by means of a general circulation model
AU: Tetsuya Tokano
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1990-2009

PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: This study aims at interpreting the zonal and meridional wind in Titan's troposphere measured by the Huygens probe by means of a general circulation model. The numerical simulation elucidates the relative importance of the seasonal variation in the Hadley circulation and Saturn's gravitational tide in affecting the actual wind profile. The observed reversal of the zonal wind at two altitudes in the lower troposphere can be reproduced with this model only if the near-surface temperature profile is asymmetric about the equator and substantial seasonal redistribution of angular momentum by the variable Hadley circulation takes place...

TI: Topography and geomorphology of the Huygens landing site on Titan
AU: Laurence A. Soderblom, Martin G. Tomasko, Brent A. Archinal, Tammy L. Becker, Michael W. Bushroe, Debbie A. Cook, Lyn R. Doose, Donna M. Galuszka, Trent M. Hare, Elpitha Howington-Kraus, Erich Karkoschka, Randolph L. Kirk, Jonathan I. Lunine, Elisabeth A. McFarlane, Bonnie L. Redding, Bashar Rizk, Mark R. Rosiek, Charles See and Peter H. Smith
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 2015-2024

PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The Descent Imager/Spectral Radiometer (DISR) aboard the Huygens Probe took several hundred visible-light images with its three cameras on approach to the surface of Titan. Several sets of stereo image pairs were collected during the descent. The digital terrain models constructed from those images show rugged topography, in places approaching the angle of repose, adjacent to flatter darker plains. Brighter regions north of the landing site display two styles of drainage patterns...

TI: Correlations between Cassini VIMS spectra and RADAR SAR images: Implications for Titan's surface composition and the character of the Huygens Probe Landing Site
AU: Laurence A. Soderblom, Randolph L. Kirk, Jonathan I. Lunine, Jeffrey A. Anderson, Kevin H. Baines, Jason W. Barnes, Janet M. Barrett, Robert H. Brown,

Bonnie J. Buratti, Roger N. Clark, Dale P. Cruikshank, Charles Elachi, Michael A. Janssen, Ralf Jaumann, Erich Karkoschka, Stéphane Le Mouélic, Rosaly M. Lopes, Ralph D. Lorenz, Thomas B. McCord, Philip D. Nicholson, et al.
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 2025-2036

PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: Titan's vast equatorial fields of RADAR-dark longitudinal dunes seen in Cassini RADAR synthetic aperture images correlate with one of two dark surface units discriminated as "brown" and "blue" in Visible and Infrared Mapping Spectrometer (VIMS) color composites...The dark dunes must be mobile on this very short timescale to prevent the accumulation of bright coatings. Huygens landed in a region of the VIMS bright and dark blue materials and about 30 km south of the nearest occurrence of dunes visible in the RADAR SAR images. Fluvial/pluvial processes, every few centuries or millennia, must be cleansing the dark floors of the incised channels and scouring the dark plains at the Huygens landing site both imaged by Descent Imager/Spectral Radiometer (DISR).

TI: Microphysical processes in Titan haze inferred from DISR/Huygens data
AU: A.V. Rodin, H.U. Keller, B. Grieger, Yu.V. Skorov, S. Schroeder, M.G Tomasko
SO: Icarus submitted 2007

2008...

TI: Latest news from Titan
AU: F. Raulin, M.-C. Gazeau and J.-P. Lebreton
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 571-572
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: Since the first publication of the Huygens in situ observations of Titan in Nature (Lebreton et al., 2005), many new results have been obtained, thanks to a more detailed analysis of the probe data, and by exploiting the synergy offered by complementary data sources allowing a multidisciplinary approach: data from the Cassini orbiter, from theoretical modelling, and from laboratory experimental studies...

TI: New laboratory measurements of CH4 in Titan's conditions and a reanalysis of the DISR near-surface spectra at the Huygens landing site
AU: D. Jacquemart, E. Lellouch, B. Bézard, C. de Bergh, A. Coustenis, N. Lacome, B. Schmitt and M. Tomasko
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 613-623
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: Laboratory spectra of methane-nitrogen mixtures have been recorded in the near-infrared range (1.0-1.65 μm) in conditions similar to Titan's near surface, to facilitate the interpretation of the DISR/DLIS (DISR-Descent Imager/Spectral Radiometer) spectra taken during the last phase of the descent of the Huygens Probe, when the surface was illuminated by a surface-science lamp...

TI: Measurements of Methane Absorption by the Descent Imager/Spectral Radiometer (DISR) During its Descent through Titan's Atmosphere
AU: M.G. Tomasko, B. Bézard, L. Doose, S. Engel, and E. Karkoschka
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 624-647
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: New low-temperature methane absorption coefficients pertinent to the Titan environment are presented as derived from the Huygens DISR spectral measurements combined with the in-situ measurements of the methane gas abundance profile measured by the Huygens Gas Chromatograph/Mass Spectrometer (GCMS)...

TI: Heat Balance in Titan's Atmosphere
AU: M.G. Tomasko, B. Bézard, L. Doose, S. Engel, E. Karkoschka and S.Vinatier
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 648-659
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The recent measurements of the vertical distribution and optical properties of haze aerosols as well as of the absorption coefficients for methane at long paths and cold temperatures by the Huygens entry probe of Titan permit the

computation of the solar heating rate on Titan with greater certainty than heretofore...

TI: Optical properties of aerosols in Titan's atmosphere
AU: Yu.V. Skorov, H.U. Keller and A.V. Rodin
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 660-668
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: In the frame of fractal modeling of tholin aggregates we made a systematic analysis of their optical properties. Ballistic particle-cluster aggregation (BPCA) and diffusion-limited aggregation (DLA) of spherical primary particles (monomers) identical in material composition were considered...

TI: A Model of Titan's Aerosols Based on Measurements Made Inside the Atmosphere
AU: M.G. Tomasko, L. Doose, S. Engel, L.E. Dafoe, R.West, M. Lemmon, E. Karkoschka and C. See
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 669-707
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The descent imager/spectral radiometer (DISR) instrument aboard the Huygens probe into the atmosphere of Titan measured the brightness of sunlight using a complement of spectrometers, photometers, and cameras that covered the spectral range from 350 to 1600 nm, looked both upward and downward, and made measurements at altitudes from 150 km to the surface...

TI: Titan's aerosols; comparison between our model and DISR findings
AU: A. Bar-Nun, V. Dimitrov and M. Tomasko
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 708-714
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: Our model...describes the experimentally found polymerization of C2H2 and HCN to form aerosol embryos, their growth and adherence to form various aerosols objects...These loose fractal objects describe well the findings of DISR on the Huygens probe...

TI: The properties of Titan's surface at the Huygens landing site from DISR observations
AU: H.U. Keller, B Grieger, M Küppers, S.E. Schröder, Y.V. Skorov, M.G. Tomasko
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 728-752
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The descent imager/spectral radiometer (DISR) onboard the Huygens probe investigated the radiation balance inside Titan's atmosphere and took hundreds of images and spectra of the ground during the descent. The scattering of the aerosols in the atmosphere and the absorption by methane strongly influence the irradiation reaching the surface...

TI: The reflectance spectrum of Titan's surface at the Huygens landing site determined by the Descent Imager/Spectral Radiometer
AU: S.E. Schröder, H.U. Keller
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 753-769
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The descent imager/spectral radiometer aboard the Huygens probe successfully acquired images and spectra of the surface of Titan. To counter the effects of haze and atmospheric methane absorption it carried a surface science lamp to illuminate the surface just before landing. We reconstruct the reflectance spectrum of the landing site...

TI: The Huygens scientific data archive: Technical overview
AU: O. Witasse, L Huber, J Zender, J-P Lebreton, etal
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 770-777
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: ...This paper presents an overview of the process the Huygens Data Archiving Working Group followed to develop and ingest the data set. A description of the data sets is also given.

TI: The methane cycle on Titan

AU: Lunine, Jonathan I., and Sushil K. Atreya.
SO: Nature Geoscience 1, no. 3 (2008): 159-164
PB:

TI: Titan's tropical storms in an evolving atmosphere.
AU: Griffith, Caitlin A., Christopher P. McKay, and Francesca Ferri.
SO: The Astrophysical Journal Letters 687, no. 1 (2008): L41.
PB:

2009...

TI: Fluvial network analysis on Titan: Evidence for subsurface structures and west-to-east wind flow, southwestern Xanadu.
AU: Burr, Devon M., Robert E. Jacobsen, Danica L. Roth, Cynthia B. Phillips, Karl L. Mitchell, and Donna Viola.
SO: Geophysical Research Letters 36.22 (2009): L22203.
PB:

TI: Comparing VIMS observations of the Huygens Landing Site with DISR and radar observations: implications for Titan geology and its spin rate.
AU: Sotin, C., E. Karkoschka, L. Le Corre, S. Le Mouelic, R. H. Brown, R. Jaumann, L. Soderblom et al.
SO: EPSC Abstracts 4 (2009).
PB:

TI: Results from the Huygens probe on Titan.
AU: Lebreton, Jean-Pierre, Athena Coustenis, Jonathan Lunine, François Raulin, Tobias Owen, and Darrell Strobel.
SO: The Astronomy and Astrophysics Review 17, no. 2 (2009): 149-179.
PB:

TI: Storms in the tropics of Titan.
AU: Schaller, E. L., H. G. Roe, T. Schneider, and M. E. Brown.
SO: Nature 460, no. 7257 (2009): 873-875.
PB:

TI: Numerical simulation of circulation of the Titan's atmosphere: Interpretation of measurements of the Huygens probe.
AU: Mingalev, I. V., Mingalev, V. S., Mingalev, O. V., Kazeminejad, B., Lammer, H., Birnat, H. K., ... & Ruker, H. O.
SO: Cosmic Research 47, no. 2 (2009): 114-125.
PB:

TI: Titan from Cassini-Huygens
AU: Brown R., Lebreton J-P., Waite J. H., Editors
SO: ISBN 978-1-4020-9214-5
PB: Springer 2009

2010...

TI: Exoplanets-New Results from Space and Ground-based Surveys
AU: Udry, Stephane.
SO: 38th COSPAR Scientific Assembly, vol. 38, p. 4271. 2010.
PB:

TI: Evidence for Lakes on Titan's Tropical Surface
AU: Griffith, Caitlin Ann, J. Turner, P. Penteado, and L. Doose.
SO: Bulletin of the American Astronomical Society, vol. 42, p. 1077. 2010.
PB:

TI: About the possible role of hydrocarbon lakes in the origin of Titan's noble gas atmospheric depletion
AU: Cordier, Daniel, Olivier Mousis, J. I. Lunine, Sébastien Lebonnois, P. Lavvas,

L. Q. Lobo, and A. G. M. Ferreira.
SO: The Astrophysical Journal Letters 721, no. 2 (2010): L117.
PB:

TI: Methane absorption coefficients for the jovian planets from laboratory, Huygens, and HST data.
AU: Karkoschka, Erich, and Martin G. Tomasko.
SO: Icarus 205, no. 2 (2010): 674-694.
PB:

TI: Titan trace gaseous composition from CIRS at the end of the Cassini-Huygens prime mission
AU: Coustenis, A., D. E. Jennings, C. A. Nixon, R. K. Achterberg, P. Lavvas, S. Vinatier, N. A. Teanby et al.
SO: Icarus 207, no. 1 (2010): 461-476.
PB:

TI: High spectral resolution infrared studies of Titan: Winds, temperature, and composition.
AU: Kostiuk, T., Hewagama, T., Fast, K. E., Livengood, T. A., Annen, J., Buhl, D., ... & Achterberg, R.
SO: Planetary and Space Science 58, no. 13 (2010): 1715-1723.
PB:

TI: Radar-bright channels on Titan.
AU: Le Gall, A., Janssen, M. A., Paillou, P., Lorenz, R. D., & Wall, S. D.
SO: Icarus 207, no. 2 (2010): 948-958.
PB:

TI: Titan’s vertical aerosol structure at the Huygens landing site: Constraints on particle size, density, charge, and refractive index.
AU: Lavvas, P., Yelle, R. V., & Griffith, C. A.
SO: Icarus 210, no. 2 (2010): 832-842.
PB:

TI: Capacitively coupled plasma used to simulate Titan's atmospheric chemistry.
AU: Alcouffe, G., Cavarroc, M., Cernogora, G., Ouni, F., Jolly, A., Boufendi, L., & Szopa, C.
SO: Plasma Sources Science and Technology 19, no. 1 (2010): 015008.
PB:

TI: Linear dunes on Titan and earth: Initial remote sensing comparisons.
AU: Radebaugh, J., R. Lorenz, T. Farr, Philippe Paillou, C. Savage, and C. Spencer.
SO: Geomorphology 121, no. 1 (2010): 122-132.
PB:

TI: Far-infrared opacity sources in Titan’s troposphere reconsidered.
AU: De Kok, R., Irwin, P. G. J., & Teanby, N. A.
SO: Icarus 209, no. 2 (2010): 854-857.
PB:

TI: Titan's atmosphere from Cassini-Huygens.
AU: Coustenis, A., Achterberg, R. K., Bampasidis, G., Jennings, D., Nixon, C., Vinatier, S., ... & Flasar, F. M.
SO: 38th COSPAR Scientific Assembly, vol. 38, p. 1374. 2010.
PB:

2011...

TI: Rapid and extensive surface changes near Titan's equator: Evidence of April showers
AU: Turtle, E. P., J. E. Perry, A. G. Hayes, R. D. Lorenz, J. W. Barnes, A. S. McEwen, R. A. West et al.

SO: Science 331, no. 6023 (2011): 1414-1417.
PB:

TI: Huygens (Probe)
AU: Raulin, François.
SO: Encyclopedia of Astrobiology, pp. 773-778. Springer Berlin Heidelberg, 2011.
PB:

TI: Condensation in Titan’s atmosphere at the Huygens landing site.
AU: Lavvas, P., C. A. Griffith, and R. V. Yelle.
SO: Icarus 215, no. 2 (2011): 732-750.
PB:

TI: Fluvial Features on Titan: New Insights from Morphology and Hydraulic Modeling.
AU: Burr, D. M., Adamkovics, M., Baker, V. R., Collins, G. C., Howard, A. D., Irwin, R. P., ... & Black, B. A.
SO: AGU Fall Meeting Abstracts, vol. 1, p. 02. 2011.
PB:

TI: Investigating in laboratory on the impact-induced chemistry and the fate of tholins in Titan surface.
AU: Nna-Mvondo, D., Khare, B. N., McKay, C. P., Juha, L., Navarro-González, R., & Ruiz-Bermejo, M.
SO: EPSC-DPS Joint Meeting 2011, vol. 1, p. 1864. 2011.
PB:

TI: Application of new methane linelists to Cassini and Earth-based data of Titan.
AU: Hirtzig, M., De Bergh, C., Courtin, R., Bézard, B., Coustenis, A., Lellouch, E., ... & Solomonidou, A.
SO: EPSC-DPS Joint Meeting 2011 (Vol. 1, p. 734).
PB:

TI: Insolation and Titan’s Tropospheric Circulation.
AU: Lora, J. M., Goodman, P., Russell, J., & Lunine, J. I.
SO: EPSC-DPS Joint Meeting 2011, vol. 1, p. 176. 2011.
PB:

TI: Linear polarization measurements with clouds of tholins produced by radio-frequency plasma.
AU: Hadamcik, E., Renard, J. B., Carrasco, N., Cernogora, G., Szopa, C., & Lasue, J.
SO: AAPP| Physical, Mathematical, and Natural Sciences 89, no. S1 (2011).
PB:

TI: Characterisation of haze, cloud and surface with VIMS onboard Cassini.
AU: Rannou, P., Le Mouélic, S., Sotin, C., & Brown, B.
SO: EPSC-DPS Joint Meeting 2011, vol. 1, p. 460. 2011.
PB:

TI: Cassini VIMS Measurements of Titan's Surface Albedo; Preliminary Results.
AU: Jake, T., Griffith, C. A., Doose, L., & Penteado, P.
SO: Bulletin of the American Astronomical Society, vol. 43, p. 43503. 2011.
PB:

TI: Insolation in Titan’s troposphere.
AU: Lora, J. M., Goodman, P. J., Russell, J. L., & Lunine, J. I.
SO: Icarus 216, no. 1 (2011): 116-119.
PB:

TI: Surface Chemistry and Particle Shape: Processes for the Evolution of Aerosols in Titan's Atmosphere.
AU: Lavvas, P., Sander, M., Kraft, M., & Imanaka, H.
SO: The Astrophysical Journal 728, no. 2 (2011): 80.
PB:

2012...

TI: An empirical line list for methane in the 1.26-1.71 μm region for planetary investigations (T = 80-300 K). Application to Titan.
AU: Campargue, A., Le Wang, Mondelain, D., Kassi, S., Bézard, B., Lellouch, E., Coustenis, A., de Bergh, C., Hirtzig, M., Drossart, P.
SO: Icarus 219, no. 1 (2012): 110-128.
PB:

TI: Applications of a new set of methane line parameters to the modeling of Titan's spectrum in the 1.58 μm window.
AU: de Bergh, C., Courtin, R., Bézard, B., Coustenis, A., Lellouch, E., Hirtzig, M., Rannou, P., Drossart, P., Campargue, A., Kassi, S., Le Wang, Boudon, V., Nikitin, A., Tyuterev, V.
SO: Planetary and Space Science 61, no. 1 (2012): 85-98.
PB:

TI: The reflectivity spectrum and opposition effect of Titan's surface observed by Huygens' DISR spectrometers.
AU: Karkoschka, Erich, Stefan E. Schröder, Martin G. Tomasko, and Horst Uwe Keller.
SO: Planetary and Space Science 60, no. 1 (2012): 342-355.
PB: Elsevier Ltd (http://www.elsevier.com)

TI: Possible tropical lakes on Titan from observations of dark terrain
AU: Griffith, Caitlin A., Juan M. Lora, Jake Turner, Paulo F. Penteado, Robert H. Brown, Martin G. Tomasko, Lyn Doose, and Charles See.
SO: Nature 486, no. 7402 (2012): 237-239.
PB:

TI: Bouncing on Titan: Motion of the Huygens probe in the seconds after landing.
AU: Schröder, S. E., Karkoschka, E., & Lorenz, R. D.
SO: Planetary and Space Science (2012).
PB:

TI: Photometric Roughness of Titan's Surface Observed by the DISR Cameras on Huygens.
AU: See, Chuck, and E. Karkoschka.
SO: In AAS/Division for Planetary Sciences Meeting Abstracts, vol. 44. 2012.
PB:

TI: The Titan Cassini-Huygens Probe.
AU: Lebreton, J-P.
SO: LPI Contributions 1683 (2012): 1120.
PB:

TI: Titan's Surface Diversity and Ongoing Processes-A Review
AU: Soderblom, Laurence A.
SO: Titan Through Time; Unlocking Titan's Past, Present and Future, vol. 1, p. 27. 2012.
PB:

TI: The surface energy balance at the Huygens landing site and the moist surface conditions on Titan.
AU: Williams, Kaj E., Christopher P. McKay, and Fredrik Persson.
SO: Planetary and Space Science 60.1 (2012): 376-385.
PB:

TI: Two boundary layers in Titan/'s lower troposphere inferred from a climate model.
AU: Charnay, Benjamin, and Sébastien Lebonnois.
SO: Nature geoscience 5, no. 2 (2012): 106-109.
PB:

TI: Prebiotic-like chemistry on Titan.
AU: Raulin, François, Coralie Brassé, Olivier Poch, and Patrice Coll.
SO: Chemical Society Reviews 41, no. 16 (2012): 5380-5393.
PB:

TI: Titan global climate model: A new 3-dimensional version of the IPSL Titan GCM.
AU: Lebonnois, S., Burgalat, J., Rannou, P., & Charnay, B.
SO: Icarus 218, no. 1 (2012): 707-722.
PB:

TI: Re-analysis of the 2003-Nov-14 Stellar Occultation by Titan with New Haze and Methane Optical Constants: Implications for Vertical Structure and Zonal Winds.
AU: Young, E. F., & Zalucha, A.
SO: AAS/Division for Planetary Sciences Meeting Abstracts, vol. 44. 2012.
PB:

TI: Preliminary Results Of Titan's Tropical Surface Albedo Using Cassini Vims Measurements.
AU: Turner, Jake, C. A. Griffith, and P. Penteado
SO: AAS/Division for Planetary Sciences Meeting Abstracts, vol. 44. 2012.
PB:

2013...

TI: New Results on Titan's Atmosphere and Surface from Huygens Probe Measurements
AU: Lorenz, Ralph.
SO: In AAS/Division for Planetary Sciences Meeting Abstracts, vol. 45. 2013.
PB:

TI: Titan's surface and atmosphere from Cassini/VIMS data with updated methane opacity.
AU: Hirtzig, M., Bézard, B., Lellouch, E., Coustenis, A., de Bergh, C., Drossart, P., ... & Le Mouélic, S.
SO: Icarus 226 (2013): 470-486.
PB:

TI: Rocks and Dust in the Planetary Neighborhood.
AU: Kwok, Sun.
SO: Stardust, pp. 11-23. , 2013.
PB: Springer Berlin Heidelberg

TI: The Atmospheric Transmission and Surface Composition of Titan.
AU: Clark, Roger N., N. Pearson, R. H. Brown, D. P. Cruikshank, J. Barnes, R. Jaumann, L. Soderblom et al.
SO: AAS/Division for Planetary Sciences Meeting Abstracts, vol. 45. 2013.
PB:

TI:
AU:
SO:
PB:

TI:
AU:
SO:
PB:

TI:
AU:
SO:
PB:

TI:

AU:
SO:
PB: