Science Mission Overview

VEX-RSSD-PO-001_9_0_Science_Poster_Nominal_MTP001_MTP019_2007Jan08.cdr

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Raymond Hoofs
Space Science Department
ESA/ESTEC
Raymond.Hoofs@esa.int

LTAN = Local Time of Ascending Node

LTAN = 0h or 12h - orbit is perpendicular to terminator

LTAN = 6h or 18h - orbit is parallel to terminator

Start of science: May 14 2006, DOY 134, Orbit nr. 23

LTAN	Date	DOY	Orbit nr.
15 h	May 20 2006	140	29
18 h	June 20 2006	171	60
21 h	July20 2006	201	90
0 h	August 17 2006	229	118
3 h	September 14 2006	257	145
6 h	October14 2006	287	176
9 h	November 9 2006	DOY 313\	201
12 h	December 7 2006	341	230
15 h	January 3, 2007	3	257
18 h	February 1, 2007	32	286
21 h	March 1, 2007	60	315
0 h	March 29, 2007	88	341
3 h	April 26 2007	116	370
6 h	May 31, 2007	145	399
9 h	June 23, 2007	174	428
12 h	July 22, 2007	203	457
15 h	August 19, 2007	231	485
18 h	September 15 2007	258	512
21 h	October 14, 2007	287	541

Viewing direction perpendicular to orbit plane

Viewing direction in line with orbit plane (as seen from S/C)

S/C HK data-rate

Total data-rate

Downlink data rate (Kbits/second): 160, 140, 120, 100, 80, 60, 40, 20

May 14 2006 Case Commissioning

May 24 2006 Extended Case Commissioning

CC | ECC | phase 1 | phase 2 | phase 3 | phase 4 | phase 5 | phase 6 | phase 7 | phase 8 | phase 9

phase 1: - Morning/Evening terminator

phase 2: - Nightside dynamic (ascending branch) - Dayside dynamics (descending branch) - Earth Occultations - Solar Occultations

phase 3: - Systematic study of morning/evening sectors - Solar Corona studies

phase 4: - Dayside dynamics (ascending branch) - Nightside dynamic (descending branch) -Earth occultations Solar occultations

phase 5: - Morning/Evening terminator

phase 6: - Nightside dynamic (asc. branch) - Dayside dynamics (desc. branch) - Solar Occultations

phase 7: - Systematic study of morning/evening sectors - Earth Occultations - Bi-static Sounding

phase 8: - Dayside dynamics (ascending branch) - Nightside dynamic (descending branch) - Solar occultations - Bi-static Sounding

phase 9: - Systematic study of morning/evening sectors - Solar Corona - Bi-static Sounding

Sunday June 4 2006 Orbit 44 Start Nominal Science Operations

Phase Correction 1 Orbit 64 June 24, 2006

Pericentre Change 1 Orbit 119 (VPER) & 126 (VAPO) August 19 & 25, 2006

NORTH Flag from False to True Orbit 125 August 24, 2006

Phase Correction 2 Orbit 182 October 20, 2006

NORTH Flag from True to False Orbit 236 December 13, 2006

Pericentre Change 2 Orbit 238 (VPER) & 245(VAPO) December 15 & 22, 2006

Phase Correction 3 Orbit 287 February 2, 2007

Venus Meteors March 13, 2007 - Orbit 326; March 16, 2007 - Orbit 329; March 18, 2007 - Orbit 331; March 25, 2007 - Orbit 338

Phase Correction 4 Orbit 330 March 17, 2007

NORTH Flag from False to True Orbit 349 April 5, 2006

Pericentre Change 3 Orbit 378 (VPER) & 385 (VAPO) May 4 & 11, 2007

10 deg illumination on +Y

Messenger Flyby Orbit 411 June 6, 2007 (VPER) (fly on June 5, 2007)

Switch HGA1 to HGA2 Orbit 409 June 4, 2007

Phase Correction 5 Orbit 421 June 16, 2007

Venus Meteors July 1, 2007 - Orbit 436

Drift Begin (pericentre) Orbit 455 July 20, 2007

NORTH Flag from True to False Orbit 461 July 26, 2006

Phase Correction 6 Orbit 484 August 18, 2007

Drift End(pericentre) Orbit 518 September 21, 2007

End of Nominal Mission Orbit 530 October 2, 2007

548

Timebar (Orbit numbers. Starts counting from capture orbit): 23 … 548

Calender weeks: 20 … 42

Calender months / Calender days: May 2006 … October 2007

Day of Year (DOY)

MTPs: MTP001, MTP002, MTP003, MTP004, MTP005, MTP006, MTP007, MTP008, MTP009, MTP010, MTP011, MTP012, MTP013, MTP014, MTP015, MTP016, MTP017, MTP018, MTP019

Eclipse

End of Eclipse Season Eclipse 41 Orbit 40 May 31, 2006

Start of Eclipse Season Eclipse 42 Orbit 107 August 6, 2006

End of Eclipse Season Eclipse 80 Orbit 145 September 13, 2006

Start of Eclipse Season Eclipse 81 Orbit 209 November 16, 2006

End of Eclipse Season Eclipse 136 Orbit 264 January 10, 2007

Start of Eclipse Season Eclipse 137 Orbit 330 March 17, 2007

End of Eclipse Season Eclipse 177 Orbit 370 April 26, 2007

Start of Eclipse Season Eclipse 178 Orbit 434 June 29, 2007

End of Eclipse Season Eclipse 231 Orbit 487 August 21, 2007

Earth occultation

Start of Earth Occ. Season Earth Occ. 2 Orbit 81 July 11, 2006

End of Earth Occ. Season Earth Occ. 52 Orbit 131 August 30, 2006

Start of Earth Occ. Season Earth Occ. 53 Orbit 215 November 22, 2006

End of Earth Occ. Season Earth Occ. 123 Orbit 285 January 31, 2007

Start of Earth Occ. Season Earth Occ. 124 Orbit 370 April 26, 2007

Start of Earth Occ. Season Earth Occ. 190 Orbit 436 July 1, 2007

Start of Earth Occ. Season Earth Occ. 124 Orbit 501 September 4, 2007

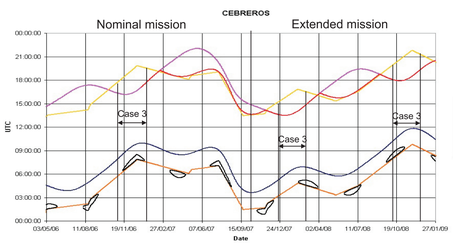
Start of Earth Occ. Season Earth Occ. 190 Orbit 515 September 18, 2007

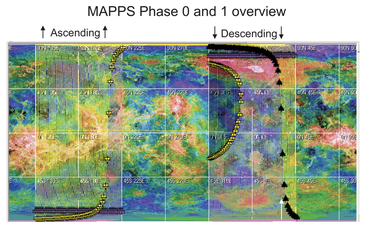
Solar opposition

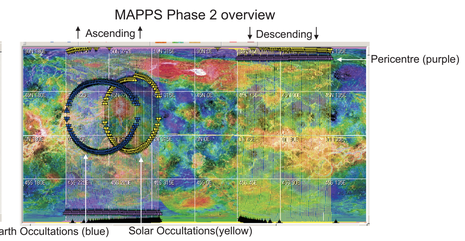
Start of Superior Conjunction SCDS 2 Orbit 179 October 17, 2006

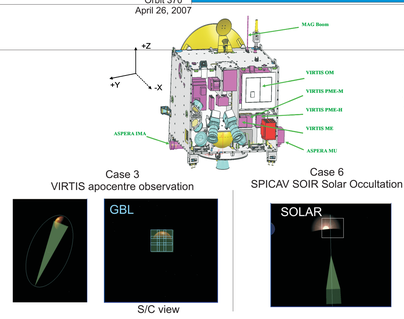
End of Superior Conjunction SCDE 2 Orbit 201 November 8, 2006

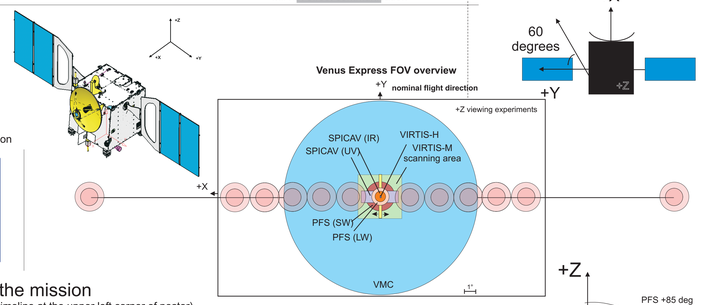
Note: inferior conjunction will not effect communication

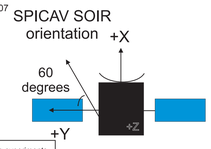


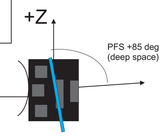








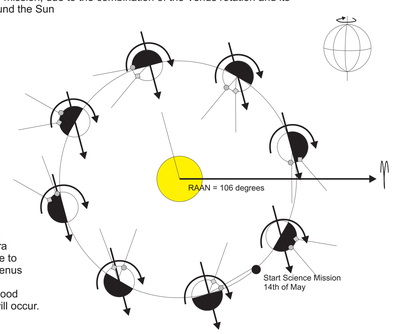




Venus siderial day = 243 days
Venus solar day = 117 days
Venus Year = 225 days
VEX orbit season = 225/4 = 56,25 days

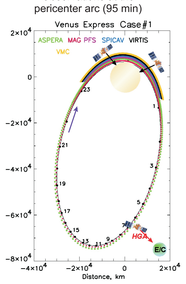
The figure below shows the movement of the Venus Meridian during the mission.
The meridian is indicated as a cirle for the first and as a square for the second Venus orbit around the Sun.
The Venus meridian is defined by the Ariadne Crater (within Ishtar Terra area longitudes)
Opposite to other planets Venus rotates clockwise

Note: an area on the Venus surface can only be observed in specific conditions (especially for high latitudes), either day, night or terminator during the complete mission, due to the combination of the Venus rotation and its orbit around the Sun

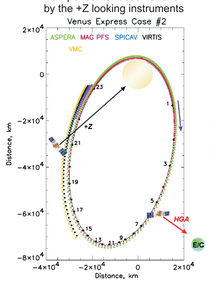


As the meridian is located in the middle of Ishtar Terra Venus Express will be able to observe this area at the Venus night side at arrival.
Also it seems that some good terminator opportunities will occur.

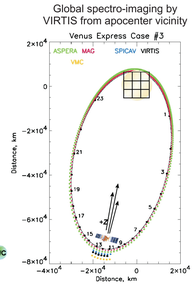
Observations at the pericenter arc (95 min)



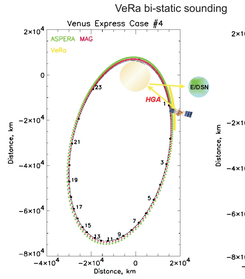
Off-pericenter observations by the +Z looking instruments



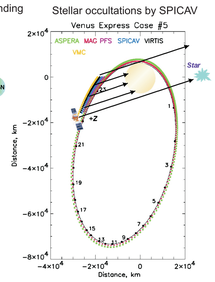
Global spectro-imaging by VIRTIS from apocenter vicinity



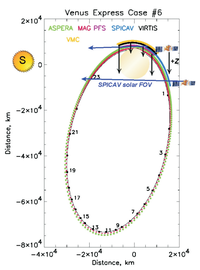
VeRa bi-static sounding



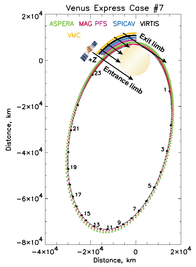
Stellar occultations by SPICAV



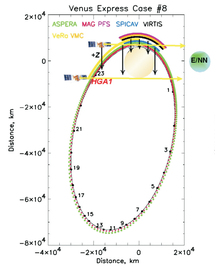
Solar occultations by SPICAV / SOIR



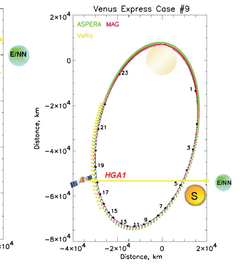
Limb observations



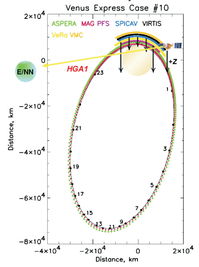
Earth radio occultations by VeRA



VeRA sounding of solar corona in conjunctions

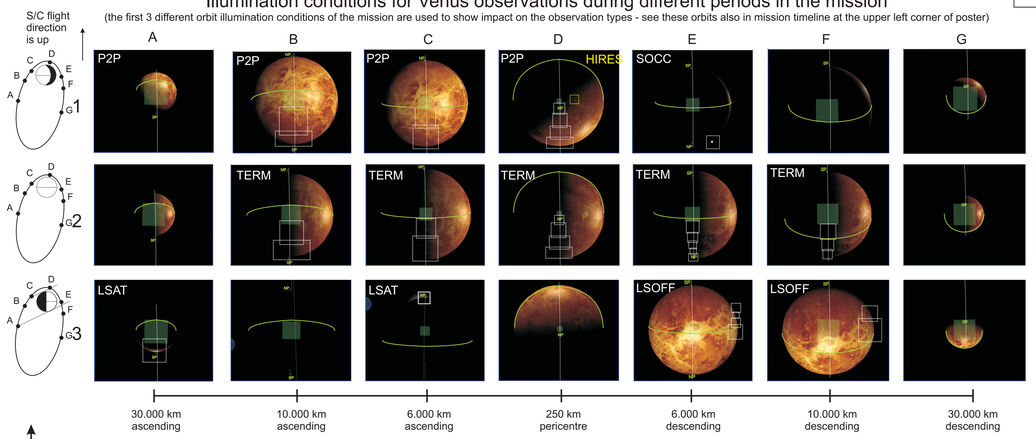


Study of the Venus gravity field anomalies by VeRa



Illumination conditions for Venus observations during different periods in the mission

(the first 3 different orbit illumination conditions of the mission are used to show impact on the observation types - see these orbits also in mission timeline at the upper left corner of poster)



The black dots in orbit (indicated by letter A, B, etc.) show observation points of images.
The black line from the 3rd orbit at point A and C shows inertial pointing for the limb observations

Clarification of figures
FOV visualisation (FOV dimensions = 15 degrees)
Green centred FOV is active FOV at that time in orbit
White FOVs are previously taken measurements (for P2P and TERM)
In case actual FOV is not NADIR (as for SOCC, SOLAR, LSAT and LSOFF) then white FOV is also active FOV for that observation type.
HIRES is yellow and shows active FOV.
GBL is visualised using blue FOV of 5 degrees to demonstrate mosaic.