Venus Express
Present Status
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ESA/ESTEC
Mission Status (1)

- The spacecraft is in an excellent condition and the fuel and power situation is very good.
- The excess friction in two reaction wheels has now stabilised at a safe level
- More than 3.5 Tbit of science data has now been downloaded to ground
- 10 earth occultation season have taken place so far. Typically radio science observations have been carried out every 1-3 orbits
- The 5th atmospheric Drag campaign finished 3 June 2011. A set of 15 data points down to an altitude of 165km have been sampled. There seems to be a periodicity of about two days in the data, with every second day higher and every other second day lower density.
Mission Status (2)

- On Sunday 5 June the star trackers lost track due to a high background noise level. Switching to the backup star tracker showed the same problem. Later it was found that also the error correction count from the EDAC on the CDMU was increasing dramatically during the same time. An extraordinary high background count was seen by ASPERA at the same time. This was most likely caused by a Solar flare.

- The study of the aero-braking with Astrium has finished. Astrium have identified a feasible case, with adequate margins, to go to 0.3-0.4 N/m2. A final presentation was given 6-6-2011.

- The data archive (PSA) has seen a dramatic improvement during the last year. Most teams are now up to date and serious research based the archived data can now be performed. Virtis is almost there…
Venus Express Science Data Archive Status
August 31st 2011

- VMC Level 3
- VIRTIS
- VeRA
- SPICE
- SPICAV-SOIR Level 3
- SPICAV-SOIR Level 2
- SPICAV
- MAG Level 4
- MAG Level 3
- MAG Level 2
- ASPERA

Legend:
- Green: Data Released
- Yellow: Data Delivered / To Be Ingested Soon
- Red: Data Available via FTP

Dates:
- Dec-05
- Jun-06
- Dec-06
- Jun-07
- Dec-07
- Jun-08
- Dec-08
- Jun-09
- Dec-09
- Jun-10
- Dec-10
- Jun-11
Mission Extension

• The Venus Express mission, together will all other ten missions up for extension, were extended to end of 2012 unconditionally, and to end of 2014 pending a technical review of the spacecraft capability in 2012.
• SPC and both advisory committees (SSEWG and SSAC) strongly commended all teams for the high quality of the missions and for the good work performed in preparing the cases for the extension.
• We did however get a fairly low ranking compared to the other missions, much because of the comparatively low number of publications. I tried to emphasise that the Venus community is becoming “born again” after a long era of no new data and no missions to Venus. It will be important in the near future to demonstrate that the community continues to grow and that the publication rate increases. We shall try different ways to achieve this. One way may be to organise data analysis workshops to encourage more scientists, also from neighbouring disciplines, to look at and work on data from Venus Express.
Atmospheric Measurements at 200-165 km

• The drag and torque measurements that have been carried out during several campaigns have been very successful and will continue when the opportunity arises again.

• The torque measurements have turned out very useful, with a strongly enhanced sensitivity to atmospheric density, while tilting one solar panel against the “wind” and one solar panel parallel to the “wind”. Information is provided by the reaction wheels. This provides data not only on the maximum density during the atmospheric pass but a detailed resolved track during the part of the trajectory where the altitude is below about 200 km.

• A slightly lower pericenter altitude than the last (165 km) will allow the use of the on board accelerometers for further improvement in these spatially resolved measurements.
Density from torque measurements ADE#5

Alt [km]

Density [kg/m³]

August 2011

VEXAG meeting #9
Density from torque measurements ADE#5

Date

28/04/2011  29/04/2011  02/05/2011  05/05/2011  08/05/2011  11/05/2011  14/05/2011  17/05/2011  20/05/2011  23/05/2011  26/05/2011  29/05/2011  01/06/2011  04/06/2011

Density [kg/m^3]


August 2011 VEXAG meeting #9
Density from Torque measurements ADE4

Date

Density 10-12 kg/m3
Aerobraking principle

- Thruster Transition Mode
- Atmosphere crossing (around pericentre)
- Slew manoeuvre (in Normal Mode)
- Slew manoeuvre (in Normal Mode)
- Flight direction
- Earth/Sun pointing

Venus Express orbit

August 2011
Pericentre altitude natural evolution
Aerobraking – most favourable case

Pericenter Argument = 82.5°

Venus Express orbit (almost polar)

Sun with low incidence with respect to SA plane and –Z_{S/C} face

VEX in aerobraking attitude close to the pericentre
Aerobraking study

Allowed Peak aerothermal flux (W/m²)

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<th>Thermal constraint due to the MLI</th>
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</table>

Note (1): Depending on the plateau the sun will be illuminating the back side of the SA either at the beginning or at the end of the plateau.
Thermal constraints

Margin due to atmosphere variability (τ)

Target aerodynamic pressure
(or target aerothermal flux)

Peak aerothermal flux (W/m²)

Φₐero_max (3000)

Φcorr_max (2300)

Φcorr_min (1000)

Corridor upper limit
Corridor lower limit

Aerobraking corridor

Limit for mandatory pericentre raising
Φrising = 90% of Φaero_max

τ = 10% (1σ)
Required delta-v for orbit reduction

- 24h-18h  90 m/s
- 18h-16h  42 m/s
- 16h-12h  118 m/s
- 24h-12h  250 m/s
What can we achieve?

- 3000 w/m² → 0.3 N/m² → 0.6 m/s
- 4000 W/m² → 0.4 N/m² → 0.8 m/s

- Each plateau ~30 days

- 18h → 90 m/s → ~150 days → ~5 plateaus Difficult!
- Can we do aerobraking in between plateaus?
- Can we operate at higher heat fluxes?
- What can we achieve by combining aerobraking and thruster activity?
- Study in progress.
- A technical review will take place on 5 September
Publications

• The cumulative number of refereed publications related to Venus Express is now approximately 222. Another 25 papers have been submitted, several of which already accepted.

• Special Issue:
  – 24 papers originating from the ESLAB 2009 meeting.
Upcoming meetings/events

• Atmospheric waves workshop: Venus, Earth, Mars
  – Date: November 9-10 ESTEC, Noordwijk, NL
  – Org. Arianna Piccialli, (H. Svedhem, D. Titov)

• SWT #27
  – Graz, Austria, 16-18 November (Host: MAG team)

• SWT #28 & Venus transit
  – Svalbard (Spitsbergen), 4-7 June 2012
Looking due North,
Longyearbyen, midnight 6 June 2012