Towards the Continuity of SPOT/ Vegetation

PROBA V(egitation) Mission

Belgian Earth Observation Day 2010
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5. Conclusion
1. PROBA-V Mission
Spot Vegetation

Since 1998 SPOT 4 and since 2002 SPOT 5, CNES satellites, fly the VEGETATION instrument.
Its provide since then daily images of the land vegetation to a large number of Users Worldwide.
Belgium has been since the beginning deeply involved in the Vegetation Program.
The various products, the daily images and the 10 days synthesis, is processed and distributed from the VITO Institute located in Mol (B).
The SPOT 4 and SPOT 5/Vegetation end of life is now planned end 2012.
Continuity is needed to provide Users with similar data.

➡️ The Belgium Science Policy and ESA have started the PROBA-V Mission in 2008
The Primary objective of the PROBA-V mission is to **continue the generation of Vegetation products.**

The PROBA-V mission is developed in the frame of the ESA General Support Technology Program (GSTP) within the ESA In Orbit Demonstration Program under the Technology and Quality Directorate Management.

The Contributors to PROBA-V mission are Belgium (>98%), Luxembourg and Canada.

PROBA-V will be the successor of PROBA-1 in orbit since Oct’2001 operated no by the Earth Observation ESA Directorate and PROBA-2 in orbit since Nov ‘2009 that will be transfer soon to the Science ESA Directorate.
Objectives:

MR-001: Main mission objective
To perform remote sensing for the vegetation observation on the Earth surface

MR-002: Secondary mission objective
The PROBA-V mission shall include the possibility to fly two technology demonstration payloads.

MR-003: Service continuity
Operations shall start in the 2012 timeframe (SPOT Vegetation Continuity)

MR-005: Mission lifetime
A nominal operational mission life of 2.5 year with extension up to 5 years

Spatial requirements:

MR-012: Mandatory GSD VNIR and SWIR
GSD shall not be greater than 1 km (SPOT performances)

MR-013: Design Goal GSD VNIR
GSD should not be greater than 1/3 km for VNIR
GSD should not be greater than 2/3 km for SWIR

Coverage:

MR-006: Daily Coverage
A daily coverage shall be guaranteed for
1) Latitudes between 35 degrees and 75 degrees North
2) Latitudes between 35 degrees and 56 degrees South

MR-007 Coverage
Coverage every two days shall be guaranteed for latitudes between 35 degrees North to 35 degrees South
In continuation of SPOT, the PROBA-V mission will continue to offer two main products, primary products (P) and synthesis products (S).

- **Primary products (P):** extracts of a segment along a single orbit
- **Synthesis products (S):** merged segments (mosaic of P products).
- **Two types:** a daily (S1) and a 10-daily product (S10).

The products will be delivered to the Users on:
- a **1km** grid (like SPOT/Vegetation) and
- a **1/3 km** grid (improved Vegetation data)
Flight Segment and Ground Segment

User Segment

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European Space Agency
Agence spatiale européenne

PROBA-V Mission
Chaudfontaine (B), 6 May 2010

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Thursday 6 May 2010
Flight Segment and Ground Segment

Phase B:
✓ Kick-off January 2009
✓ System Requirements May 2009
✓ Preliminary Design Review September 2009

Phase C/D:
✓ Kick-off December 2009
➡ Subsystems CDR March to June 2010
➡ System CDR September 2010
➡ Integration Readiness Review December 2010
➡ Payload Delivery July 2011
➡ Flight Acceptance Review January 2012

User Segment

Phase B:
✓ Kick-off August 2009
✓ System Requirements Review October 2009
✓ Preliminary Design Review April 2010

Phase C/D:
➡ Kick-off May 2010
➡ System CDR December 2010
➡ System Deployment July 2011
➡ Operational Readiness Review January 2012

Launcher

Target Launch date in Q1 2012

Backup Launchers (in negotiation):
Soyouz from Kourou (piggy back on Pleyade 1B)
Falcon 1E (dedicated launch)
Russian Launcher (TBD)

Main Launcher:
Vega (dedicated launch TBC)
2. PROBA-V Satellite
The Main driver for the satellite design are:

- ✓ Recurrent from PROBA-2 (small platform of about 120kg)
- ✓ Allocation for
  - ➡ Vegetation instrument
  - ➡ Two technology demonstrators
- ✓ Design lifetime of 2.5 years with appropriate margin philosophy
- ✓ Single failure tolerant at spacecraft level
- ✓ System availability goal of 95%
- ✓ VEGA as primary launcher + back-up launcher (TBD)
- ✓ Late integration of payload
Orbit selection based on SPOT/Vegetation:

Mission Requirements:

➡️ 100% daily coverage above 35° and below -35°
➡️ 100% two-daily coverage
➡️ 90% daily coverage of equatorial zones
➡️ Minimum swath width of 2250 km
➡️ LTDN between 10:30-11:30 AM

From these requirements the following orbital parameters have been chosen:

➡️ Orbit parameters:
➡️ Altitude: 820 ± 10 km (launcher dispersion)
➡️ Eccentricity: 0
➡️ Inclination: SSO + 0.1° (TBC with Launcher Authority)
PROBA-V Platform Characteristics

- Mass: 160 kg
- Dimensions: 765x730x840 mm³
- Three axis-stabilised
- Body mounted Solar Array
- Platform H-structure
- Vegetation Instrument 35kg

SPOT-5 Platform Characteristics

- Mass: 3000 kg with
- Vegetation Instrument 120kg
3. Vegetation Instrument
Driver Requirements

- Field of View 102.6°
- Swath width: 2250 km at 800 km altitude
- Ground Sample Distance: 1km and 300m
- VNIR Ground Sampling Distance is 100 m in centre, 350 m at edge
- SWIR Ground Sampling Distance is 200 m in centre, 700 m at edge
VNIR DETECTOR: quadrilinear fro E2V

- 4 VNIR bands 6000pix/band – 13µ x 13µ
- 3 bands used

**Filters:**
- Blue 447 – 493 nm
- Red 610 – 690 nm
- NIR 777 – 893 nm

SWIR DETECTOR (ESA GSTP development)

- 1570 – 1650 nm
- Supplier XenICs
- 3 x 1024 newly developed; 25µ x 25µ
- mechanically butted
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Conclusion

- By end 2012 SPOT/Vegetation data production will be discontinued
- PROBA-V is under development to provide continuity of the Vegetation data equivalent to SPOT/Vegetation data (1km and spectral bands)
- Thanks to new technologies, improved data spatial resolution up to 1/3 km will be distributed to Users.
- PROBA-V needs to be in orbit by early 2012 to be fully commissioned by end 2012.
- PROBA-V new developments cover the Flight Segment, the Vegetation Instrument and the User Segment

➡ The project is on track to meet these challenging objectives.
Thank you for your attention