



News on Image Acquisition for Campaign 2008

Outline of presentation

- Roadmap - where are we ?
- VHR sensor menu
- VHR summary issues
- VHR type of window • HR sensor menu
- HR summary issues
- Documentation and References
- WorldView1 – initial assessment

[Formosat2: © NSPO [2007], Distributed by SPOTImage]



WorldView1 "Distributed by EURIMAGE S.p.A. © DIGITALGLOBE [2008]"

• Roadmap to Image Acquisition Campaign 2008

- Selection of Control Zones and Risk Analysis

- ⑨ responsibility GEOPAC - guidelines

- MS Satellite Image Requirements for the 2008 Campaign

- ⑨ responsibility GEOPAC - letter plus Annex

- Delivery of generalised shapefiles, and further details

- ⑨ responsibility CID CID

- ⑨ templates filled in by MS and received by CID

- Technical and Competitive Feasibility

- ⑨ responsibility CID January-March

- ⑨ communication and acceptance by MS Administration March 2008

- Image Acquisition Campaign start...

- ⑨ indeed already started

- ⑨ autumn/winter, HR-1, VHR

Where we are...

VHR sensor menu; dedicated acquisition

| VHR Sensor | Products | GSD [m] | Swath (at nadir) | Approx Capacity [km2] in a Dedicated scenario | Proposed role | Comments / Constraints |
|------------|---------------------------------|-----------|------------------|--|---------------|--|
| IKONOS | PAN, MSP (4 bands), PANMERGE | 1 / 4 | 11,3 | 120.000 | PRIME | most efficient site 30x30, but may be larger up to 40x60km ; capacity will be forced |
| QUICKBIRD | PAN, MSP (4 bands), PANMERGE | 0,6 / 2,4 | 16,5 | 30-40000 | PRIME | to be within 1 fragment 14 km max width, most efficient size 12x30km |
| EROS A | PAN | 1,8 | 14 | 10.000 | BACKUP (*) | most efficient site 13x25km (or longer) |
| EROS B | PAN | 0,7 | 7 | 30.000 | BACKUP (*) | most efficient site 26x28km |
| SPOT5 | SPS PAN supermode | 2,5 | 60,0 | 25.000 | BACKUP (*) | acquisition of SPS PAN and SPOT 5 MSP is possible in same pass |
| F2 | PAN, MSP (4 bands), PANMERGE | 2 | 24 | 5.000 | BACKUP | resolution at off-nadir angle 30deg approx 3m ; across angle max 20deg. ; along angle max 25 deg. ; capacity should be seen together with HR backup sum 15.000 |
| WorldView1 | PAN | 0,5 | 17,6 | 10.000 | BACKUP (*) | ongoing geometric accuracy testing |
| SUM PRIME | | | | 150.000 | | |
| SUM BACKUP | | | | 80.000 | | |

(*) - can be coupled with HR (SPOT 5, F2) to obtain MSP component over VHR window

Technical constraint ! approx. 170.000 required...

VHR; summary issues for the Campaign

- prime dedicated (Ikonos, Quickbird)
 - > sites > area(km²) cf. 2007: 264/170.300 (cf. 223/153.00)
- late VHR acquisition allows archive HR search (case by case basis)
- backup sensors (Eros A, Eros B, WorldView1, Formosat2 (F2) and Spot5 supermode (SPS))
- backup procedures changed:
 - backup placed on zones where feasibility assessment with prime sensors failed, or where they declared “high” difficulties
 - backup window opens 10 days after dedicated prime window
 - if only PAN backup programmed, extra Spot 5 MSP programmed over window (this Spot5 HR has priority over any overlapping HR windows) – backup closure if prime collects (= 2007)
 - flexible use of backup; re-programme closed backup on other zone where necessary (5 days delay for reprogramming)
 - window ending without prime dedicated, but with backup PAN and MSP => window closure and concentration on other targets
 - extension OK (if control procedure allows) if no backup, or no acquisition at end of window
- haze flag = 2007
- series of proposed accepted => gives all proposed uploads

VHR; summary issues continued...

- exclusion of OrbView3 (not functioning since March 4, 2007)
- EROS B
 - larger use in 2008 sum Eros A/B 22.000 km² planned (cf. 12.000 acquired in 2007) – no orthorectification by JRC in 2008
 - sw suites Socet Set version 5.4.1, Erdas IMAGINE 9.2 (LPS) and PCI Geomatica 10.1.1
- F2
 - larger use in 2008 7.500 km² planned (cf. 5.500 acquired in 2007)
 - panchromatic, or bundled, or pansharpened(*) [(*) - ongoing check with SPOTImage]
 - no orthorectification by JRC in 2008
 - sw suites Socet Set, PCI Geomatica, Erdas Imagine 9.1 with fix 33599 or Erdas IMAGINE 9.2, Keystone SIPOrtho, Prodigeo
 - JRC assessment paper; 2008 leave 5m RMSE(1_D), restriction across/along angle 20/25, pixel size ≈ Spot SPS
- WorldView1 (launched 18/09/2007)
 - test in Campaign 2008; 6000 km² programmed (5 sites)
 - ongoing geometric accuracy assessment Erdas, PCI, SIPOrtho [see end of presentation]

VHR; type of windows

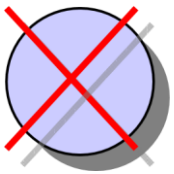

| <i>VHR type of window - CwRS Campaign 2008</i> | | |
|--|---|--|
| DEDICATED PRIME SENSOR | IKONOS or QUICKBIRD | IKONOS or QUICKBIRD |
| BACKUP | N | Y |
| DEDICATED BACKUP SENSOR | n/a | F2 (BUNDLE or PANMERGE); EROS A,B (PAN); WORLDVIEW1 (PAN); SPS (PAN) opens 10 days later than dedicated prime window |
| HR SENSOR IN VHR WINDOW | if VHR acquisition late possible archive HR search for earlier MSP component | SPOT5 MSP (if dedicated backup sensor is ≠ F2) |
| EXTENSION | possible if no acquisition at window end | only possible if no prime, no backup (incl. MSP HR) |

HR sensor menu; 1st come 1st served acquisition

| HR Sensor | Products | GSD [m] | Swath width (at nadir) | Approx Capacity [scenes or km2] in a 1st come 1st served scenario; mean "winners" plus uploaded "losers" | Proposed role |
|---------------|----------------------------------|---------|------------------------|--|--|
| SPOT 2 | MSP 3 bands (no SWIR) | 20 | 60 | 160 ; plus approx 70 ; sum 230 | autumn, winter, HR-1, HR+1, HR+2 |
| SPOT 4 | MSP 4 bands (incl. SWIR) | 20 | 60 | 210 ; plus approx 80 ; sum 290 | autumn, winter, HR-1, HR+1, HR+2 |
| SPOT 5 | MSP 4 bands (incl. SWIR) | 10 | 60 | 200 ; plus approx. 50 ; sum 250 | autumn, winter, HR-1, HR+1, HR _{VHR} , HR+2 |
| IRS P6 | MSP 4 bands (incl SWIR) | 23,5 | 127 - 141 | 40 ; plus approx. 50 ; sum 90 | autumn, winter, HR-1, HR+1, HR+2 |
| Landsat 5 | MSP 7 bands | 30 | 183 | 40 ; plus approx. 60 ; sum 100 | autumn, winter, HR-1, HR+1, HR+2 |
| F2 | MSP 4 bands (incl. BLUE) | 8 | 24 | 10000 km2 ; approx 15 scenes / window gives approx. 45 | HR _{VHR} |
| DMC | MSP 3 bands (Landsat 2,3,4 like) | 32 | 325 | 5 ; plus approx. 5 ; sum 10 | autumn, winter, HR-1, HR+1, HR+2 |
| ALOS - AVNIR2 | MSP 4 bands (incl. BLUE) | 10 | 70 | unknown | HR - archive searches |
| SUM | | | | 1015 | |

Economic constraint ! No technical capacity constraint !

HR; summary issues for the Campaign

- no circles / only shapes defining control zones  
- window naming HR-1, HR+1, HR+2..., dead period or earliest opening date
- HR-1 closes latest when VHR (aerial, satellite) opens
- radar no
- HR archive search if late VHR
 - possibility to use ALOS; AVNIR-2 orthorectification module; PCI Geomatica v 9.1 onwards
- semi automatic orthorectification (DE, LT; bilateral contacts)

Documentation and Referencing

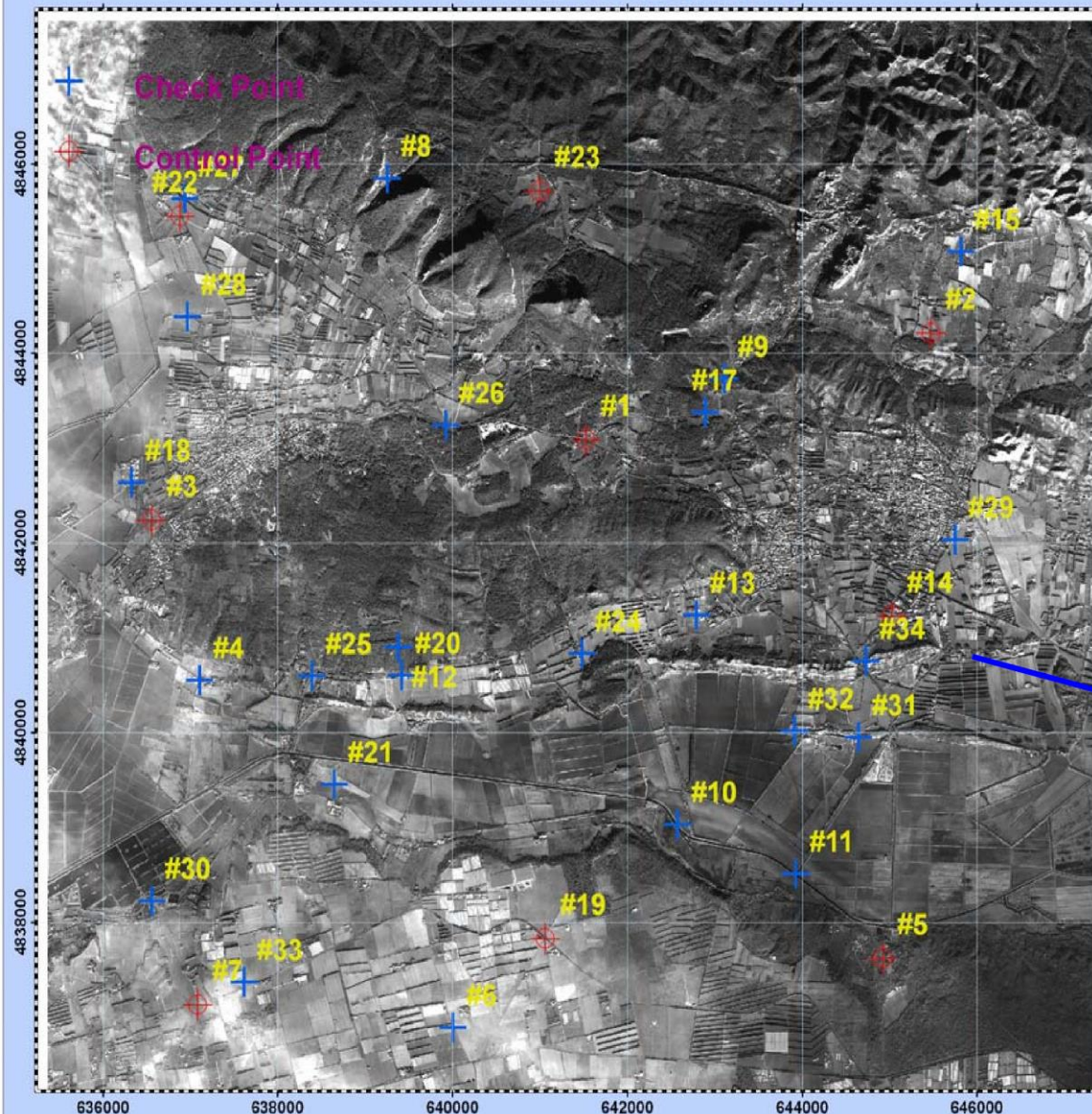
Documents on the image acquisition workflow and rules:

- VHR Image Specifications for the CwRS Programme
 - [ref JRC IPSC/G03/C/PAR/ D(2008)(9268)]
 - red / blue text
- HR Specifications for the CwRS Programme
 - [2008 Campaign [ref JRC IPSC/G03/C/PAR/ D(2008)(9269)]
 - new issues, and important issues from old recommendations -> 1 document
- wiki CAP
- LIODOTNET manuals – being updated

WorldView-1 Image Geometric Correction

- Image
 - Image_1 WV1 ORStandard LV_2A, Geo-TIFF, UTM 31N
 - Image_2 WV1 Basic LV_1B, No projection
 - Date, 2008-01-15, Mean Off Nadir View Angle 34.5°, winter image (low sun angle) – Location Mausanne, France
- Digital Elevation Model– DEM; produced from ADS40, UTM 31 WGS 84, GSD 2m, RMSE_z ≤ 0.6m
- GCPs and CPs
 - 9 GCPs, Origin Vexcel QC project ; GPS points [x, y, z] accuracy ≤ 10 cm ()
 - 24 CPs
- 11 from Vexcel QC project
- 4 from ADS40 QC project ([x, y, z] accuracy ≤ 10 cm)
- 9 from Vexcel ortho-corrected image GSD 0.5m – Software & Geometric Correction Models
- ERDAS IMAGINE 9.2
 - QuickBird RPC model
 - QuickBird/WorldView - Orbital Pushbroom model • PCI (still being tested)

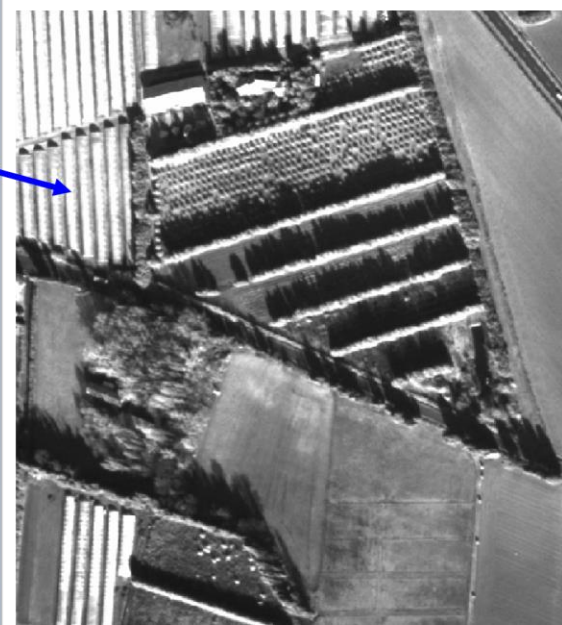
GCPs and CPs distribution



- Date, 2008-01-15, Mean Off Nadir View Angle 34.5°
- Location Maussane, France
- Resolution 0.5m

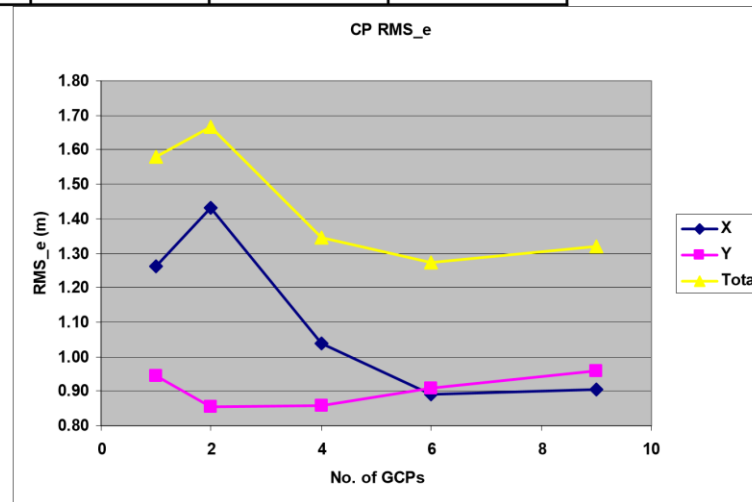
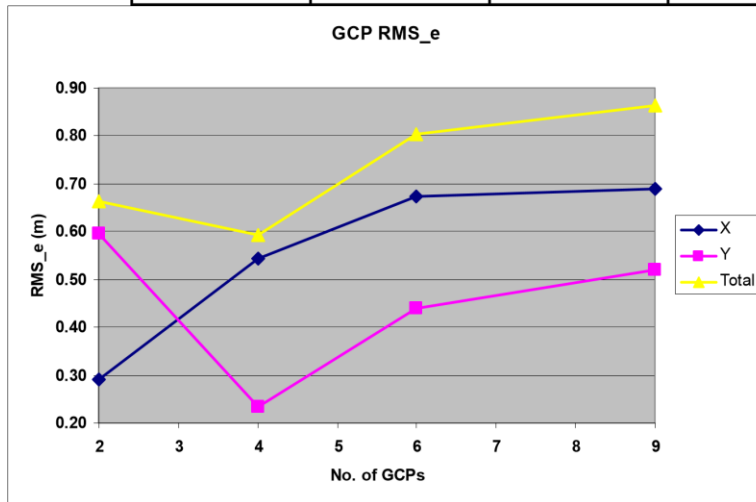
RMS_e of Standard_LV2A

| Sd_LV2A | RMS_e (m) |
|---------|-----------|
| X | 34.23 |
| Y | 6.97 |
| Total | 34.93 |



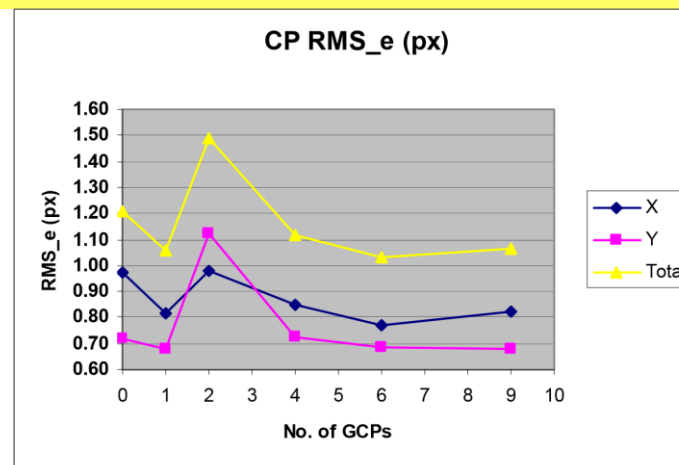
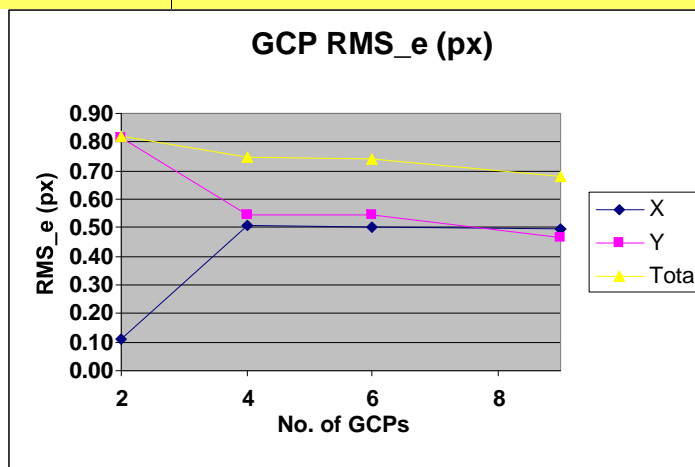
ORStandard2A Geometric corrected by QB RPC

| No. of GCPs | GCP RMS_e (m) | | | CP RMS_e (m) | | |
|-------------|---------------|------|-------|--------------|------|-------|
| | X | Y | Total | X | Y | Total |
| 9 | 0.69 | 0.52 | 0.86 | 0.90 | 0.96 | 1.32 |
| 6 | 0.67 | 0.44 | 0.80 | 0.89 | 0.91 | 1.27 |
| 4 | 0.54 | 0.23 | 0.59 | 1.04 | 0.86 | 1.35 |
| 2 | 0.29 | 0.60 | 0.66 | 1.43 | 0.86 | 1.67 |
| 1 | 0.00 | 0.00 | 0.00 | 1.26 | 0.95 | 1.58 |



Basic LV1B Geometric corrected by QB/WV Rigorous Model

| No. of GCPs | RMS_e (px) GCP | | | RMS_e (px) CP | | |
|-------------|----------------|------|-------|---------------|------|-------|
| | X | Y | Total | X | Y | Total |
| 9 | 0.50 | 0.47 | 0.68 | 0.82 | 0.68 | 1.07 |
| 6 | 0.50 | 0.55 | 0.74 | 0.77 | 0.68 | 1.03 |
| 4 | 0.51 | 0.55 | 0.74 | 0.85 | 0.72 | 1.12 |
| 2 | 0.11 | 0.81 | 0.82 | 0.98 | 1.12 | 1.49 |
| 1 | 0.00 | 0.00 | 0.00 | 0.82 | 0.68 | 1.06 |
| 0 | | | | 0.97 | 0.72 | 1.21 |



WorldView-1 Image Geometric Correction cont.

- for WV1
 - Campaign 2008 approx. 6000 km² (5 sites)
 - use ERDAS or PCI
- request basic imagery for best results, but be sure to have correct sw suite versions
 - ERDAS IMAGINE 9.2 reads both RPC, and rigorous (Orbital Pushbroom) model parameters –
ERDAS IMAGINE 9.1 only RPC
- PCI version 10.1.2.
- SIPOrtho
- thanks !
- let us hope for a successful campaign 2008 !