HABITALP

HABITALP Final Conference

14th – 15th September 2006
Berchtesgaden GER

INTERREG III B project HABITALP:

A Contribution to Alpine Landscape Management

This project has received European Regional Development Funding through the INTERREG IIIB Community Initiative

Alpine Space
Interreg III B

Ruedi Haller
Pius Hauenstein

PARC NAZIUNAL SVIZZER

HAUENSTEIN GEOINFORMATIK

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The Alpine Space through the Bird's Eye:

Harmonized Technical Specifications for Alpine Aerial Images

This project has received European Regional Development Funding through the INTERREG IIIB Community Initiative

Alpine Space

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Workpackage 5

Census and Orthorectification of Colour Infrared Aerial Photographs

This project has received European Regional Development Funding through the INTERREG IIIB Community Initiative

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Ruedi Haller
Pius Hauenstein

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Aim of the Workpackage

- Application form:
  - After successful WP implementation each partner area will be covered by a set of colour infrared (CIR) aerial images.

Objectives

- Define **harmonized flight definitions** for all flights
- Define common quality requirements based on the use of aerial images and the derived data within and beyond Habitalp.
- Support the less experienced project partners during the task.
- **Ensure the communication** between the different national groups.
- **Deliver congenerous** aerial images and ortho photos for delineation and interpretation

Method

Aerial photographs provide replicable and standardized methods for landscape surveillance

- Remote sensing based on colour infrared (CIR) images should be used.
- The investigated area should be mapped all over the available area of the images.

Planned actions

- **Existing images** in the involved areas should be listed and evaluated
- Aerial image flights were tendered and conducted.
- Subcontracted companies should execute the aero triangulation and the calculation of the orthophotos.
- All results should be delivered to the specific partner and the transnational data base.

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Workflow

- Flight plan
- Control point setup
- Flight
- Film development
- Film Scanning
- Aerotriangulation
- Orthorectification
- Radiometric correction
- Data delivery
- Workflow report and documentation

NPGRANPA

Terra Bildmessflug GmbH & Co, Schumannstr. 21, D-71667 Marbach

DATE: 21/Jul/2004 TIME: 07:37

```
            Project: AVTITALI
               Area: NPGRANPA
  Coordinate system: ITALY UTM
Camera Focal Length: 305.00 mm
        Film Format:  230 x  230 mm
 Magnetic Variation: E  0.0ø
          GAP Limit: +/- 200 m
 Data Annotation #1: WGS84
 Data Annotation #2: True Altitude [ft]
```

Line Parameter Listing :

LINE/SEG	ALTITUDE MSL [ft]	ALTITUDE AGL [ft]	GL [ft]	FOTO SCALE	FORE LAP [%]	BASE LENGTH [m]	DTK [ø]	TOTAL OF FOTOS	LINE LENGTH [km]
1	1	21507	13007	8500	1: 12999	62	1136	61	6	5.681
1	2	21507	13007	8500	1: 12999	62	1136	61	5	4.544
1	3	21507	13007	8500	1: 12999	62	1136	61	5	4.544
2	1	22007	13007	9000	1: 12999	62	1136	61	37	40.901
3	1	22007	13007	9000	1: 12999	62	1136	61	37	40.901
4	1	22007	13007	9000	1: 12999	62	1136	61	28	30.676
5	1	22007	13007	9000	1: 12999	62	1136	61	27	29.540
6	1	22007	13007	9000	1: 12999	62	1136	61	24	26.131
7	1	22007	13007	9000	1: 12999	62	1136	61	21	22.723
8	1	22007	13007	9000	1: 12999	62	1136	61	17	18.178
9	1	22007	13007	9000	1: 12999	62	1136	61	10	10.225
10	1	21207	13007	8200	1: 12999	62	1136	61	7	6.817
11	1	18907	13007	5900	1: 12999	62	1136	61	4	3.408
12	1	14808	13008	1799	1: 13000	62	1136	1	4	3.409
13	1	18308	13008	5299	1: 13000	62	1136	1	7	6.817
14	1	20208	13008	7199	1: 13000	62	1136	1	10	10.226
15	1	20208	13008	7199	1: 13000	62	1136	1	10	10.226
16	1	20508	13008	7499	1: 13000	62	1136	1	11	11.362
17	1	20508	13008	7499	1: 13000	62	1136	1	6	5.681
18	1	18307	13007	5299	1: 12999	62	1136	1	9	9.089
19	1	19507	13007	6499	1: 12999	62	1136	4	12	12.497
20	1	19508	13008	6499	1: 13000	62	1136	23	10	10.226
21	1	19507	13007	6499	1: 12999	62	1136	5	8	7.953
22	1	23007	13007	9999	1: 12999	80	598	337	9	4.784

Total number of lines/segments: 24
Total number of photos : 324

Total line length : 181.716 nm <==> 336.539 km

Estimated project time : 2 h 30 min (140 kts , 3 min per turn)

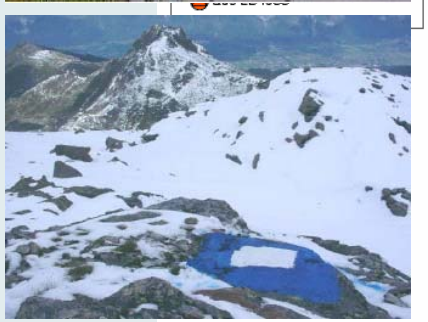
Terra Bildmessflug GmbH & Co, 71667 Marbach

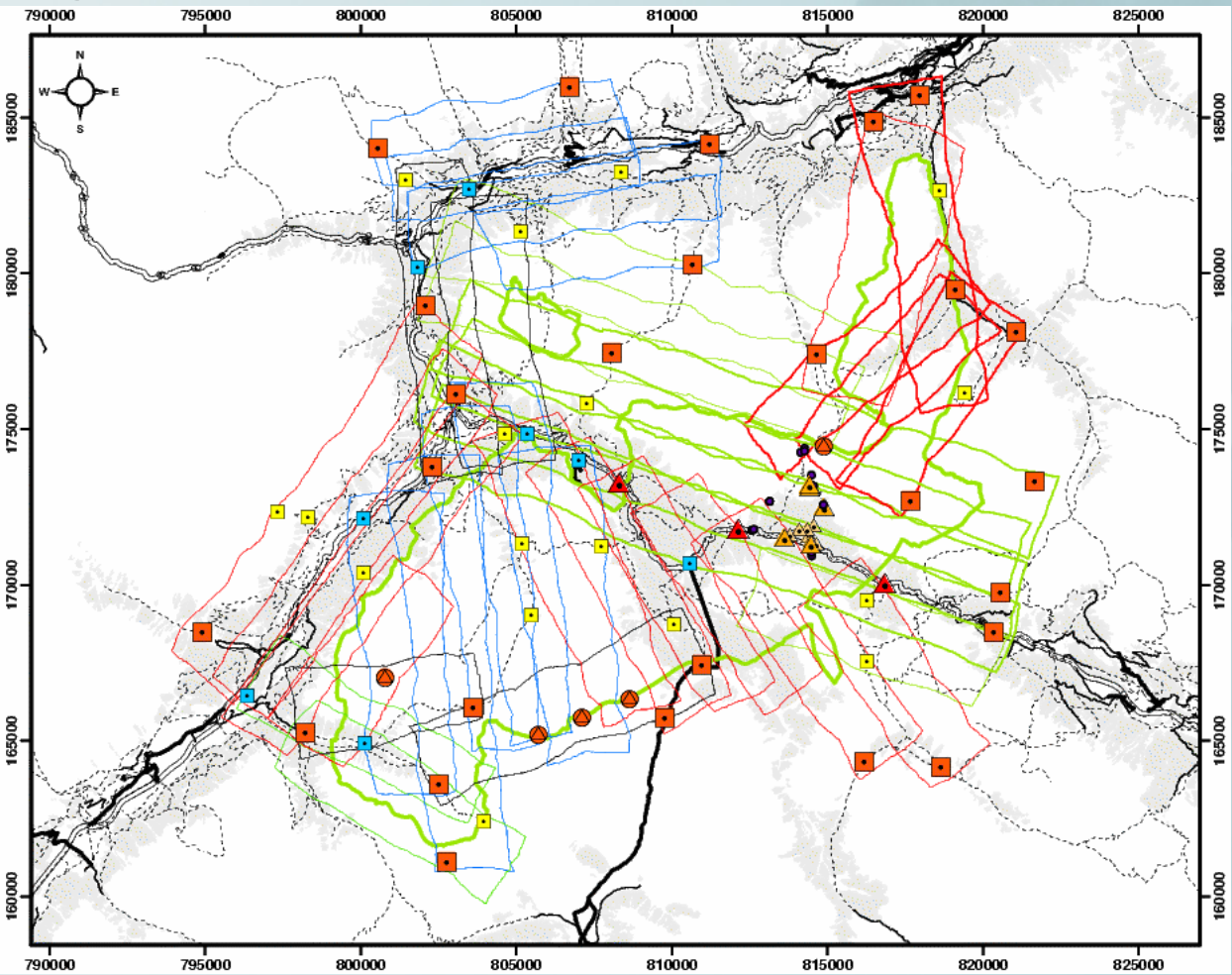
Listing of PROJECT: AVTITALI AREA: NPGRANPA Page: 2

CREATED BY

CHECKED BY

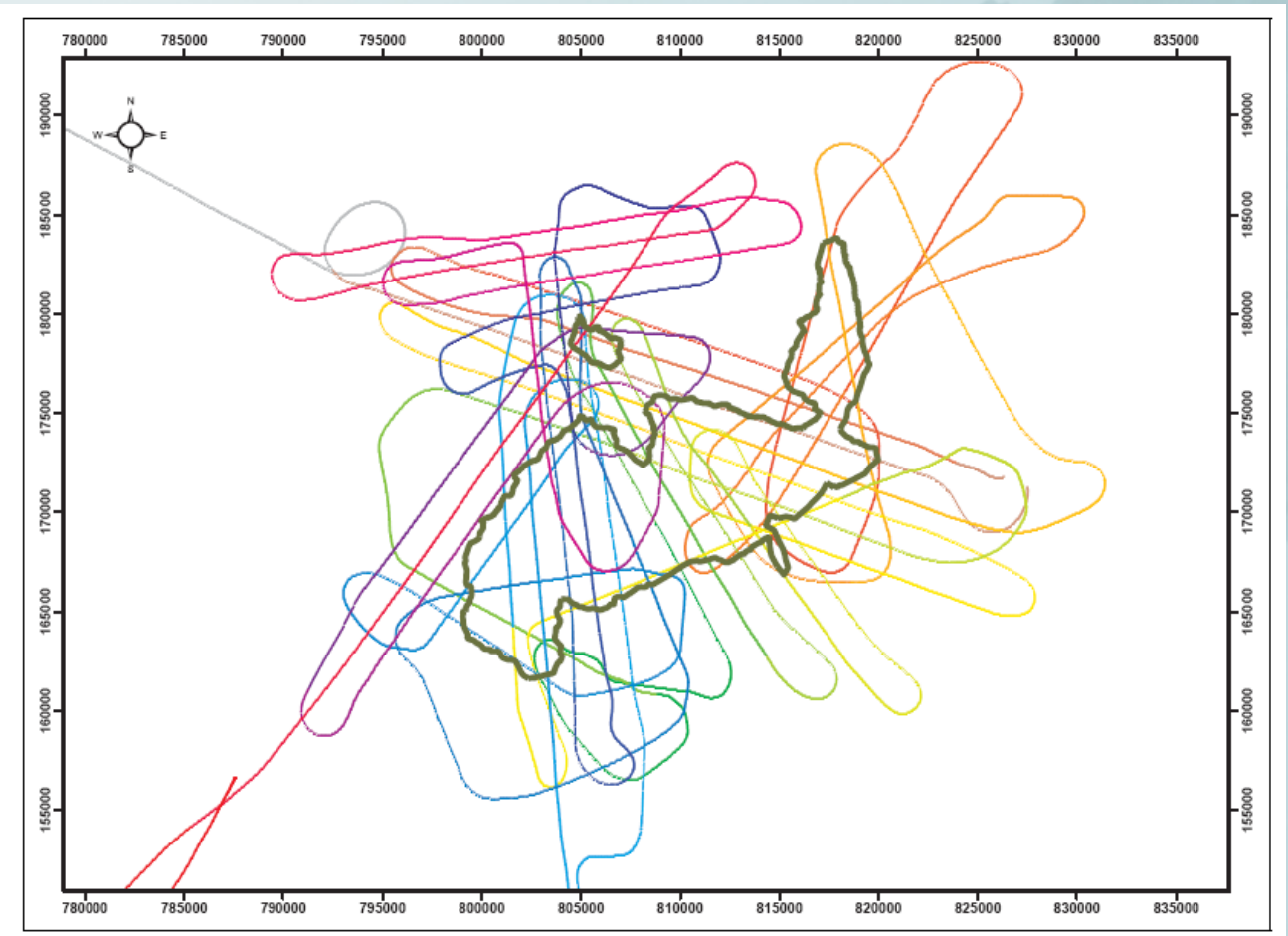
Control Point setting





Flight

Flight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S

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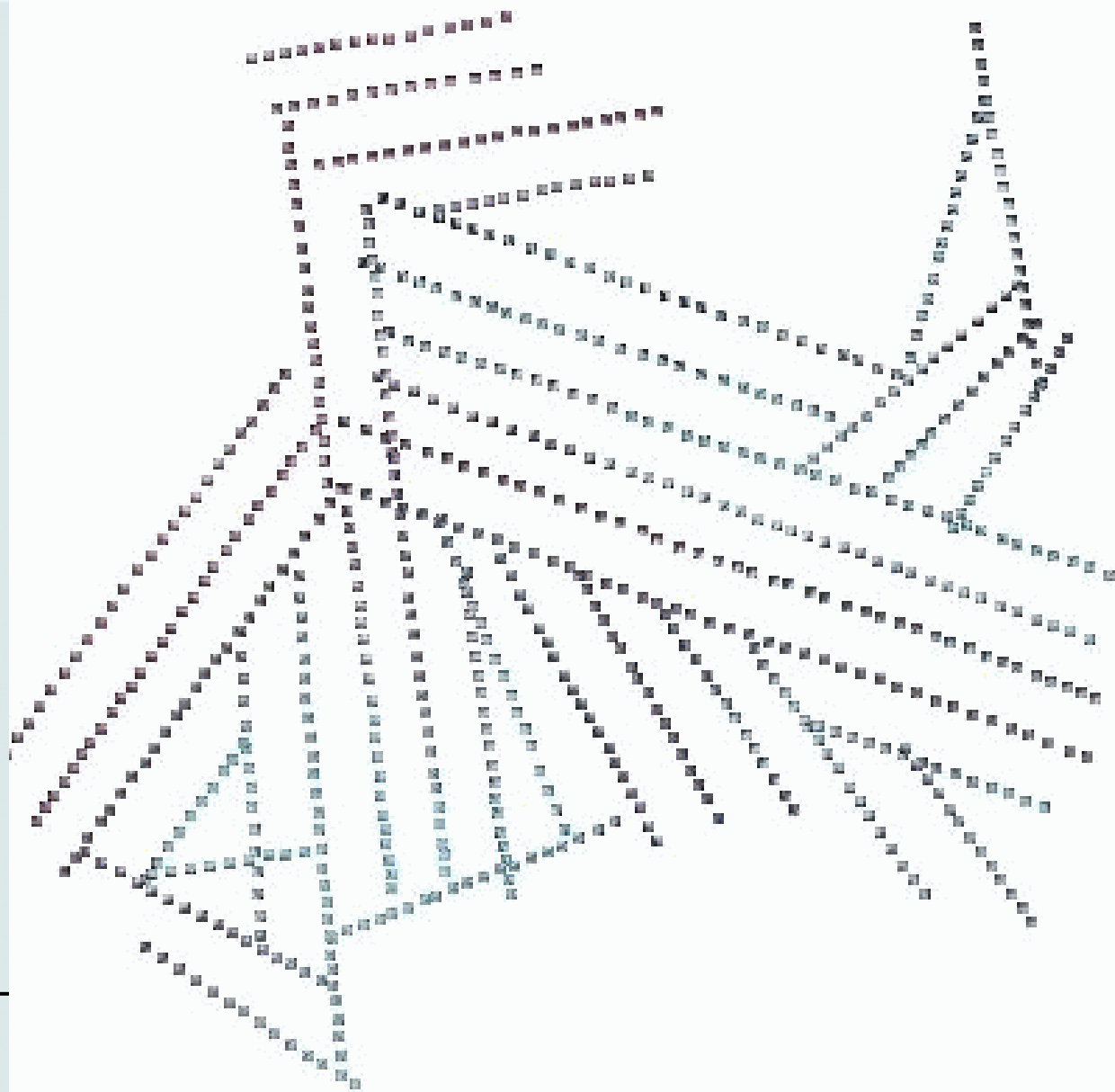
Film development
Aerotriangulation



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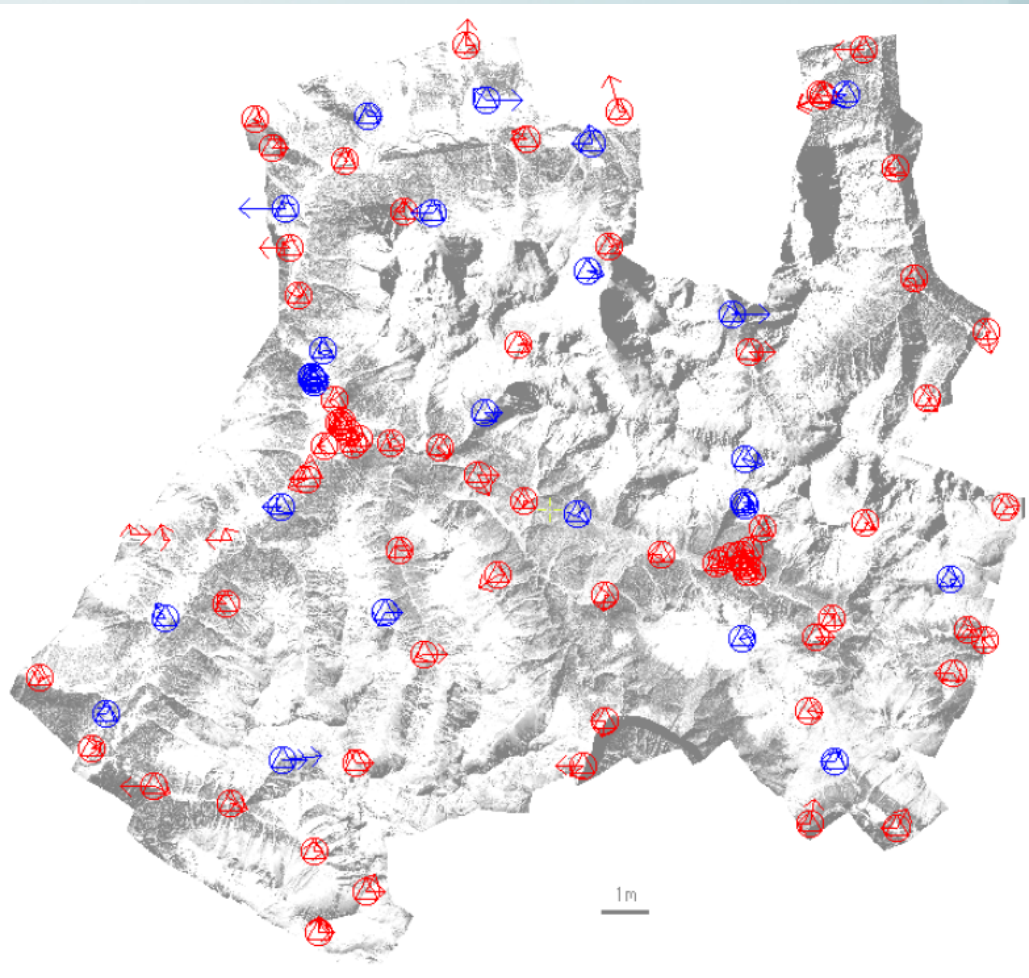
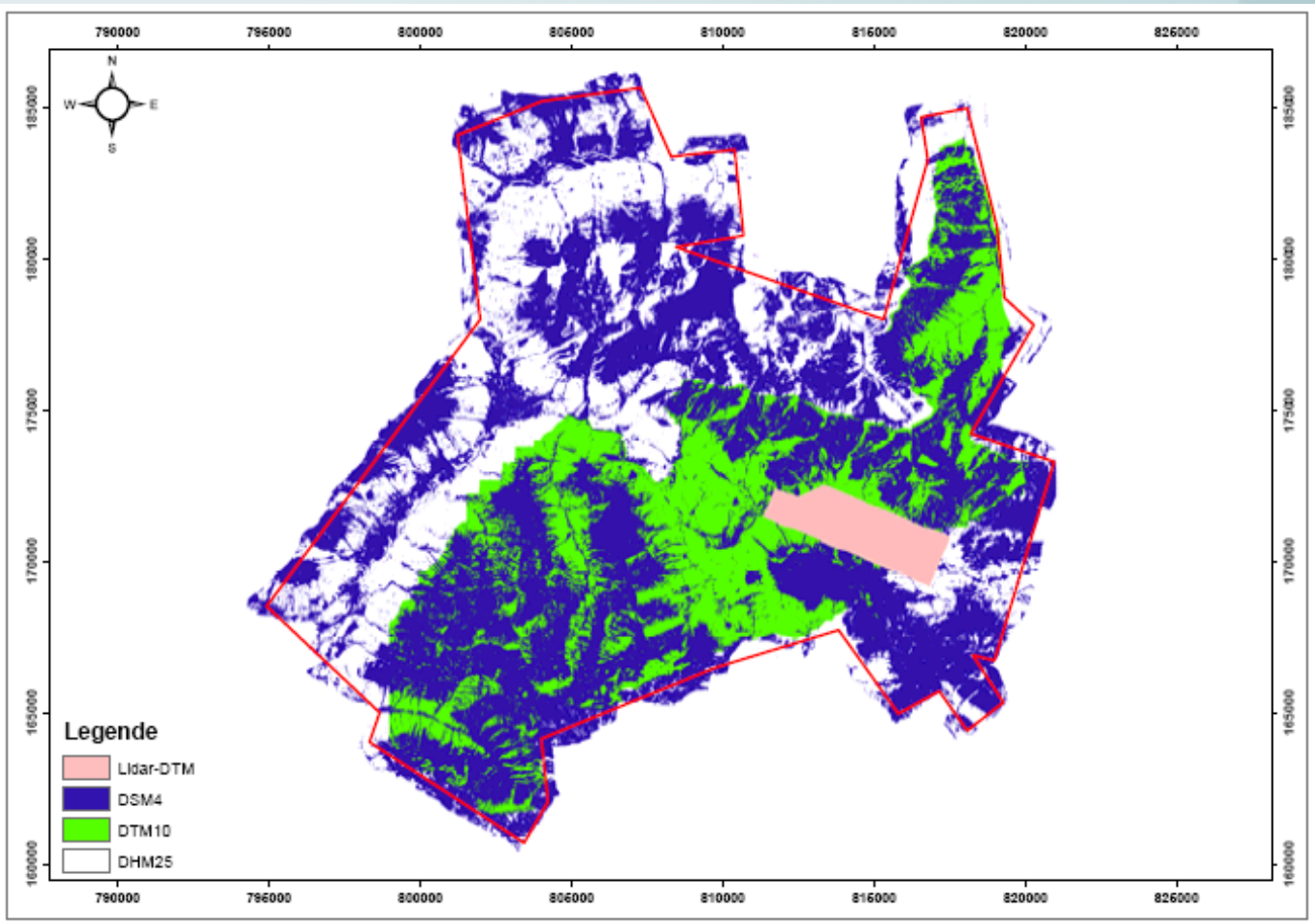
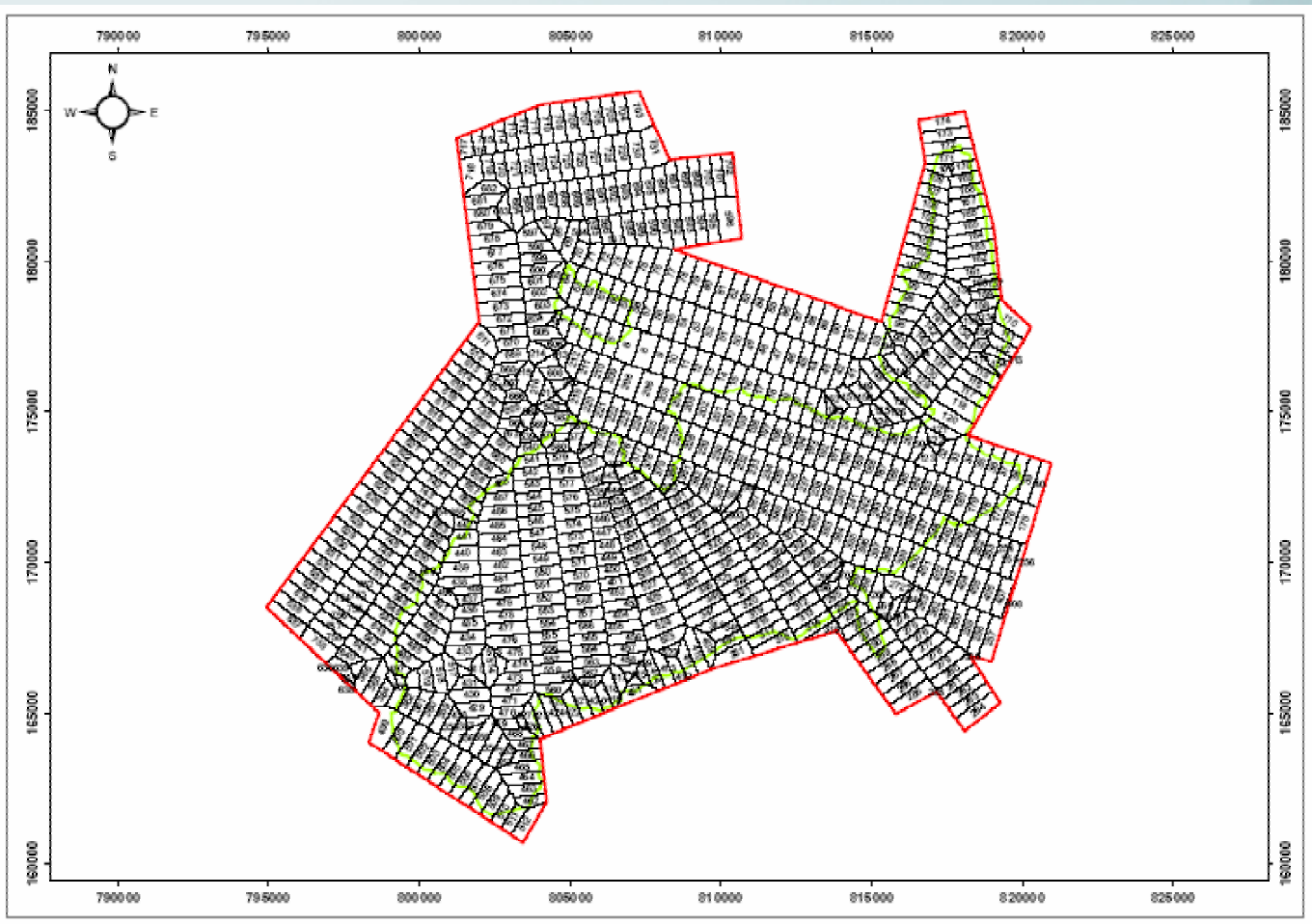
Aerotriangulation



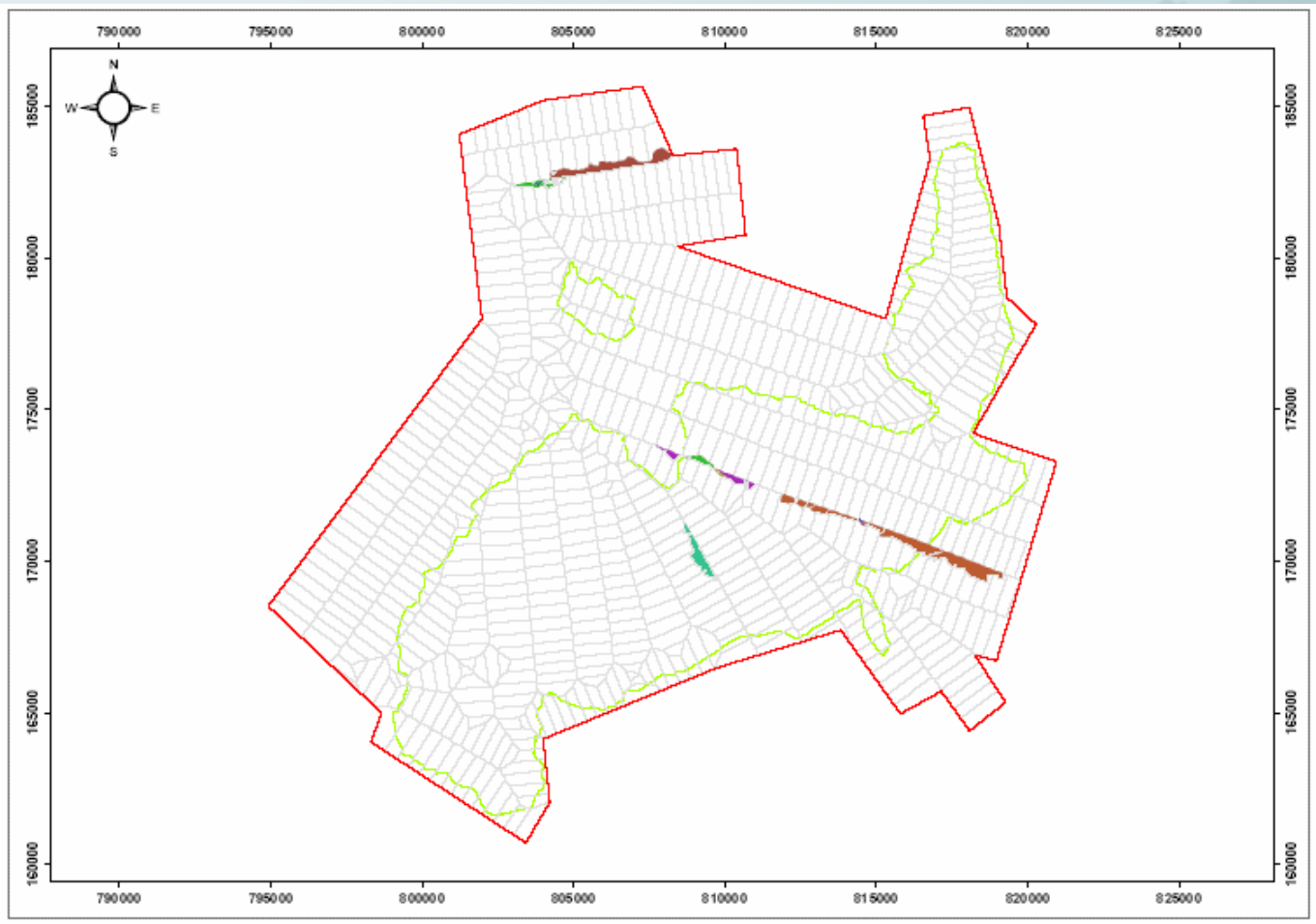
Orthorectification



Orthorectification



Radiometric correction



Data delivery and documentation

Schweizerischer Nationalpark - Luftbildbefliegung 2000 (IR)

Bild-Orientierung und Orthophotoerstellung

Technischer Bericht

Bearbeitung: Stephan Imfeld[1], Ruedi Haller[2]

INGENIEURGEMEINSCHAFT
VERMESSUNG
AVT
IMST - LANDECK - ZELL/ZILLER - WIEN
INNSBRUCK-ST.JOHANN-REUTTE

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A-6460 IMST, EICHENWEG 42
TEL.: ++43 (0)5412 6930-0 FAX: ++43 (0)5412 6930-26 E-MAIL: avt@avt.at
BEFUGT MIT BESCHEID DES BUNDESMINISTERIUMS FÜR WIRTSCHAFTLICHE ANGELEGENHEITEN VOM 20.12.1994, ZAHL: 91.519/33 – III/7/94
ZERTIFIZIERTES MANAGEMENTSYSTEM NACH ISO 9001

Trudener Horn
Provincia Autonoma Bolzano
Titel / Caption

Interreg III B Projekt - HABITALP
Untertitel / Subhead

CIR-Bildflug und Scannen
Digitale Aerotriangulation
DHM und Orthophoto-Erstellung
Thema / Subject

Existing images

Project partner	recent aerial images available	year(s) of census	data availability: analog (photo) or digital ?	DEM available - resolution - date - data source	CIR orthoimage (= rectified aerial CIR photo) available	covered image area in km ²	scale	
NPB	**yes**	1997	digital	YES - 10 m - 1997 - digitized from photogrammetric maps	YES	470	1:11.000 for 1400 m above sea level	
		1990	analogue	NO	NO	470	1:10.000 for 1400 m above sealevel	
		1980	analogue	NO	NO	470	1:10.000 for 1400 m above sealevel	
ASTERS	**yes**	1998	Digital, but no originals available for stereoscopic view	YES- 20m but no full rights of use	YES	All the area		
APB	**yes**	1991	analogue	YES - 10m - 1999 - digitized from maps	NO	30	1:22.000-25.000	
CPNS	**yes**	1991	analogue	yes - 10m - 1999 digitized from maps	NO	30		
		1991 ??	analogue					
		???						
NPHT	**yes**	1998	Digital RGB only CIR analogue	YES - 25 m	NO	~ 2.000	1:16.000 for 2200 m above sea level	
		1998	analogue	YES - 25 m	NO	~ 2.000	1:11.000 for 2200 m above sea level	
		1998	analogue	YES - 25 m	NO	~ 2.000	1:11.000 for 2200 m above sea level	
PNV	**Yes**	1996	analogue	YES - 50 m - 2002 - IGN	NO	about 550	about 1:20 000 (ordered : 1:17 000)	
PN Écrins	**yes**	1993	analogue	NO	NO	700		
PNMA	**no**							
PNDB	**-**							
PNGP	**no**							
SNP	**yes**	2000	digital	YES - 20 m with break lines, inside SNP YES - 25 m without break lines	NO (Yes for test area)	ca. 380	aprox. 1:10'000	
		1988	analogue	NO	NO	ca. 170	aprox. 1.9'000	

Technical specifications for the flight

- Camera: should allow an adequate quality of the orthophotos, 300 mm objective
- System: DGPS and FMC (Forward Motion Compensation)
- Average scale 1:10 000
- Overlapping in flight direction: 60%
- Overlapping across the flight direction: 30%
- Flights between the 1st of July and 31st of August
- Film: Kodachrome III Infrared 1443

Technical specifications for the aerotriangulation

- Orientation in the local geodetic systems
- RMSE of aerotriangulation < 20 cm

Technical specifications for the orthophotos

- Ground pixel resolution 15 – 20 cm
- Overall accuracy of the images < 1m

The tender procedures

- National groups

- France
  - Tender on European Level
  - Leadership PNE
  - PNV decided to announce the flight over the total area with **additional financing outside the HABITALP project**.
  - ASTERS announced 27 000 ha (more than 100% of the protected areas)
  - Tender was submitted in March 2003
  - Offer evaluation 6th of May
    - AEROSCAN s.a.r.l. from Tomblaine (F) get the mandate

The tender procedures

- Italy
  - Leadership CPNS
  - National tenders evaluated in April 2003
    - **The offers were almost 800% higher than expected**
  - Start of a Europea tender procedure at June 2003
  - 1st of August 2003, the Italian PP accepted the offer from AVT ZT-GmbH (A) and terra bildmessflug GmbH & Co (D)

- Germany
  - Offer of terra bildmessflug GmbH & Co accepted by NPB

Problems, deviations and solutions

- Delay of the flights due to
  - Contract delay
  - Extraordinary summer 2003
  - Few days for a flight according to the specifications in summer 2004
  - End of 2004: NPB ok, France 40%, Italy 29%

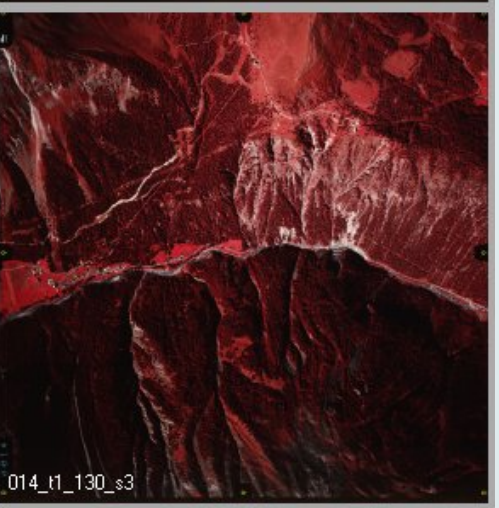
➢ Prolongation of the project (1 year)

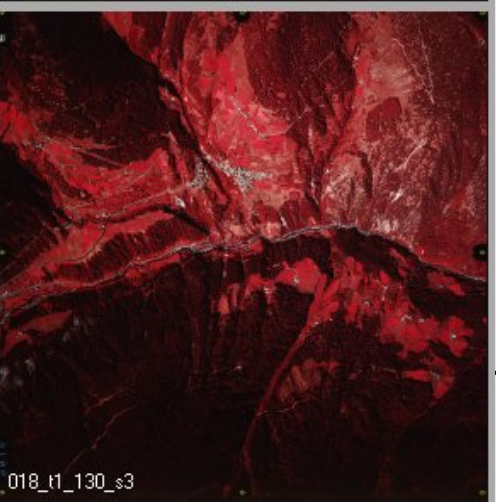
➢ Optimizing agreement between the involved partner
  - willingness for a tight time plan for WP5 to WP7 (interpretation)
  - Improvement of the communication (weather, vegetation), 7*24

- 2005:
  - Flights in PNGP and PNMA
  - Habitalp parts CPNS, ASTERS, PNV
  - No flights in PNDB due to military restrictions

Small problems and solutions

- PNMA: Some images were damaged during the developing process
  - Solution: Images were accepted, the flight company offered a price reduction.





Maximizing image information

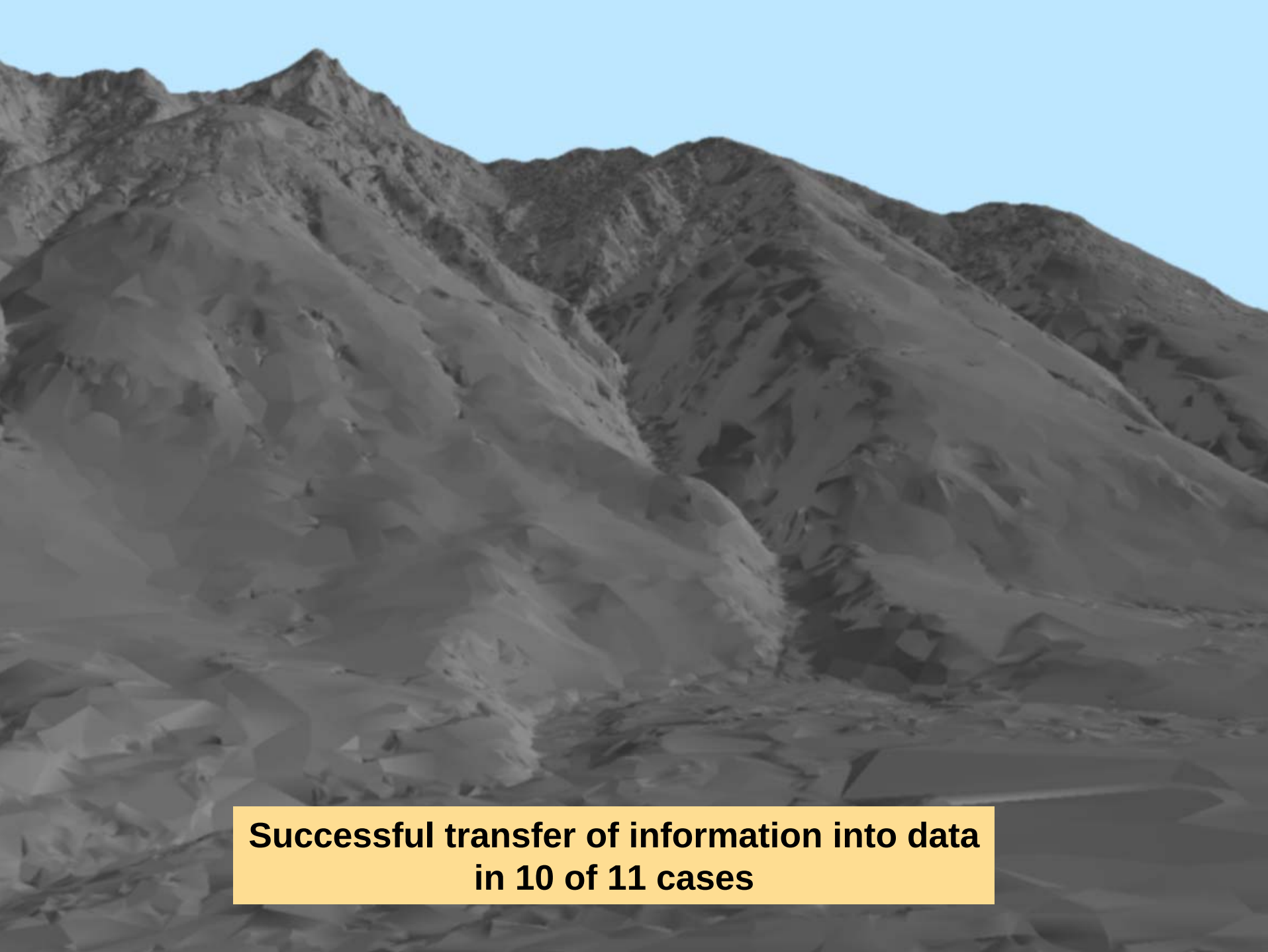
- CPNS: Defining the scan parameters for the images
  - Solution: t1 (left)

Successful implementation of accuracy requirements

Tested 0.59 metres horizontal accuracy at 95% confidence level.

- The positions in the dataset will have an error with respect to the true ground position that is equal to or smaller than the reported accuracy value of 0.59 m.
- This value corresponds to the radius of a circle of uncertainty, where the true of theoretical location of the point falls within that circle 95% of the time.


Successful transfer of information into data
in 10 of 11 cases


Successful transfer of information into data
in 10 of 11 cases


Successful transfer of information into data
in 10 of 11 cases

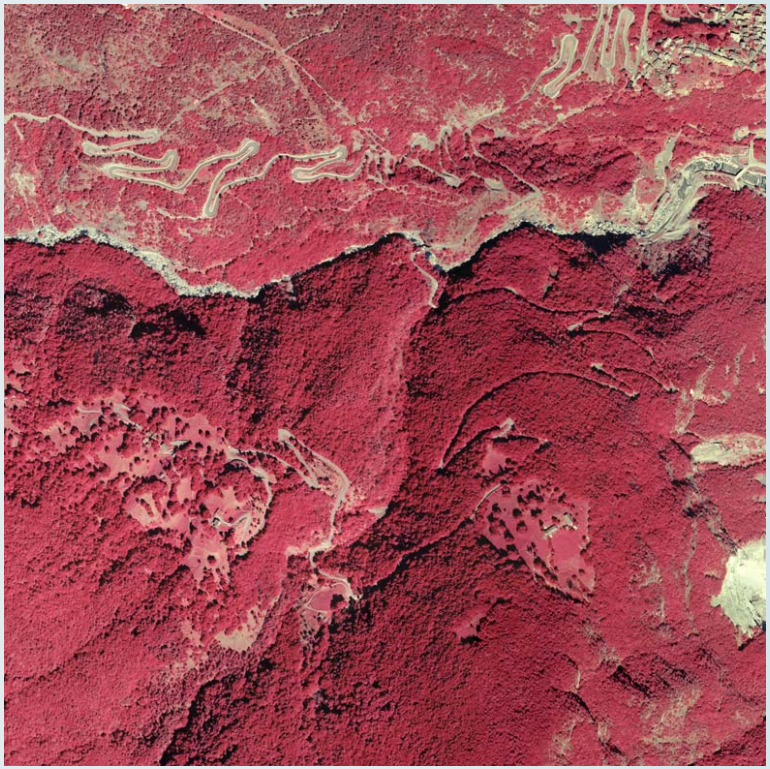
Operational success of flight campaigns

- 10 of 11 Partners had images and therefore the base for the mapping (7680 km^2)
- For 8 Partners the images were produced during the HABITALP project (4710 km^2)
- 7 partners were able to cover the whole area (with additional funds and efforts), 1 partner could only cover the inevitable parts
- 2 partners had existing images of the required quality
- For the 8 flights, 2 companies were assigned
- 1 company delivered proper quality, the other on had to repeat some parts of the flights.

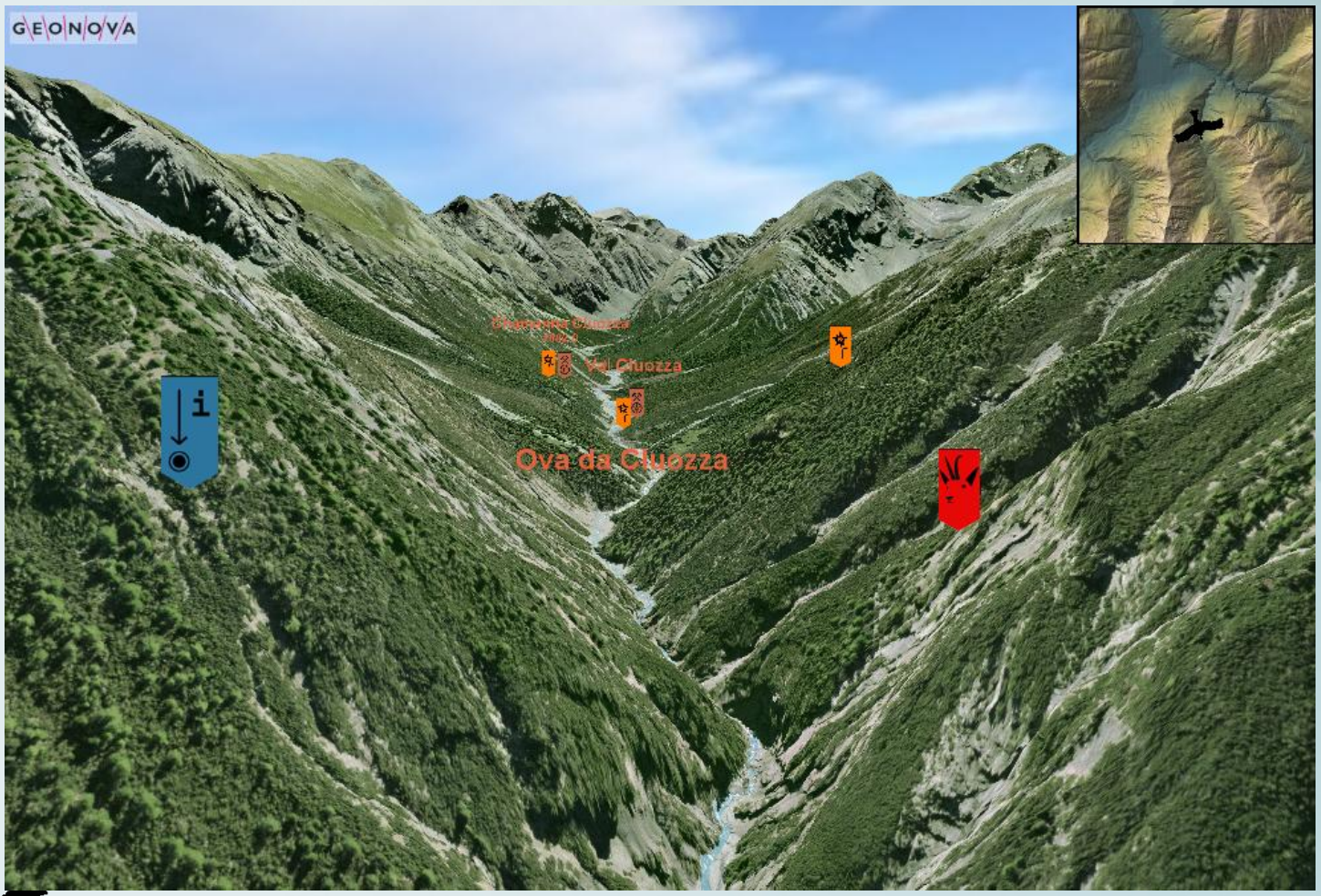
Results

	NPB	NPHT	APB	CPNS	SNP	PNMA	PNGP	PNV	ASTERS	PNE
Camera	Zeiss RMK TOP 30	Zeiss RMK Top 30/23	RMK TOP 30	RMK TOP 30	Leica RC 30	Zeiss RMK TOP 30	Zeiss RMK TOP 30	ZEISS LMK 2000	ZEISS LMK 2000	ZEISS LMK 2000
Lens focal length	305,084 mm	Topar A3 Objektiv	305 mm	305 mm	303 mm	305,083 mm	305,083 mm	304 mm	304 mm	304 mm
Film type	Kodak Aerochrome III Infrared 1443	Kodak Aerochrome II Infrared 2443	Kodak Aerochrome IR 1443	Kodak Aerochrome IR 1443	Kodak Aerochrome Infrared II 2443	Kodak Aerochrome III IR 1443	Kodak Aerochrome III IR 1443	Kodak Aerochrome III Infrared 1443	Kodak Aerochrome III Infrared 1443	Kodak Aerochrome III Infrared 1443
Resolution	63 l/mm	63 l/mm	63 l/mm	63 l/mm	Ca 63 l/mm	63 l/mm	63 l/mm	Ca 63 l/mm	Ca 63 l/mm	Ca 63 l/mm
Scan Resolution	12,5 µm		12.5 µm	12.5 µm	14 µm	12,5 µm	12,5 µm	14 µm	14 µm	14 µm
Medium scale	1:11'000	1:16.000	1:13 '000	1:13 '000	1:10 '000	1:13 '000	1:13 '000	1:10 '000	1:10 '000	1:10 '000
Planned overlap in flight direction	65%	60%	62%	60%	75%	60%	60%	75%	75%	75%
Planned overlap across the flight direction	40%	40%	30%	30%	ca. 35%	20%	20%	ca. 35%	ca. 35%	ca. 35%
Planned flight area (ha)	47000	260000	13800	110000	aprox. 37000	aprox. 7900	aprox. 40'000	aprox. 200000	aprox. 27000	aprox 24350
ha	47000	260000	13800	110000	37000	8900	40000	200000	27000	24350
Date of the flight	16.07.2003	9.08.1998 – 12.08.1998	18.09.2004	18.09.2004 3.7.2005 15.09.2005	24.08.2000	05.08.2005	05.08.2005	15. August 2004, 08. August 2005, 09. August 2005	11.08.2003	01.08.2003
Number of images	436	920	120		760	48	276	897 , 608 , 792	378	305
Flight company	Terra Bildmessflug GmbH&Co, Marbach	Hansa Luftbild, Münster;Photogrammetrie GmbH, München	TERRA – Bildmessflug GmbH&CO	TERRA – Bildmessflug GmbH&CO	L+T, Flugdienst / KSL	TERRA – Bildmessflug GmbH&CO	TERRA – Bildmessflug GmbH&CO	AEROSCAN sarl	AEROSCAN sarl	AEROSCAN sarl
Ortho image area (ha)	47000	260 000RGB	13700	35500	aprox. 36400	aprox. 7900	aprox. 40'000	aprox. 36 600	aprox. 27 000	aprox. 24350
Pixel ground resolution	20 cm	50 cm	15 cm	15 cm	20 cm	15 cm	15 cm	15 cm	15 cm	15 cm

Added values



The birds eye look



Conclusions

- The use of a well established technique seemed to be the best way to avoid surprises and delays.
- A timely delivery of a the required qualitiy remains the critical point
  - The dependecy on climatic factors (weather, snow) remains high.
  - The possible timespan for flights is very short
- The number of companies with experiences and a well established quality management is small

- Nevertheless, aerial image flights have the advantage to be adjustable

Conclusions

- The improvement of the communication after 1 year of experience was a key to sucess finally
  - Better information for flight company
  - Better understanding of restrictions and limits of the flight by the park managers
  - Better instruction of local people for control point setting

- Knowledge transfer is depending on the willingness of both sides and requires available human resources on the PP side.

Outlook

- The network is established within the Réseau Alpin: New flights could be arranged easier.

- New technologies have to be carefully evaluated in terms of the long term goal of a landscape monitoring: **the detection of changes**.

  – Comparabiltiy with older images have to be guaranteed
  – High resolution needed due to slow spatial processes of change
  – The fully operational production and following usage of the images/data has to be guaranteed to avoid technical oriented methodological approaches instead of ecological objectives.

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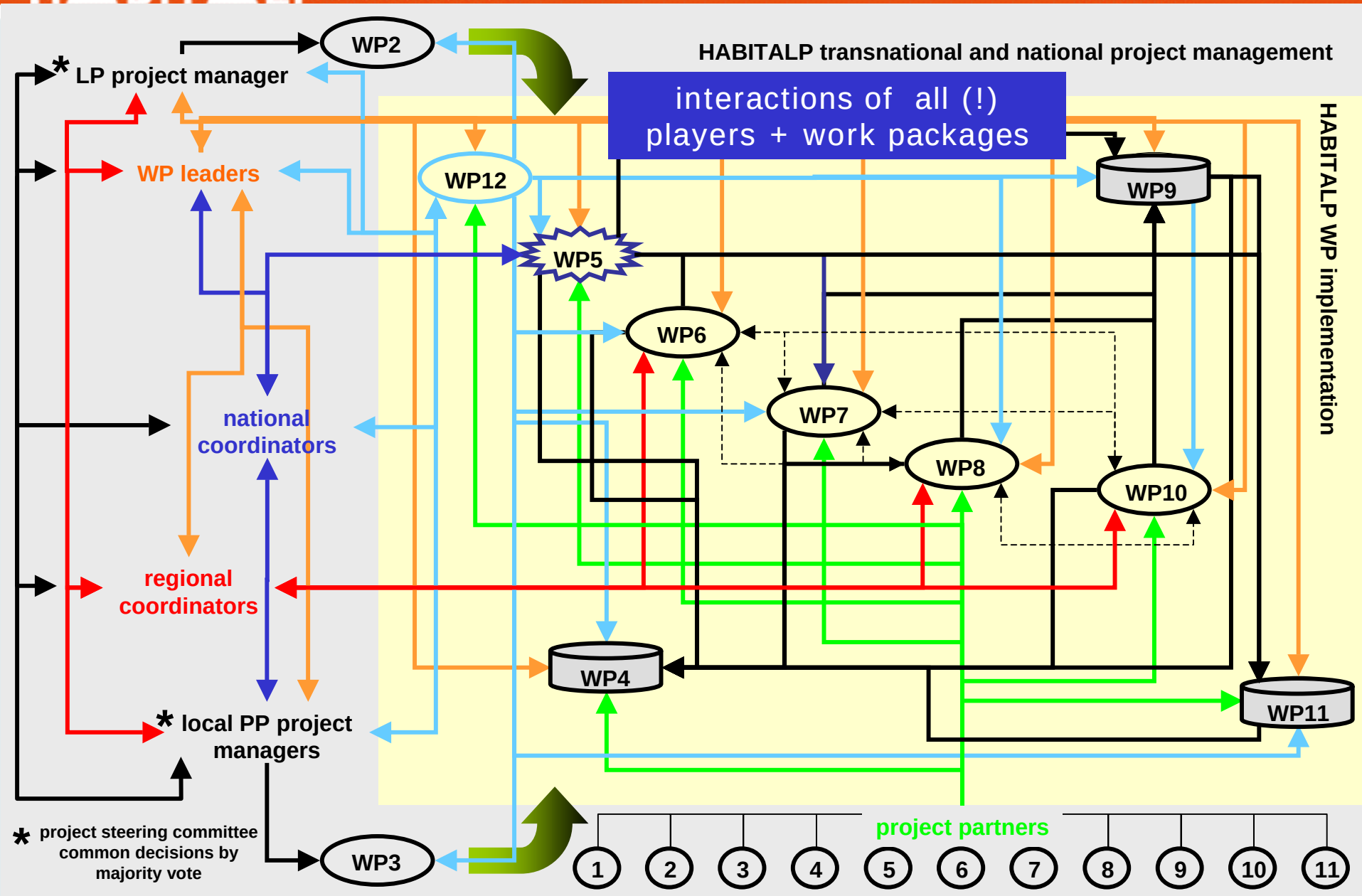
HABITALP transnational and national project management
interactions of all (!) players + work packages
HABITALP WP implementation
* LP project manager
WP leaders
national coordinators
regional coordinators
* local PP project managers
* project steering committee common decisions by majority vote
WP2
WP12
WP5
WP6
WP7
WP8
WP9
WP10
WP4
WP11
WP3
project partners
1
2
3
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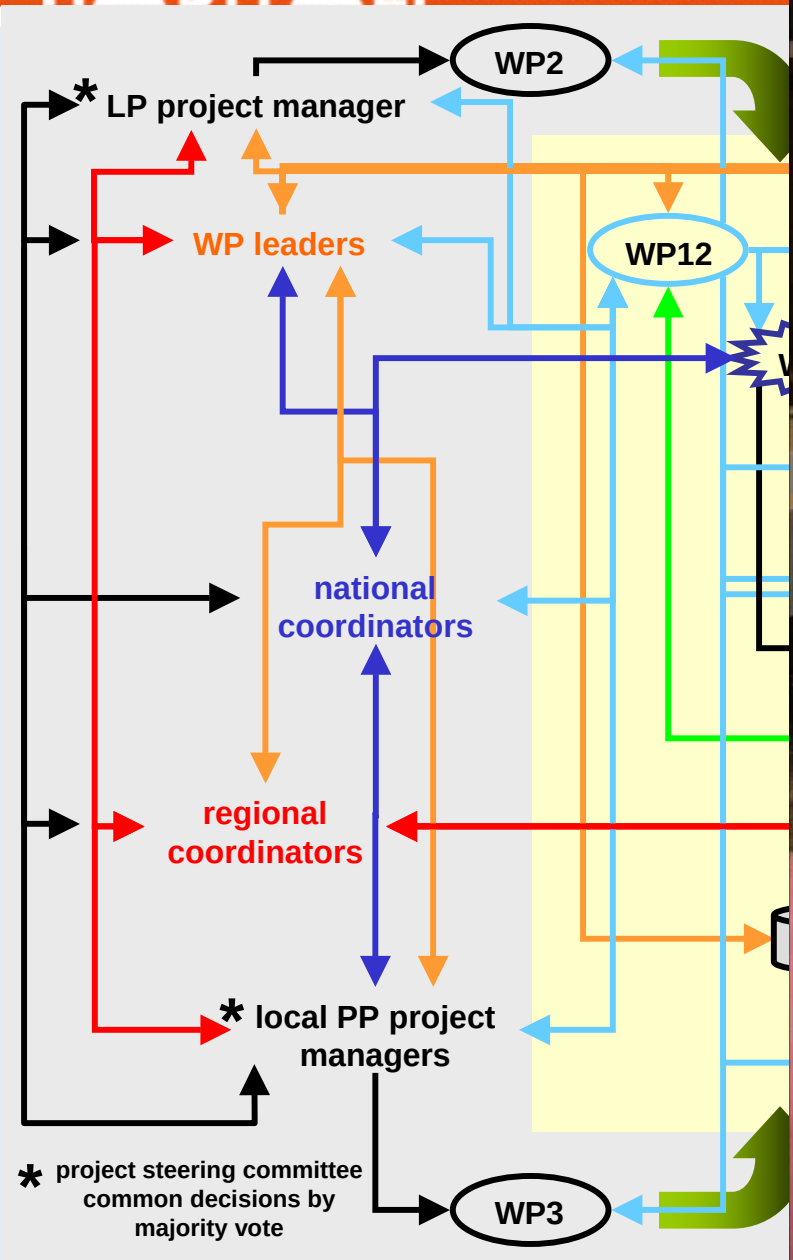
10
11

HABITALP


WP2
* LP project manager
WP leaders
WP12
national coordinators
regional coordinators
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WP3
* project steering committee common decisions by majority vote

HABITALP

Thank you very much for your attention!

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Alpine Space

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