

Orthoimage specifications



Geoinformation management
GeoCAP
AGRICULTURE UNIT
EC - Joint Research Centre

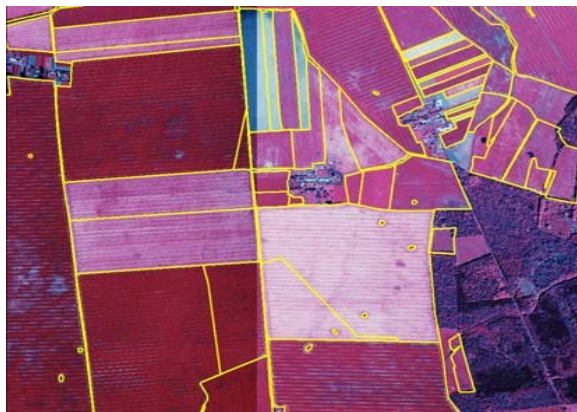
Overview

- Review of the state-of-play for orthoimage production in EU
- Rationale for the development of common specifications
- Draft set of specifications
- Next steps to be taken



Orthoimage & CAP

- **Extensive use although not compulsory**
 - LPIS background for almost all MS
 - CwRS continuously gaining ground over traditional control; being implemented in 24 MS this year



Diversity of imagery

- Multiple needs
- Variety of options for image acquisition
- Now-how and local market
- Special conditions (e.g. flying restrictions)



Image resolution

- Spatial resolution (GSD)
- Spectral resolution (B/W,MS,PAN)
- Radiometric resolution (bits/pixel)
- Temporal resolution (age, date, update cycle)

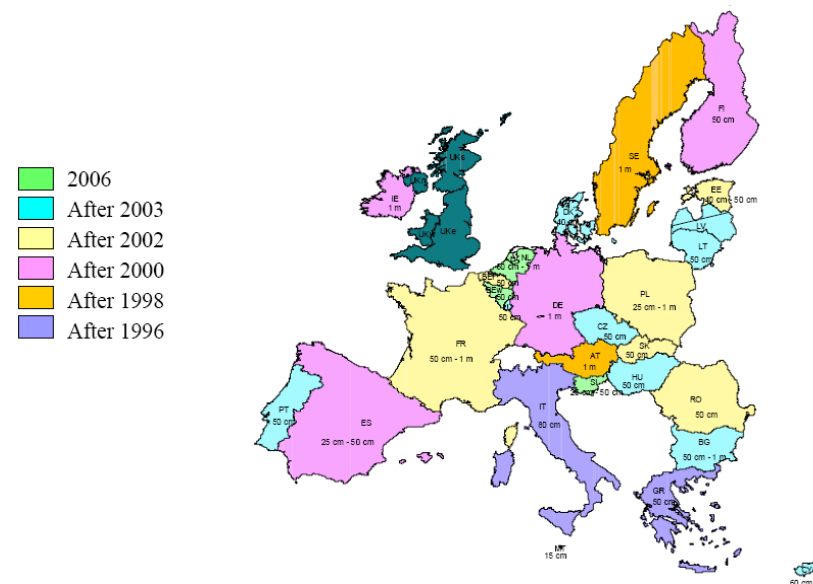


Image acquisition

- Airborne or Spaceborne
- Analogue or Digital
- Frame or Line imaging geometry
- Use of GPS/INS or not
- Large or medium format



Photogrammetric Processing

- **Georeferencing**
 - Image geometry, GCPs
- **Image processing**
 - Scan, Unpack, corrections
- **Orthorectification**
 - DEM/DTM/DSM
- **Orthomosaicking**
 - Radiometric non-uniformities & geometric discrepancies

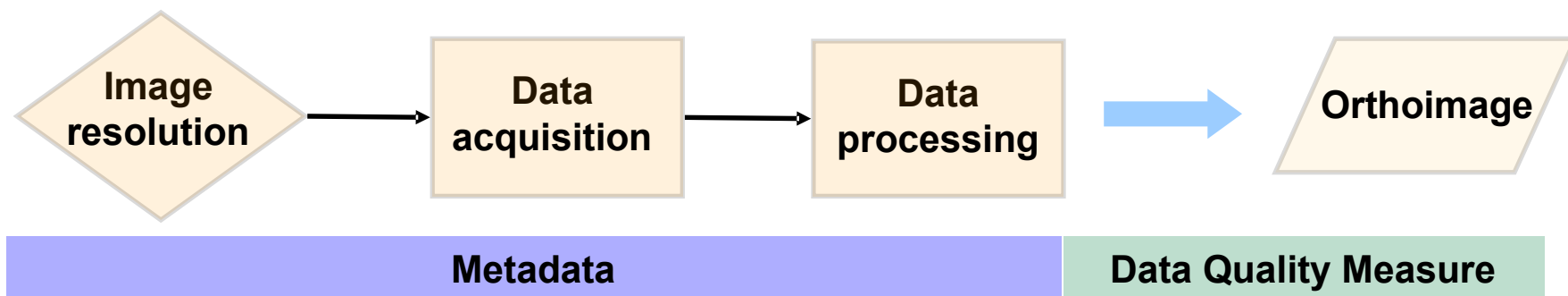


Objective of common specifications

- Support the quality control process (faster, cheaper)
- Avoid reinvention of the wheel
- Accommodate INSPIRE development (annex II theme)
 - provide input for the INSPIRE Implementing Rule
 - anticipate Compliance with INSPIRE requirements

Scope of common specifications

Guidelines for best practice and Quality Checking

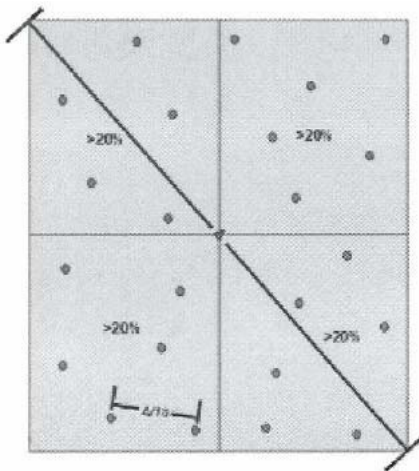


- Establish a core set of measures to ensure sufficient image quality for the purposes of LPIS
- Define the set of metadata necessary for data documentation and overall job tracking

Defining Image quality

- **Geometric accuracy**

- Well established process for defining it (RMSE of CPs)
 - >20 CPs per ortho
 - Check 5-10% of the total



- DEM check
- Risk analysis
- Available accurate vector data

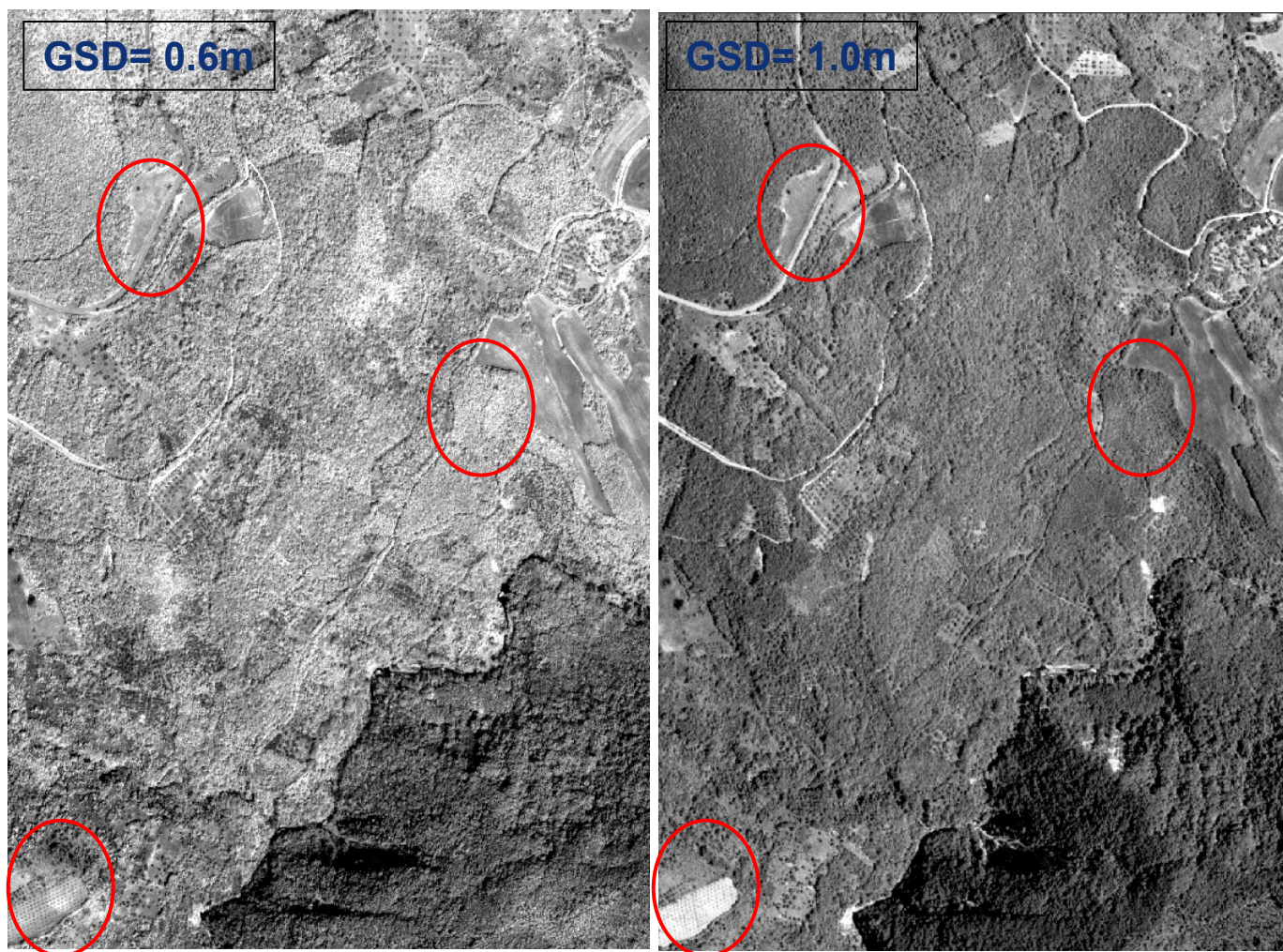
Defining Image quality

- **Radiometric quality**

- Very important but also more complicated to be quantified
- Relatively recent advent of different type of digital sensors
- There is research taking place but not much literature on standards

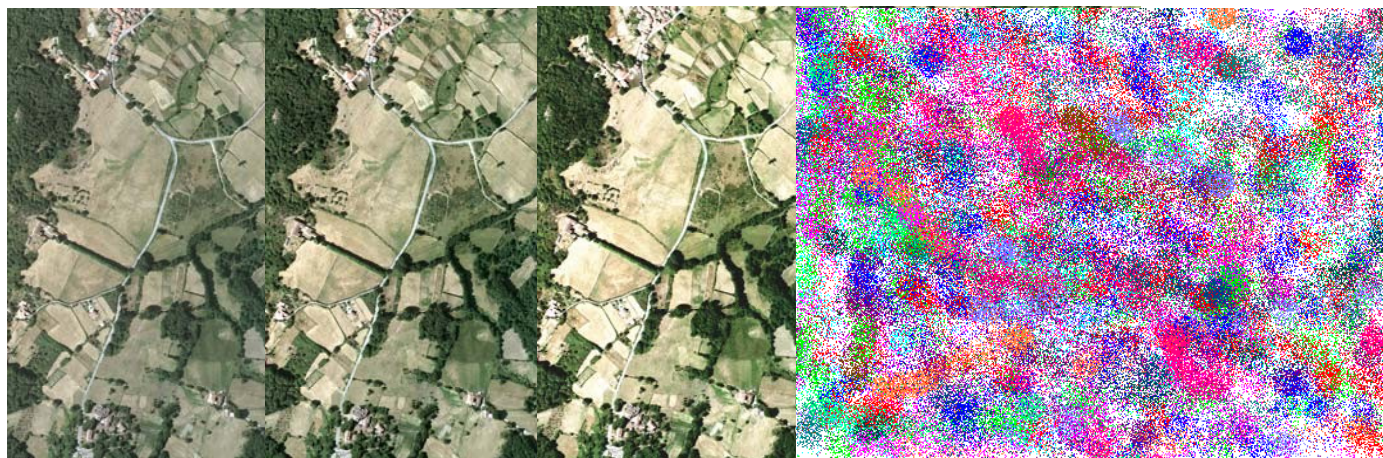


Defining Image quality



Radiometric quality

- Define quality measures based on orthoimage histograms (e.g. contrast, saturation, noise)
- Easy to create the metadata and check automatically



DQ_MEASURE	DQ_CONFORMANCE_LEVEL	Remarks
GSD	$\leq 1\text{m}$	Original image 1:1 for digital 1.2:1 for scanned (Metadata)
Radiometric resolution	≥ 8 bits/channel	If original better should it be maintained?
Cloud cover	$< 5\text{-}10\%$	Per map sheet and in total
Saturation (Overall clipping)	$< 0.5\%$ at each tail OR $1\text{-}2\%$ for $[H(0,5)+H(n-5,n)]/H(0,n)$	Luminosity H if color
Histogram Peak	$< 15\%$ of middle value	
Color balance	$< 2\%$ between min and max value of triplet	
Noise	SD of values < 12	Each channel
Contrast	The coefficient of variation ^[1] of the image DN values should be in the range of $10\text{-}20\%$	
Geometric accuracy	RMSE _{x,y} $\leq 2.5\text{ m}$ For 95% confidence level $\Delta x,y \leq 1.96 * 2.5\text{m} = 4.9\text{m}$	NumOfCPS ≥ 20 well distributed
Mosaicking	DN variation on similar area type not to exceed 10% in average (or 4% between each of the 3 channels)	
Mosaicking	Geometric mismatches along seam lines < 3 pixels	Maybe related to RMSE _{x,y}
Mosaicking	No seams through buildings	Visual check
Compression	Lossless (TIF, LZW-TIF) Visually lossless (JPEG2000, ECW, MrSID)	Only at last stage (storage)

^[1] Represented as the Standard Deviation of the DN values as a percentage of the available grey levels

Steps to be taken

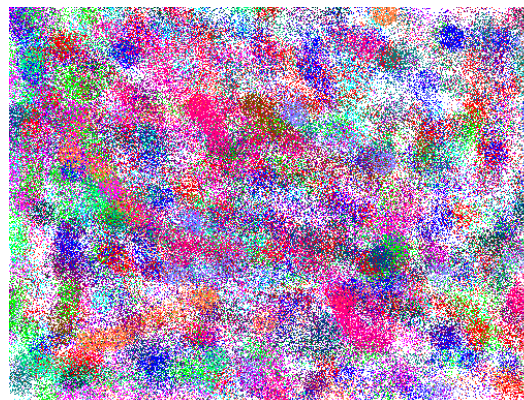
- **Discuss and refine the current DQ measures and conformance levels (expect feedback from MS)**
 - Independent of Imaging system & platform
 - Simple to check (automatically when possible)
- **Produce draft specs for the required metadata**
 - Documentation of data
 - Full job tracking (no need for intermediate data)
 - Interoperability (INSPIRE)
- **Specifications will be ISO compliant**

Orthoimage specifications

Thank you-Any Q?



Geoinformation management
GeoCAP
AGRICULTURE UNIT
EC - Joint Research Centre



Disclaimer: "Anastasia's view about image quality may not in any circumstances be regarded as stating an official position of the European Commission."