JOANNEUM RESEARCH DIGITAL

DIGITAL - Institute for Information and Communication Technologies

EuroSDR Benchmark on High Density Image Matching for DSM Generation

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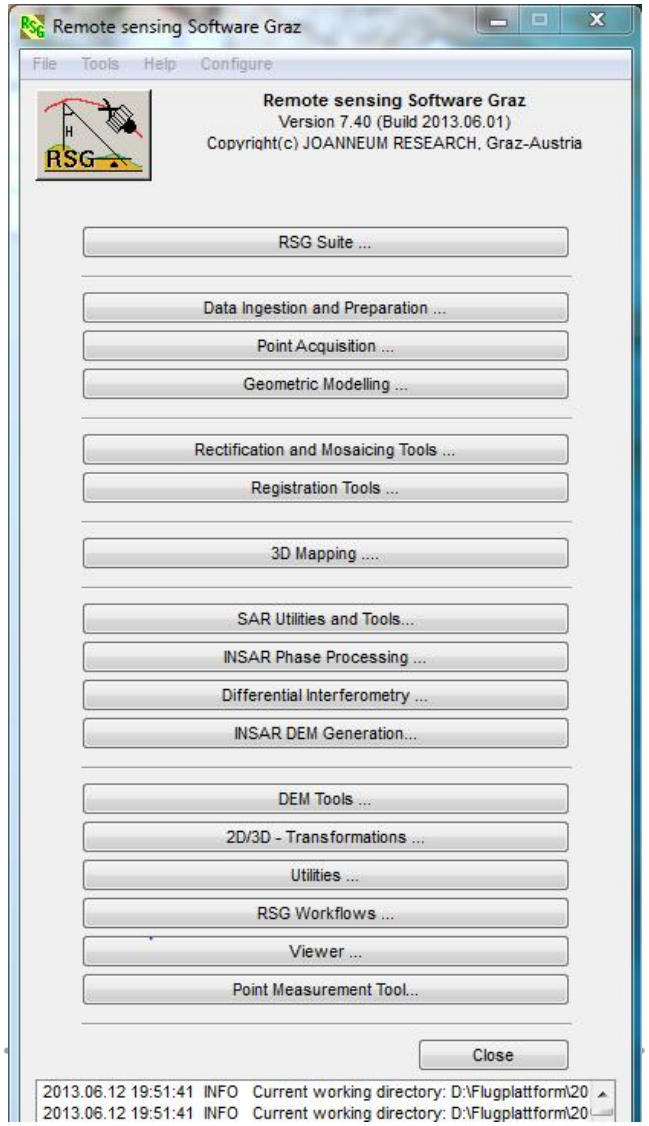
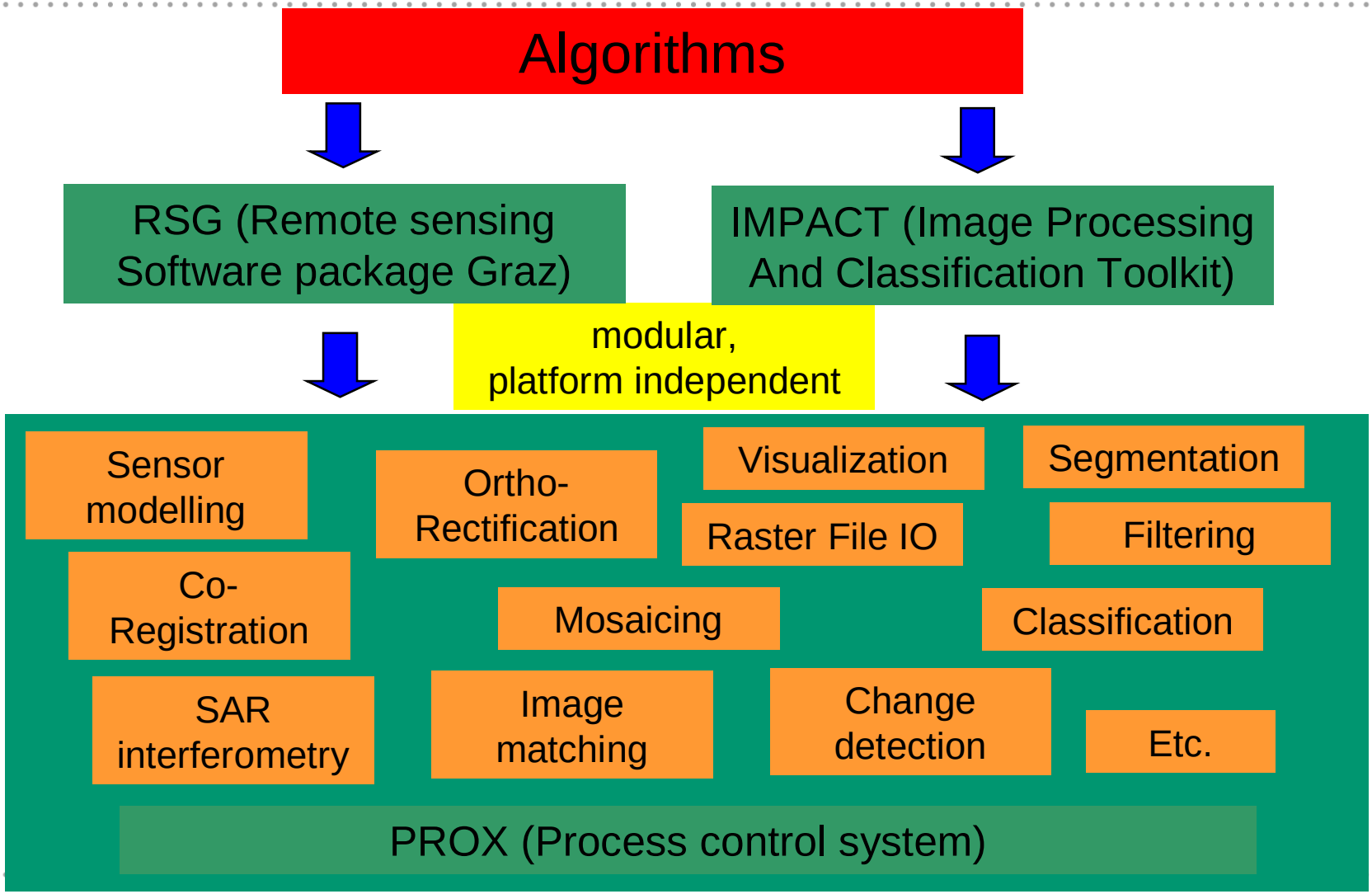
Software

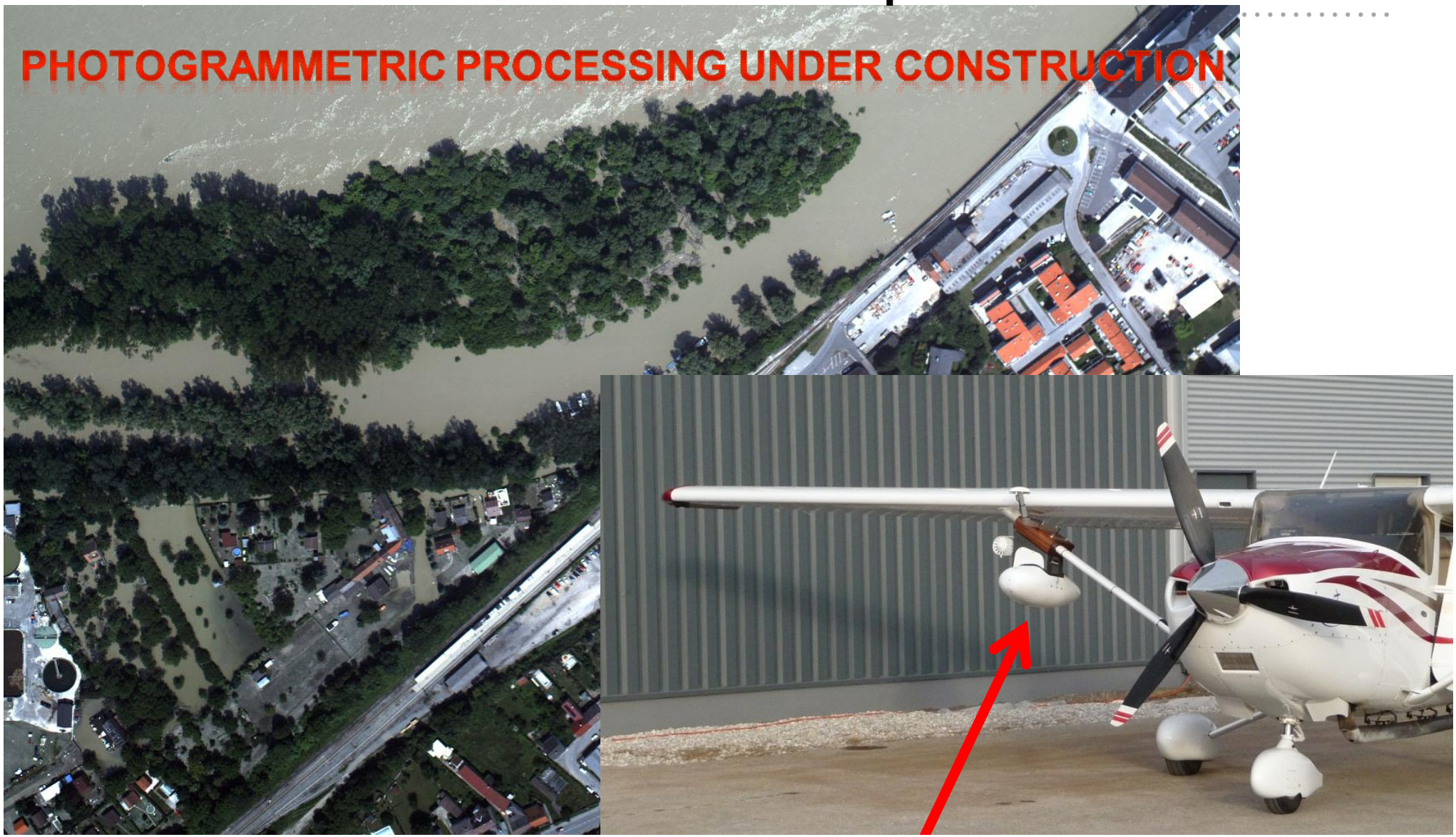
- RSG - Remote Sensing software package Graz
  - Ø Software for geometric processing of remote sensing image data since 1980
  - Ø Parts integrated at various “ground segments”, e.g. DLR (ERS-SRTM), Infoterra (TerraSAR-X), ESA,…
  - Ø Offered/distributed to project partners and universities
  - Ø Commercial available
- Ø Since 1998: ~ 340 licenses



Software

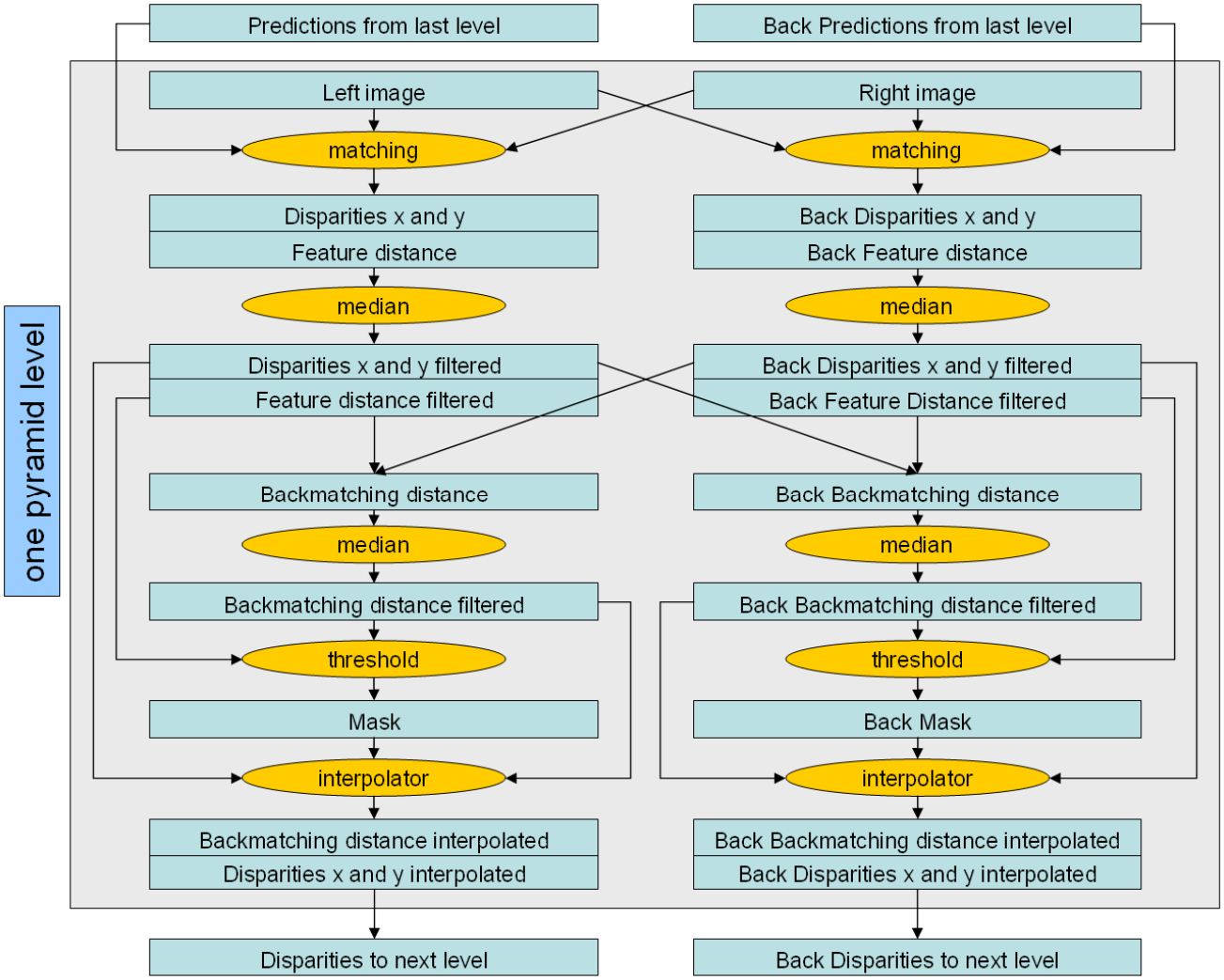

Algorithms
RSG (Remote sensing Software package Graz)
IMPACT (Image Processing And Classification Toolkit)
modular, platform independent
Sensor modelling
Ortho-Rectification
Visualization
Segmentation
Raster File IO
Filtering
Co-Registration
Mosaicing
Classification
SAR interferometry
Image matching
Change detection
Etc.
PROX (Process control system)

ADAM^{C}
Airborne Data Acquisition Module



Hierarchical Matching

- Many cost functions
  - § NCC, Census, MI,…
  - § Combinations
- Two matching criteria
  - WTA and SGM
- Backmatching
- Prediction
  - Low order polynomial
  - Coarse DEM
- Filter
- Interpolation
- Adaptive penalty p2



Hardware

- Windows PC (but RSG works also under Linux,…)
  - Intel Xeon CPU E5-2650, 2.0 GHz,
  - 16 Cores, 32 GB RAM
  - No GPU !!!
  - RAID 5 storage with 3.6 TB hard disk (but of course not that much really available ;-))

Processing Time – Vaihingen/Enz

Processing step	Duration	Total
Preparation		17 min 3 sec
Normalization + Prediction	32 sec*	34 min 12 sec**
Matching	15 min 52 sec*	15 h 4 min**
Forward intersection	26 sec*	24 min 42 sec**
DSM generation		51 min 14 sec
DSM finalisation		5 min 56 sec

* Stereo pair 04 - 05
** 57 Stereo pairs

Processing Time - Munich

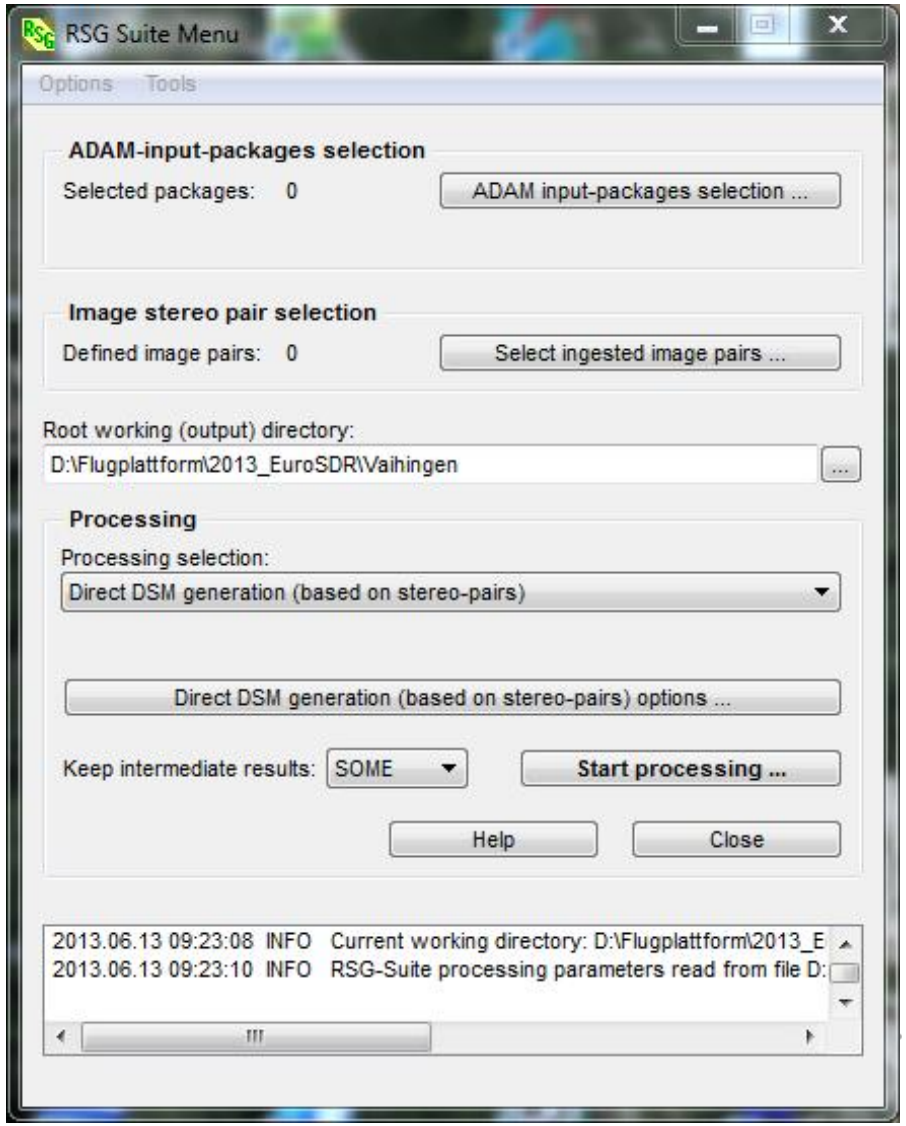
Processing step	Duration	Total
Preparation		5 min 21 sec
Normalization + Prediction	29 sec*	10 min 38 sec**
Matching	56 min 56 sec*	20 h 52 min**
Forward intersection	54 sec*	19 min 48 sec**
DSM generation		9 min 57 sec
DSM finalisation		2 min 28 sec

* Stereo pair 313 - 314
** 22 Stereo pairs

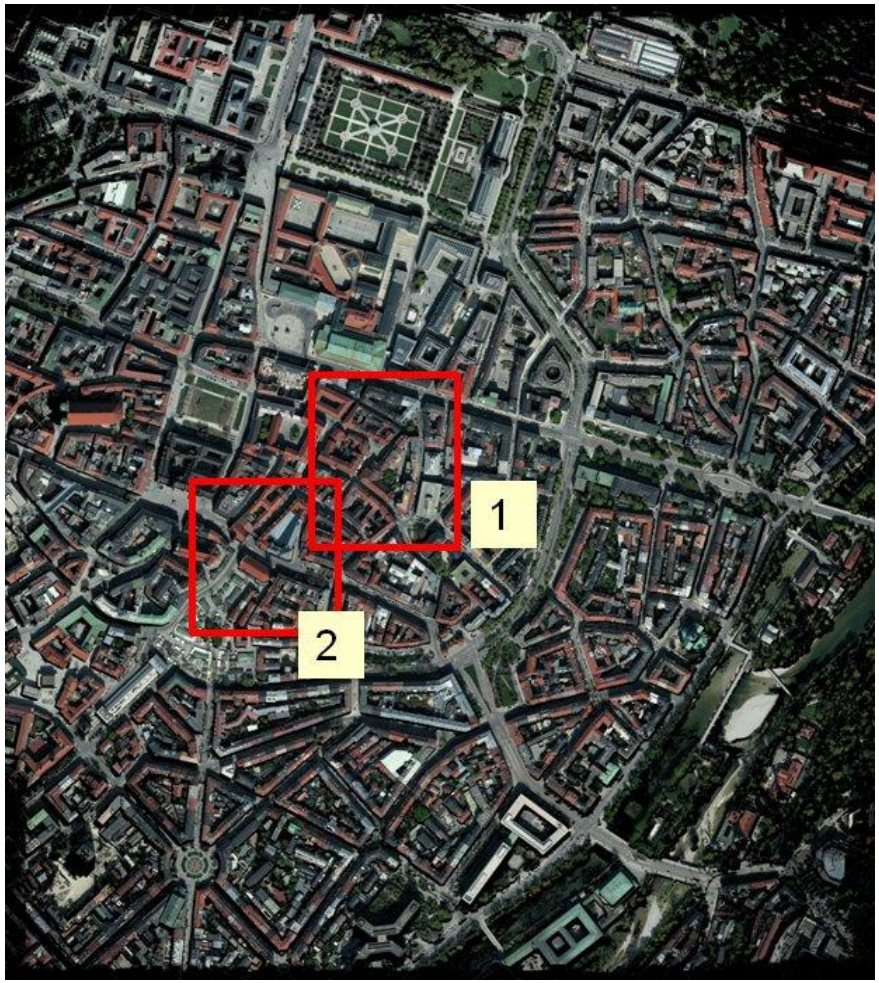
NON-LINEAR BEHAVIOUR DUE TO (UNCLEAR) SWAPPING

Manual Interaction

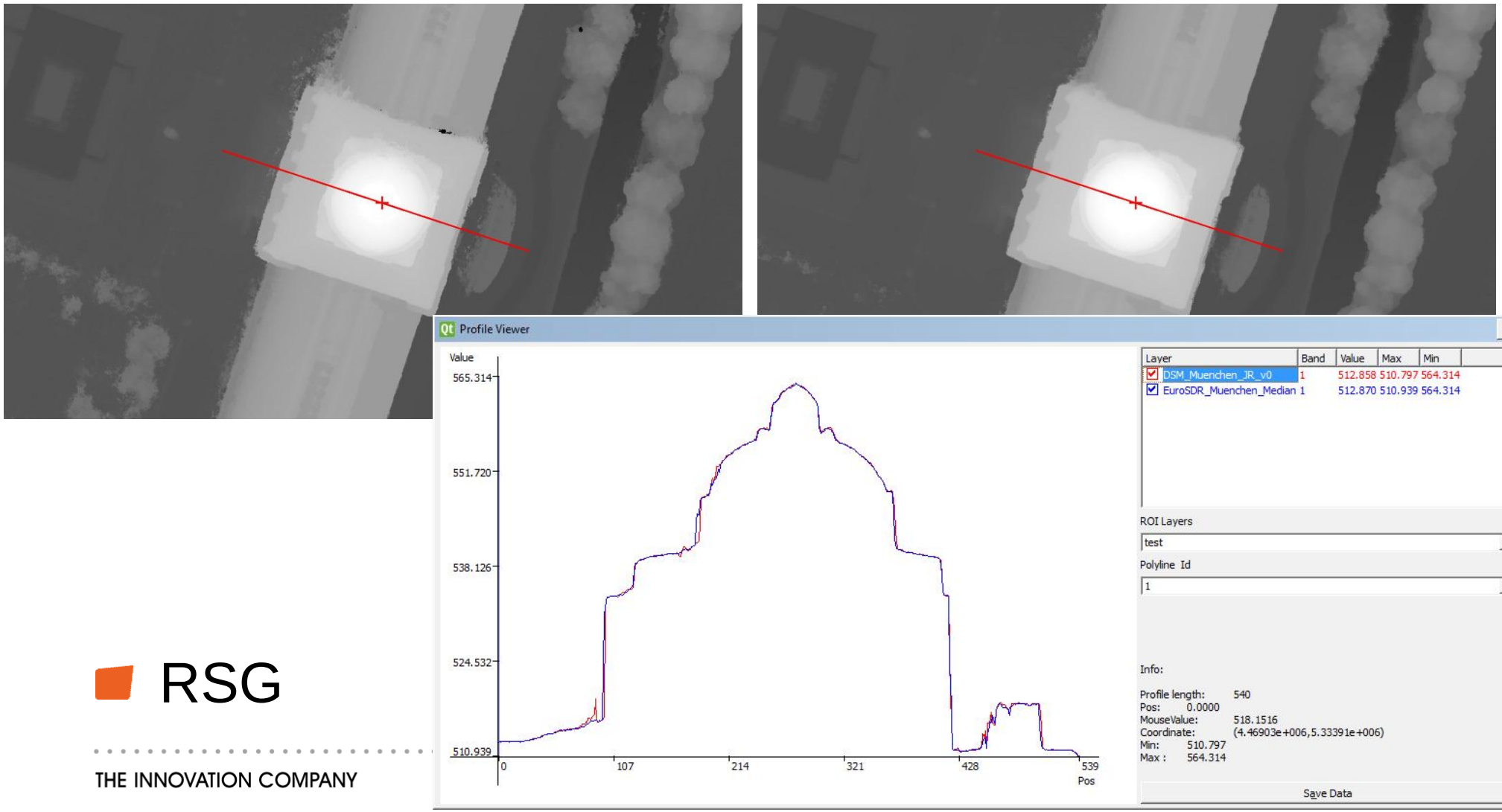
- Data preparation
  - Could be avoided if standardised meta information
- Stereo pair selection
  - Can also be done automatically
- No DSM editing (by purpose)



Munich



Munich



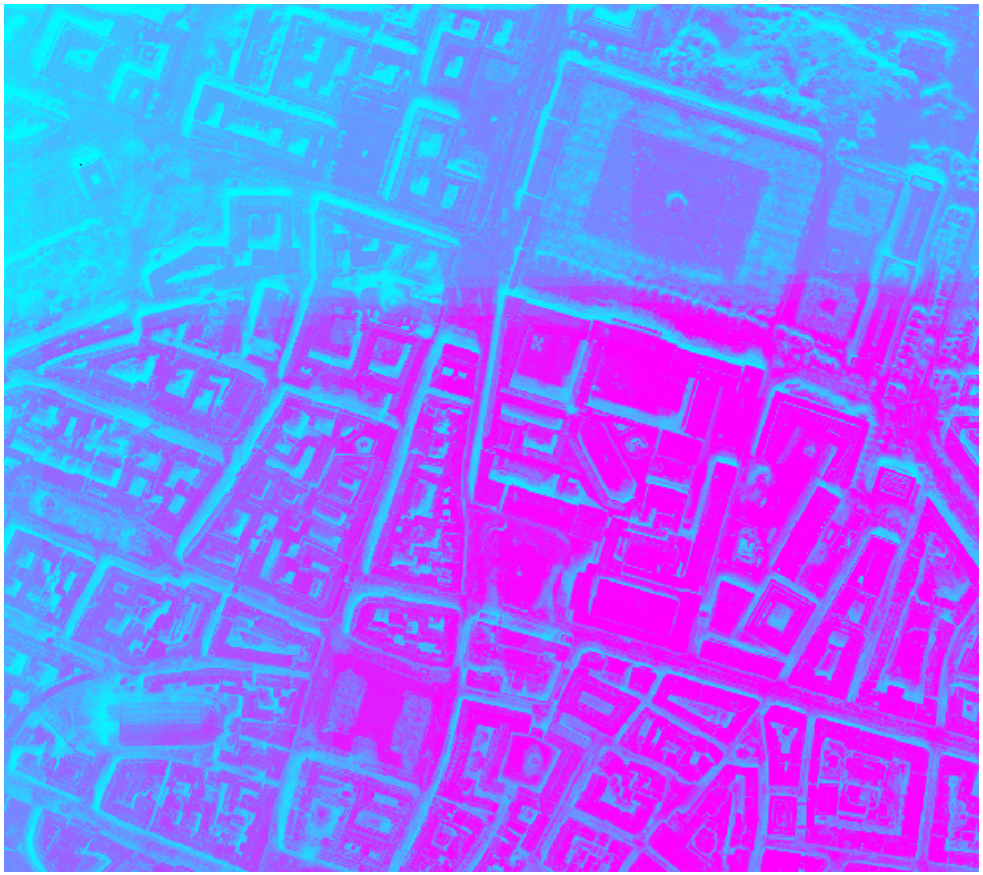
RSG

THE INNOVATION COMPANY

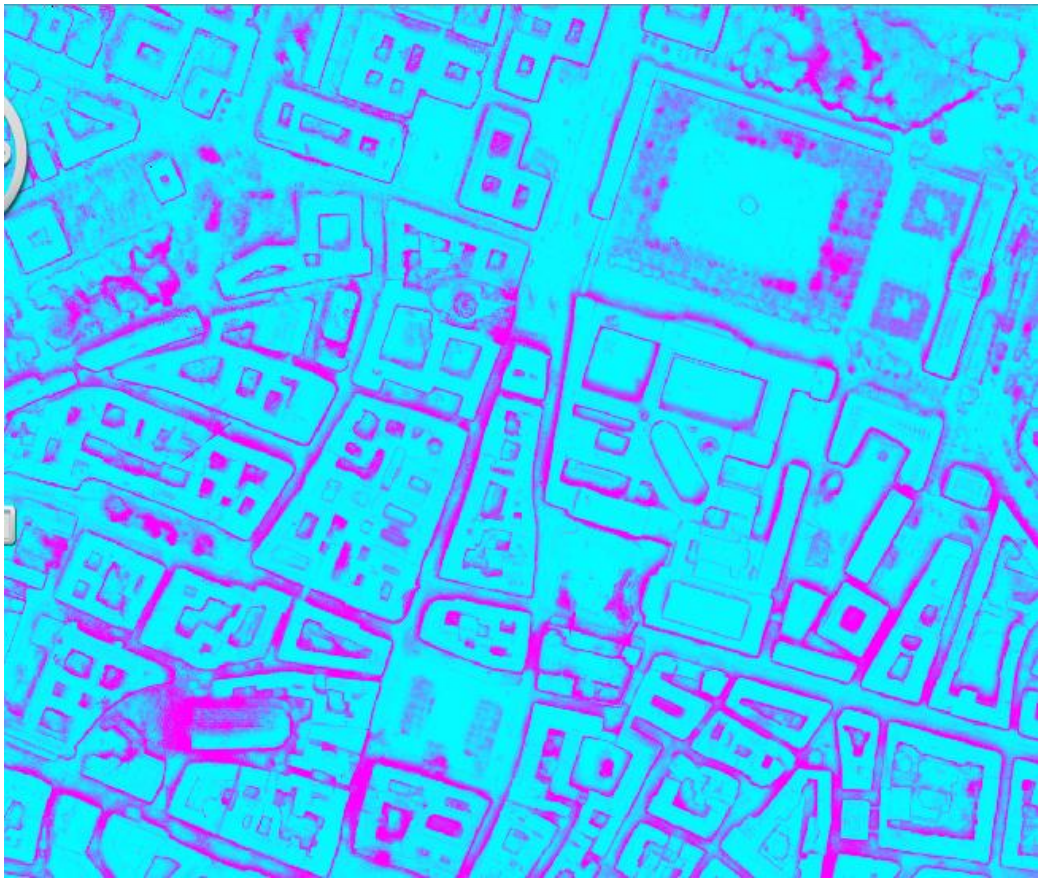
Problems

- Interpretation of meta information (exterior & interior orientation)
  - Different for Vaihingen and Munich data set
  - Different with respect to other (UltraCam) data sets
- Time for processing (matching)
  - Will change soon!
- Blunder detection
  - EuroSDR data set for us the first to “play”

Example



- No. valids [1-120]



- Std. Dev. [0m – 65m]

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