NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY

Know the Earth... Show the Way... Understand the World

Kompsat-3 Absolute Geolocation Accuracy Evaluation

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Outline

- Background
- Evaluation
- Results

Background

- Launched: 17 May 2012
  - 0.7m panchromatic / 2.8m multispectral Ground Sampled Distance (GSD) imagery
- Satrec Initiative provided Kompsat-3 images to TVQ
  - 25 Panchromatic and multispectral Level 1R image products
  - In NITF format with Rational Polynomial Coefficients (RPC) support data for geolocation
- TVQ used SOCET GXP to perform assessment
  - Only panchromatic images were assessed
  - Only 16 images were assessed as 9 images were not readable from DVDs provided

Ground Truth

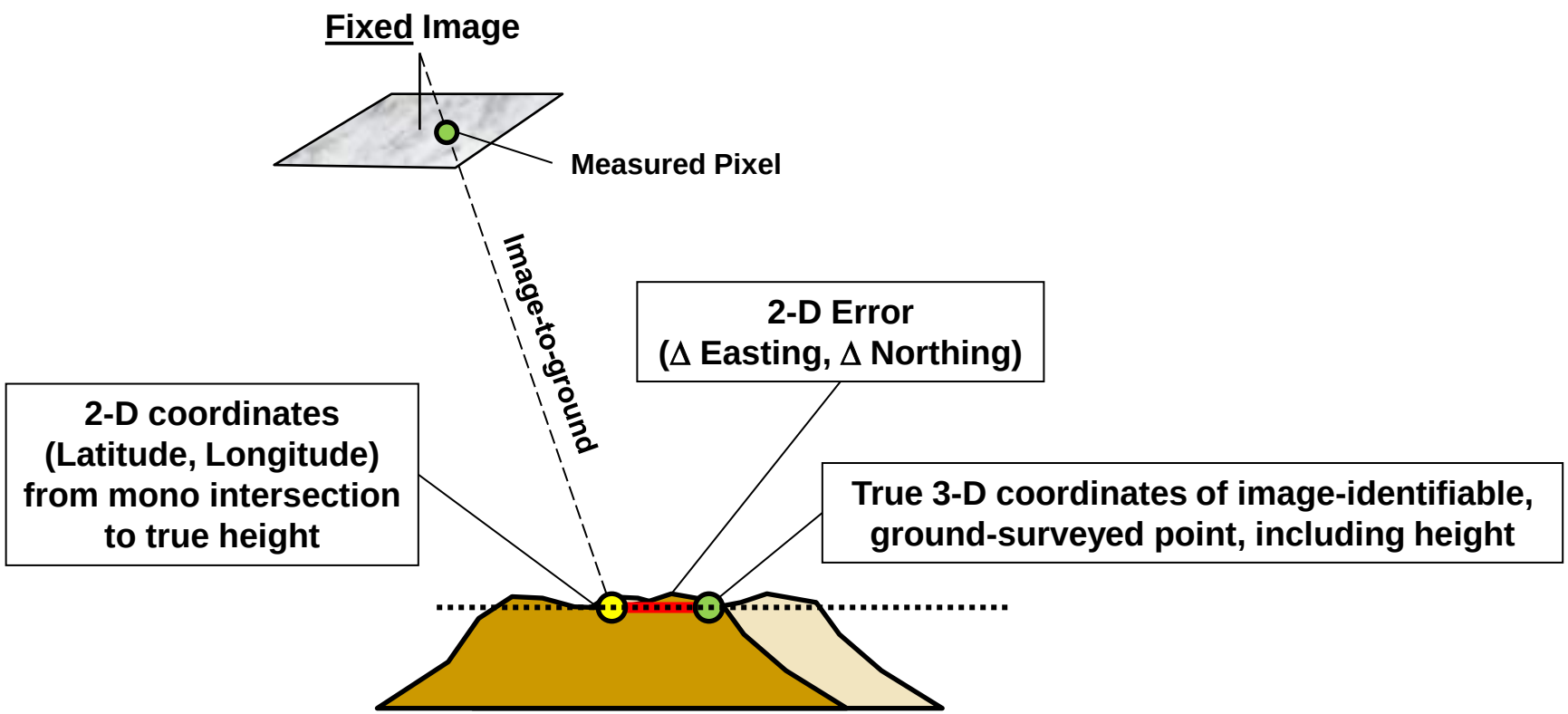
- Terminal Aeronautical Global Navigation Satellite System (GNSS) Geodetic Survey (TAGGS) test sites
- Provides accurately-surveyed coordinates for aerodromes
  - Runways
  - Navigation aids
  - Vertical obstructions
  - Ground Control Points (GCPs)
- Supports safety of air navigation
- Typically 0.25m (1σ) accuracy in each coordinate direction

http://earth-info.nga.mil/GandG/geosurveys/TAGGS.html

Mono Intersection

- TAGGS ground-surveyed points used as check points
  - Identifiable points measured on each image
- Mono intersection used to determine 2-D coordinates of each point using:
  - Measured pixel
  - RPC support data
  - Known height from TAGGS check point

Mono Intersection



Consolidated Errors

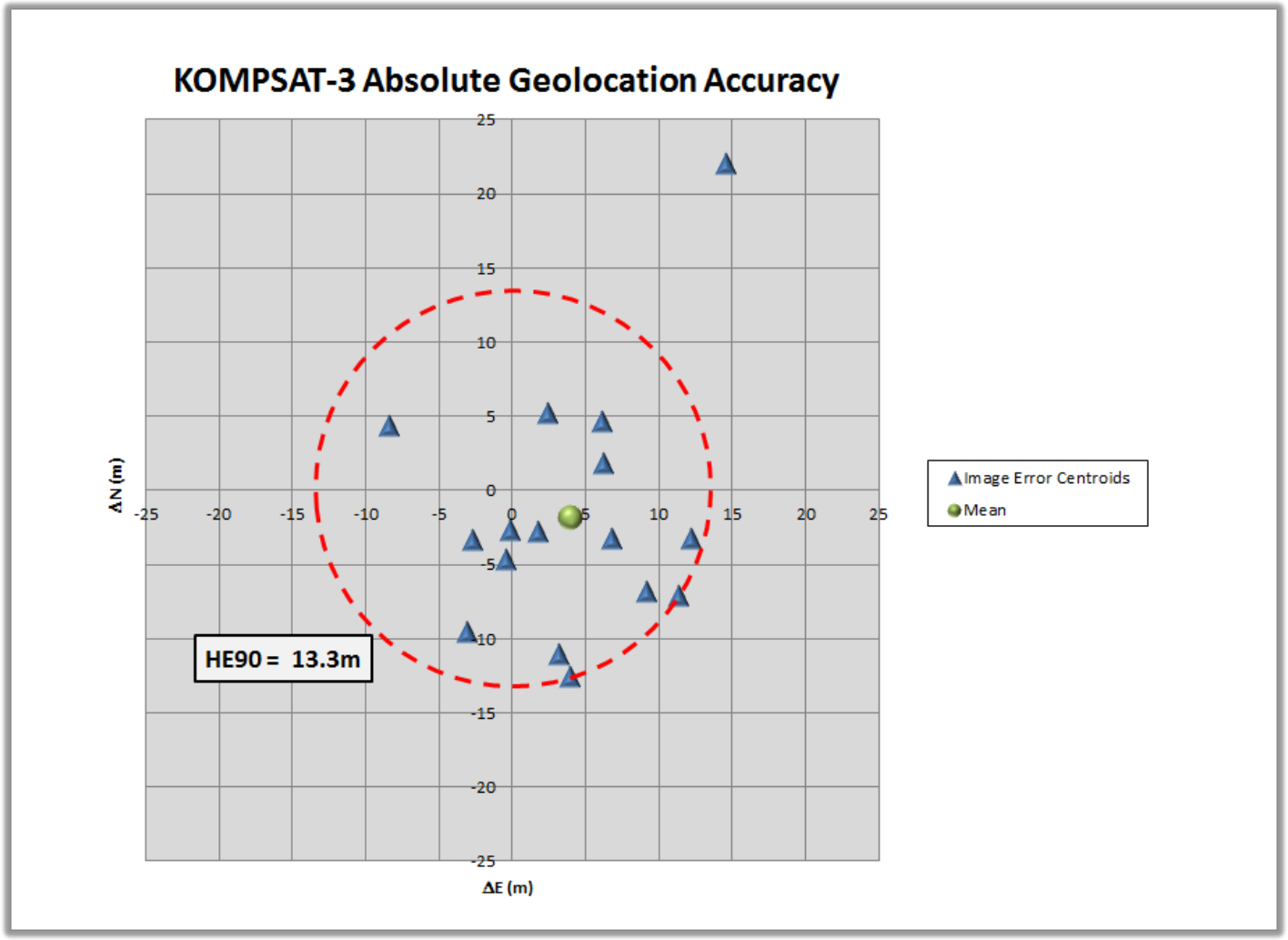
- Test sites have varying number of check points
- To weight each image equally, consolidate errors into single data point for each image
- Use error centroid
  - Compute mean "Δ Easting" and "Δ Northing" values
    - Convert into horizontal "Δ Radial" value
- "Δ Radial" values sorted by magnitude and used to estimate Horizontal Error 90% (HE90) sample statistic
- Non-parametric cutoff formula = 0.9n + 0.5 in which n is number of images
- HE90 value linearly interpolated to cutoff position

Geolocation Accuracy Results

Test Site	Image Date	n	Mean ΔE (m)	Mean ΔN (m)	Δr (m)
Bandari	26-Dec-2013	15	1.8	-2.8	3.3
Dobbins	14-Mar-2013	9	3.9	-12.5	13.1
Dyess	20-Jan-2014	17	2.4	5.2	5.8
Jomo Kenyatta	20-Jan-2013	16	3.2	-11.1	11.5
Karshi Khanabad	14-Jul-2014	5	14.6	22.0	26.4
Kirkuk	21-Jun-2014	14	-3.0	-9.5	10.0
Mactan	04-Feb-2014	15	6.2	1.9	6.5
Masirah Island	13-Jul-2014	23	11.3	-7.1	13.4
Menara	24-Feb-2013	16	-8.4	4.4	9.4
Mosul	26-Jun-2014	7	6.2	4.6	7.7
Nellis	17-Aug-2014	13	-0.2	-2.7	2.7
Ninoy Aquino	21-Apr-2014	23	9.2	-6.8	11.4
Riga	02-Mar-2013	11	-2.7	-3.4	4.3
Seeb	23-Jul-2014	10	12.3	-3.2	12.7
Shabaz	03-Nov-2014	19	6.8	-3.3	7.5
Sidi Ahmed	30-May-2013	13	-0.4	-4.7	4.7
		Mean	**3.9**	**-1.8**	**9.4**
		Std Dev	**6.2**	**8.3**	**5.8**
		Max	**14.6**	**22.0**	**26.4**
		Min	**-8.4**	**-12.5**	**2.7**

Horizontal Error 90% (HE90) is 13.3 meters

Geolocation Accuracy Results



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