



JACIE

Geometric Accuracy Assessment OrbView ORTHO Products

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Methodology-



- **Used Image Assessment Software (IAS) with base image of high geometric confidence to assess geometric characteristics of unknown products.**
- **Original software written in 1980's for Landsat geo-assessment. Uses normalized cross-correlation of grey levels in variable sized chips for image matching.**
- **Feasibility of software use for high-resolution imagery was first investigated by comparison of software generated results with manual interpretation results in 2003 (Lee and Coan).**

Products Evaluated (1 of 3)-

OrbView Ortho (1:50k)

Panchromatic

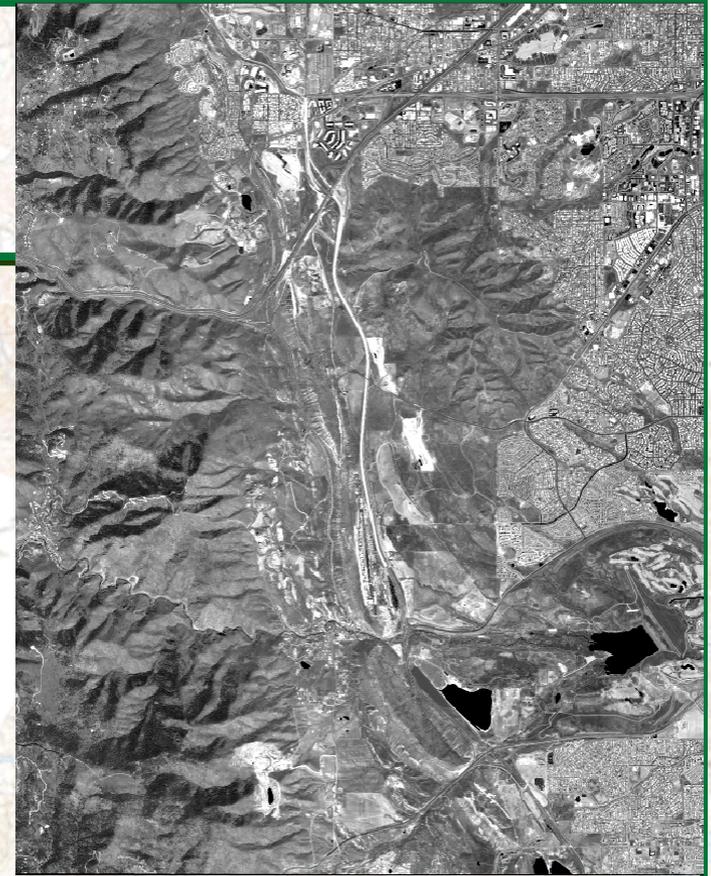
1m GSD

CE90% ≤ 25m

Location: Morrison, CO

**Base imagery: USGS Digital Ortho
Quarter Quadrangles (DOQQs)**

Issues: DOQQ base imagery and OrbView image differ by years – many developments have been built in the Colorado Front Range in that interval. However, using DOQQs is very tempting, due to their nation-wide availability. Historically, IAS uses DOQQs for Landsat geo-assessments.



Results (1 of 3)-

Morrison OrbView ORTHO 1:50K panchromatic
"CE90% <= 25m" (DOQQ to OV3)

Number of valid control points = 188.

National Standard for Spatial Data Accuracy
(NSSDA) Statistics

RMSE_x = 3.912

RMSE_y = 4.885

RMSE Vector = 6.258

RMSE_{min}/RMSE_{max} = 0.801 FGDC Case 2

Accuracy (95 percent confidence) = 10.766

Former National Map Accuracy Standard (NMAS) Statistic

Circular Map Accuracy Standard (CMAS, 90%) = 9.497

Absolute Horizontal Accuracy, via the Polynomial Combination of
Means and Sigmas (from MIL-STD-600001) Thomas Ager paper, pg. 5

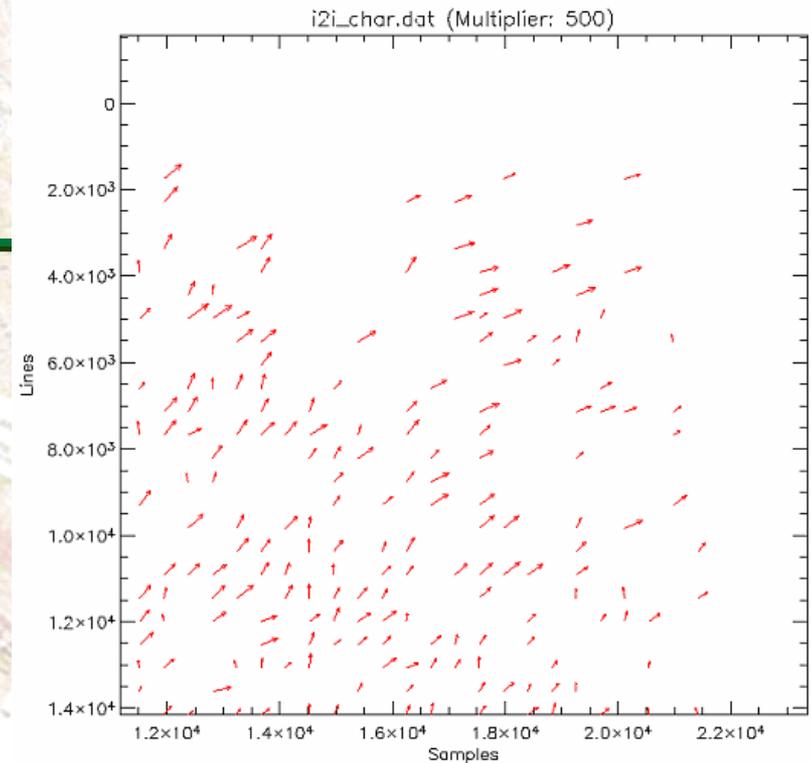
Horizontal Bias = 5.710

Std Dev (delta x, y) = 2.135, 1.426

Horizontal Std Dev = 1.815

Horiz_Bias/Horiz_Std_Dev = 3.146

Absolute CE90 = 8.271



Products Evaluated (2 of 3)-

OrbView Ortho (1:24k)

Panchromatic

1m GSD

CE90% \leq 12m

Location: Sioux Falls, SD

**Base imagery: Current aerial
photogrammetric orthomosaic**

Issues: Both base imagery and the OrbView image acquired in late April, 2004. Scanned film orthophoto mosaic product was resampled from 2 ft color resolution to a panchromatic 1m resolution.



Results (2 of 3)-

Sioux Falls OrbView ORTHO 1:24K panchromatic
"CE90% <= 12m" (Orthophoto to OV3)

Number of valid control points = 212.

National Standard for Spatial Data Accuracy
(NSSDA) Statistics

RMSE_x = 1.038

RMSE_y = 1.961

RMSE Vector = 2.219

RMSE_{min}/RMSE_{max} = 0.529*

Accuracy (95% confidence) = 3.671*

*RMSE component ratio not addressed by FGDC Cases,
making a formal computation of NSSDA Accuracy invalid.

Former National Map Accuracy Standard (NMAS) Statistic

Circular Map Accuracy Standard (CMAS, 90%) = 3.368

Absolute Horizontal Accuracy, via the Polynomial Combination of
Means and Sigmas (from MIL-STD-600001) Thomas Ager paper, pg. 5

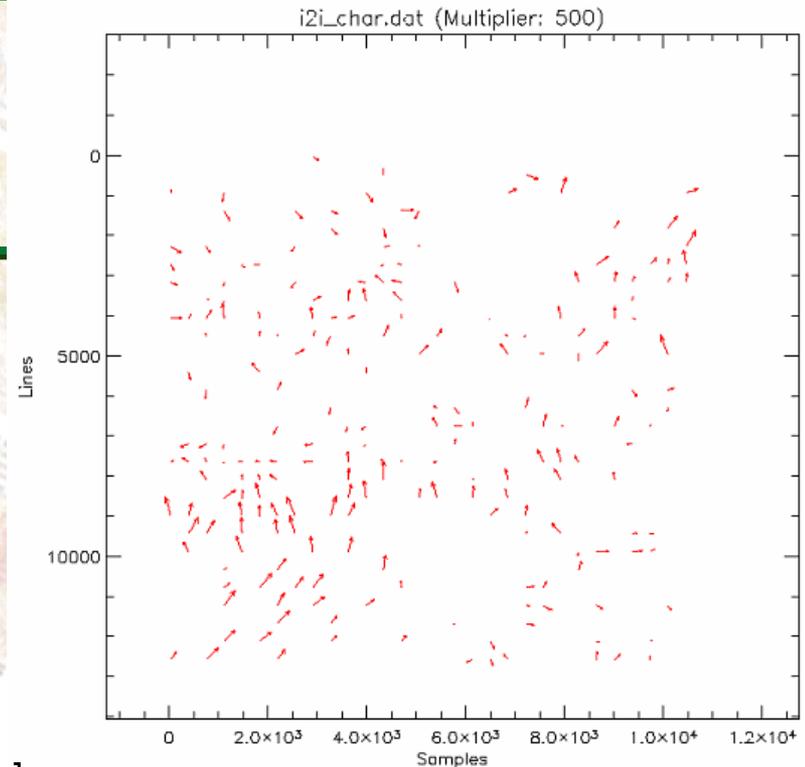
Horizontal Bias = 1.105

Std Dev (delta x, y) = 1.004, 1.647

Horizontal Std Dev = 1.364

Horiz_Bias/Horiz_Std_Dev = 0.811

Absolute CE90 = 3.336



Products Evaluated (3 of 3)-

OrbView Ortho (1:24k)

Multispectral

4m GSD

CE90% \leq 18m

**Location: EROS Data Center,
Edison TWP, SD**

Base imagery: Current aerial photogrammetric orthomosaic

Issues: Base imagery acquired late April, 2004, OrbView image acquired late July, 2004 – major phenological changes in farmland (plowed ground to mature crops). Scanned film orthophoto product was resampled from 2 ft color resolution to a color 4m resolution.



Results (3 of 3)-

EDC OrbView ORTHO 1:24K Multispectral,
4 meter pixels, "CE90% <= 18m" (Orthophoto Base)

Number of valid control points = 35.

National Standard for Spatial Data Accuracy
(NSSDA) Statistics

RMSE_x = 2.355 (9.42m)

RMSE_y = 0.898 (3.59m)

RMSE Vector = 2.521 (10.08m)

RMSE_{min}/RMSE_{max} = 0.381*

Accuracy (95% confidence) = 3.982* (15.93m*)

*RMSE component ratio not addressed by FGDC Cases,
making a formal computation of NSSDA Accuracy invalid.

Former National Map Accuracy Standard (NMAS) Statistic

Circular Map Accuracy Standard (CMAS, 90%) = 3.825 (15.3m)

Absolute Horizontal Accuracy, via the Polynomial Combination of
Means and Sigmas (from MIL-STD-600001) Thomas Ager paper, pg. 5

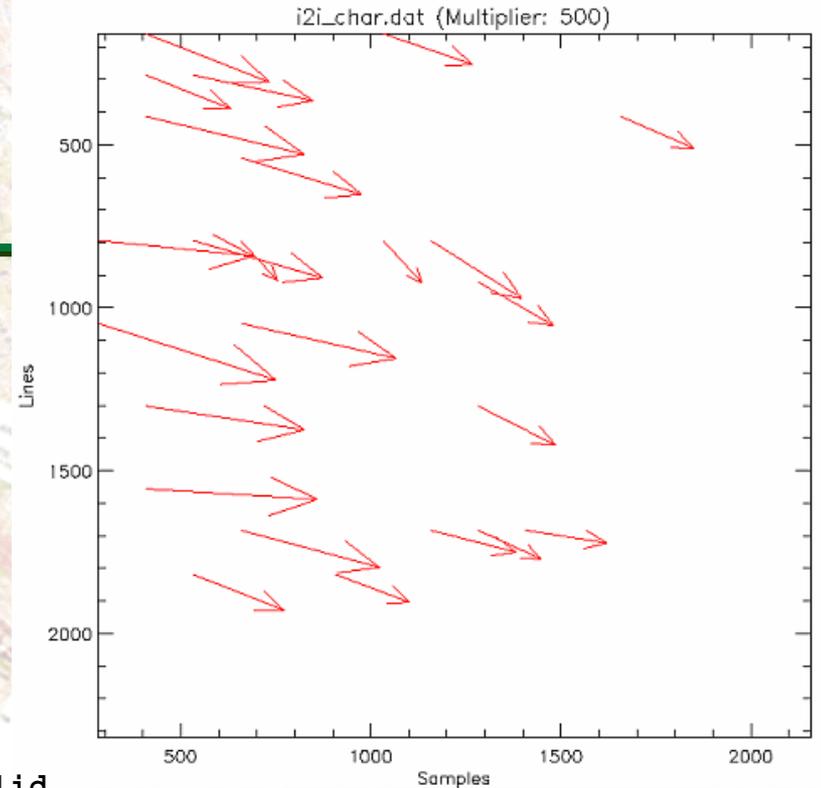
Horizontal Bias = 2.313

Std Dev (delta x, y) = 0.808, 0.616

Horizontal Std Dev = 0.718

Horiz_Bias/Horiz_Std_Dev = 3.220

Absolute CE90 = 3.326 (13.30m)



Summary-

- All evaluated OrbView ORTHO products exceeded CE90% specifications per OrbView ORTHO product descriptions
- IAS performed well on wide variety of base imagery – extreme temporal/phenological differences did not “break” the software’s ability to find suitable matching chips.
- IAS enabled all three products to be evaluated in minutes - compared to the normal man-days required for traditional field surveys and manual point selection and analysis. Currently, most of the existing effort goes into pre-processing (resampling, reprojecting, rescaling) the base imagery to match the product to be evaluated.