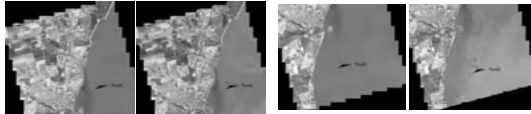


Coastal Mapping and Change Detection Using High-Resolution IKONOS Satellite Imagery

supported by the Digital Government Program of NSF, Grant No. 91494

IKONOS Image Data

The 1m resolution IKONOS Geo stereo images



the first stereo pair

the second stereo pair

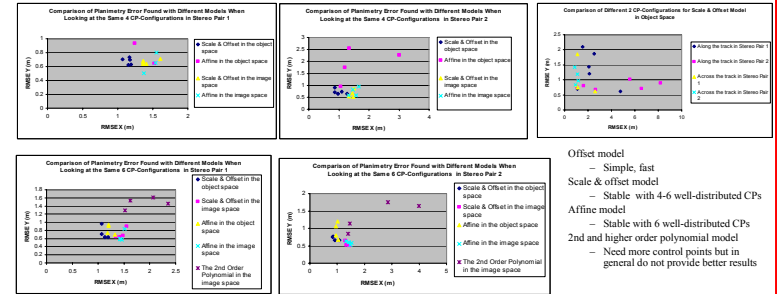
The 4m resolution IKONOS image



Geometric processing of IKONOS Imagery

Four models defined both in the image space and in the object space

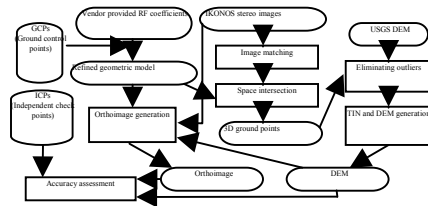
	ID	Adjustment Models	Pts No
Object space	1	Offset $X' = a_1, Y' = b_1, Z' = c_1$	1
	2	Scale & Offset $X' = a_1 + b_1 J$ $Y' = b_2 + b_2 J$ $Z' = c_1 + c_1 Z$	2
	3	Affine $X' = a_1 + a_1 X + a_2 Y + a_3 Z$ $Y' = b_1 + b_1 X + b_2 Y + b_3 Z$ $Z' = c_1 + c_1 X + c_2 Y + c_3 Z$	4
	4	2 nd poly $X' = a_1 + a_1 X + a_2 Y + a_3 Z + a_4 X^2 + a_5 Y^2 + a_6 Z^2$ $Y' = b_1 + b_1 X + b_2 Y + b_3 Z + b_4 XY + b_5 YZ$ $Z' = c_1 + c_1 X + c_2 Y + c_3 Z + c_4 XY + c_5 YZ$ $+ c_6 Z^2 + c_7 X^2 + c_8 Y^2 + c_9 Z^2$	10
Image space	1	Offset $X' = a_1, Y' = b_1$	1
	2	Scale & Offset $X' = a_1 + a_1 J$ $Y' = b_1 + b_1 J$	2
	3	Affine $X' = a_1 + a_1 J$ $Y' = b_1 + b_1 J + b_2 J^2$	3
	4	2 nd poly $X' = a_1 + a_1 J + a_2 J^2 + a_3 J^3 + a_4 J^4$ $Y' = b_1 + b_1 J + b_2 J^2 + b_3 J^3 + b_4 J^4$	6



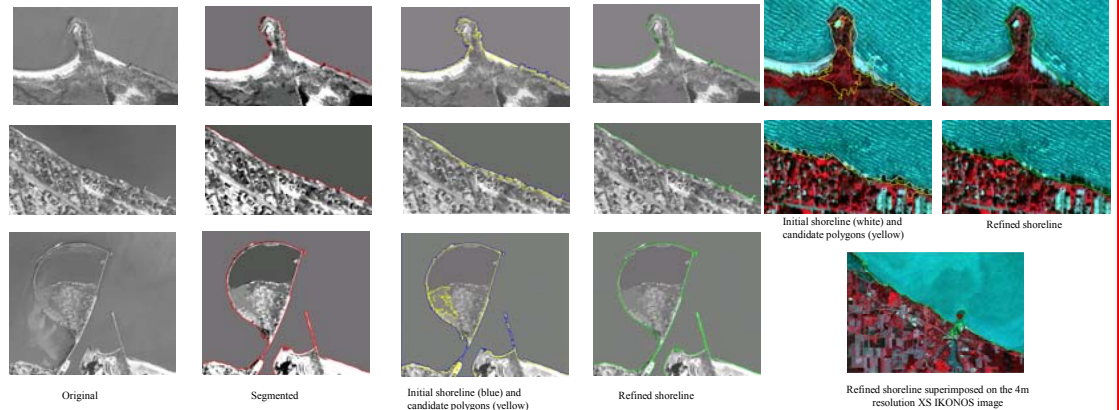
- Offset model
- Simple, fast
- Scale & offset model
- Stable with 4-6 well-distributed CPs
- Affine model
- Stable with 6 well-distributed CPs
 - 2nd and higher order polynomial model
 - Need more control points but in general do not provide better results

Coastal Area Mapping from IKONOS Imagery

Automatic DEM and Orthoimage Generation



Result



Automatic 3D Shoreline Extraction

- Mean shift segmentation
- Major water body identification
- Initial shoreline extraction
- Shoreline refinement

- A simple adjustment model (either the Affine or the Scale & Offset) is effective
 - Elimination of the systematic errors
 - Improvement of the 3D geopositioning accuracy to a 1-2 m level comparable to IKONOS Precision stereo imagery
- The semi-automatic method for processing IKONOS imagery is effective