

Automated Near-Real Time Cloud and Cloud Shadow Detection in High Resolution VNIR Imagery



JACIE

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GDA Corp.

Presentation Outline

-  **Project Overview**
-  **Core Technology**
-  **Current Development Status**
-  **Next Steps / Critical Action Items**
-  **Future Directions**
-  **Acknowledgements**



Project Overview

CASA—Cloud And Shadow Assessment

CHALLENGE

- Fully automated, per-pixel cloud and cloud shadow detection in medium and high-resolution RS data without the use of thermal data.

SOLUTION

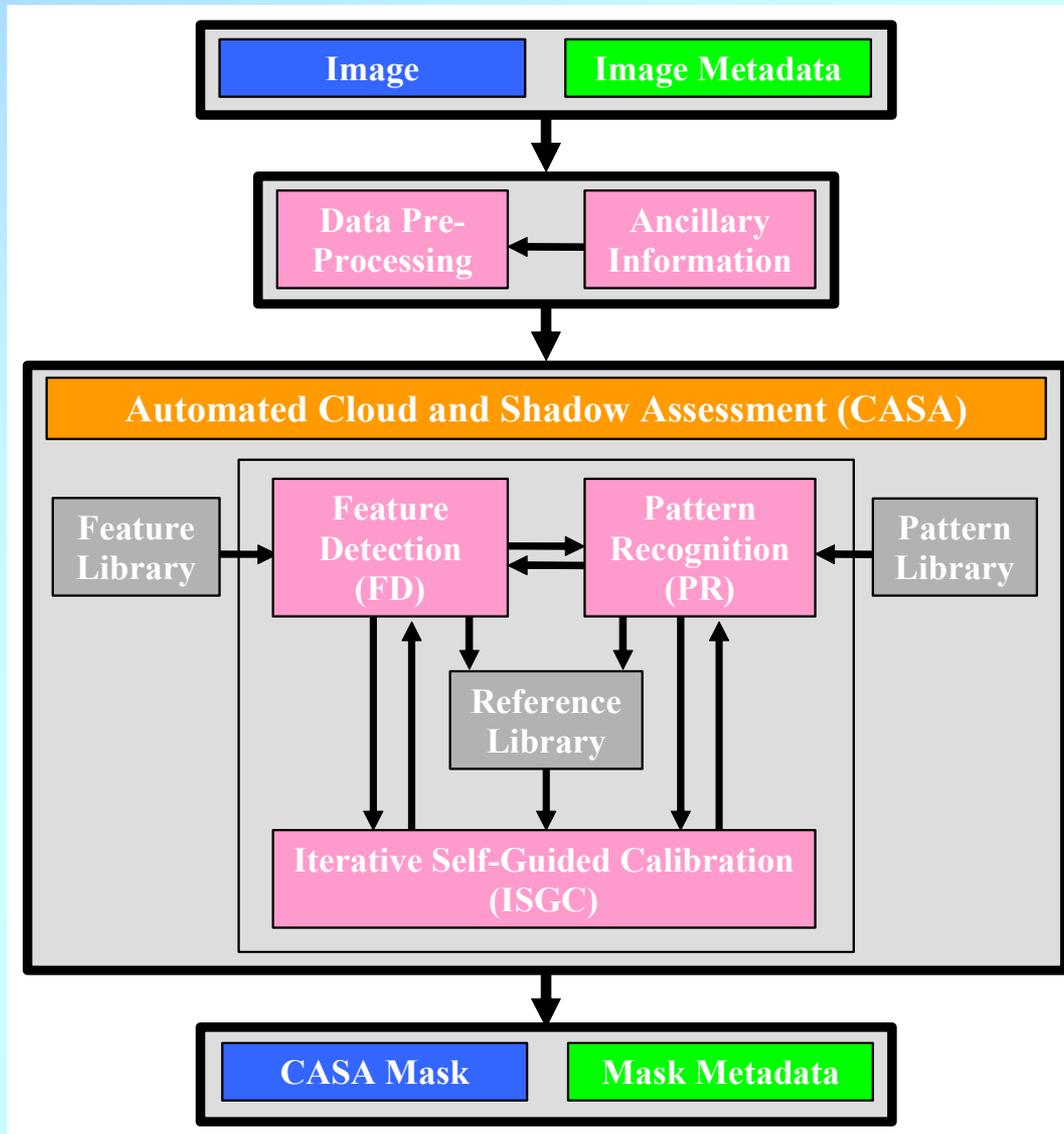
- CASA System—An innovative set of algorithms based on spectral, spatial and contextual information, and hierarchical self-learning logic. Near-real time, fully automated, per-pixel detection limited to VNIR data.

VALUE

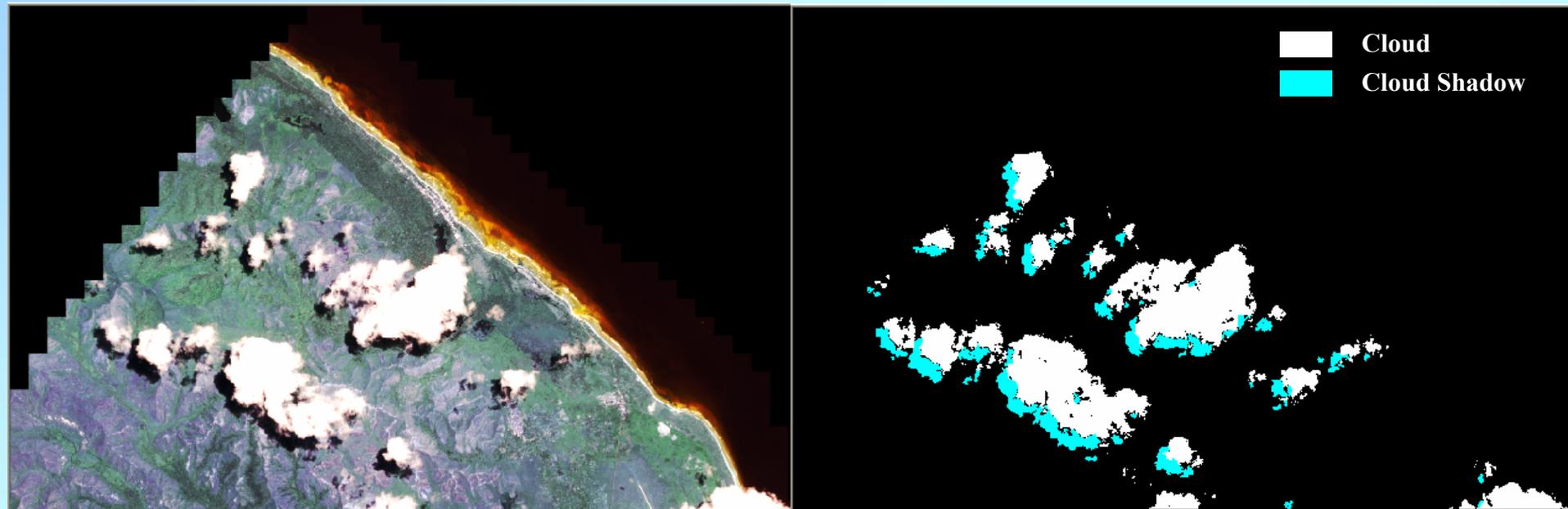
- Reduce labor & operating costs for cloud identification, and QA/QC; create new products from data previously considered loss; achieve detection rates which would allow on-board, (near)-real time cloud detection; and contributes innovative R&D on AFE



CASA Algorithm Architecture



CASA Examples

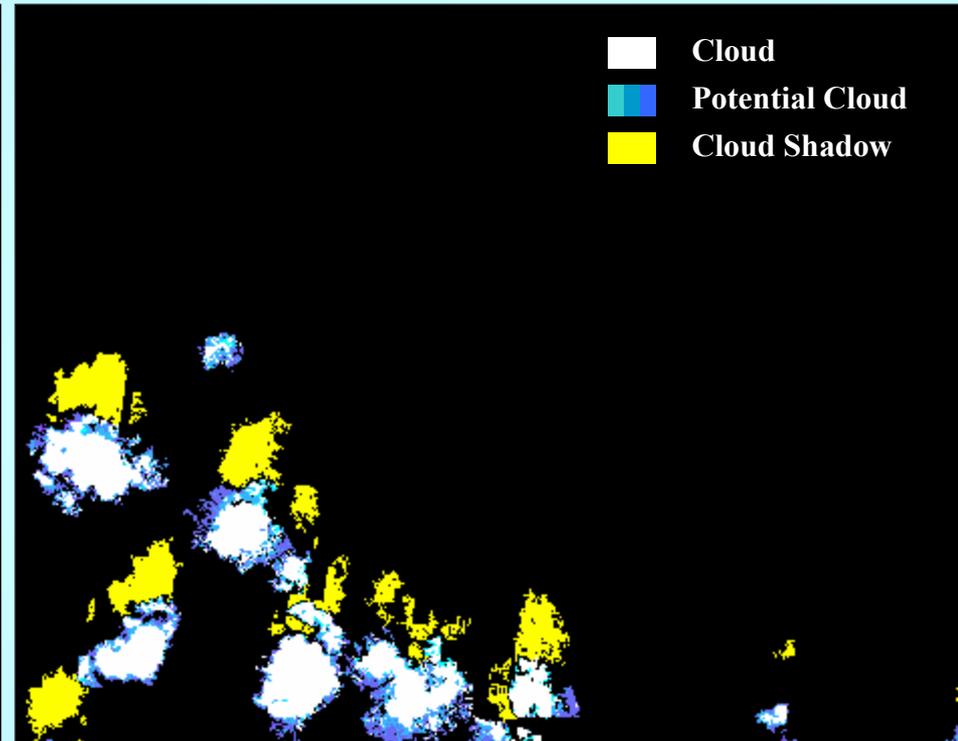
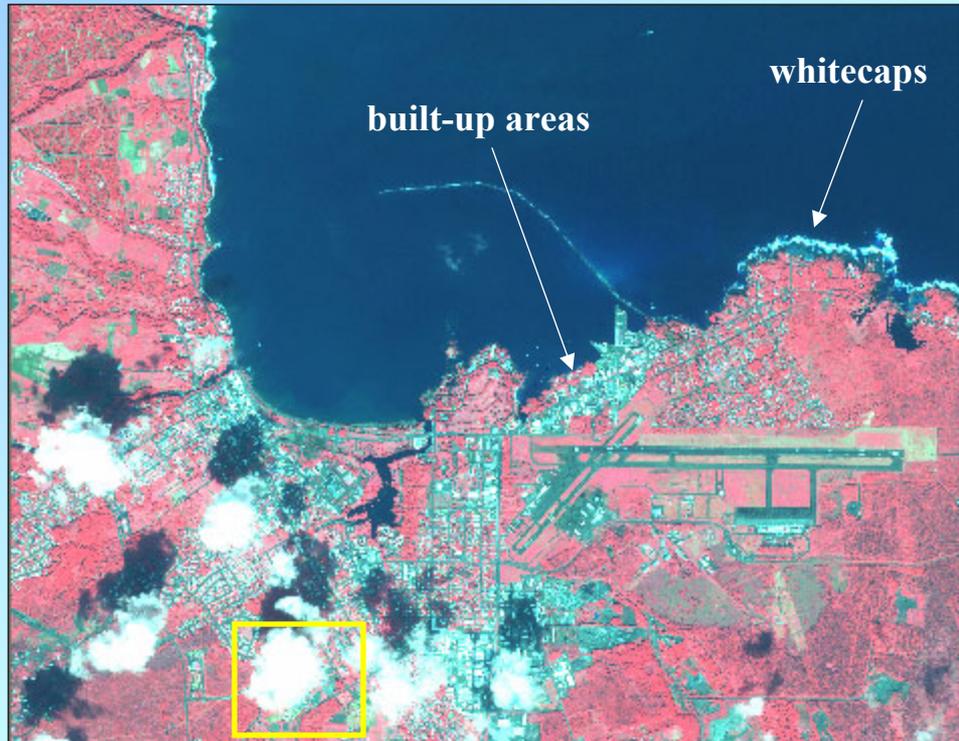


Imagery (c) Space Imaging LLC



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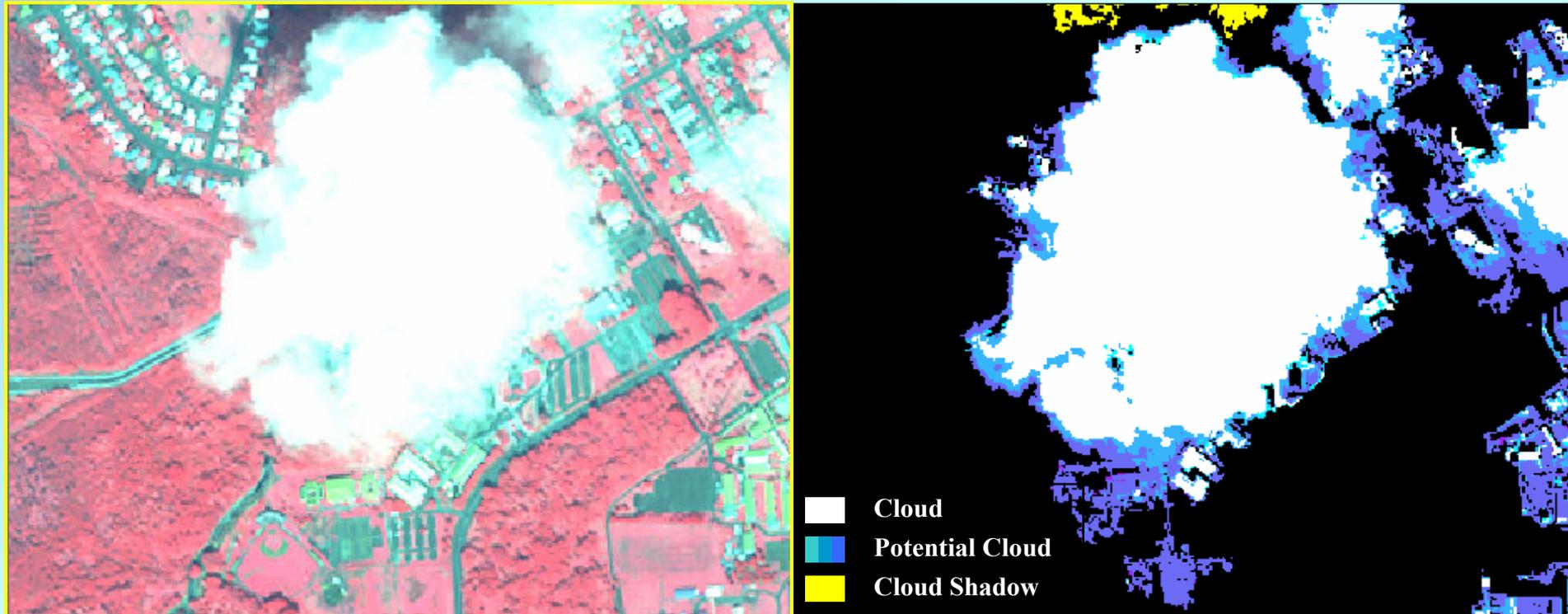
CASA Examples



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CASA Examples

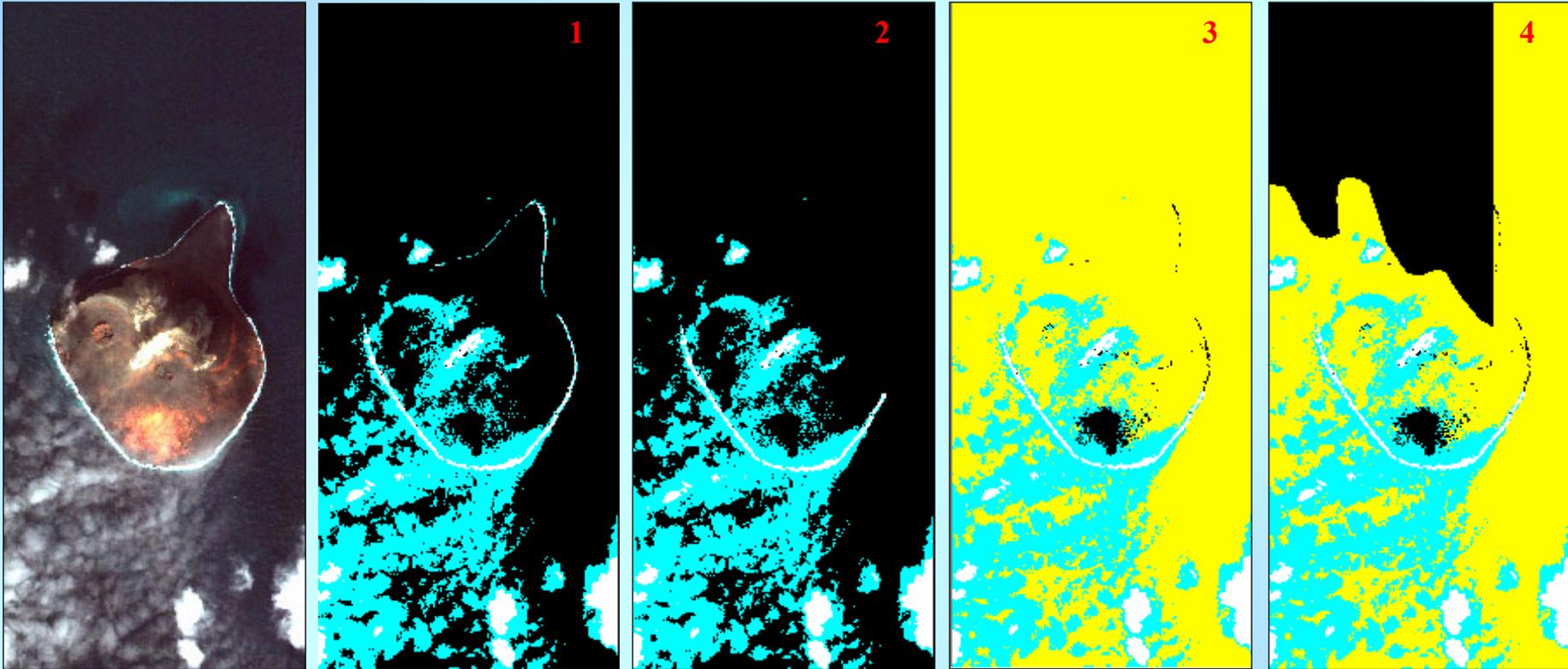


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CASA Examples



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CASA—Current Development Status

- One year into 2-year Phase II NASA SBIR
- Prototype is fully automated
- Straight C++ implementation except for Image I/O and User Interface
- Current runtime is 10-12 minutes for Landsat 7 and 4-7 minutes for Ikonos running on a 2GHz Pentium with only minimal algorithm/code optimizations to date
- Early prototype tested on ~ 200 Landsat and Ikonos scenes for various seasons and regions

Sensor	Leaf-on		Leaf-off	
	agreement (%)	disagreement (%)	agreement (%)	disagreement (%)
Landsat 5 TM	91	9	75	25
Landsat 7 ETM+	90	10	92	8
Average (%)	91	9	87	13



Next Steps / Critical Action Items

Next Steps

- Version 1: January/February 2005 (Landsat)
- Landsat 7 formal validation study
- Algorithm revisions & optimizations
- Benchmarking
- Final system delivered to NASA: January 2006

Action Items

- Extend CASA to other commercial sensors: Looking for commercial validation datasets as well as validation partners

Goals:

- Commercial-grade system: February 2006
- Accuracy: within 10% of the truth for 95% of all scenes processed
- Runtime: real- to near-real time



Future Directions

Extending this technology to other applications & features

Examples include, but not limited to:

- Enhancement of features located under shadows
- Automated AFE/ATR
- Rapid analysis of LULC change through innovative change detection techniques
- Automated updates of road & hydrology networks and building footprints

Phase III Contract Vehicle:

Work that “derives from, extends, or logically concludes efforts performed under prior SBIR funding agreements” (Products, production, services, R/R&D); No competition is required –can be “sole source”; Small business limits do not apply; funding can come from any Federal agency.



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Data

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