



Resourcesat-1 A WiFS Data at the USDA and Plans for 2007

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Civil Commercial Imagery Evaluation Workshop

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- **USDA-SIA supports remote sensing activities of the Department including:**
 - Provide administrative management of the USDA Remote Sensing Archive,
 - Transfer of satellite imagery to the agencies,
 - Coordinating agency satellite imagery data needs; and
 - Arranging for acquisition and preparation of imagery for use to the extent of existing capabilities.

- Code of Federal Regulation Title 7 section 2-43
 - 7 CFR Subtitle A (1-1-06 Edition)

Funding Sources

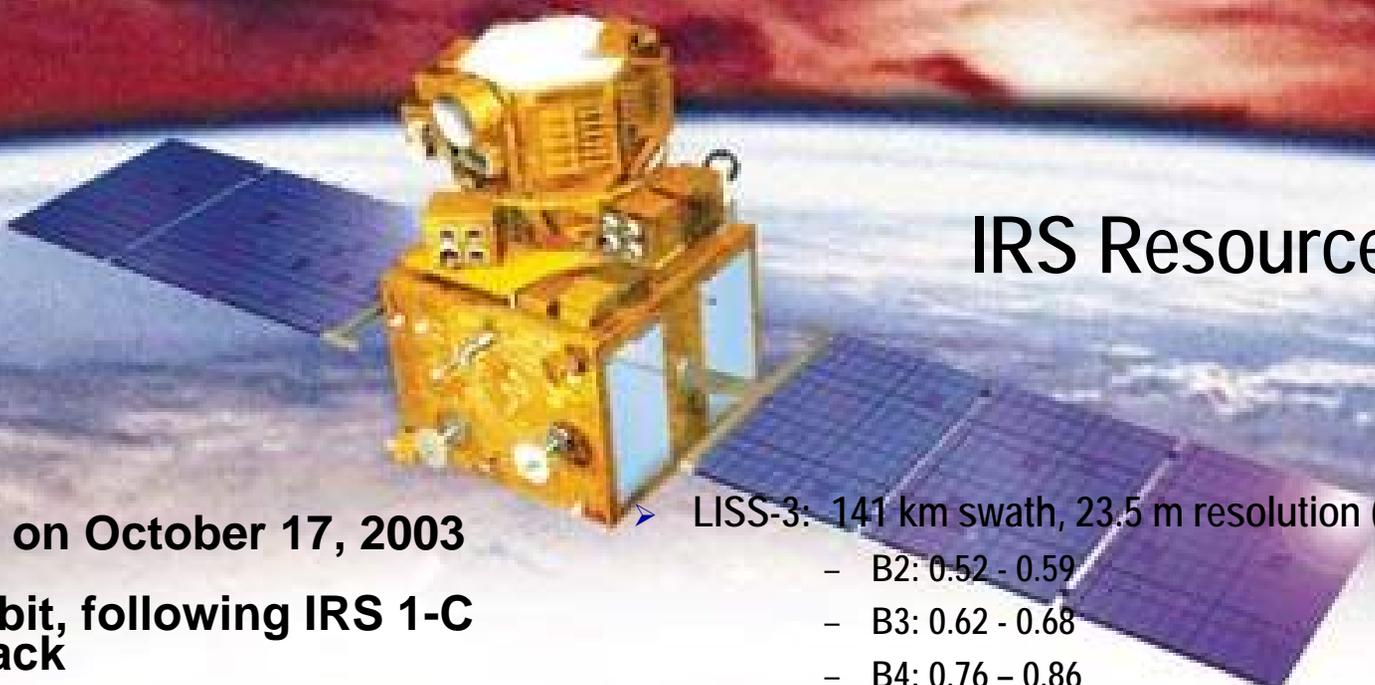
- USDA purchases satellite imagery using Commodity Credit Corporation (CCC) funds
- Purchases need to meet certain criteria.
 - From commercial sources
 - “Best value” to the US government
 - In-line with CCC Mission Elements
 - Price stability
 - Natural resource conservation
- Additional funds come from the subscription fees of the participating agencies.

Background for USDA-SIA

- Established in 2000
- Participating agencies:
 - National Agricultural Statistics Service,
 - Foreign Agricultural Service,
 - Farm Service Agency,
 - Natural Resource Conservation Service,
 - Risk Management Agency,
 - US Forest Service,
 - Animal Plant Health Inspection Service
 - Agricultural Research Service
- Affiliated with USGS/EROS
 - Broad MOU for cooperative efforts.
- USDA is one of the leading purchasers of commercial, medium resolution satellite imagery.
 - Purchased primarily Landsat data prior to 2006.



IRS Resourcesat-1



Launched on October 17, 2003

817 km orbit, following IRS 1-C ground track

Spacecraft lift-off mass: 1360kg

5 year mission

Local time: 10:30 +/- 5 minutes

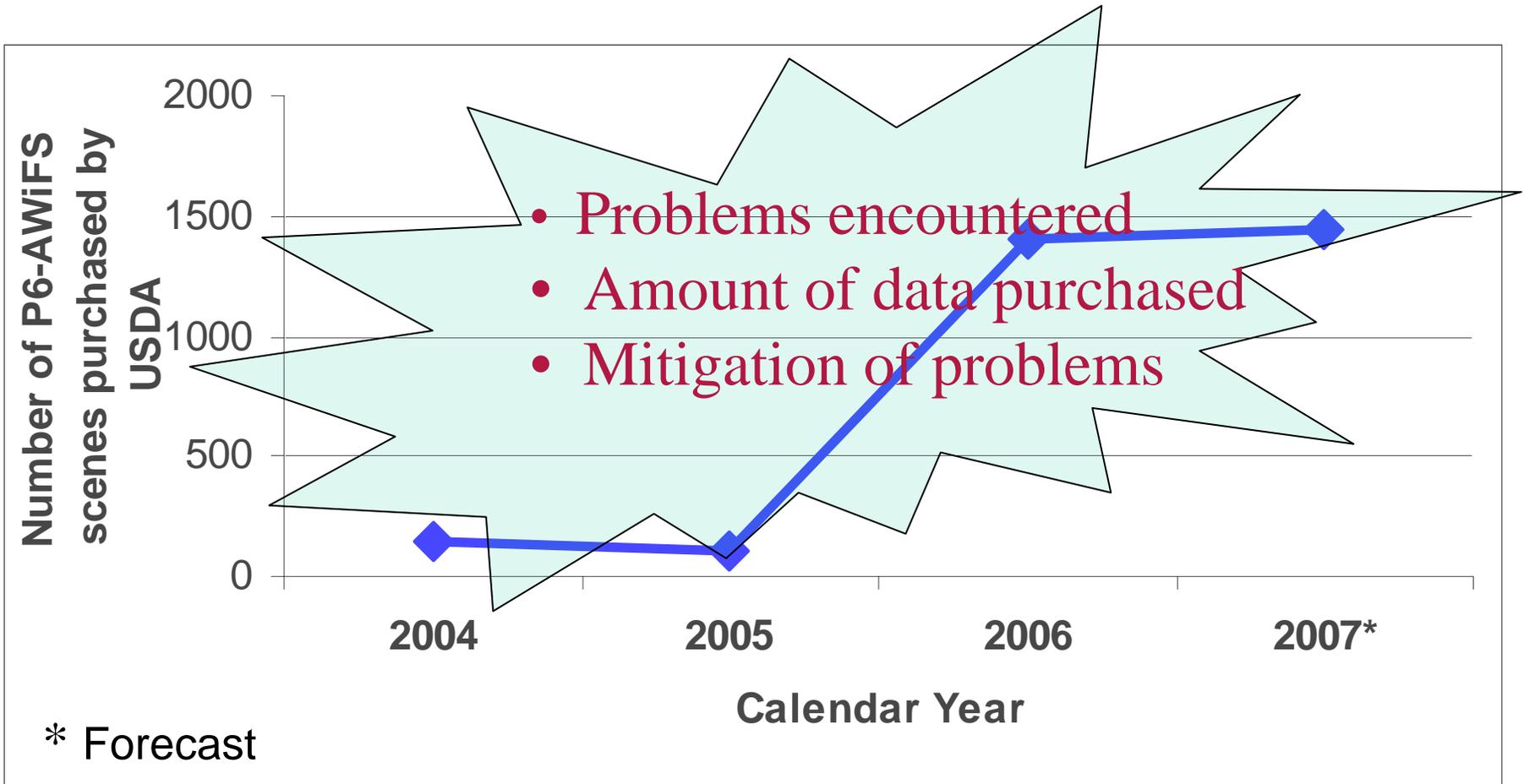
12 Orbits per day, 101.35 minutes

On-board memory: 152 GB (BOL), 120 GB (EOL)

- LISS-3: 141 km swath, 23.5 m resolution (all bands).
 - B2: 0.52 - 0.59
 - B3: 0.62 - 0.68
 - B4: 0.76 - 0.86
 - B5: 1.55 - 1.70
- LISS-4: 23.5 km (Mx mode) & 70.3 km (mono) swath, 5.8 m resolution (all bands).
 - B2: 0.52 - 0.59
 - B3: 0.62 - 0.68
 - B4: 0.76 - 0.86
- AWiFS: 737 km combined swath, 56 m resolution at nadir, 70 m resolution at field edges.
 - B2: 0.52 - 0.59
 - B3: 0.62 - 0.68
 - B4: 0.76 - 0.86
 - B5: 1.55 - 1.70



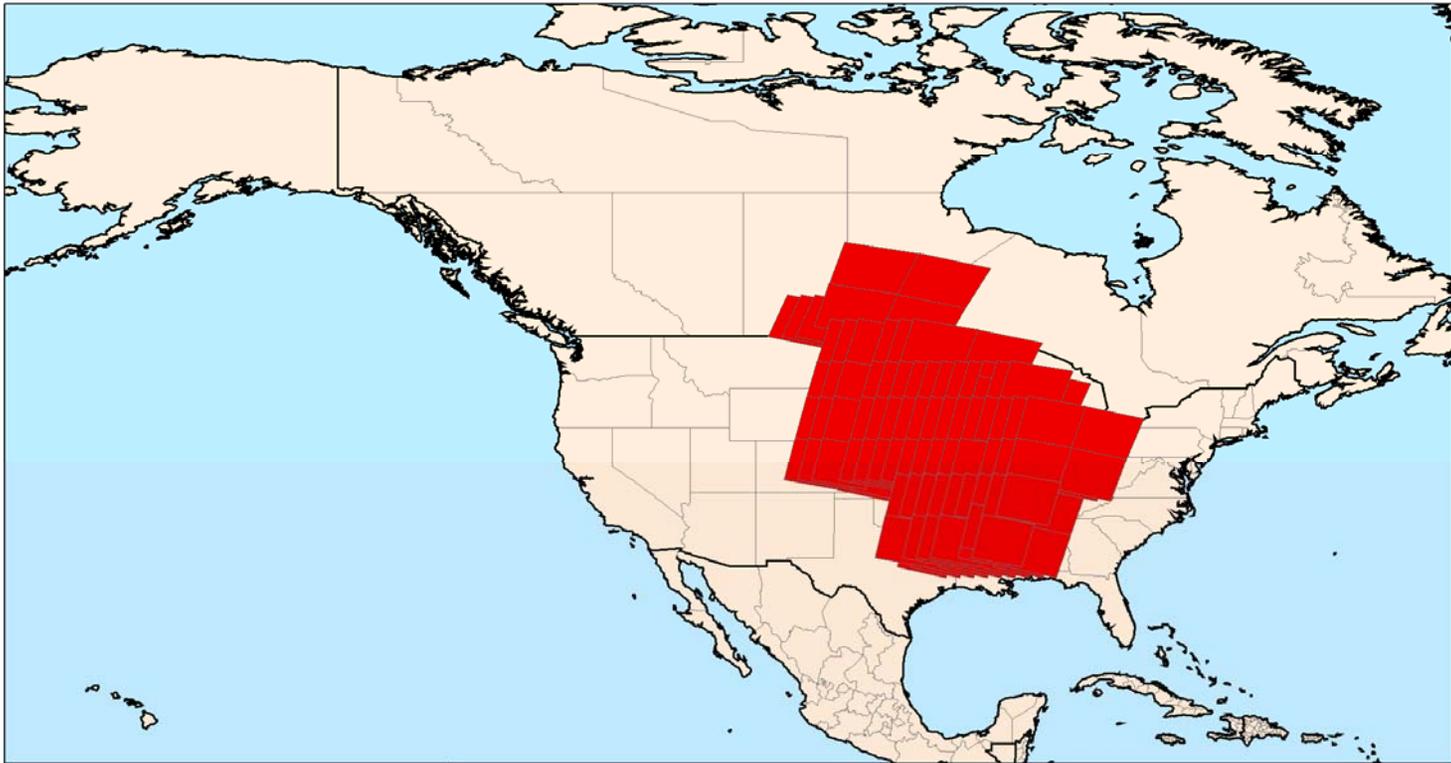
How Did USDA Transition to P6-AWiFS?



2004: Research

- **Ordered geo-rectified AWiFS data**
 - Problems with registration of A & C quads.
 - Needed 50+ points to orthorectify each scene.
 - This is operationally difficult for USDA-SIA to manage.
- **Ordered scenes through USGS contract.**
 - Delivery of data not specified in contract terms and conditions.
 - Not sure when data would arrive.
 - This impedes operational use.
 - License is for single agency.
 - Limits value to USDA
 - Difficult to work with operationally.

Resourcesat-1 AWiFS at USDA -- 2004



Legend

- 2004_pr_P6AWiF at USDA
- State Borders (ESRI_2006)
- Country Borders (ESRI_2006)

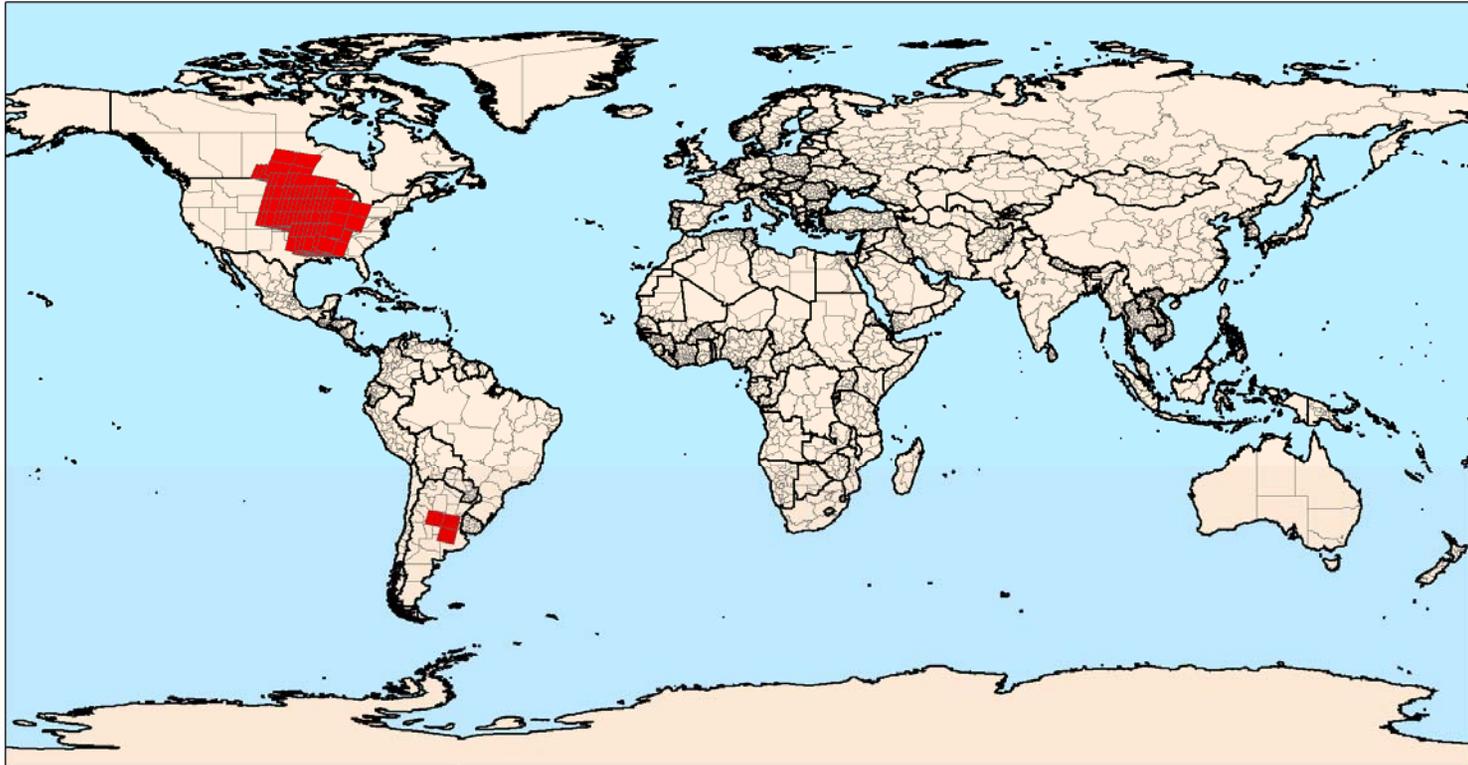


USDA is acquiring
P6-AWiFS satellite
data through
commercial channels.

For more information, please contact
Robert Tetrauit (202) 690-0130 robert.tetrauit@usda.gov

YEAR	HOLDINGS at USDA	UNIQUE PATH- ROW-QUADS
2004	142	142
2005	100	92
2006	1401	478

Resourcesat-1 AWiFS at USDA -- 2004



Legend

- 2004_pr_P6AWiF at USDA
- State Borders (ESRI_2006)
- Country Borders (ESRI_2006)



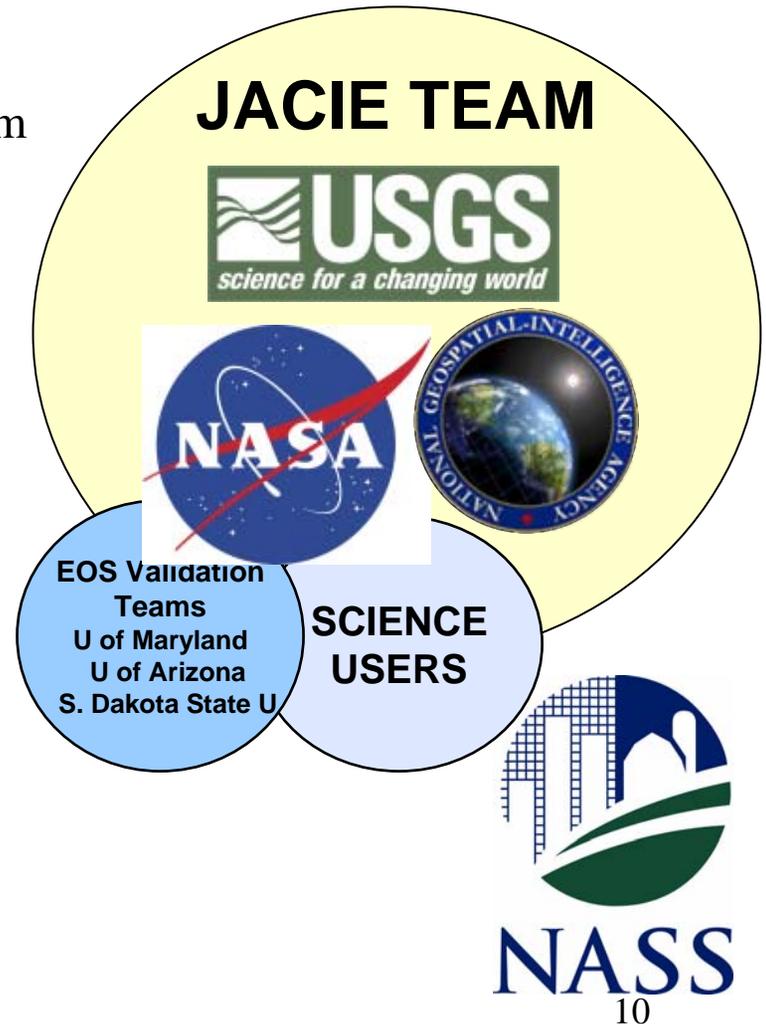
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2004 to 2005 Mitigation

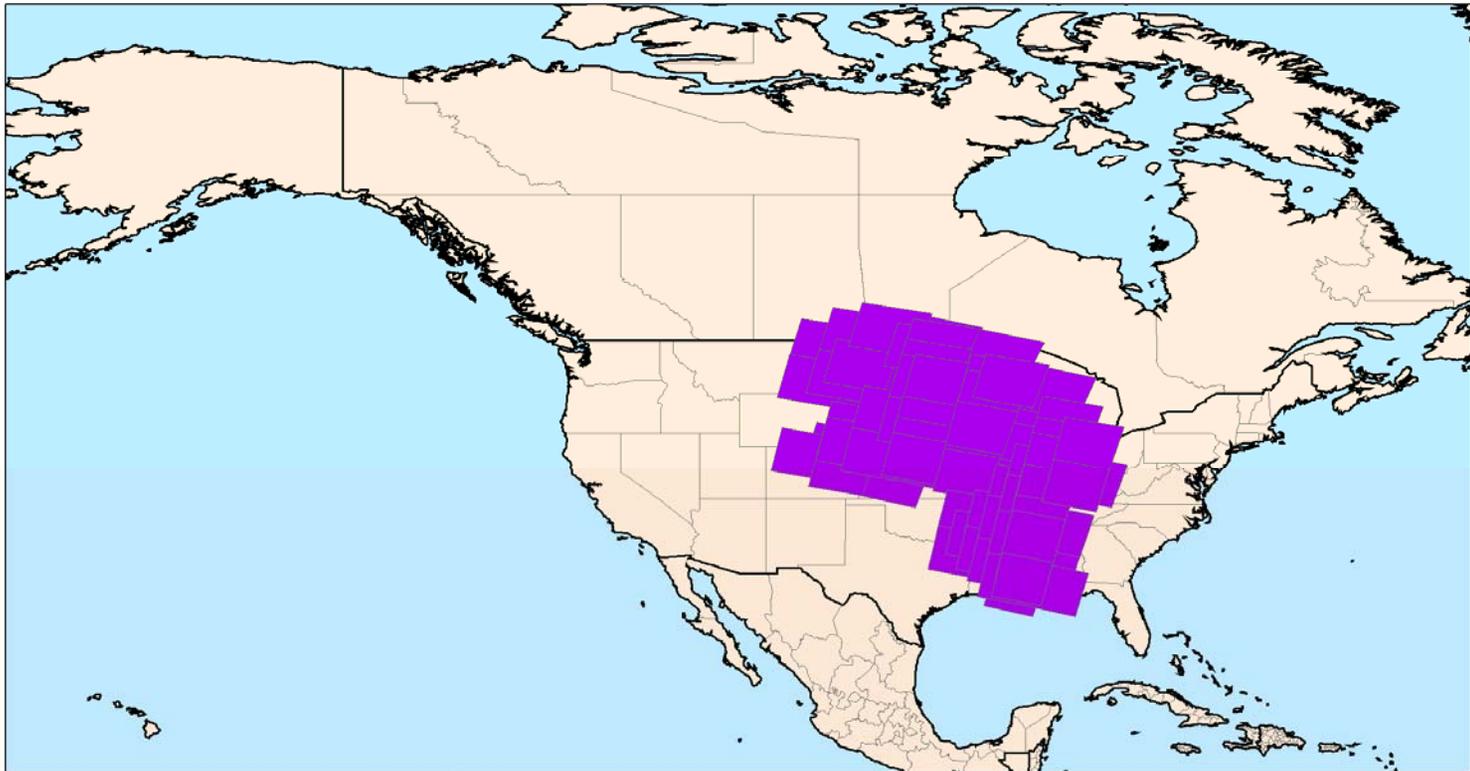
- **Data quality issues mitigated**
 - USDA-FAS approached NASA to perform an initial characterization of the AWiFS sensor (*Nov. 2004*)
- **JACIE Characterizations**
 - Geopositional Assessment
 - Radiometric Calibration characterization
 - Spatial Resolution characterization
- **Application Characterization**
 - National Agricultural Statistics Service (NASS)
 - Comparison of Landsat TM to RESOURCESAT-1 AWiFS (un-temporal)



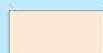
2005: Research

- **Ordered ortho-rectified AWiFS data**
 - Few problems with registration of the quads.
- **Ordered scenes through USGS contract.**
 - Delivery of data not specified in contract terms and conditions, i.e., not sure when data would arrive.
 - This impedes operational use.
 - License is for single agency.
 - Limits value to USDA.
 - Difficult to work with operationally.
 - Problem with data collects in July 2005
 - *No money transferred = no collects.*
 - USDA was used to Landsat policy “Always on.”

Resourcesat-1 AWiFS at USDA -- 2005



Legend

-  2005_pr_P6AWIF at USDA
-  State Borders (ESRI_2006)
-  Country Borders (ESRI_2006)

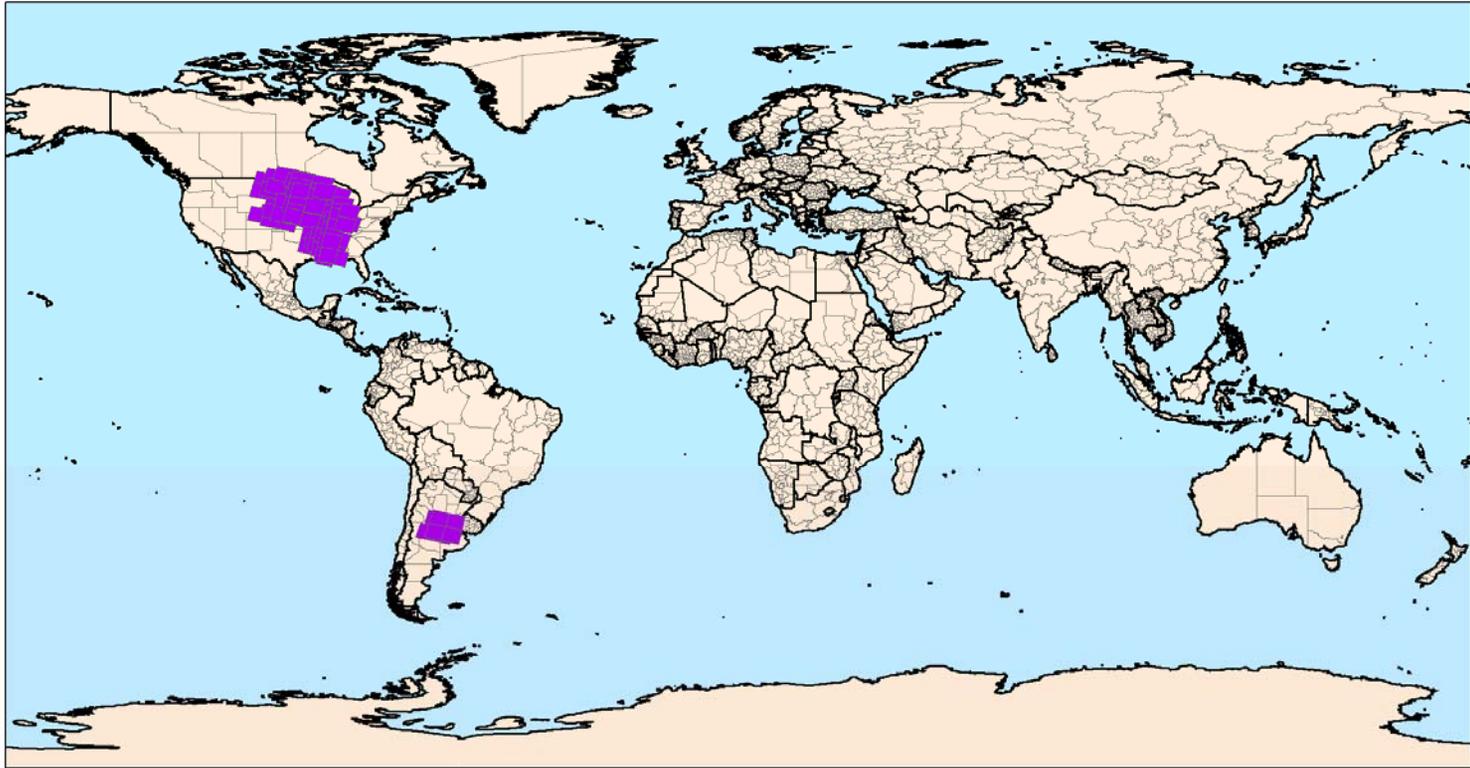


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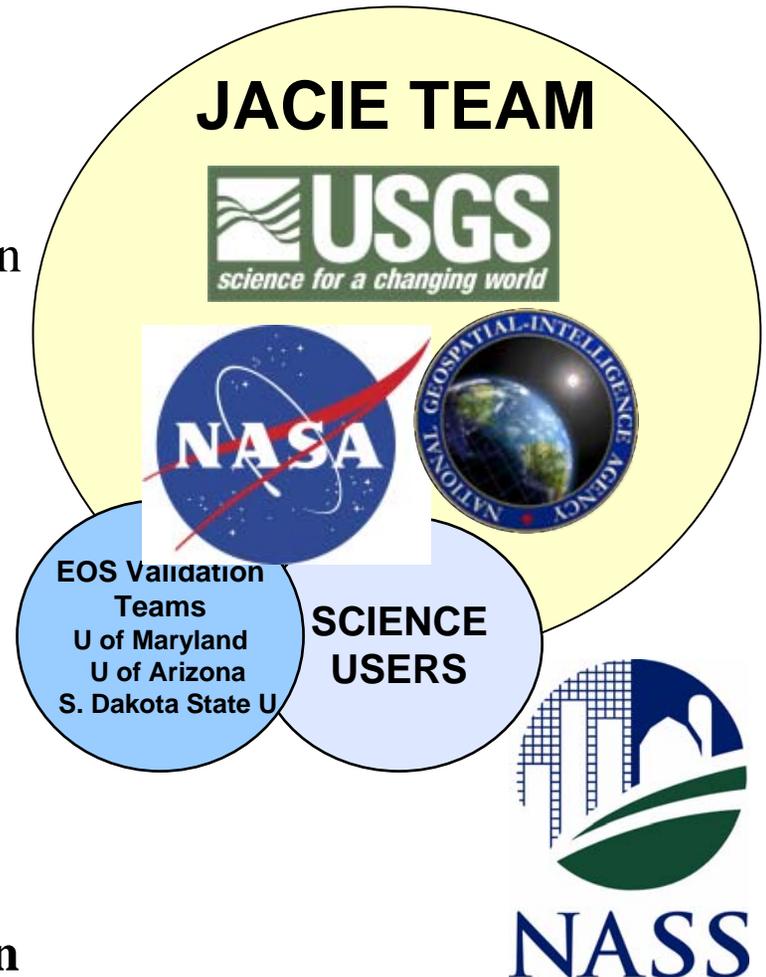
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2005 to 2006 Mitigation—Data Quality Issues

- **JACIE Characterizations—March 2006**
 - Geopositional Assessment
 - Radiometric Calibration characterization
 - Spatial Resolution characterization
- **USDA-FAS Seminar—Application Research—Sept. 2006**
 - Crop Acreage Estimation: Landsat TM and AWiFS Initial Assessments 2004-2005, NASS-SARS, **Claire Boryan**
 - Crop Acreage Estimation, Landsat TM and AWiFS for Nebraska 2005, NASS-SARS, **Bob Seffrin**
 - TM vs. AWiFS: A comparison of coincident imagery for classifying croplands, NASS-SARS, **Dave Johnson**



2005 to 2006 Mitigation—Contract Issues

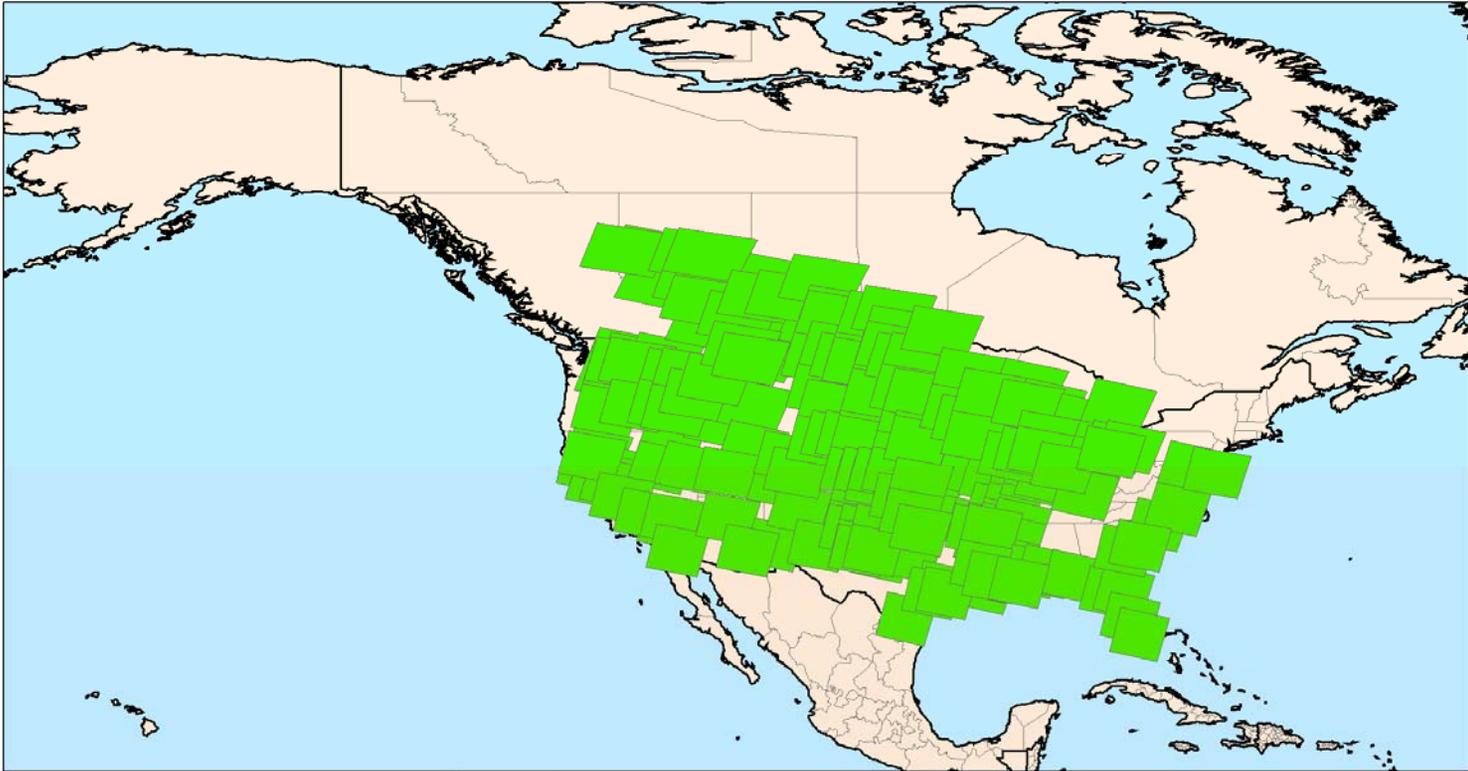
- **Prime Vendor Contract**
 - Nov. 2005 (negotiations) Feb. 2006 (final)
 - Arctic Slope Regional Corporation Management Services (ASRC-MS is USDA's prime contractor) and Global Marketing Insights (sub-contractor) negotiated satellite imagery and services contract for USDA.
- **Seven satellite imagery providers**
 - SPOT, GeoEye, Orbview, Digital Globe, Eurimage, MDA-Radarsat, MDA-Federal.
- **Base Year**
 - Delivery times negotiated
 - Prices negotiated



2006: 1st Year Operational

- Ordered ortho-rectified AWiFS data
 - No problems with registration for the quads.
- Ordered scenes through ASRC contract.
 - Delivery of AWiFS data is monitored.
 - 5 days for North America
 - 10 days for rest of world.
 - Delivery on CDROM by FedEx
 - License is Tier 2—More flexible!
 - 1st customer group = US Federal/Civilian government
 - 2nd customer group undesignated
 - “Always on” problem mitigated by large US standing order.
 - Each path was turned on for entire communications cone.
 - Induced collection of LISS3 and LISS4 PAN as well.

Resourcesat-1 AWiFS at USDA -- 2006



Legend

- 2006_pr_P6AWIF at USDA
- State Borders (ESRI_2006)
- Country Borders (ESRI_2006)

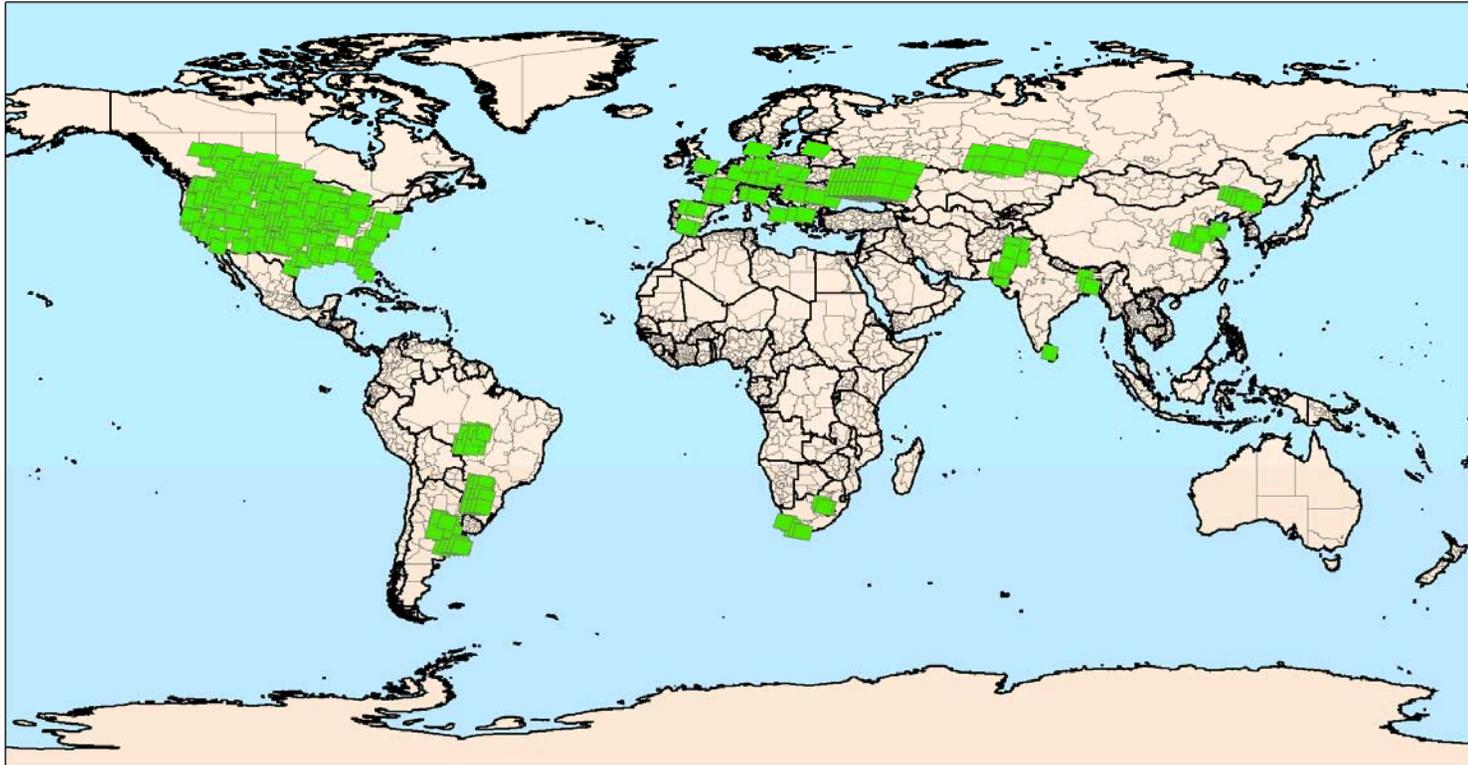


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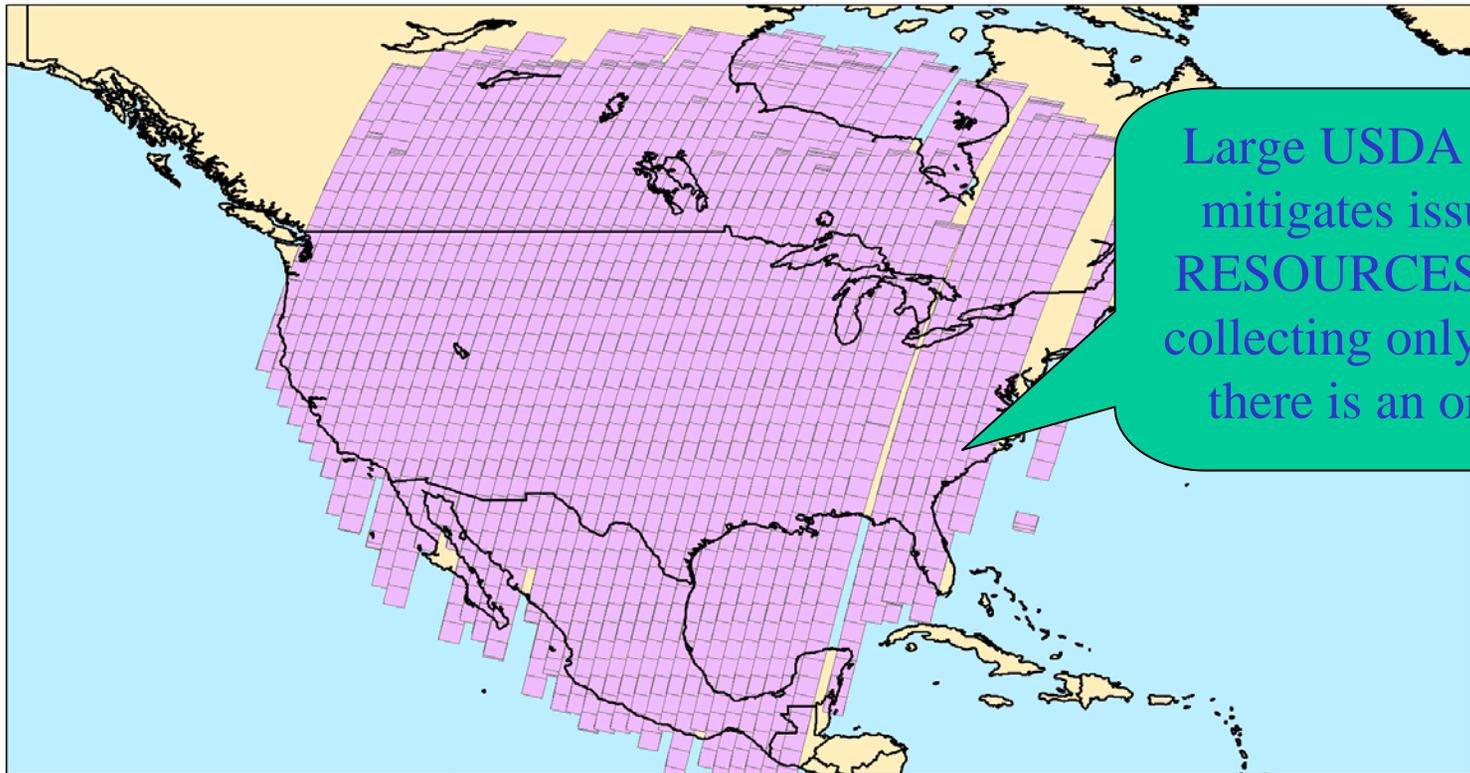


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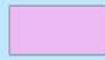
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Resourcesat-1 LISS3 at GeoEye -- 2006



Large USDA order mitigates issue of RESOURCESAT-1 collecting only when there is an order.

Legend

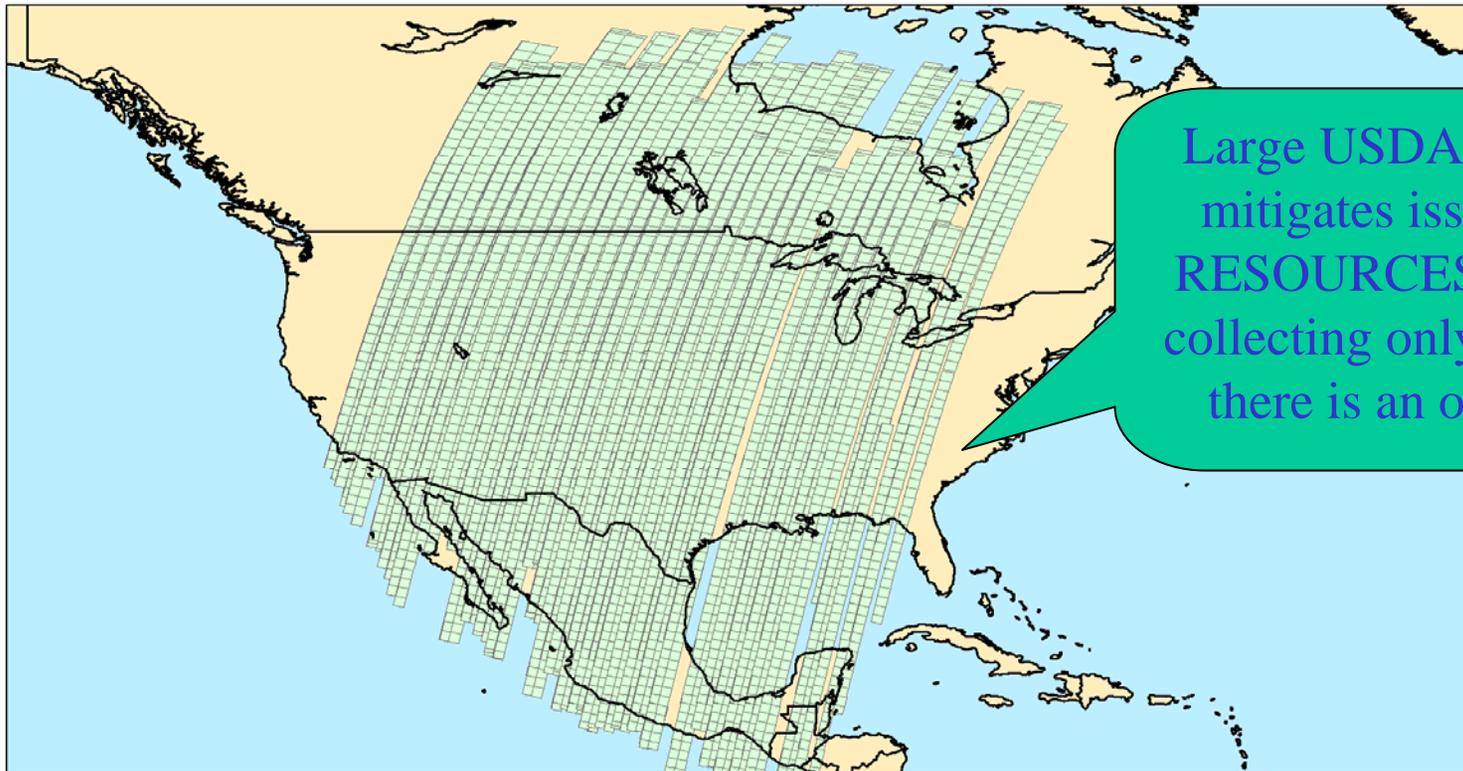
-  LISS3_113006 for 2006
-  International Border_ESRI



USDA's large P6-AWiFS order in 2006 induced collection of LISS3 satellite data. Over 66 % of LISS3 scenes in GeoEye's collection are from 2006.

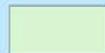
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Resourcesat-1 LISS4 PAN at GeoEye -- 2006



Large USDA order mitigates issue of RESOURCESAT-1 collecting only when there is an order.

Legend

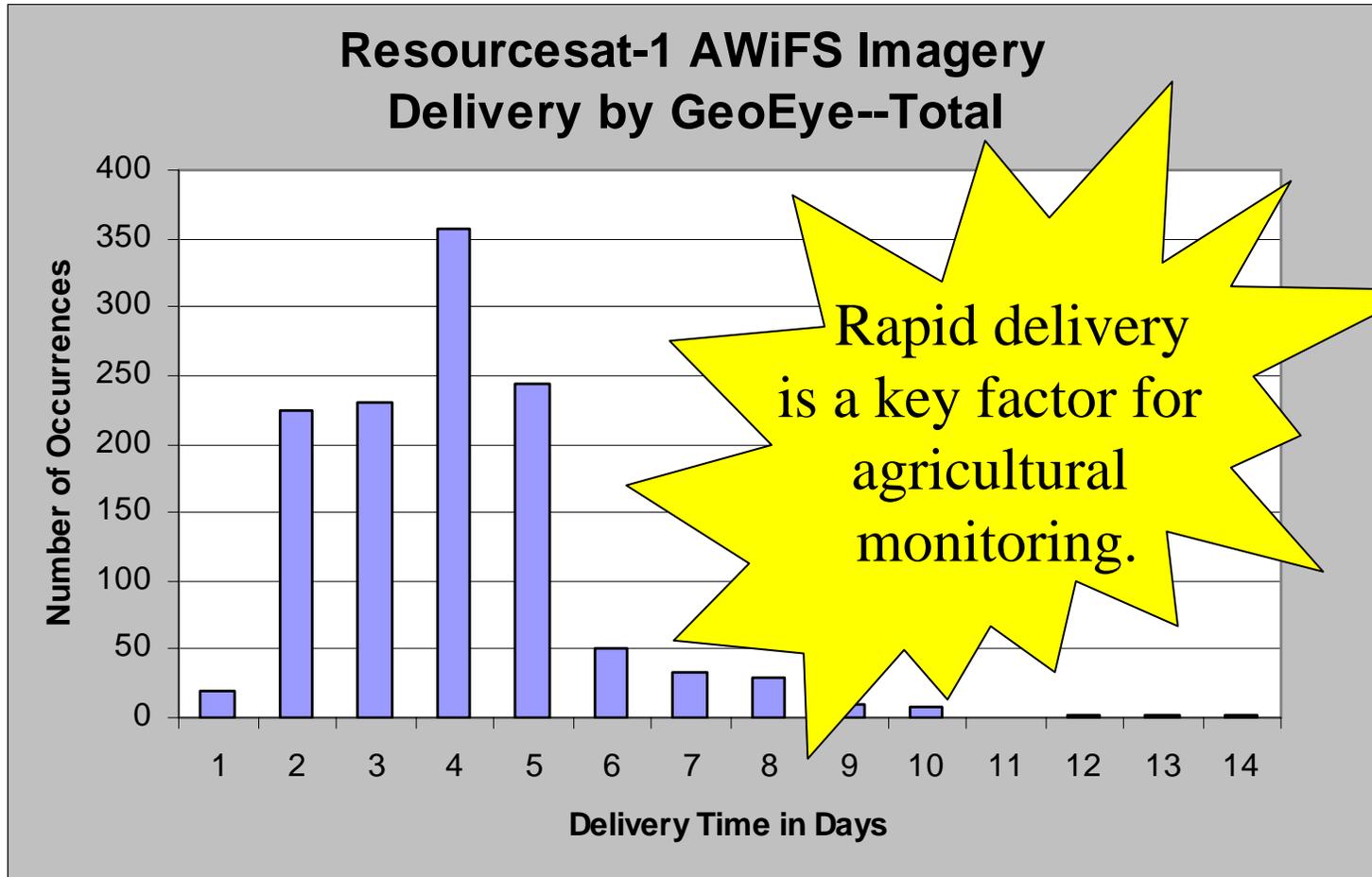
-  p6_l4pn_113006 for 2006
-  International Border_ESRI



USDA's large P6-AWiFS order in 2006 induced collection of LISS4 PAN satellite data. About 10,600 LISS4 PAN scenes in GeoEye's collection are from 2006.

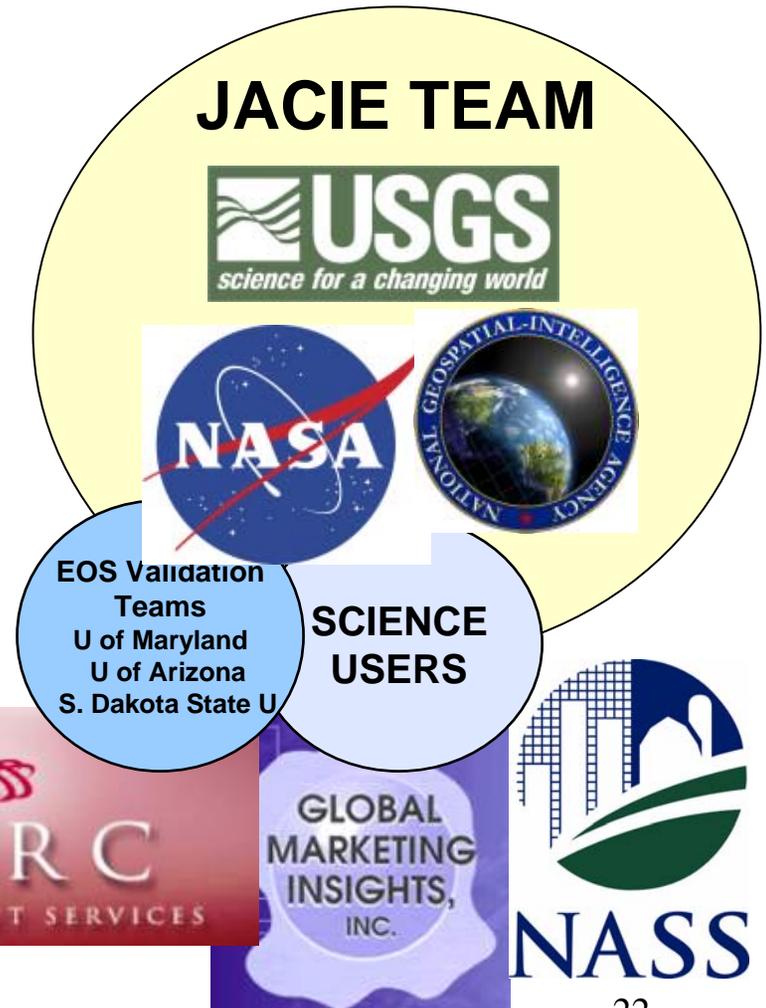
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Rapid Delivery of AWiFS Data 12/2005 to 12/2006

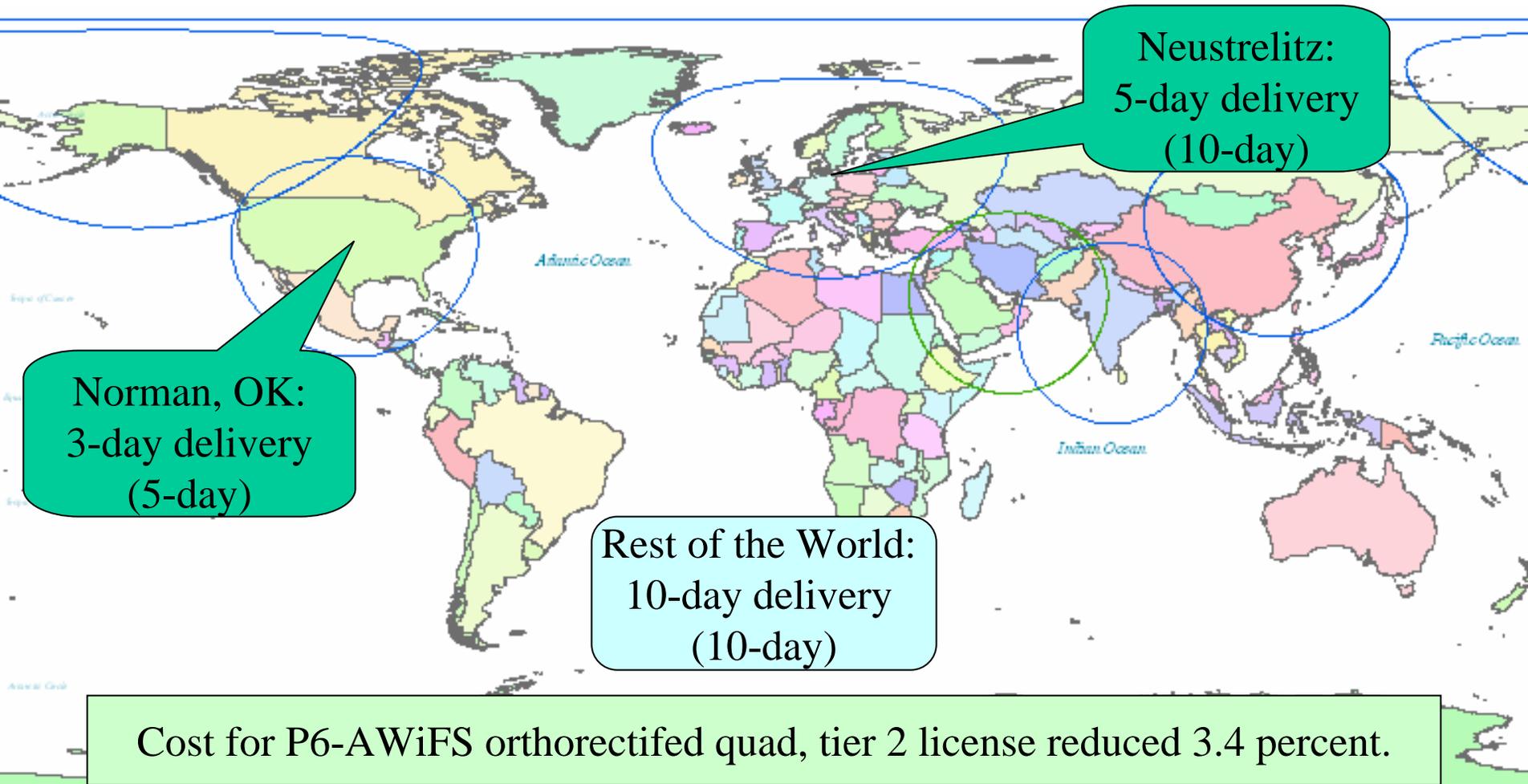


2006 to 2007 Mitigation

- Data Characterization—continues
- Application Research—continues
- Contract Issues—continues
- Option Year 1
 - Delivery times negotiated and reduced
 - Prices negotiated and reduced



Changes to Terms and Conditions of USDA contract for 2007 for Resourcesat-1 Groundstaions



USDA Plans for 2007—Where?

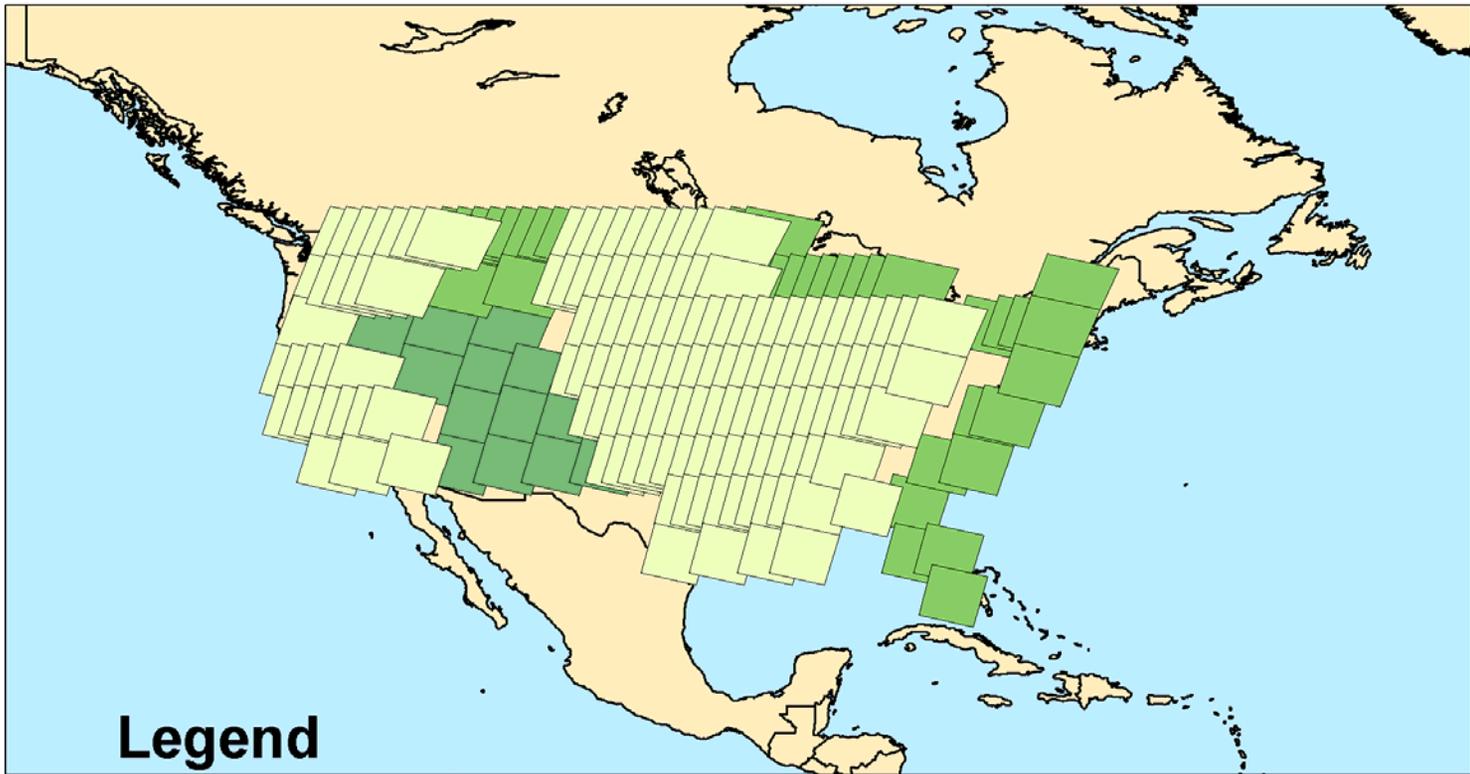
- USDA plans to purchase RESOURCESESAT-1 AWiFS data for FY2007.
- The following are underway now

– Brazil	Second Year
– Argentina	of Collection
– South Africa	First Year
– Zimbabwe	of Collection
– Northwest Africa (Algeria, Tunisia, and Morocco)	

- Pending

– US	-- China	Second Year
– Russia/Ukraine	-- Canada	of Collection
– Kazakhstan	-- Pakistan/Bangladesh	
– Europe		

USDA's US Standing Order: Resourcesat-1 AWiFS in FY2007 June 1 to Sept. 30



Legend

- FY2007_USA_07 April
- FY2007_USA_07 May
- FY2007_USA_07 June
- International Border_ESRI

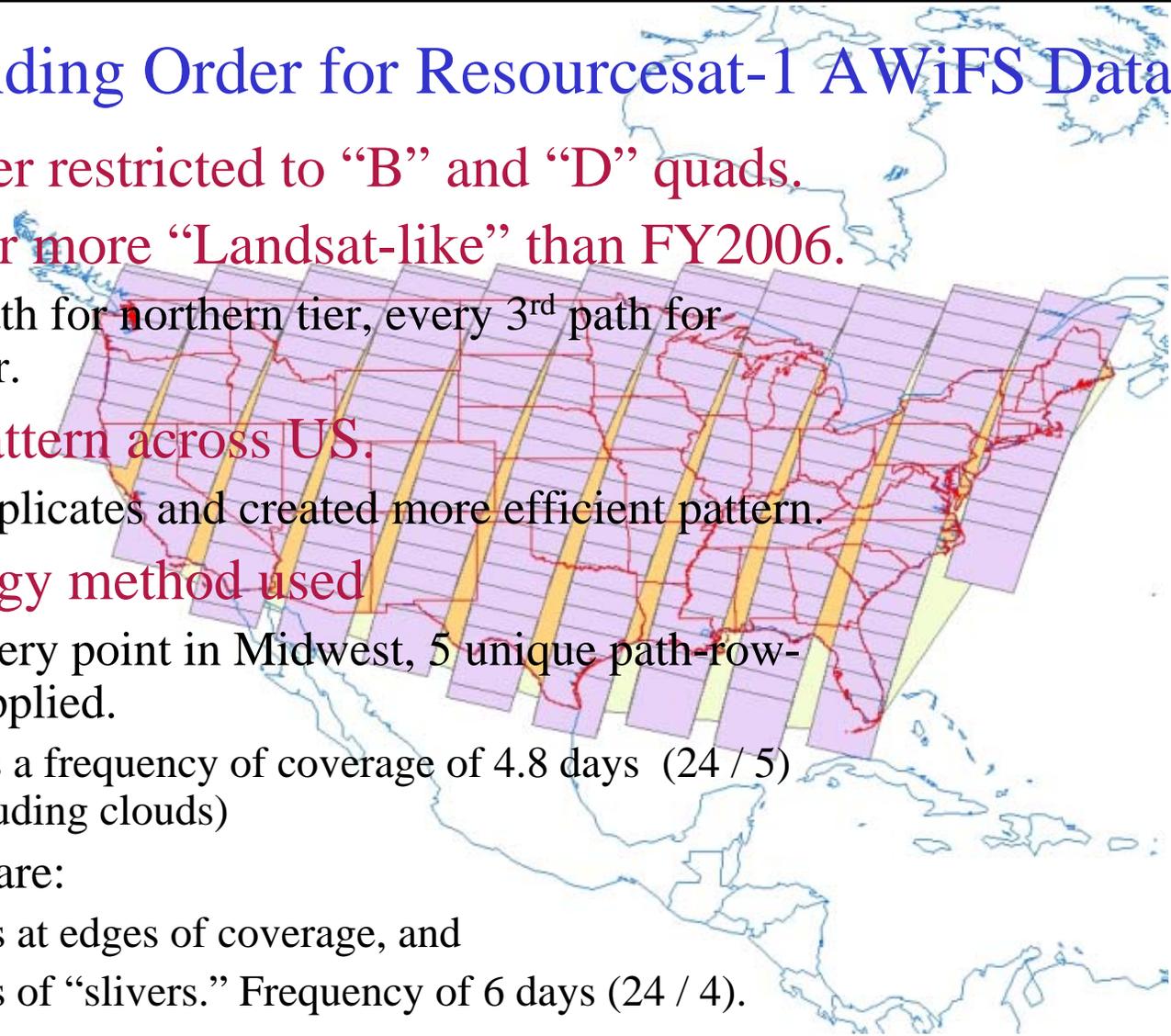


The USDA's P6-AWiFS US standing order is displayed; however, only the scenes which are <50% cloudy are purchased.

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USDA's US Standing Order for Resourcesat-1 AWiFS Data

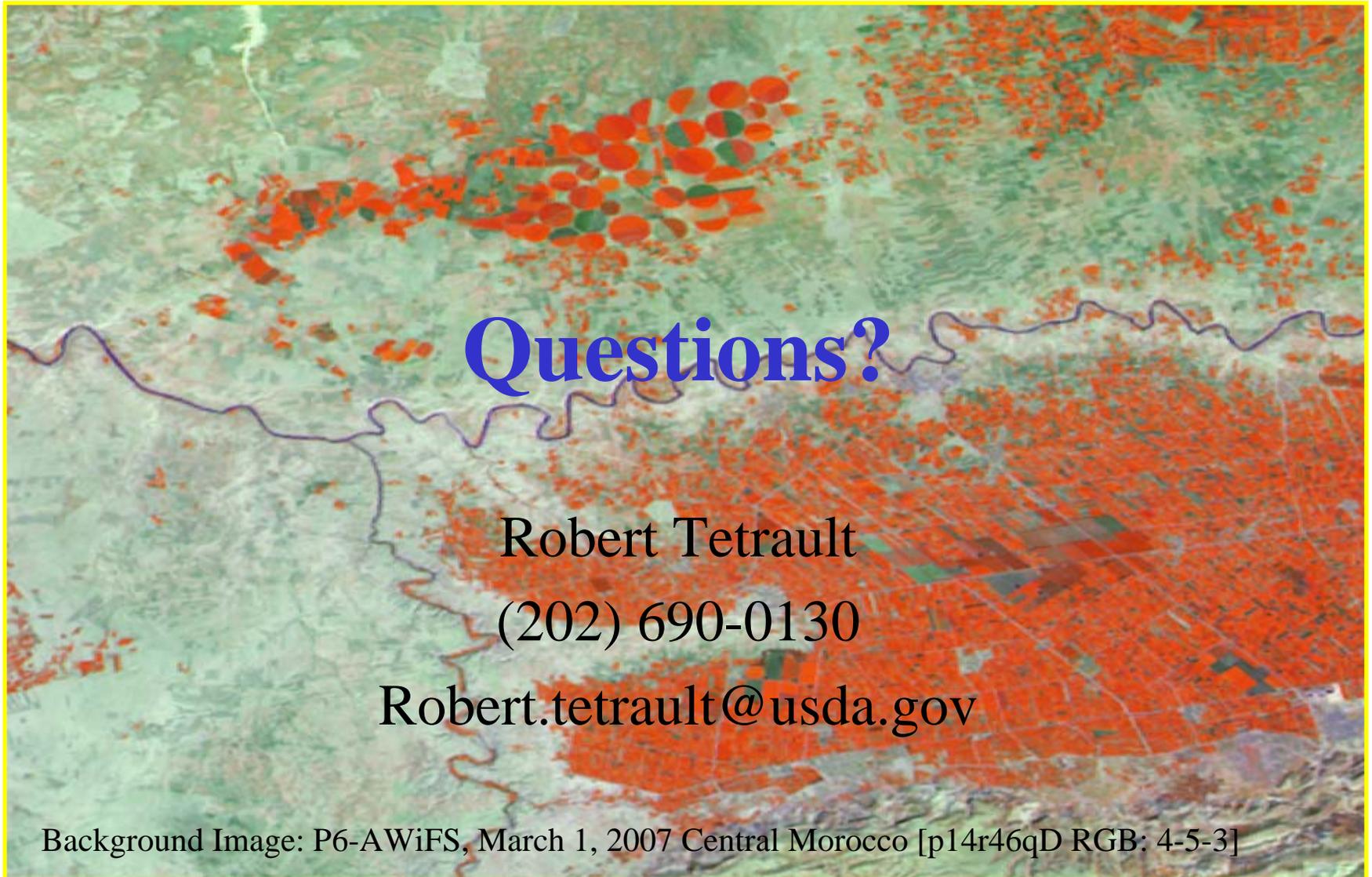
- Standing order restricted to “B” and “D” quads.
- FY2007 order more “Landsat-like” than FY2006.
 - Every 4th path for northern tier, every 3rd path for southern tier.
- Optimized pattern across US.
 - Reduced duplicates and created more efficient pattern.
- Point Topology method used
 - For most every point in Midwest, 5 unique path-row-quads are applied.
 - Produces a frequency of coverage of 4.8 days ($24 / 5$) (not including clouds)
 - Exceptions are:
 - (1) Areas at edges of coverage, and
 - (2) Areas of “slivers.” Frequency of 6 days ($24 / 4$).



USDA Plans for 2007, continued

- Scenes that are less than 50 % cloudy are processed into ortho's
- Scenes that are more than 50% cloudy are flagged for "Request for Action" (RFA)
 - RFA's are screened by the USDA-SIA and a decision to purchase or not is made.

USDA does not plan to purchase data after Sept. 30, 2007 leading to a potential gap if there is a disaster event(s) after Sept. 30



Questions?

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Background Image: P6-AWiFS, March 1, 2007 Central Morocco [p14r46qD RGB: 4-5-3]



Backup Slides

USDA Plans for 2007—What?

- **Product Type: Orthorectified**
 - Scene: path,row, quad
 - Spectral: 4-bands (green, red, NIR, SWIR)
 - Format: unstacked GeoTIFF
 - Projection: Lambert Conformal Conic
 - Datum: WGS-84
 - Resampling: cubic convolution
 - Bit Depth: 8-bit
 - Size: 276 MB
 - Delivery: ftp
 - License: Tier 2