



UK-DMC2 agricultural applications and contributions to JECAM

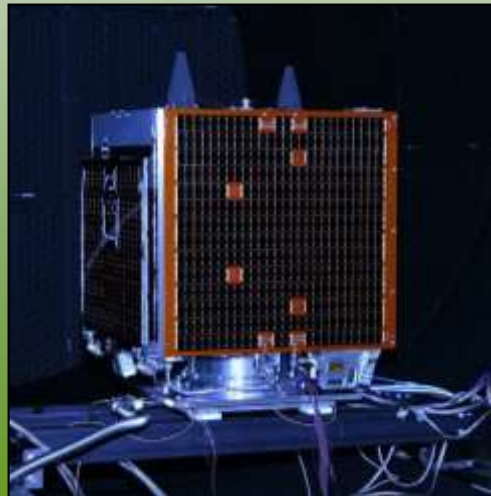
Gary Holmes

DMC International Imaging Ltd

July 2014

UK-DMC2 Characteristics

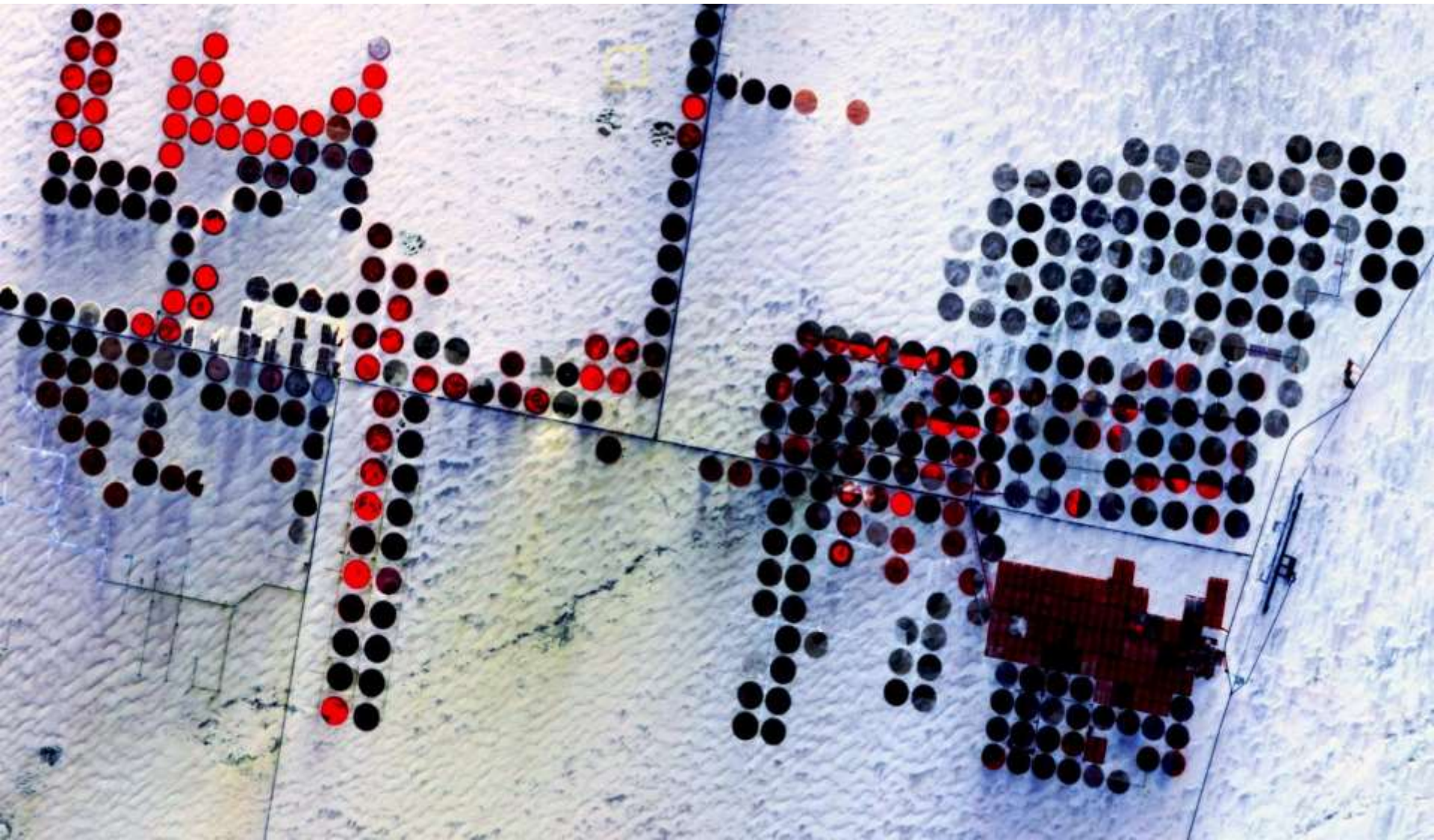
- Launched 29th July 2009
- Unique combination of swath and resolution:
 - 650km swath
 - 22m GSD
- NIR/R/G bands equivalent to Landsat bands 4/3/2
- Regularly cross-calibrated with Landsat which is regarded as ‘gold standard’
- Capable of very regular coverage of large areas
- Almost daily imaging opportunity (together with sister satellite, Deimos-1)



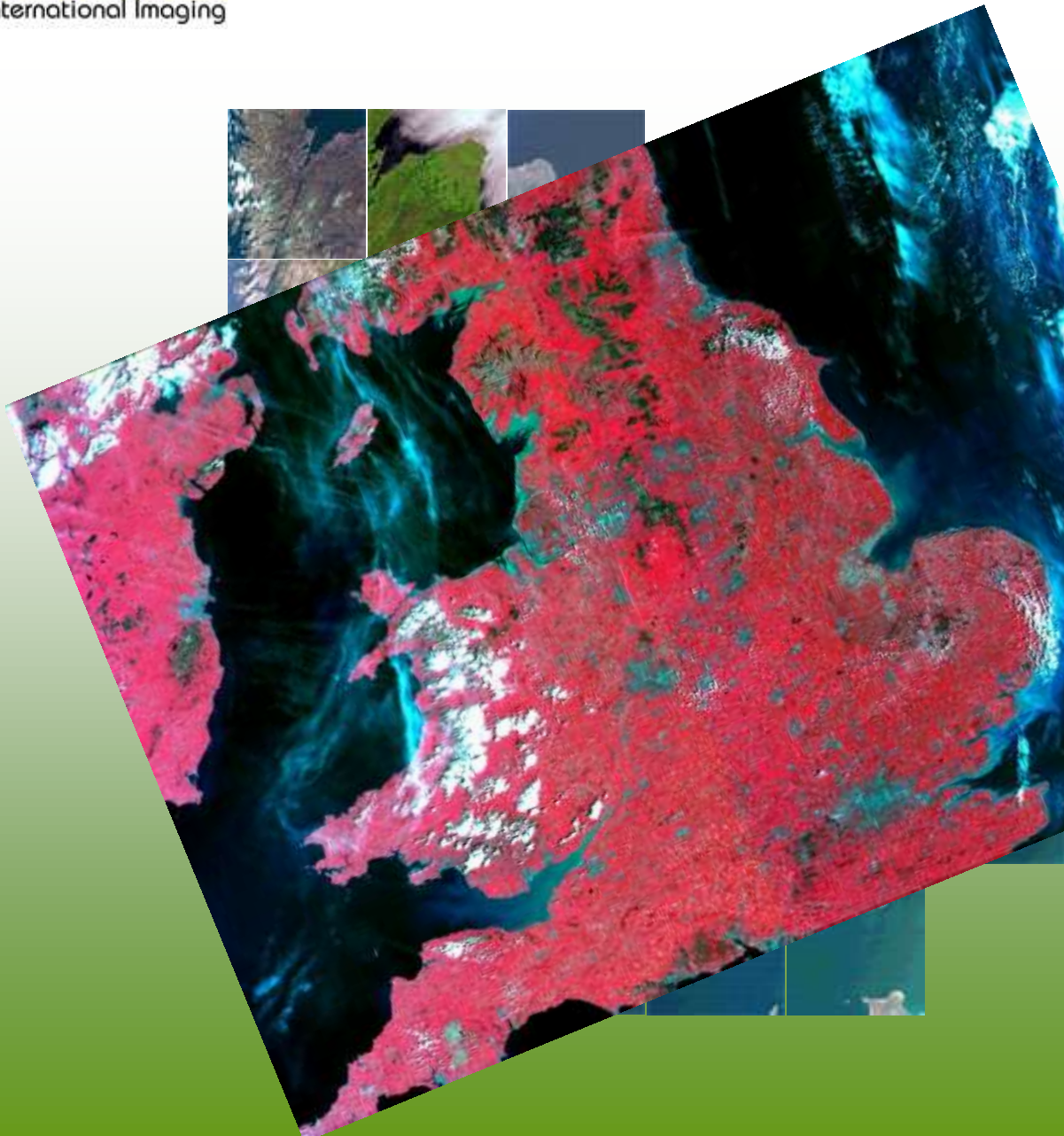
Amsterdam, Netherlands



UK-DMC-2, 2010



Timeliness and regularity



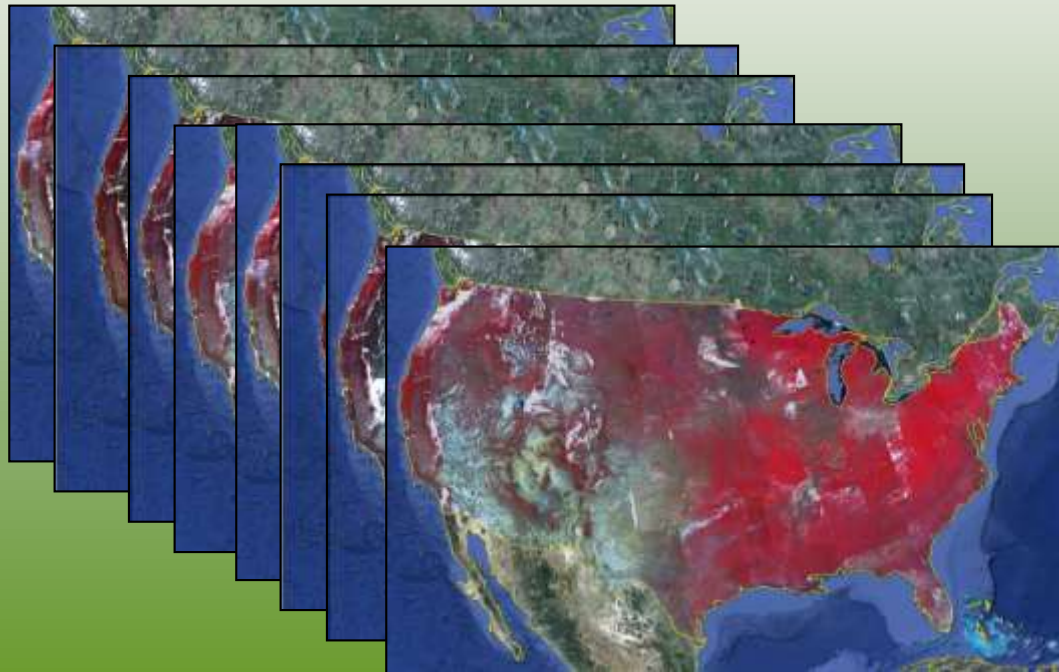
DMC 600 x 560 km Image

- single image from UK-DMC
- Most of England captured within 1 minute
 - Almost daily acquisition opportunities mean we rarely miss the clear days when they come
- Typically 15-30 cloud-free DMC coverages per year for any location in UK
- More frequent coverage possible in most other countries!
- Ideal for consistent classification approach
- Also provides basis for precision farming services

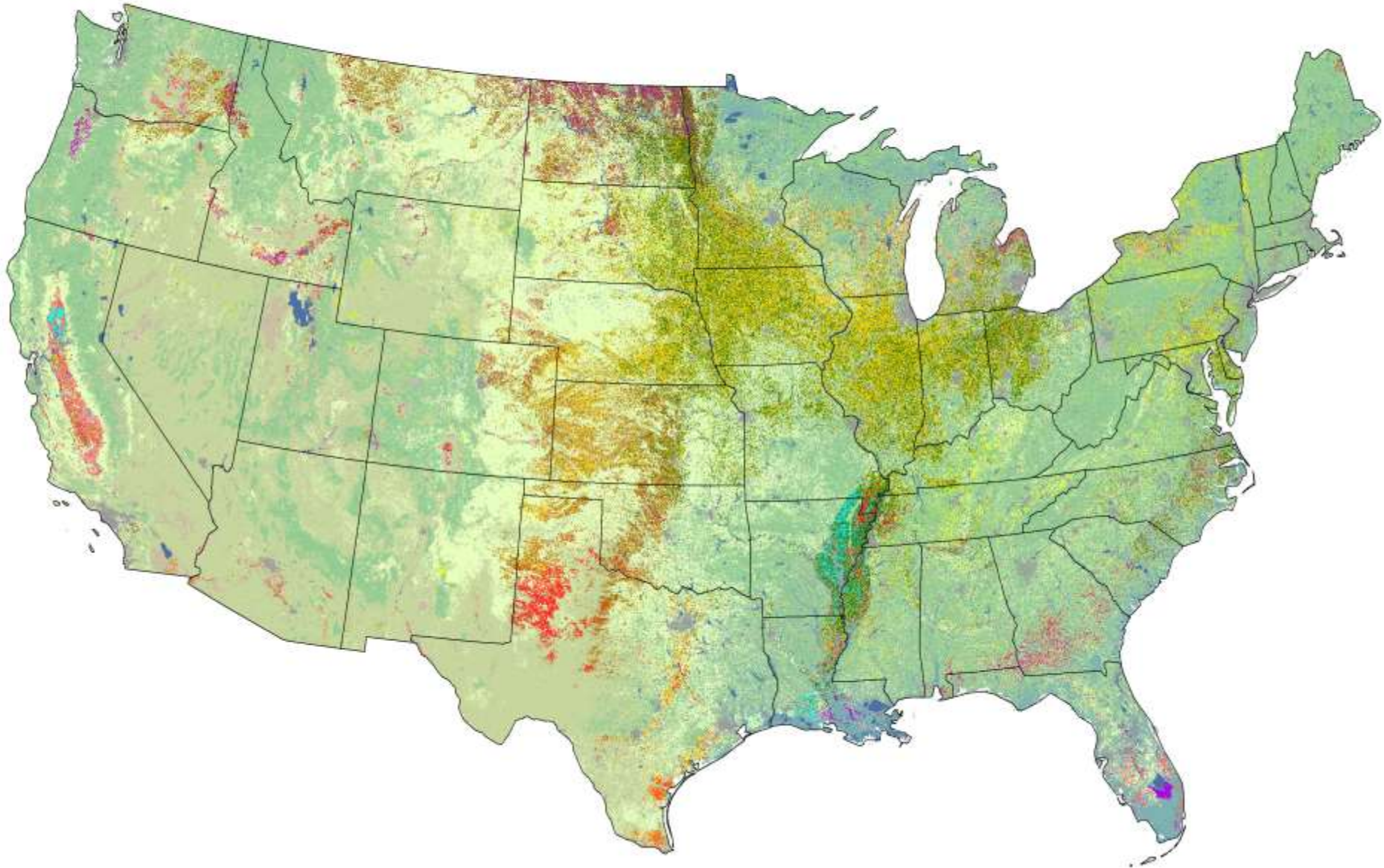
Examples of operational systems using DMC imagery

USA Multitemporal Coverage for USDA

- For US Department of Agriculture for detailed crop classification
- Satellites used: UK-DMC2 and Deimos-1
- Complete coverage of lower 48 States every 15-days
- 12 coverages April–September (average ~90% cloud-free)
- 150 Million km² of cloud-free imagery delivered per year
- Augments the available Landsat datasets



USDA Cropland Data Layer










2011 Continental United States Land Cover Categories (by decreasing acreage)

National Cropland Data Layer Legend

Agriculture

 Pasture/Grass	 Triticale	 Dbl Crop Lettuce/Cotton
 Corn	 Citrus	 Mustard
 Soybeans	 Safflower	 Plums
 Winter Wheat	 Pistachios	 Dbl Crop Barley/Sorghum
 Fallow/Idle Cropland	 Blueberries	 Broccoli
 Other Hay/Non Alfalfa	 Christmas Trees	 Radishes
 Alfalfa	 Dbl Crop Barley/Soybeans	 Garlic
 Cotton	 Tomatoes	 Speltz
 Spring Wheat	 Onions	 Vetch
 Sorghum	 Flaxseed	 Apricots
 Dbl Crop WinWht/Soybeans	 Dbl Crop Oats/Corn	 Caneberries
 Rice	 Pop or Orn Corn	 Greens
 Barley	 Herbs	 Nectarines
 Oranges	 Misc Veggies & Fruits	 Cucumbers
 Oats	 Olives	 Other Small Grains
 Sunflower	 Other Tree Crops	 Turnips
 Dry Beans	 Dbl Crop Corn/Soybeans	 Dbl Crop Lettuce/Cantaloupe
 Peanuts	 Sweet Potatoes	 Camelina
 Durum Wheat	 Peaches	 Cauliflower
 Sugarbeets	 Cranberries	 Rape Seed
 Potatoes	 Tobacco	 Honeydew Melons
 Canola	 Cantaloupes	 Celery
 Sugarcane	 Prunes	 Dbl Crop Durum Wht/Sorghum
 Almonds	 Dbl Crop Barley/Corn	 Eggplants
 Sod/Grass Seed	 Dbl Crop Soybeans/Cotton	 Gourds
 Grapes	 Pears	 Dbl Crop Lettuce/Barley
 Apples	 Lettuce	
 Rye	 Dbl Crop Lettuce/Durum Wht	
 Peas	 Watermelons	
 Millet	 Switchgrass	
 Walnuts	 Asparagus	
 Lentils	 Carrots	
 Pecans	 Strawberries	
 Dbl Crop WinWht/Cotton	 Pumpkins	
 Dbl Crop WinWht/Sorghum	 Squash	
 Sweet Corn	 Cabbage	
 Aquaculture	 Peppers	
 Clover/Wildflowers	 Dbl Crop Soybeans/Oats	
 Other Crops	 Hops	
 Dbl Crop WinWht/Com	 Mint	
 Cherries	 Pomegranates	

Non-Agriculture

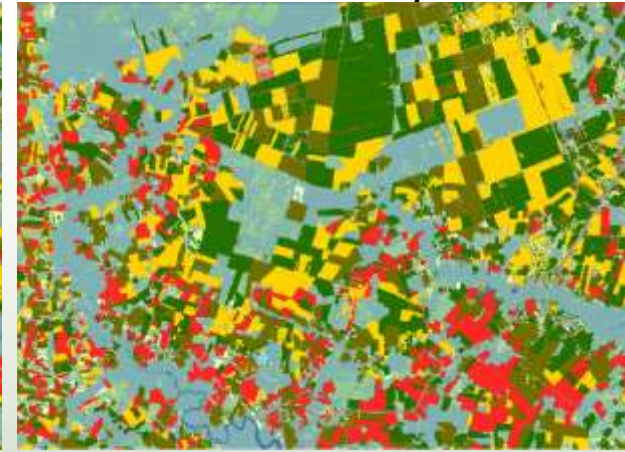
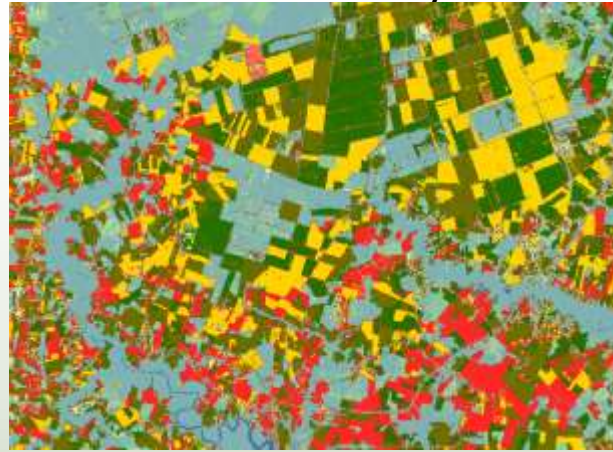
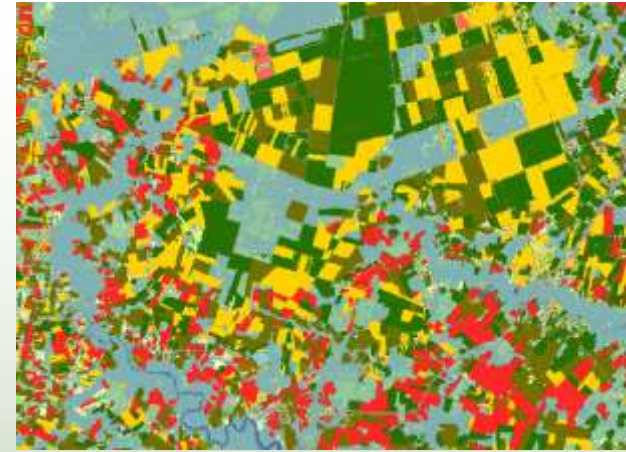
 Forest
 Shrubland
 Developed
 Wetlands
 Water
 Barren
 Perennial Ice/Snow

Improved Crop Classification Results through multitemporal DMC acquisitions: North Carolina Example

Landsat & DMC

Landsat Only

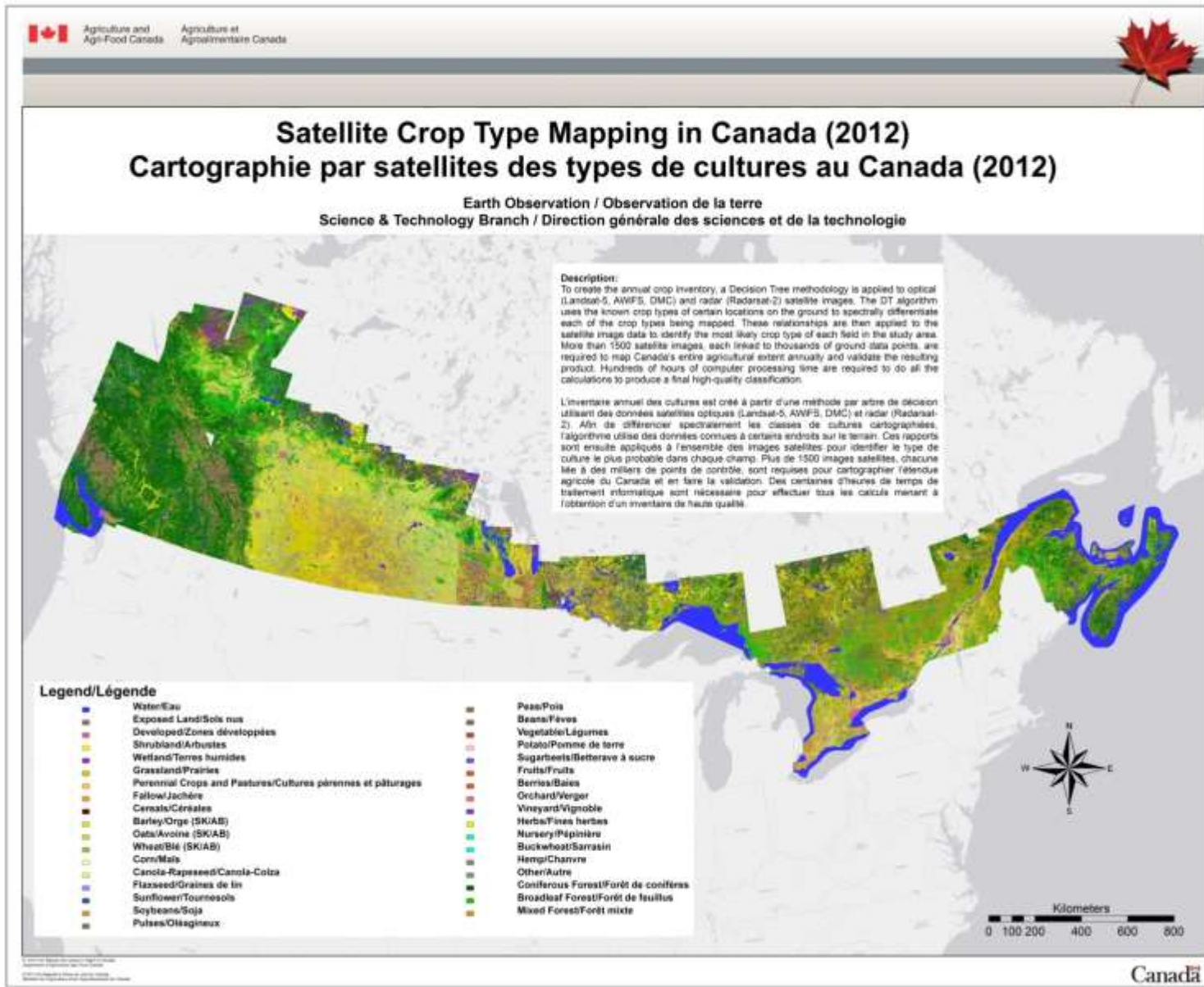
DMC Only



	Producer	User
ALL CROPS	81.7%	
Corn	94.3%	92.1%
Cotton	96.3%	94.4%
Soybeans	84.7%	84.0%
WW/Soy	93.9%	87.9%
Pasture	66.5%	68.1%
Peanuts	87.1%	92.8%

	Producer	User
ALL CROPS	69.0%	
Corn	83.3%	81.9%
Cotton	91.0%	85.3%
Soybeans	62.9%	71.1%
WW/Soy	79.9%	82.0%
Pasture	58.5%	44.0%
Peanuts	71.4%	90.0%

	Producer	User
ALL CROPS	81.6%	
Corn	94.6%	92.1%
Cotton	95.9%	94.4%
Soybeans	84.3%	83.3%
WW/Soy	93.8%	87.7%
Pasture	67.2%	68.9%
Peanuts	82.1%	91.0%

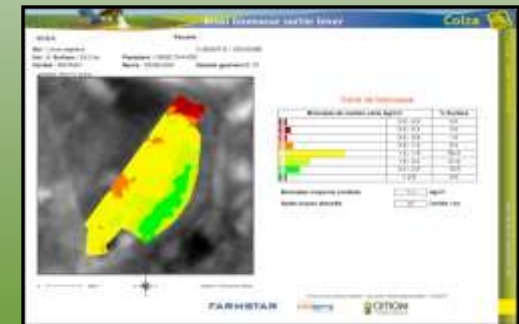
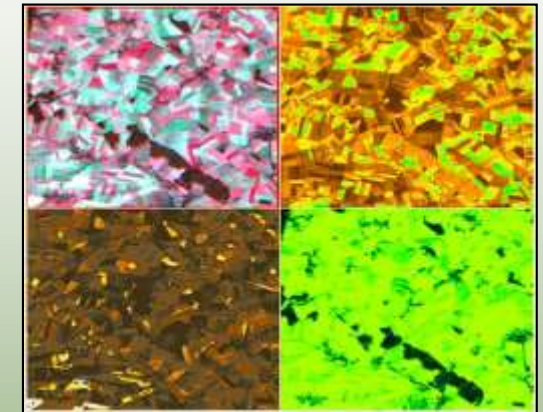


Precision Agriculture: The Imagery Acquisition Challenge for Satellites

- **Highly demanding application for remote sensing:**
 - Very large areas to be covered for operational services
 - Multitemporal coverage needed
 - Timeliness is vital (cloud-free data at specific growth stages)
 - High enough resolution to map within-field variability
 - Rapid processing & delivery (for NRT services)
 - Must be low cost per acre
- **DMC constellation matches these demands well**
 - wide swath sensors on multiple small satellites
- **DMC imagery now used for Precision Ag in:**
 - USA, Canada, Argentina, Brazil, UK, France, Netherlands, Sweden, Ukraine, Russia, Australia, South Africa, Japan

e.g. FarmStar (France)

- Used by >15,000 farmers in France
- Most of France imaged cloud-free at 5 growth stages in winter/spring
- Biophysical parameters estimated through canopy reflectance model inversion
- Biophysical data integrated with meteo, soil and crop variety info
- National guidelines used to create fertiliser and growth regulator recommendation maps
- Farming more profitable and reduced diffuse pollution



UK-DMC2 Contributions to JECAM sites

- **Paraguay**
- **Argentina**
- **USA**
- **Canada**
- **Russia (via Scanex)**
- **China (via 21AT)**

- None of the sites are receiving DMC data as intensively as is possible for operational campaigns, but nevertheless DMCii hopes the datasets are a useful contribution to JECAM research
- Shortage of communication. Sometimes we are not even sure if the datasets are actually being collected from the ftp site! Please let us know!
- DMCii would love to hear feedback from the data users!

An aerial photograph of a coastline, likely a bay or inlet, with a mix of red and blue water. The land is visible in the center and right, showing some buildings and vegetation. The water is a deep red color, with some blue areas, possibly indicating different depths or water types. The overall scene is a natural landscape with a prominent color palette of red and blue.

Sorry I could not attend the JECAM
meeting personally.

Please applaud the brave presenter!

Gary Holmes

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