ABoVE Science Cloud, Data Holdings, and High Resolution Imagery
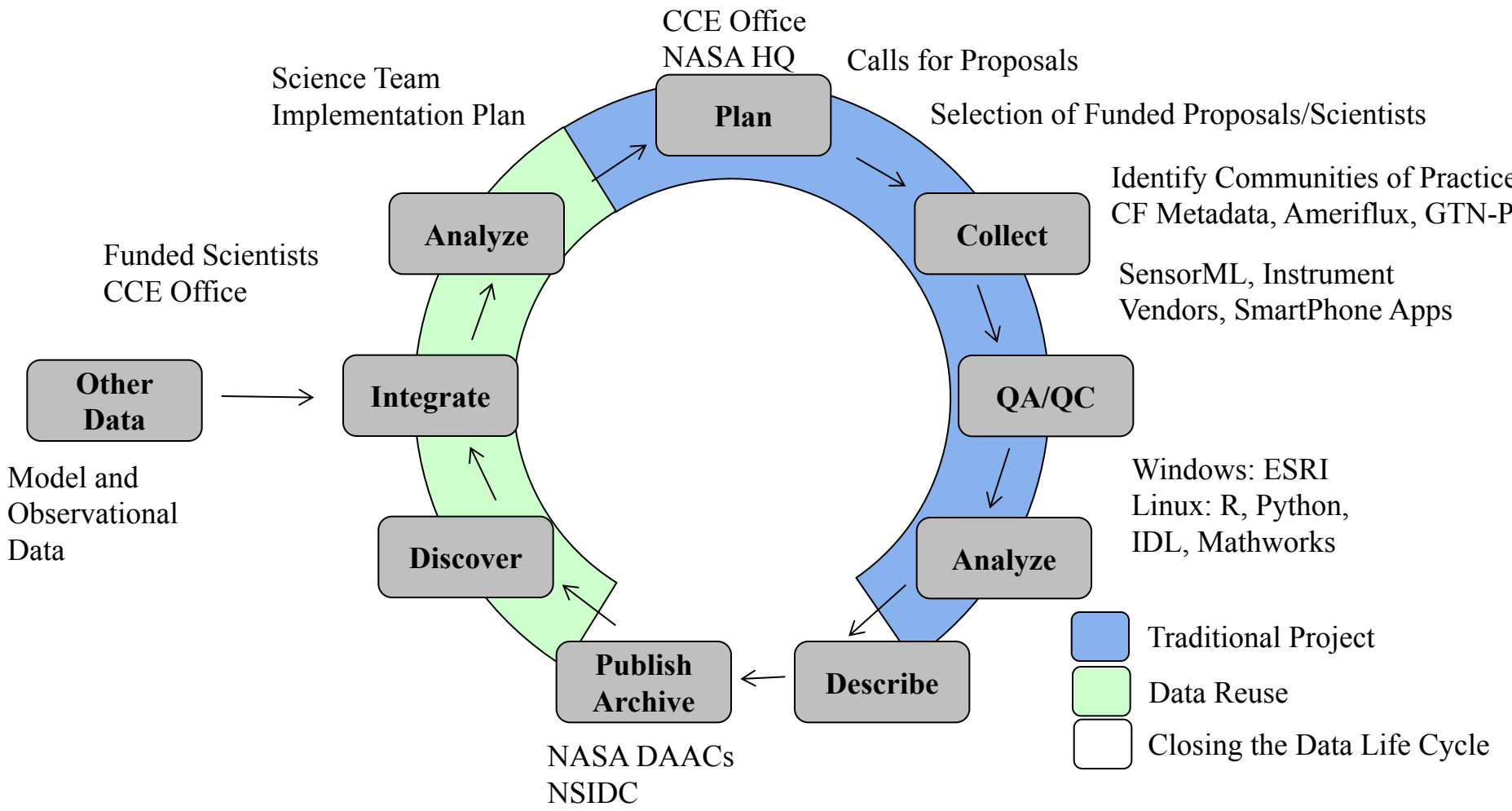
Liz Hoy, Peter Griffith, Dan Duffy

and many many others
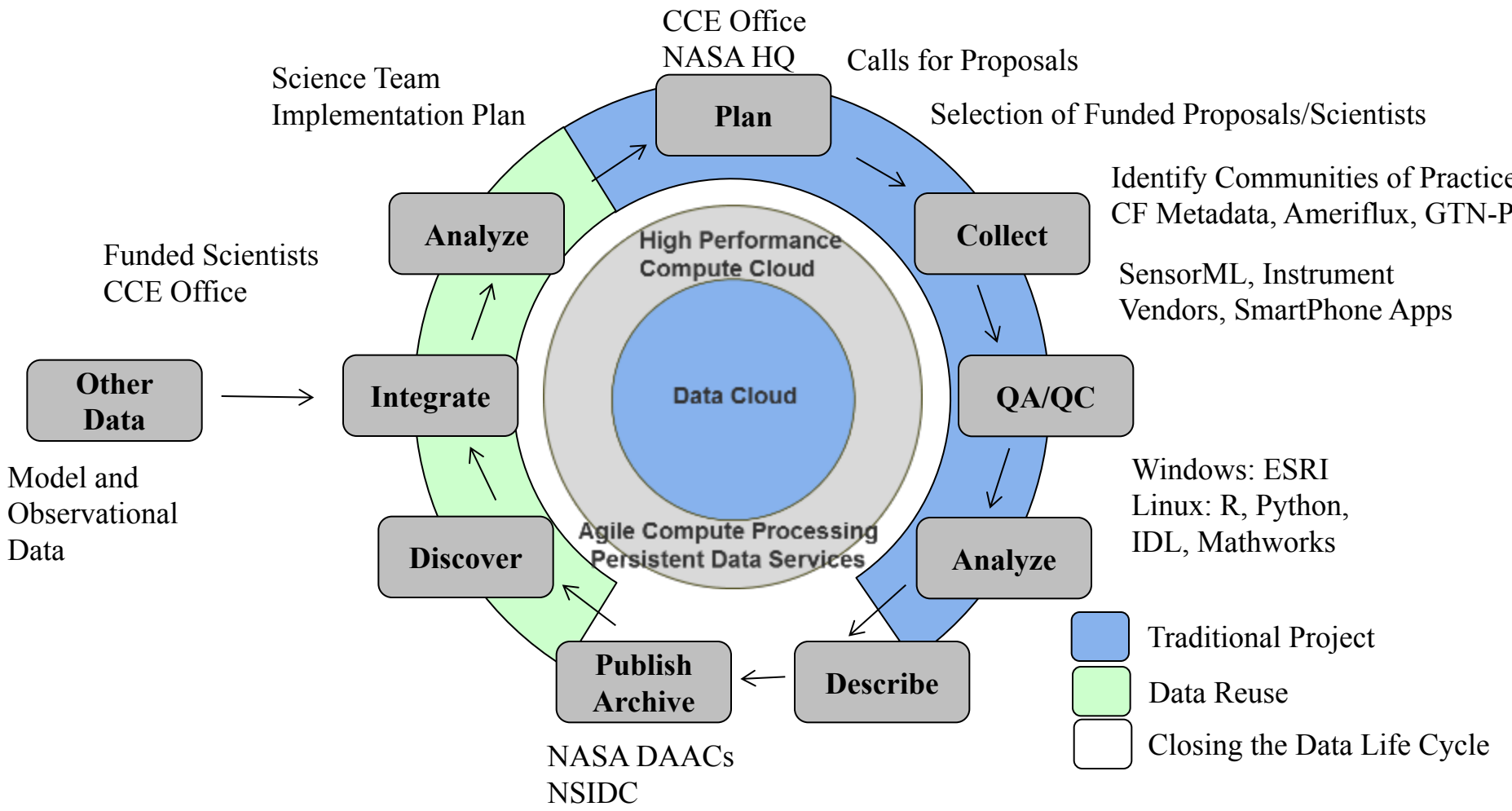
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The ABoVE Science Cloud is the center of the data lifecycle.

Augmented from Rüegg et al 2014 in *Front Ecol Environ*

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NASA

The ABoVE Science Cloud is the center of the data lifecycle.

CCE Office
NASA HQ

Calls for Proposals

Plan

Selection of Funded Proposals/Scientists

Science Team
Implementation Plan

Analyze

Collect

Identify Communities of Practice
CF Metadata, Ameriflux, GTN-P

Funded Scientists
CCE Office

SensorML, Instrument
Vendors, SmartPhone Apps

Integrate

QA/QC

Other Data

High Performance
Compute Cloud

Data Cloud

Model and
Observational
Data

Agile Compute Processing
Persistent Data Services

Windows: ESRI
Linux: R, Python,
IDL, Mathworks

Discover

Analyze

**Publish
Archive**

Describe

NASA DAACs
NSIDC

Traditional Project

Data Reuse

Closing the Data Life Cycle

Augmented from Rüegg et al 2014 in *Front Ecol Environ*

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NASA

Advanced Data Analytics Platform (ADAPT)
"High Performance Science Cloud"

ADAPT provides data processing and analytic services for NASA Scientists. A portion of ADAPT is dedicated to ABoVE (the ABoVE Science Cloud).

Adjunct to the NCCS HPC environment
- Lower barrier to entry for scientists
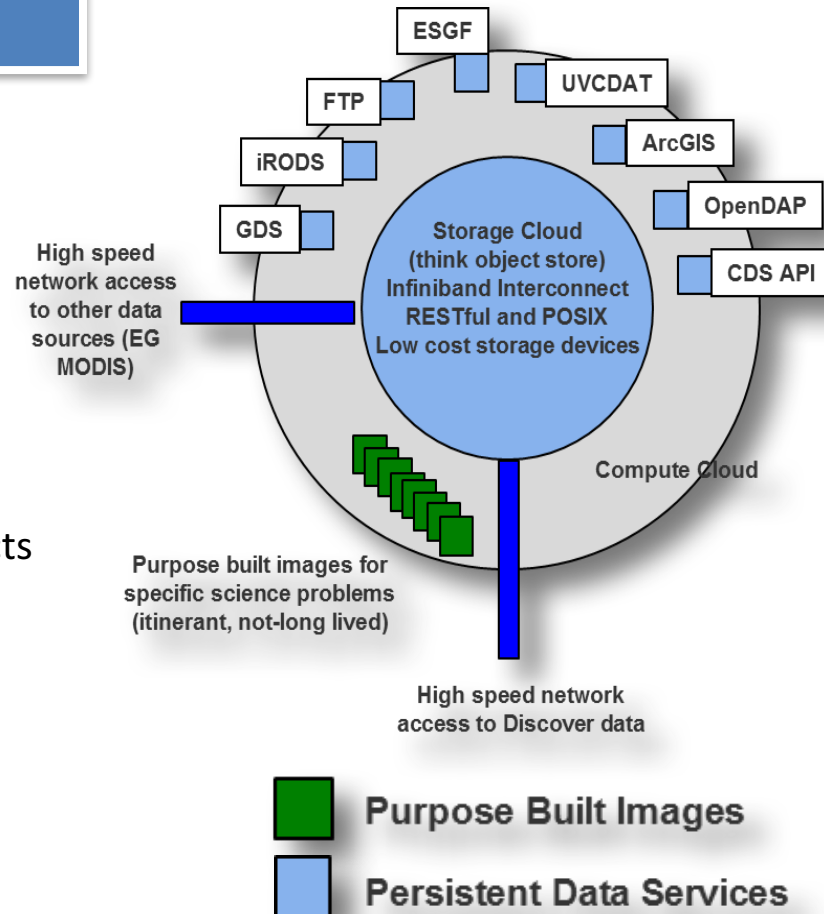- Customized run-time environments
- Reusable HPC/Discover hardware

Expanded customer base
- Scientist brings their analysis to the data
- Extensible storage; build and expand as needed
- Persistent data services build in virtual machines
- Create purpose built VMs for specific science projects

Difference between a commodity cloud
- Platform-as-a-Service that comes close to matching HPC levels of performance
- Critical Node-to-node communication – high speed, low latency
- Shared, high performance file system
- Management and rapid provisioning of resources

**High Performance Science Cloud Conceptual Architecture**

ESGF
FTP
UVCDAT
iRODS
ArcGIS
GDS
OpenDAP
CDS API

High speed network access to other data sources (EG MODIS)

Storage Cloud (think object store) Infiniband Interconnect RESTful and POSIX Low cost storage devices

Compute Cloud

Purpose built images for specific science problems (itinerant, not-long lived)

High speed network access to Discover data

Purpose Built Images

Persistent Data Services

ABoVE Science Cloud Data Holdings

Large Collections	Amount (TB)
Landsat – Surface reflectance	123
MODIS – Daily 500m surface reflectance	57
MERRA – GEOS-5 reanalysis	192
DigitalGlobe Imagery	>2000
Total	**> 2372 TB**

Other Data Sets

- ASTER GDEM
- Gonsamo Vegetation Phenology
- Landcover (EOSD, GL30)
- Potter CASA outputs
- Zhu MODIS-derived snow data
- Carroll Water Maps
- Schaefer ReSALT data
- Watts Fractional Water Product
- *Others as the team requests…*

Find a list of all common datasets available on the ASC here>>
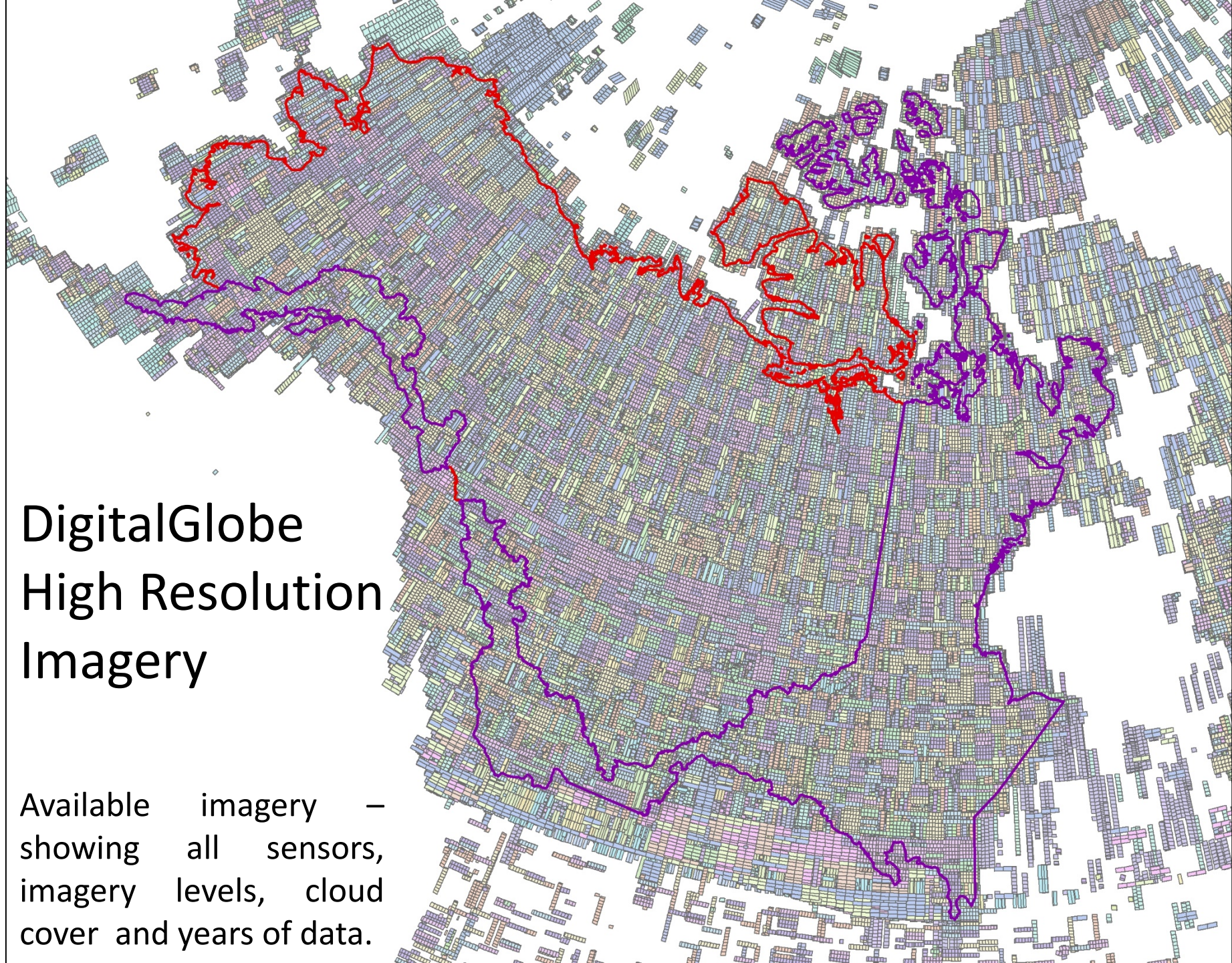
DigitalGlobe
High Resolution
Imagery

Available imagery – showing all sensors, imagery levels, cloud cover and years of data.

DigitalGlobe Usage by ABoVE Scientists

82 people from 38 projects have requested use of DigitalGlobe imagery on the ASC

Totals	DEM	Training and Validation	Land Cover, Land Use & Change	Logistics/ Site Selection
Projects	7	20	31	9
People	9	31	73	16

Apply for an account here: http://above.nasa.gov/sciencecloud_setup.html

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Proper Use of NextView Licensed DigitalGlobe Imagery for ABoVE researchers

Find this presentation on the ABoVE website>>
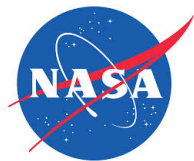
DigitalGlobe Imagery

- US National Geospatial Agency (NGA) licenses DigitalGlobe imagery which can be used for US federal government purposes

- NASA ABoVE researchers are able to access and analyze this imagery pursuant to the NextView license agreement NGA has developed with DigitalGlobe

- ABoVE researchers must sign the NASA-NGA data use policy acknowledging they understand the NextView license agreement terms

Imagery and Imagery Derived Products

Any new DigitalGlobe imagery or imagery derived products must contain **copyright** and **NextView License** notice.

Product Type	Subject to:	
	Copyright	NextView License
Imagery	✓	✓
Imagery Derived Product (e.g. image-based maps, reduced resolution images)	✓	✓
Derived Products* (e.g. maps, line drawings, DEM)	N/A	N/A

*Derived product methodology should attribute initial imagery to DigitalGlobe

Imagery Example:
Barrow Shoreline

© 2015 DigitalGlobe NextView License

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ABoVE researchers have online access to view imagery through the DigitalGlobe EnhancedView Web Hosting Service

- Ability to view imagery, however not a space to process imagery
- Imagery from ~2011 and forward is available within the web-based system
- Must adhere to the NASA-NGA data policy and the NextView License to use
- Learn more online here: http://above.nasa.gov/sciencecloud_setup.html

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ABoVE NGA/DigitalGlobe Imagery Tasking for 2017

Imagery tasking is through the CCE Office with help from the Polar Geospatial Center. PGC synthesizes DG tasking across multiple Arctic groups, balancing the needs of these groups.
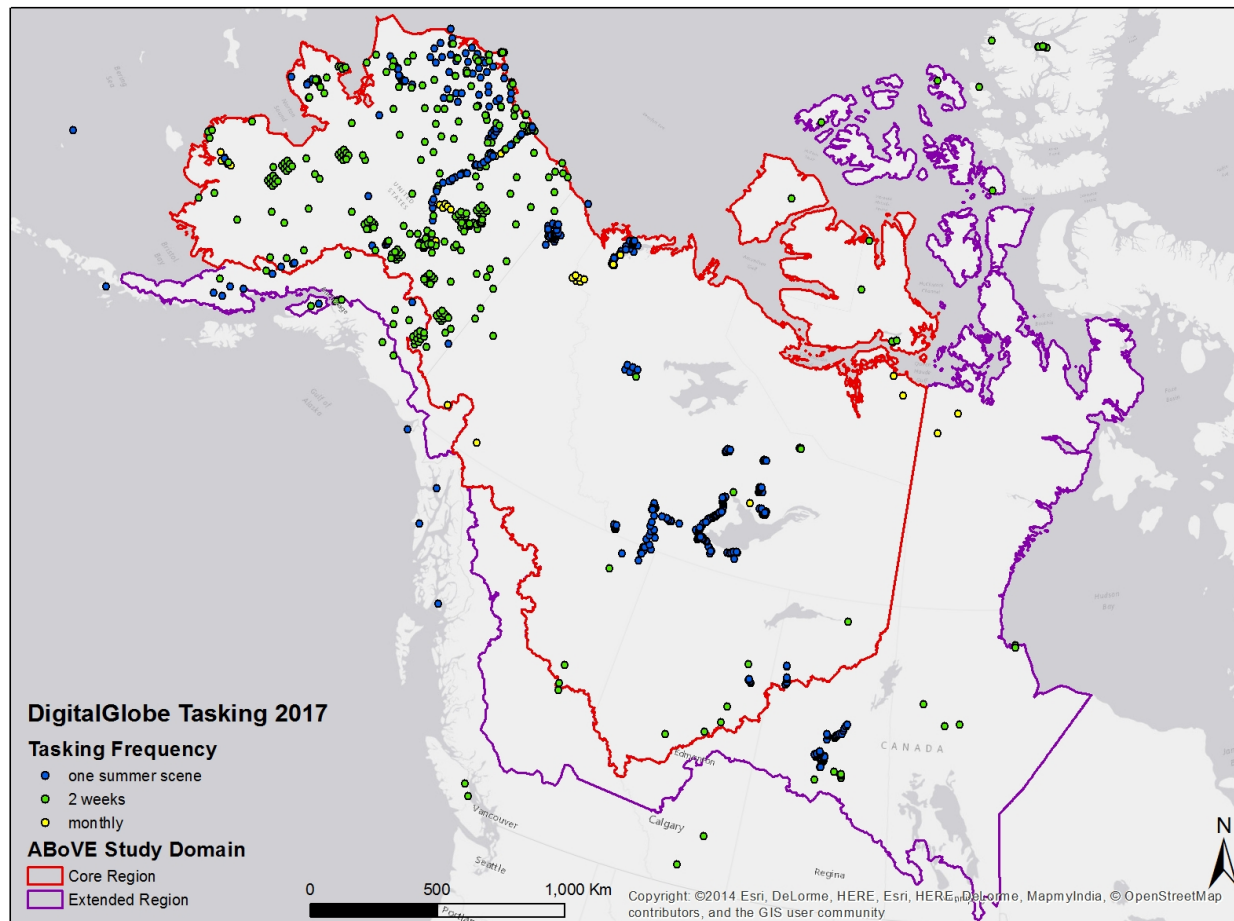
Canadian Space Agency – RadarSat 2 Tasking

- **SAR WG** of the Polar Space Task Group (PSTG) has committed to **support ABoVE**

- CSA will provide **free RadarSat 2 images** to ABoVE teams across domain

- Two elements:

  - **Monitoring strategy** for entire ABoVE domain – blanket RadarSat2 coverage (~30m resolution) – <u>need to identify best timing for this</u>

  - **Specific Targets** for Imaging: <u>need to compile list of requirements from teams that require RadarSat2 for their science</u>

- POLAR and NASA will contact teams to assemble this information

- CSA will also present this to the PSTG so that **other agencies may support**.

Ad-hoc Working Group

Franz Meyer	Mahta Moghaddam	Liza Jenkins	Chris Derksen
Nancy French	Kevin Schaefer	Eric Kasischke	Merritt Turetsky
Laura Bourgeau-Chavez	Go Iwahana	Larry Smith	Donald McLennan
Alireza Tabatabaeenejad	Ridha Touzi	Jon Ranson	

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http://above.nasa.gov/sciencecloud.html?

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The ABoVE Science Cloud (ASC)

Referenced on page A.4-8 in NASA Research Announcement for Terrestrial Ecology: Airborne Campaign For ABoVE NNH16ZDA001N-TE

Science Cloud Setup Instructions

About the Science Cloud

Webinar

The NASA Center for Climate Simulation (NCCS) has partnered with the NASA Carbon Cycle and Ecosystems Office (CCE Office) to create a high performance science cloud for this field campaign. The ABoVE Science Cloud combines high performance computing with emerging technologies and data management with tools for analyzing and processing geographic information to create an environment specifically designed for large-scale modeling, analysis of remote sensing data, copious disk storage for "big data" with integrated data management, and integration of core variables from in-situ networks. The ABoVE Science Cloud is a collaboration that promises to accelerate the pace of new Arctic science for researchers participating in the field campaign. Furthermore, by

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