



JACIE: A Brief History, Achievements, and Lessons Learned

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Joint Agency Commercial Imagery Evaluation

NASA • NGA • NOAA • USDA • USGS



What Is JACIE?



- ◆ **Joint Agency Commercial (Civil) Imagery Evaluation – JACIE**
- ◆ **JACIE informs the U.S. Federal Government about the quality of remotely sensed data sources, including new civil and commercial systems, data, and products**
- ◆ **JACIE data quality parameters: Primarily focused on Geodetic /Geometric accuracy, Spatial performance, and Radiometric performance**
 - ◆ JACIE partners are also interested in technical factors affecting data quality, usability, and interoperability

JACIE Background



- ◆ **Began at NIMA CCAP, Feb 3rd, 2000, held first Workshop in 2001**

- ◆ Began w/ high-res commercial: IKONOS, then QuickBird
- ◆ Expanded to all commercial and foreign civilian
- ◆ Held every year except 2004 (Hurricane Katrina)
- ◆ ~2005: Leadership transfers from NASA Stennis to USGS

- ◆ **Current JACIE Team – Stakeholders, Co-Chairs:**

- ◆ NASA – Brad Doorn, Kurt Thome
- ◆ NOAA – Mitch Goldberg, Kevin Gallo
- ◆ USGS – Tim Newman, Greg Stensaas
- ◆ NGA – Frank Avila, Dave Case
- ◆ USDA – Glenn Bethel, Dath Mita

- ◆ **JACIE Meetings:**

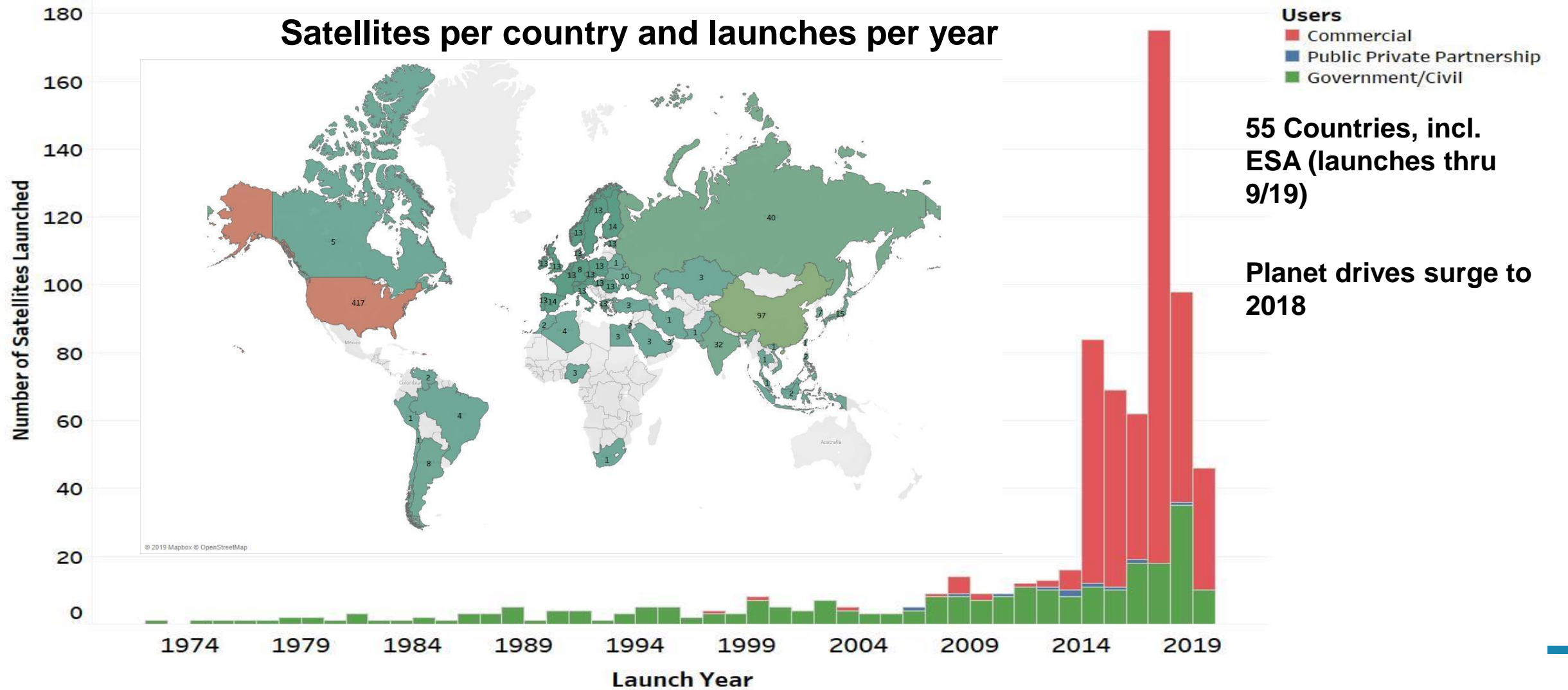
- ◆ Annual Stakeholders meeting for guidance
- ◆ Monthly Management Co-Chair's meeting and Technical Team meetings (telecons)
- ◆ Annual JACIE Workshop

Why JACIE?



- ◆ **Imagery Sources expanding significantly, both Gov't and Commercial**
- ◆ **Technology continues rapid growth, changing the way things are done**
 - ◆ Integrated Sensors, data fusion, software and processing, storage, many pieces are coming together to allow many integrated information products
- ◆ **Decision-makers facing many questions:**
 - ◆ What to use, what to buy? Will it meet my needs?
- ◆ **JACIE helps to provide those answers**
 - ◆ Provides independent assessments of data
- ◆ **JACIE Also helps Community (Civil/Commercial)**
 - ◆ Encourages development of new methods for processing, testing, assessing data
 - ◆ Work with new players to help them understand what is needed

Multiple data sources from space



JACIE Looks At Numerous Data Types



◆ Primary Focus is Satellite Imaging

- ◆ Traditional systems: Landsat, Sentinel-2a/2b, ResourceSat-2, MODIS, ASTER, GOES, VIIRS,
- ◆ SmallSats: Deimos, DMC, CBERS, ...
- ◆ CubeSats: Planet, Astro Digital, ...,
- ◆ ISS: DESIS, Climate Absolute Radiance and Refractivity Observatory (CLARREO) mission , ...,
- ◆ Cal/val missions: CLARREO mission and TRUTHS, ...,

◆ Have also looked at Airborne

- ◆ Hyperspectral and multi-spectral imagery
- ◆ LIDAR and SAR
- ◆ Thermal
- ◆ Combined Lidar/SAR/Optical

JACIE Works with Data Providers



- ◆ JACIE works to maintain collegial relationship with Data Providers
- ◆ Early JACIEs helped IKONOS, Quickbird/Digital Globe
- ◆ Have also worked with: Deimos, DMCii, GISTDA (Thailand), RapidEye, SkySat, AstroDigital, Planet
 - ◆ Provide feedback
 - ◆ Insight into our analyses, reports
- ◆ NGA also works closely with potential providers

JACIE Annual Workshops



- ◆ **Initially held in Washington, DC area**
- ◆ **Then Co-located with ASPRS Annual Conference**
 - ◆ Registration fees, travel
- ◆ **Returned to DC area in 2017**
 - ◆ Nexus of users and decision-makers
- ◆ **Focus is on technical talks**
 - ◆ Pure marketing discouraged, but some talks have both
- ◆ **Additional Talks**
 - ◆ Agency representatives tell of their activities and plans
 - ◆ Keynote speakers – the View from Above (Industry, Government, Policy)

ECCOE Workshop Added

- ◆ **EROS Calibration Center of Excellence (ECCOE) Workshop collocated with JACIE**
 - ◆ A focused “deep-dive” into a single calibration topic with invited speakers
 - ◆ 2019 Topic: “Calibrating Sun-synchronous and Geosynchronous Satellites: Sharing Best Practices”



2019 JACIE 18th Annual Workshop Stats



- ◆ **143 (free) registrants, 117 attendees**
- ◆ **38 speakers**
 - ◆ 17 Gov't, 20 Commercial, 1 Educational
 - ◆ 33 from USA, 1ea from Australia, France, Italy, S.Korea, UK
 - ◆ US Agencies: NASA, NGA, NOAA, NRO, State, USDA, USGS
 - ◆ Foreign Gov't: ESA-ESRIN, GeoScience Australia, KARI, NPL, CNES
 - ◆ Commercial: I2R, KBR, L3Harris, Labsphere, MAXAR, Planet, Raytheon, SSAI
- ◆ **Good cross-section of remote sensing community**

18th Joint Agency Commercial Imagery Evaluation (JACIE) Workshop – Sep 24-26, 2019



Data Quality and Interoperability

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- ◆ The panel session on Moving Toward a Common Reporting Framework by Sam Hunt- NPL, Valentina Boccia, ESA ESRIN, Greg Stensaas, USGS, and Ignacio Zuleta, Planet and associated questions/response from the audience provided session confirmation of the continued need create common definitions and guidelines for data quality and uncertainty.



- There are many efforts moving in a similar direction and they need to be combined to support the community.
- There is a strong effort evolving among JACIE (USGS, NASA, NGA, NOAA, and USDA) and the JACIE community partners, including European Space Agency (ESA), National Physical Laboratory (NPL), Committee on Earth Observation Satellites (CEOS), Global Space-based Inter-Calibration System (GSICS), and others, to move forward as a combined effort in this area.
- **Agreement that JACIE would work with CEOS (Space Agencies) to help bring data quality definitions, measures, and best practices together.**

JACIE Achievements



- ◆ **Helped the US Gov't to become more aware of data and opportunities**
- ◆ **Aided growth in the community**
- ◆ **Improved Data Quality**
- ◆ **Facilitated Information Sharing**
- ◆ **Helped to Build Trust – in all directions**
- ◆ **Helped promote new calibration methods and resources**
- ◆ **Spurred collaboration and opportunities**

Land Remote Sensing Satellite Compendium



- ◆ 2019 Joint Agency Commercial Imagery Evaluation (JACIE) Land Remote Sensing Satellite Compendium <https://pubs.er.usgs.gov/publication/cir1455>
- ◆ Reference: USGS RCA-EO Earth Observing Systems Database

A screenshot of the USGS Publications Warehouse website. The top navigation bar includes "USGS Publications Warehouse", "Explore", "Documentation", and "Contact". The main content area features a cover image for "2019 Joint Agency Commercial Imagery Evaluation— Land Remote Sensing Satellite Compendium" (Circular 1455). The cover image shows a satellite over a map of the United States. The text on the page reads: "2019 Joint Agency Commercial Imagery Evaluation— Land Remote Sensing Satellite Compendium", "Circular 1455", "In collaboration with Joint Agency Commercial Imagery Evaluation", "By: Jon B. Christopherson, Shankar N. Ramaseri Chandra, and Joel Q. Quanbeck", and a DOI link: "https://doi.org/10.3133/cir1455". There is also a "Tweet" button.

Links

- Document: [Report \(18.9 MB pdf\)](#)



JACIE Exposes Us...



- ◆ **To New Systems, and assessments of those systems**
 - ◆ WorldView Legion – multiple 500kg-class sats w/ 30cm resolution
 - ◆ CO3D – Effort to develop worldwide elevation map by CNES (France)
 - ◆ Planet’s SuperDoves – 8 bands now, 14 bands coming. UberDoves to have 32 band max?
 - ◆ DESIS – German-made hyperspectral sensor aboard ISS
 - ◆ This JACIE included 1st public presentation on new data purchasing by NRO!
- ◆ **To new calibration ideas, methods, tool, techniques, and partners**
 - ◆ Automated Spatial MTF assessment tool (KARI)
 - ◆ ESA - Earthnet Data Assessment Pilot, EDAP – Joint Quality Reporting
 - ◆ ESA VH-RODA Conference– being modeled after JACIE process and workshop
- ◆ **To new ideas – ideas, plans, and players that shape our world**
 - ◆ Enhanced data partners being developed for cross calibration
 - ◆ Calibration/Validation and Interoperability definitions and standards
 - Industry wants *necessary* Gov’t standards to be imposed

JACIE Lesson Learned (and things we should be doing!)



- ◆ **JACIE is a volunteer effort and expectation needs strong leadership**
- ◆ **Trust in the JACIE community is important**
 - ◆ Working with global partners across Government and Industry
 - ◆ Work with partners to present information together
- ◆ **Coordination across multiple Agencies is Challenging**
- ◆ **Prioritization is Difficult**
 - ◆ Different agencies, different priorities
 - ◆ Easy to get distracted by the many opportunities
- ◆ **JACIE provides a wealth of information, but is becoming unwieldy**
 - ◆ Becoming difficult to obtain the information needed
 - ◆ There are over 600 presentations made on calibration, characterization, and application assessment
- ◆ **Results need to be presented in a more consistent, useful manner**

JACIE Future

- ◆ Assessments of higher-order products
- ◆ Error and Uncertainty traceability
- ◆ Big Data, the “Cloud”
- ◆ Hyperspectral data assessments
- ◆ Spectral characterizations
- ◆ Build toward interoperability
- ◆ More opportunities for Government and Industry to work together
- ◆ Work to “operationalize” some of JACIE work (Data Buys, reporting, etc.)

Questions?

New Calibration Sites and Processes

- ◆ **Nice to see thoughts of ca/val/verification over different sites (bright, dark)**
 - ◆ BDRF
 - ◆ Hyperspectral over sites
 - ◆ Lets continue to support and push this!!!
 - ◆ Work with on-going efforts
- ◆ **Help establish common definitions and documents to build upon**
- ◆ **Very exciting to see common test sites and definitions; RadCalNet; Keep this moving!!!**



Cooperation in Commercial Data



Frank Avila NGA, Peter Meund, NRO

- ◆ Joint NGA-NRO agreement directs NRO to be IC and DoD primary acquirer of commercial GEOINT imagery and NGA to be primary acquirer of commercial GEOINT analytic services and data
- ◆ Commercial GEOINT Activity (CGA) - A joint NGA and NRO effort designed to ensure that the US Government takes full advantage of legacy and emerging commercial GEOINT capabilities to satisfy mission needs and maximize the efficiency and effectiveness of the overhead architecture
 - ◆ ***CGA includes capabilities and application assessment (JACIE- like)***
- ◆ **Global Enhanced GEOINT Delivery (G-EGD): Replaces Enhanced View Web Service (EVWS) for users including civil users**
- ◆ **Studies and market research will inform next phase (2020+) of acquisition**

2019 JACIE Commercial Panel Highlights

Robbie Schingler, Planet Co-founder

- ◆ Operating ~148 satellites currently
 - 5 RapidEye, 15 SkySats, 110+ Doves,
 - 20 SuperDoves
 - 25+ ground stations
- ◆ Currently downlinking 6-8 TB/day
- ◆ Agriculture is ~40% of their market, but others are growing
- ◆ He sees Planet primarily as Data Managers, foundation for the rest of their work
- ◆ Looking at Ship-to-ship transfer
- ◆ Telecom Mega Constellations could change the CONOPS for remote sensing
- ◆ "Data is the new Oil" (some economist said) - has yet to be priced well



Leadership in Earth Observation coming from ESA and China (panel question)

2019 JACIE Commercial Panel Highlights



Orla Dermody, MAXAR/Digital Globe (Product Development Lead)

- **They are being driven by new technologies**
 - Autonomous Navigation is a huge driver, so is 5G
 - Also by NGOs: For the Bill & Melinda Gates foundations: Took 3 weeks to make a million km², >90% accurate map, millions of buildings, in Tanzania to help spread mosquito nets and fight disease
 - Mapping is a huge trend -"Google Maps poised to be an \$11B business in 4 years" (said in 2019)
 - Africa is a huge underserved area, wide-open to opportunities
- **WorldView Legion - first launch in 2021-22, Q1-Q3 timeline; will triple Maxar's 30cm resolution collecting capability**
- **Timeliness (low-latency) is key**
- **What Gov't can do to help the EO Community: Grow the people pipeline, Reward holistic innovation, Collaborate and attack the problem of scale**