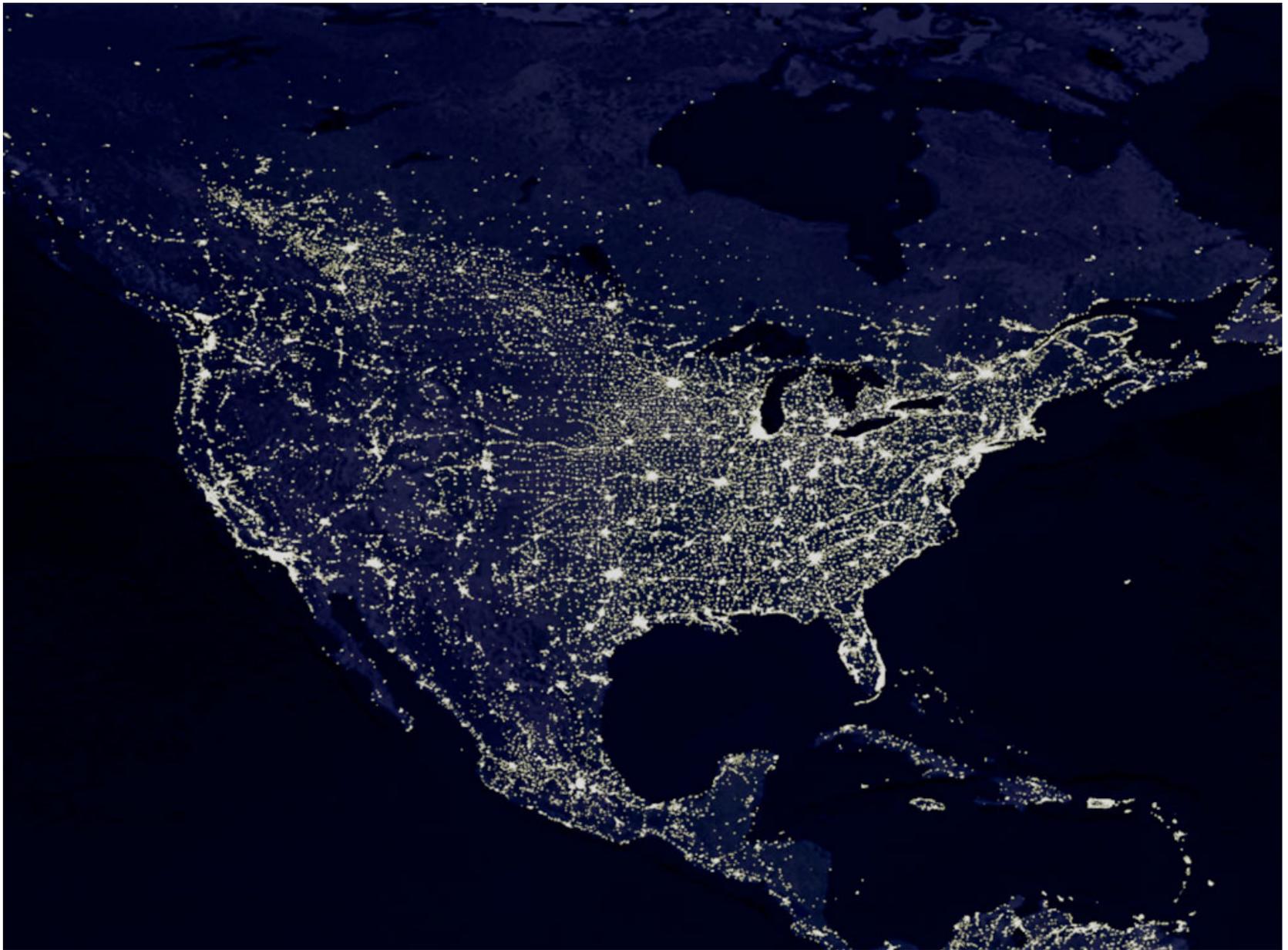


This image is a composite of data taken by the VIIRS instrument aboard the Suomi NPP satellite in April and October 2012.



This photograph, taken from space by a satellite, shows North America at night in 2001. The lights show population centers from small towns to large metropolitan areas. From NASA's *Visible Earth*.

WORKSHOP EMPHASES

DATA QUALITY

&

REMOTE SENSING APPLICATIONS

Quality Emphasis

Le mieux est l'ennemi du bien.

The best is the enemy of the good. Voltaire

Where do you stand?

That “good” or “good enough” is very satisfactory
or, conversely,

that striving for the best will always drive the good to become better in the
reaching for the “best”

Applications Emphasis

THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS



Not Quite Random Topics

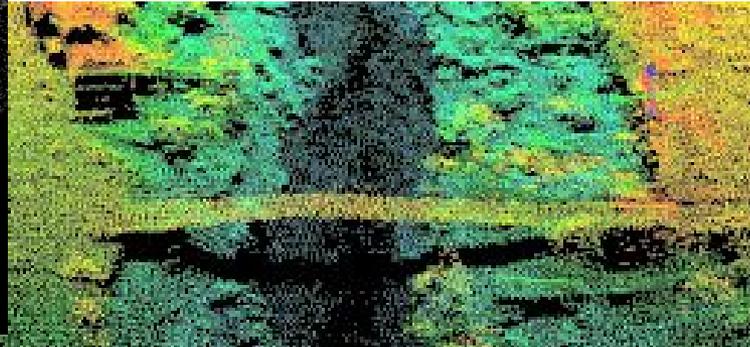
Treasuring Point Clouds

- Perfecting Robust 3D in Extraction and GIS Use
- Turning the look “at earth” to “in space”
- Linking Satellites, Airborne, UAS, and Other Remote Sensors to an Ocean Faring Robot

LiDAR_{plus} Point Clouds



PEOP LiDAR image by Gerald Bowden, USGS



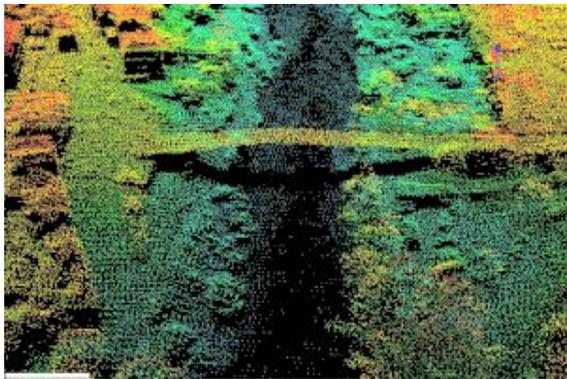
Ironbridge Gorge World Heritage Site UK

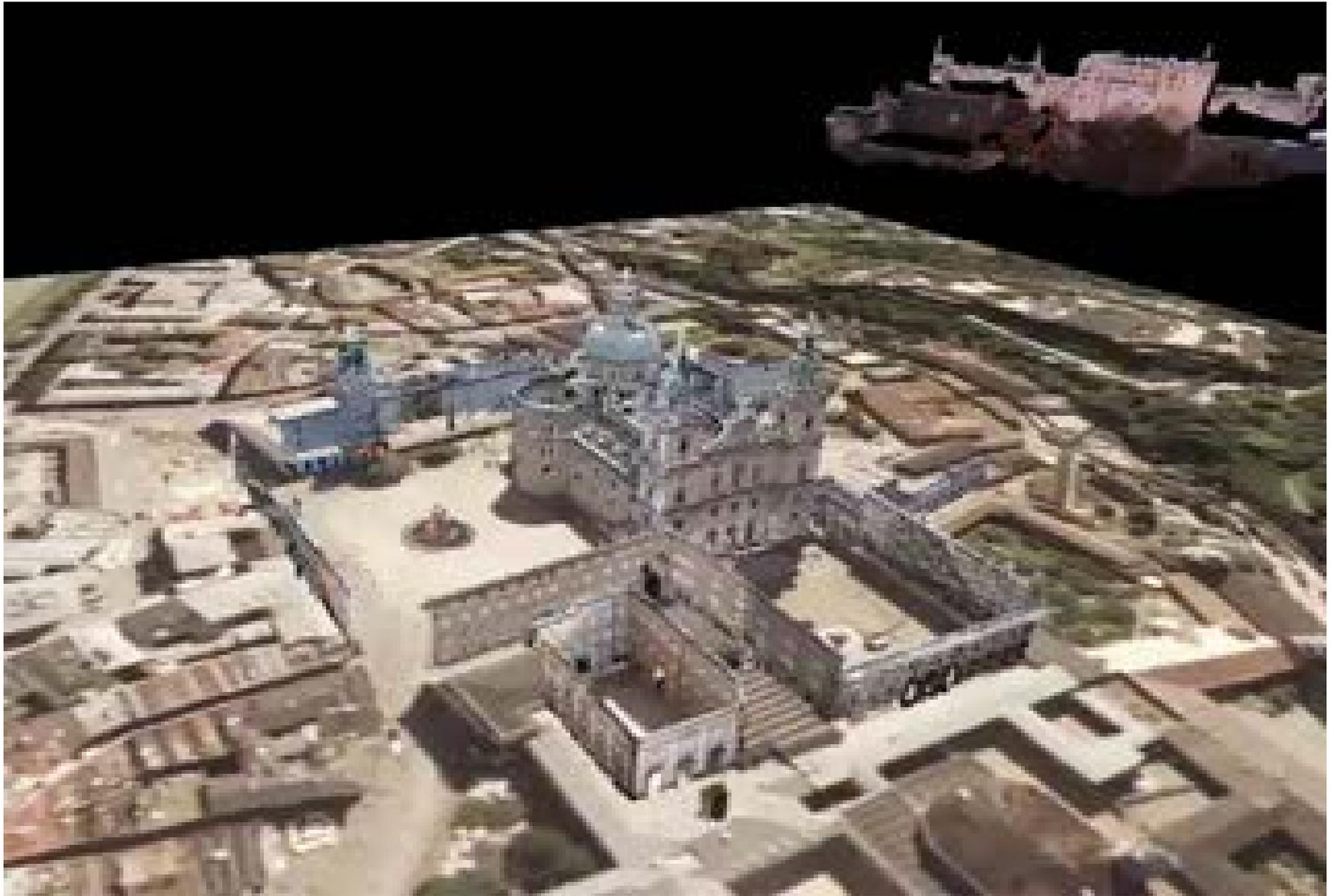


3d ladar lidar.wmv



PIEQF LIDAR image by Gerald Beaman, USGS







Photogrammetry Point Clouds



by Aer0metrex_admin
12/18/2011

Photo point-cloud comprised of millions of 3D points extracted from 140 photographs using photogrammetric technology

Using the Technology Copilot is an iPad



Not Quite Random Topics

- Treasuring Point Clouds

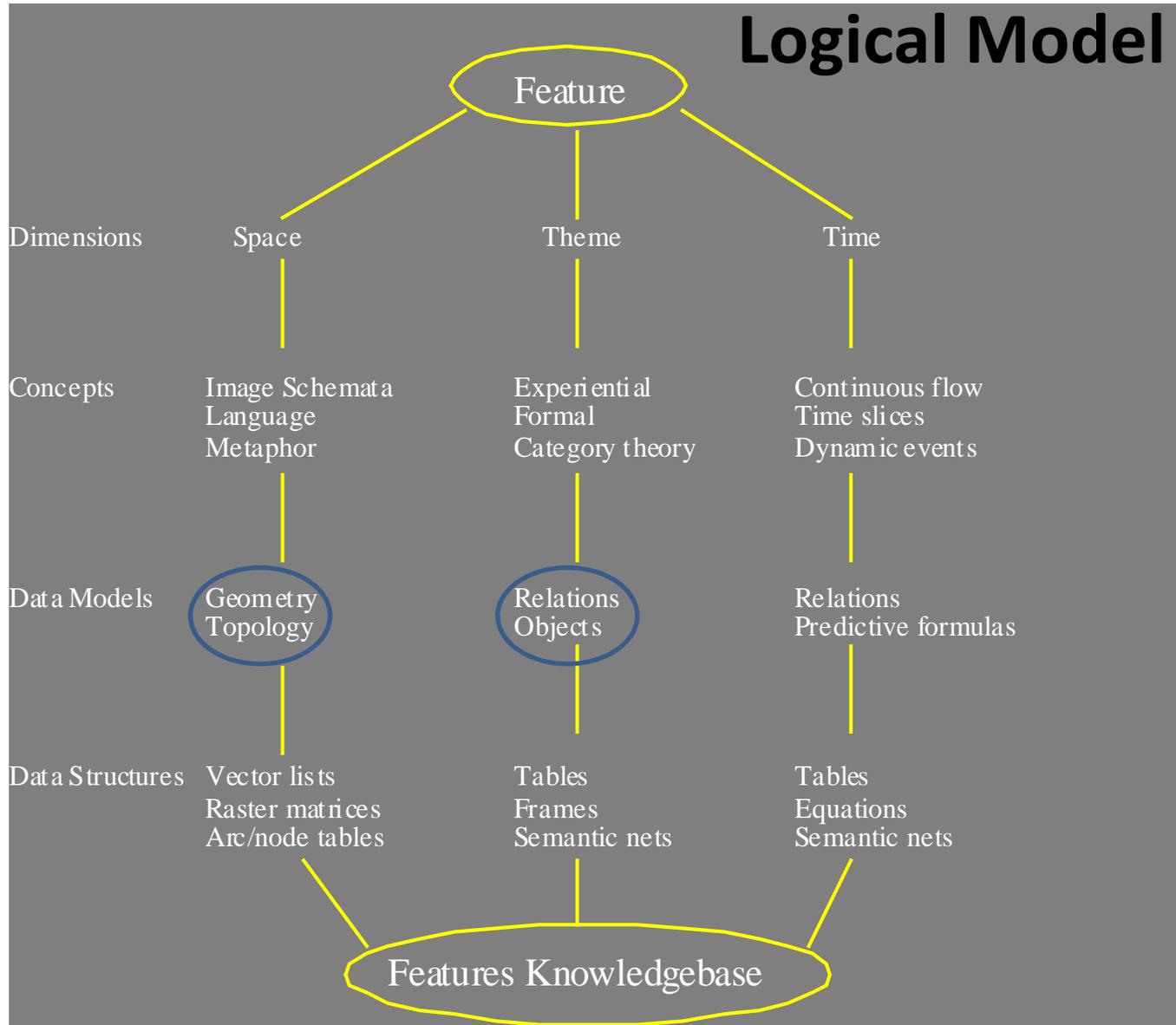
 Perfecting Robust 3D in Extraction and GIS Use

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The Issues

- Humans perceive the geographic world as a set of entities with spatial, thematic, and temporal attributes.
- A fusion of remote sensors with reliable metadata can emulate that spatial, thematic, and temporal perception.
- Without appropriate data models, GIS analysis and decision support are constrained from access to extracted information.

Multidimensional Theory of Geographic Features and Relations



The quality of the Information populating such a data model is highly correlated to the quality of the source.

True 3-D

- Here z is *not* an attribute but an element of the location of the point
- If z is missing, object does not exist!
- *Several* z 's possible for a single x - y pair,
- Store data in structures that actually reference locations in 3D space (x,y,z)
- E.g., Soundings in the ocean or atmosphere, geologic logs of wells

Not Quite Random Topics

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The Issue

- The Earth orbits the Sun among a swarm of asteroids whose orbits cross Earth's orbit.
- More than a million of these Near Earth Asteroids are larger than the asteroid that struck Tunguska in 1908 or exploded over Chelyabinsk only two months ago.
- Currently there is no comprehensive dynamic map of our inner solar system showing the positions and trajectories of these asteroids that might threaten Earth.
- Less than 1% of the over one million asteroids greater than 40 meters have been identified to date.

“Meteor Strike” Aired On NOVA (PBS)

3/27/2013

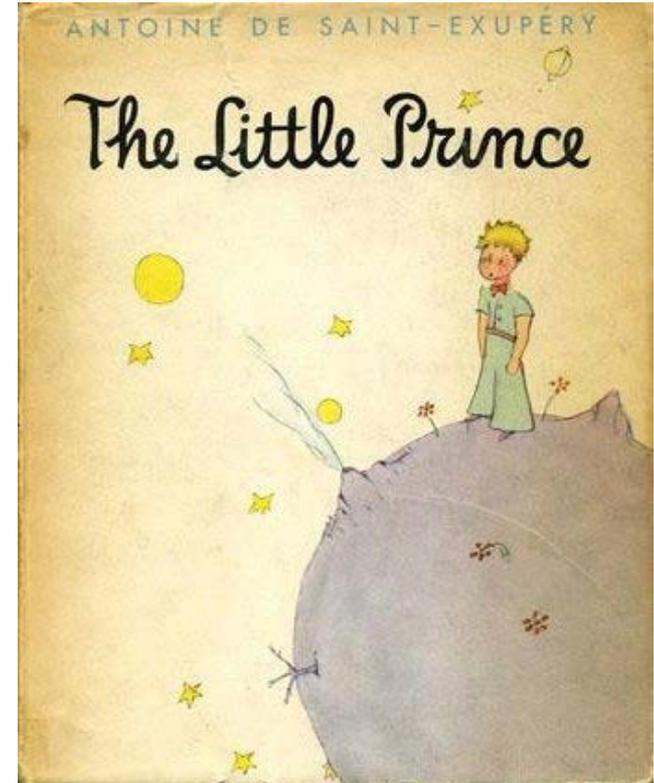
“ A blinding flash of light streaked across the Russian sky, followed by a shuddering blast strong enough to damage buildings and send more than 1,000 people to the hospital. On the morning of February 15, 2013, a 7,000-ton asteroid crashed into the Earth’s atmosphere.

According to NASA, the Siberian meteor exploded with the power of 30 Hiroshima bombs and was the largest object to burst in the atmosphere since the Tunguska event of 1908, which was also in Siberia and left few eyewitnesses or clues.

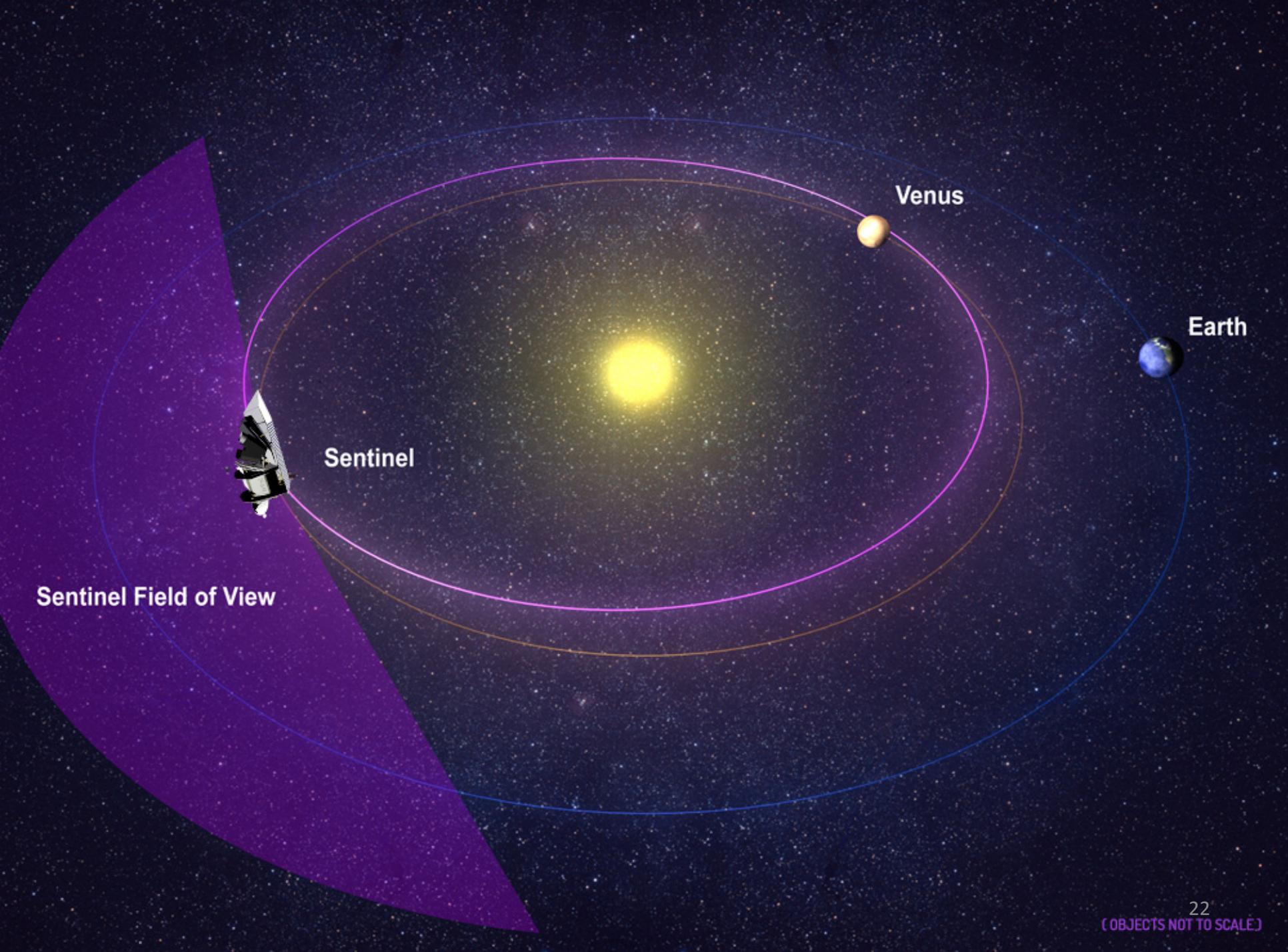
This time, the event was captured by digital dashboard cameras, now common in Russian autos and trucks. Within days, NOVA crews joined impact scientists in Russia as they hunted for clues about the meteor’s origin and makeup. From their findings, it’s clear we came close to a far worse disaster, which NOVA sets in perspective by looking at greater explosions from the past, including Tunguska and the asteroid that wiped out the dinosaurs 65 million years ago. ”

B612 Foundation: Sentinel Mission

- The B612 Foundation
 - Nonprofit 501(c) 3 organization dedicated to opening up the frontier of space exploration and protecting humanity from asteroid impacts.
 - Build and operate the first privately funded, launched, and operated interplanetary mission – an infrared space telescope, (6/12/2012 announcement)
 - Will place telescope in orbit around the Sun to discover, map, and track asteroids whose orbits approach Earth and threaten humanity.
- The spacecraft and instrument use high-heritage flight proven deep space systems, originally developed by NASA, to minimize technical and programmatic risks.
 - Large space-based telescopes (Spitzer, Kepler),
 - Large format camera made up of many individual detectors (Kepler),
 - Cryogenically cooled instrument (Spitzer). By detecting and tracking nearly all of the Near Earth Objects greater than 50 meters in diameter
- Sentinel will create a map of the solar system in Earth's neighborhood enabling future robotic and manned exploration. The Sentinel data will also identify objects that are potentially hazardous to humans to provide an early warning to protect the Earth from impact.



Dr. Edward Lu



Sentinel Field of View

Sentinel

Venus

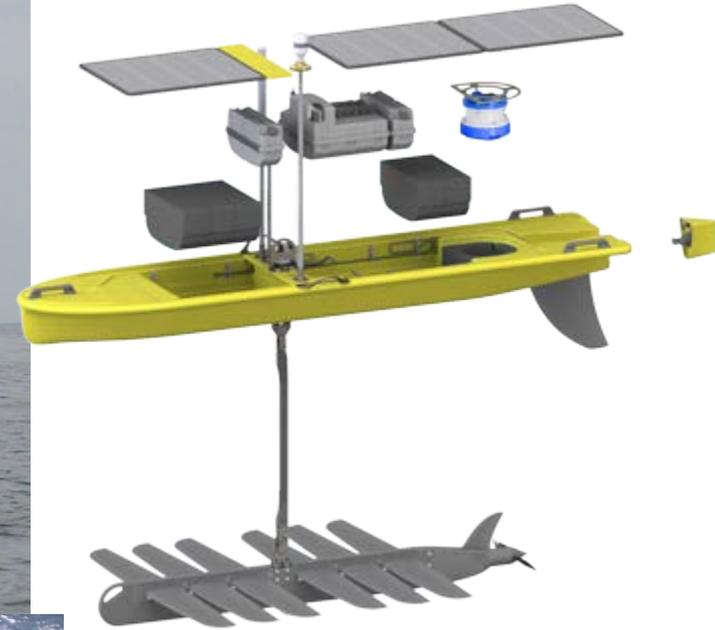
Earth

B612 will discover and “accurately and dynamically map” 50 times more asteroids than have been found by all other telescopes combined.

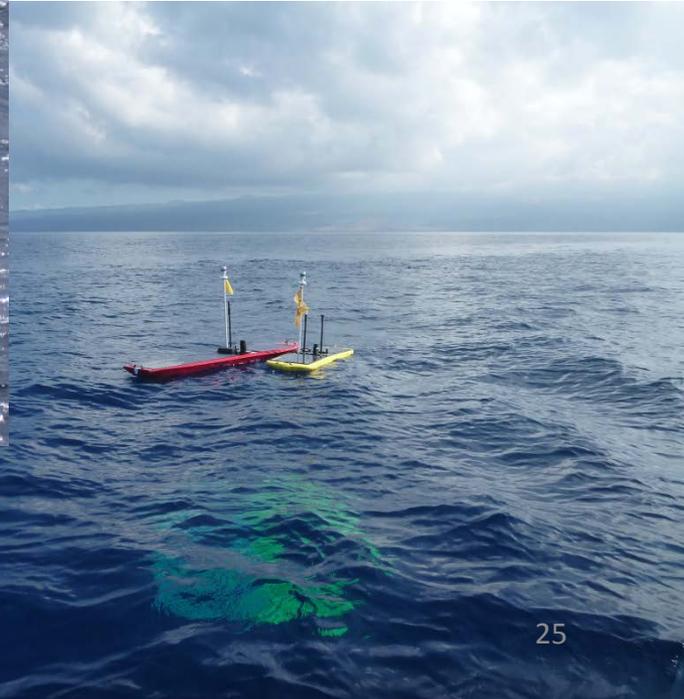
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liquid
robotics



Wave Glider SV2 travelled over 300,000 miles and survived sharks, hurricanes and cyclones.



Liquid Robotics Wave Glider

Case Studies

- **Monitoring Arctic Sea Ice in the Beaufort Sea**

Customer: NOAA PMEL

Two Arctic Wave Gliders covered over 900 nautical miles (1,325 and 1,418 respectively) and recorded and transmitted nearly 900,000 temperature measurements, forming a data set that shows the Beaufort Sea was anomalously warm in the summer of 2011.



- **Tracking Great White Sharks**

Customer: Stanford University's Blue Serengeti Initiative and TOPP

"The Wave Glider is an unmanned robot. It's a data-collecting mobile platform. It can carry sensors for everything from weather to sea surface temperatures. Our goal is to use revolutionary technology that increases our capacity to observe our oceans and census populations, improve fisheries management models, and monitor animal responses to climate change."



- **Do You Know Where Your Fish Are?**

Customer: Cornell University

"This is a game changer. The Wave Glider gives us the means for continuous acoustic monitoring of fish and micronekton populations, at a fraction of the operational costs of shipboard surveys."



- **Predicting the Big One**

Customer: Scripps Institution of Oceanography

"When you have a large earthquake, it's important to quickly estimate the parameters of where it was and how big the seafloor displacement was. In order to do this, you need improved coverage in the ocean." *Wave Gliders serve as communication gateways for transmitting live seismic data from the seafloor to the ocean surface to shore via satellite.*



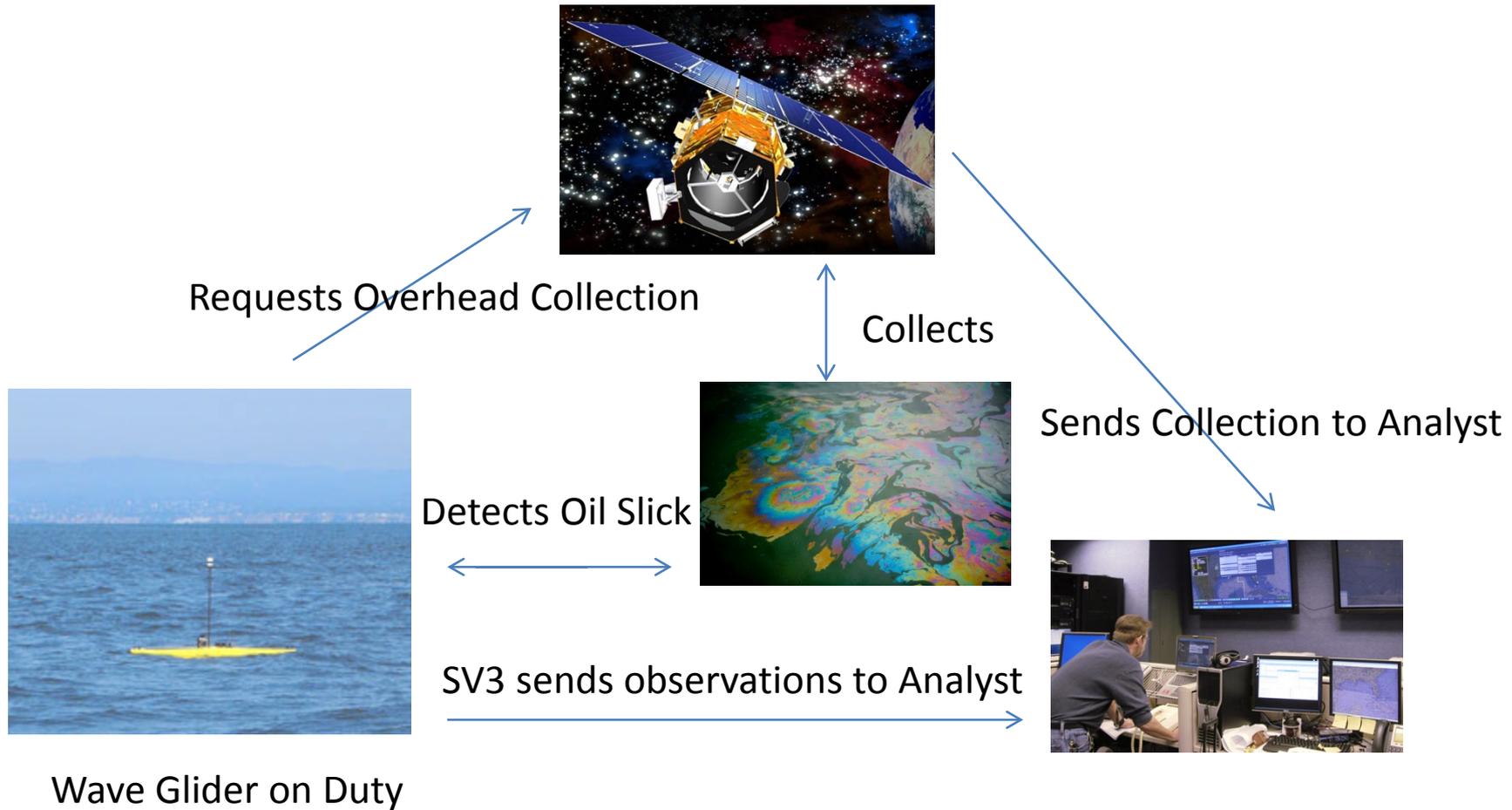
- **Air-Sea Interface Monitoring of Hurricanes**

Customer: NOAA AOML

"Among the [Wave Glider's] notable features are the ability to use the platform for more than just one application, the ability to reconfigure the platform to meet your scientific need, and the ability for long-duration sensing that lends the platform to such a wide variety of applications



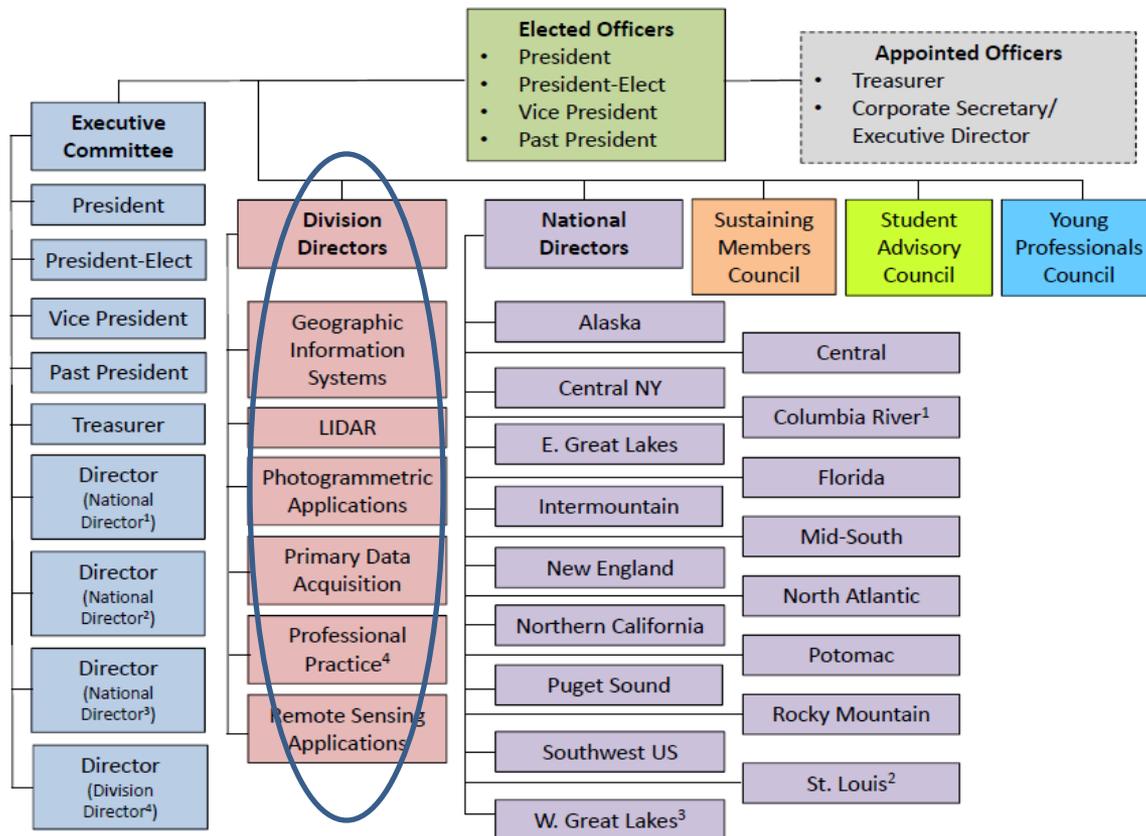
Just Imagine





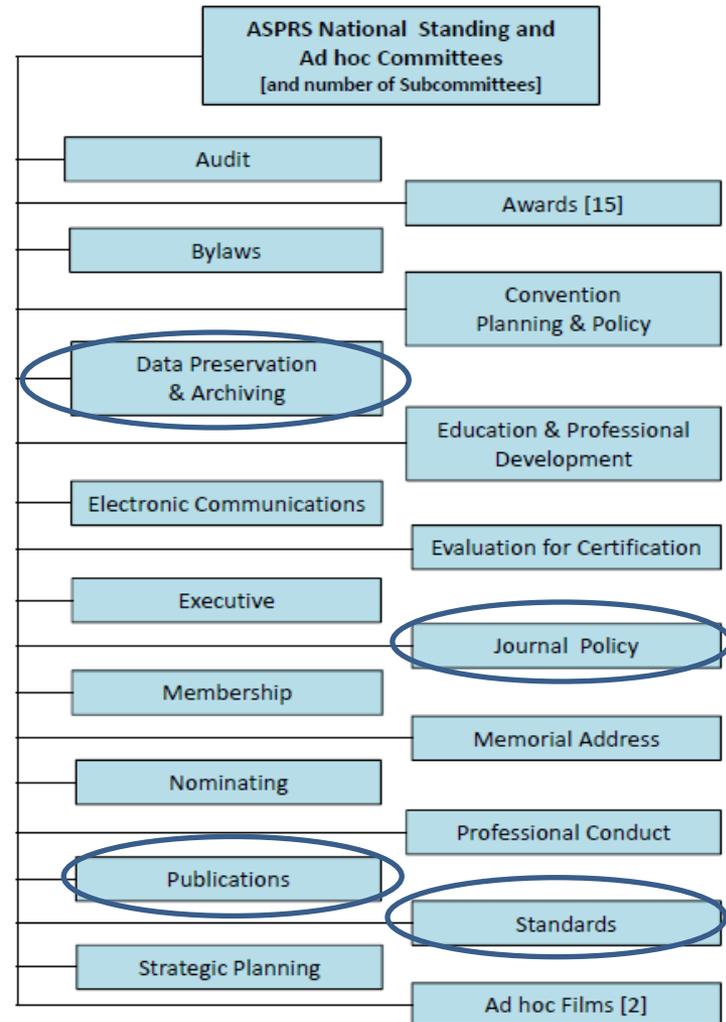
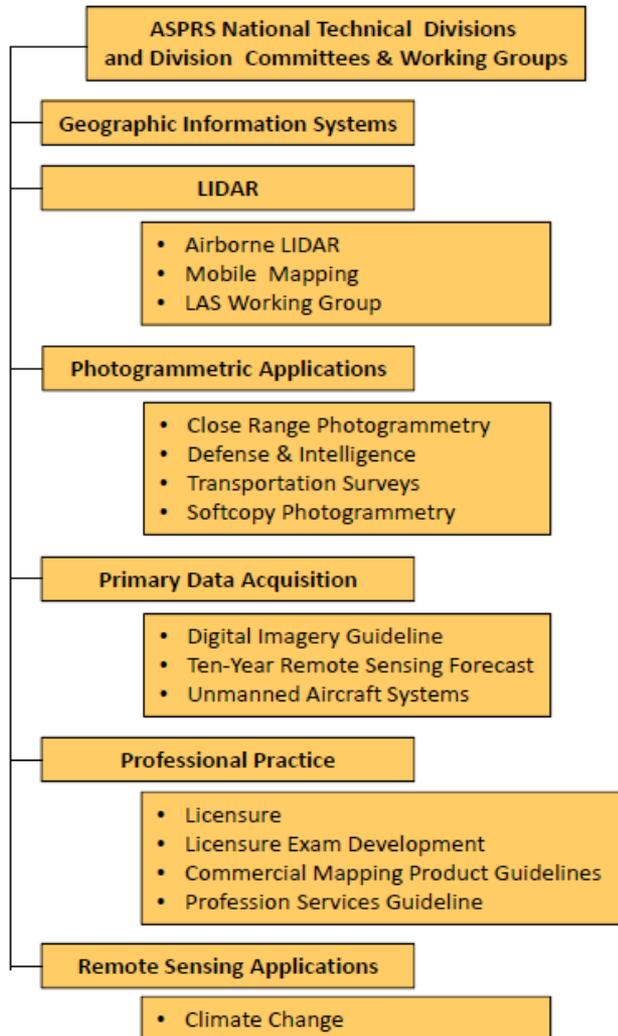


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ASPRS Division Activity Summary

This table describes the current projects of each ASPRS Division. [last update 03-28-13]

Title/Description
Best practices for collecting and processing airborne LiDAR for topographic products
LAS 1.4
Cooperative Extensions / Supplements to LAS
LAS Validation Software
Best Practices for Geometric Accuracy of LiDAR
LiDAR density and spacing specification
Mobile mapping, Best Practices
ASPRS Accuracy Standards for Large Scale Mapping
Review of the FGDC Geographic Information Framework Data Content Std – Part 2: Digital Orthophotography
Image Quality
In Situ Calibration Ad Hoc Committee
Oblique Imagery Specification
Consolidation of the Procurement Guidelines for Products and Services
Wikipedia content
High Data Volume Management
Climate Change Committee
Academic Engagement Subcommittee
Student Involvement in RSAD
Run ASPRS booths at conferences for CAGIS, ESRI conferences
Datum guidelines



Joint Agency Commercial Imagery Evaluation

&

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INFORMATION SOCIETY

“People acting together can accomplish things no individual acting alone could ever hope to bring about.”

Franklin Delano Roosevelt