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Integrating Information from LiDAR Data with your GIS

David A. Gonzalez

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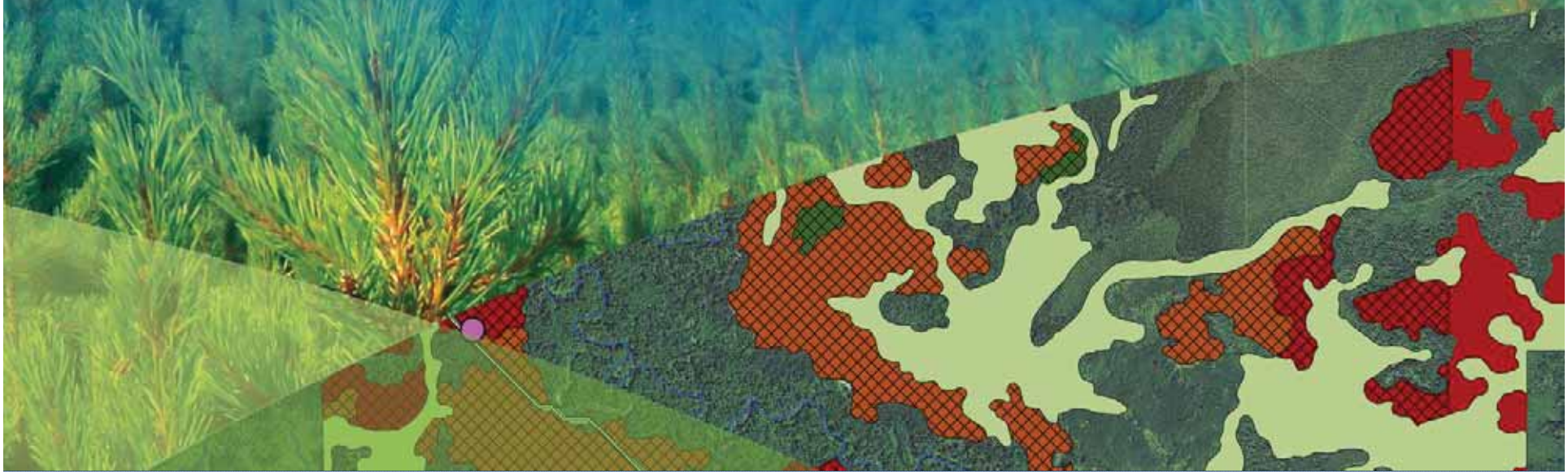
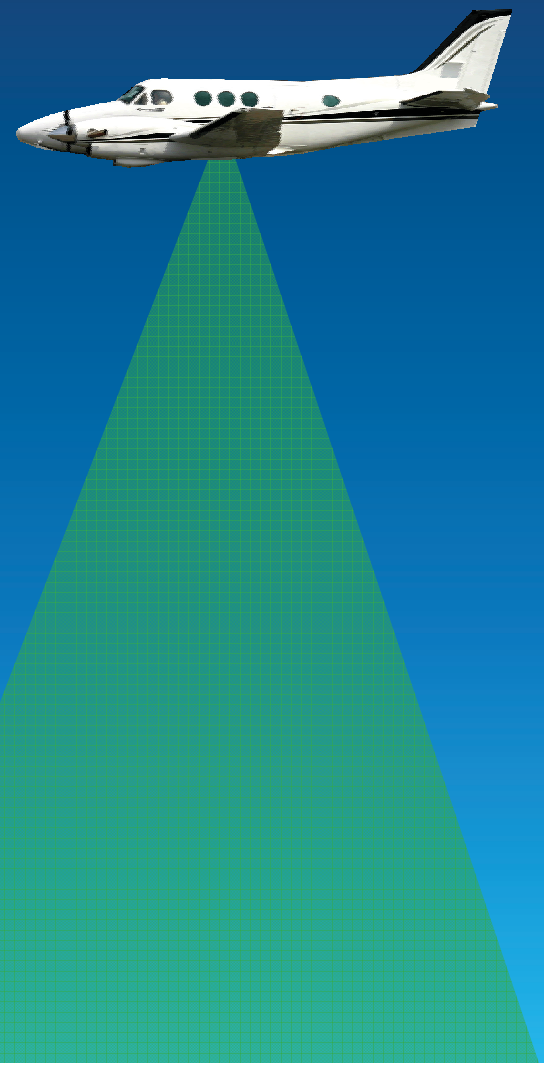


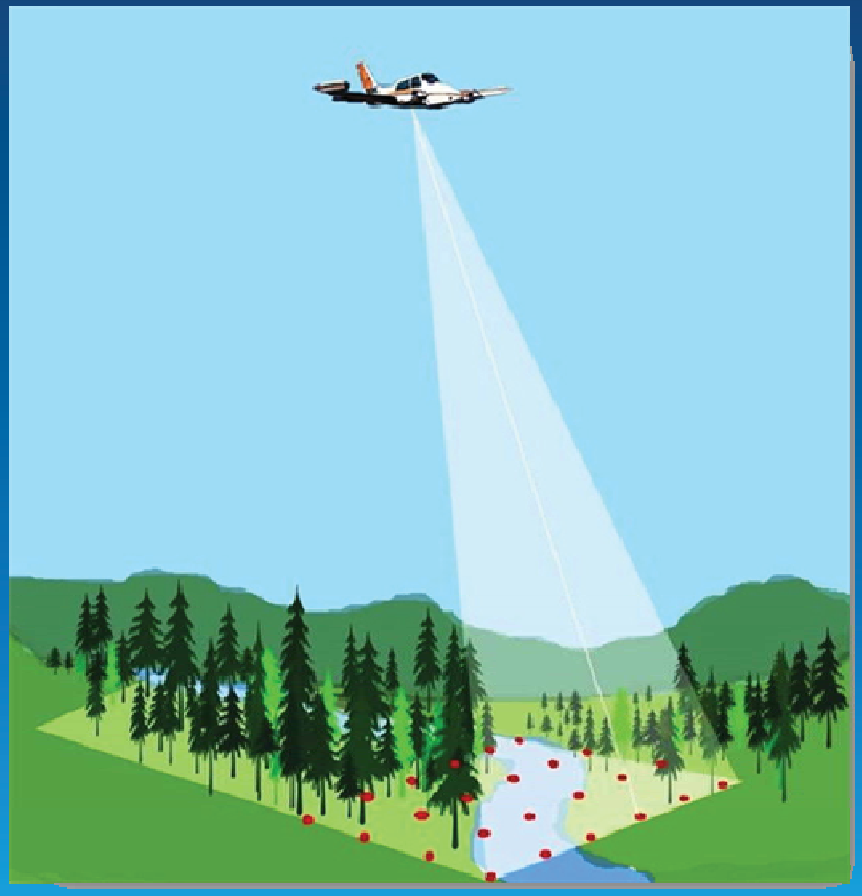
Agenda

- Trends fueling LiDAR analysis opportunities
- LiDAR as a valued source of information for your GIS
- Leveraging LiDAR for Decision Support Systems

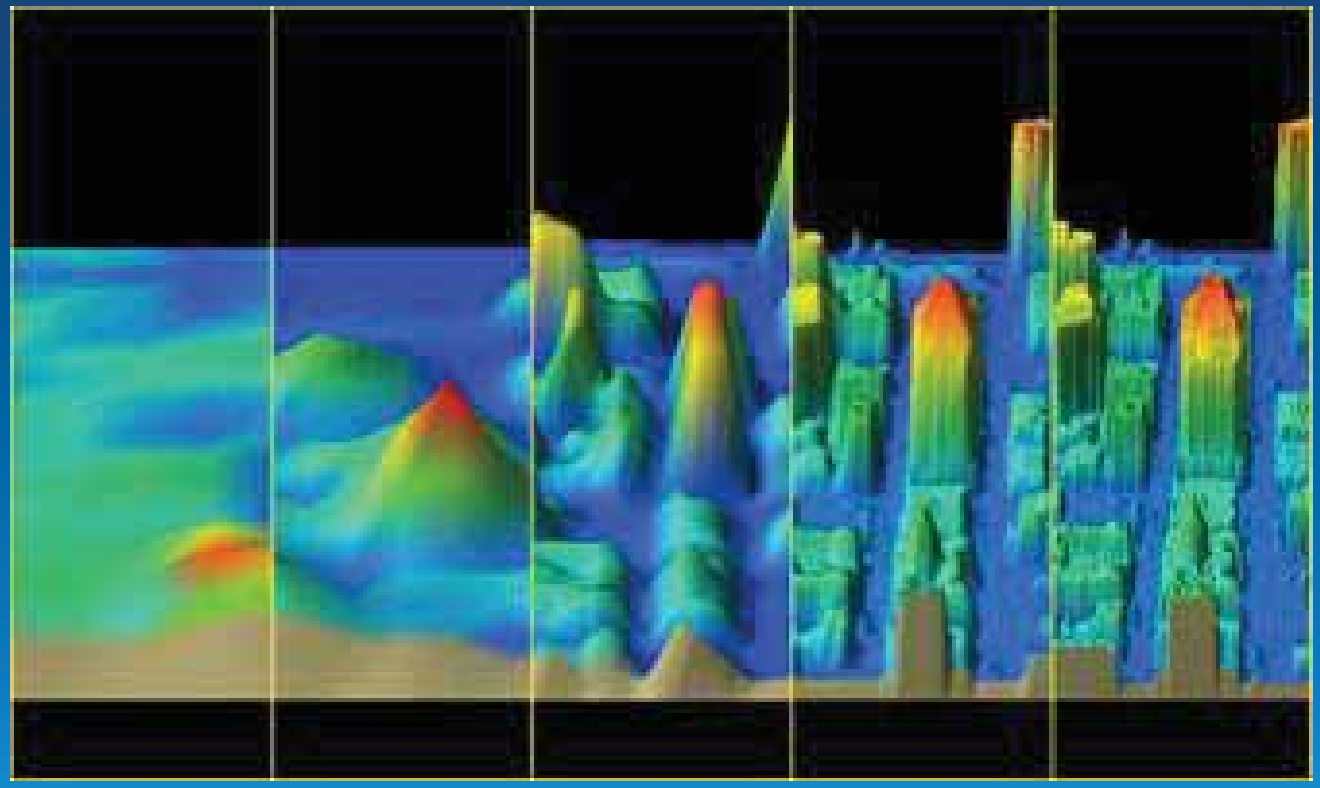


Trend: Growing Prevalence of LiDAR Data

- Declining acquisition costs
- Flexible deployments
- Fast, accurate measures
- Easily survey remote areas



Trend: Evolution of LiDAR Resolution



From Terrain Updates

To Feature Extraction

Trend: The Convergence of Paradigms

Integrated Tools for Multidimensional Analysis

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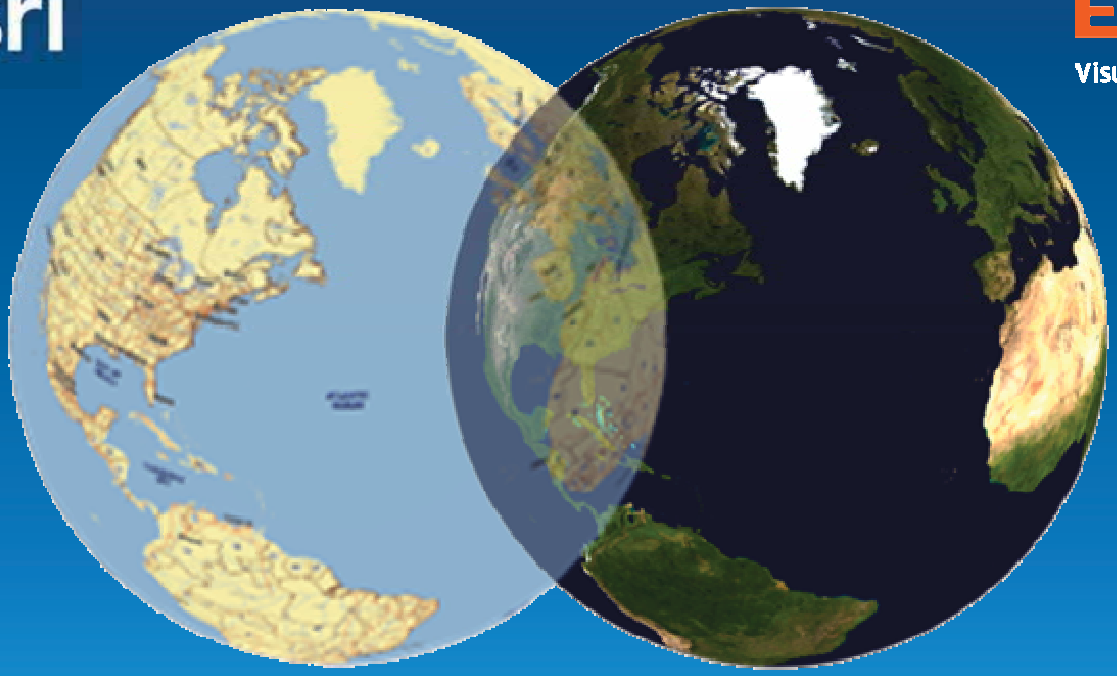
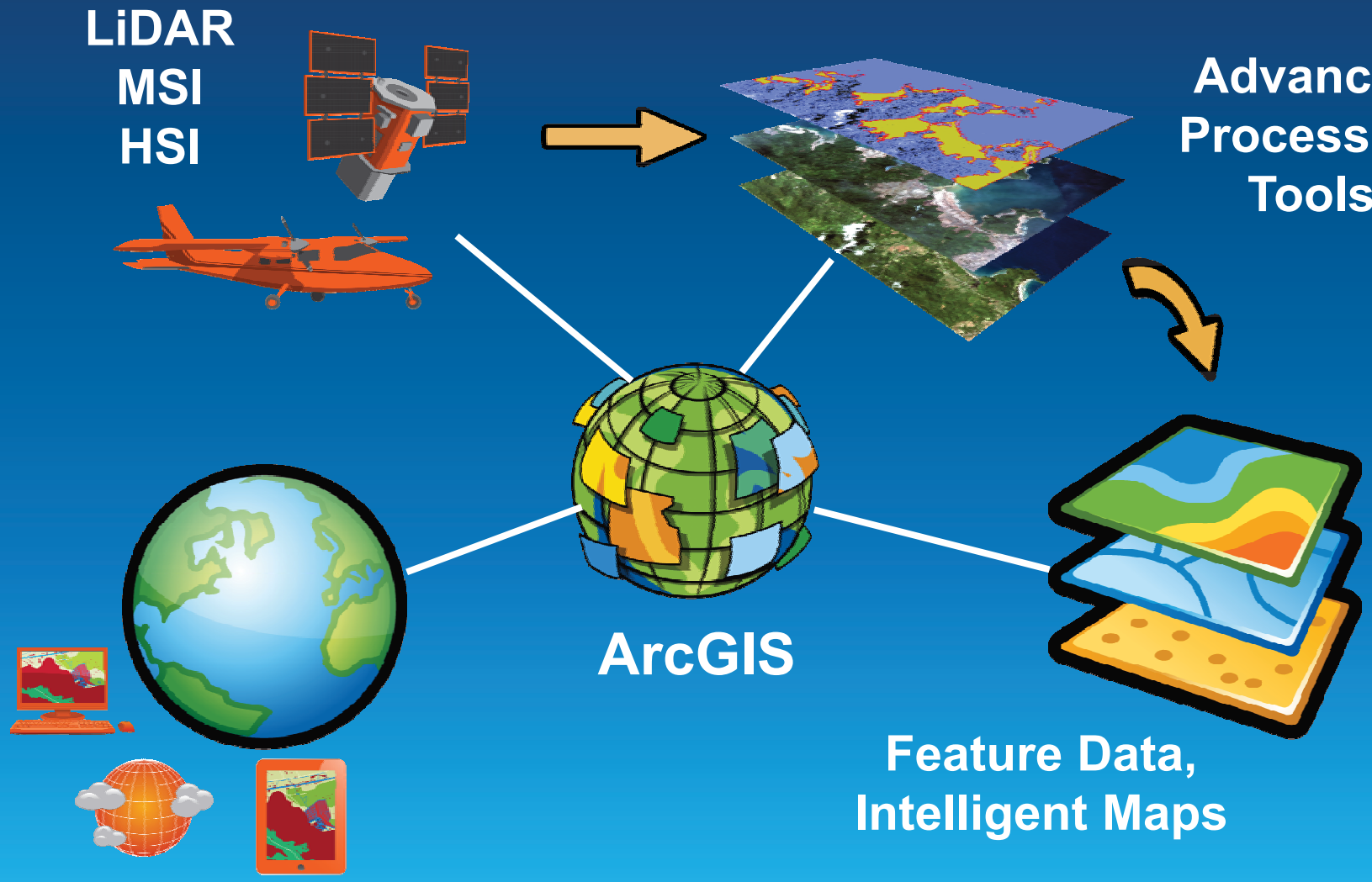


GIS Remote Sensing

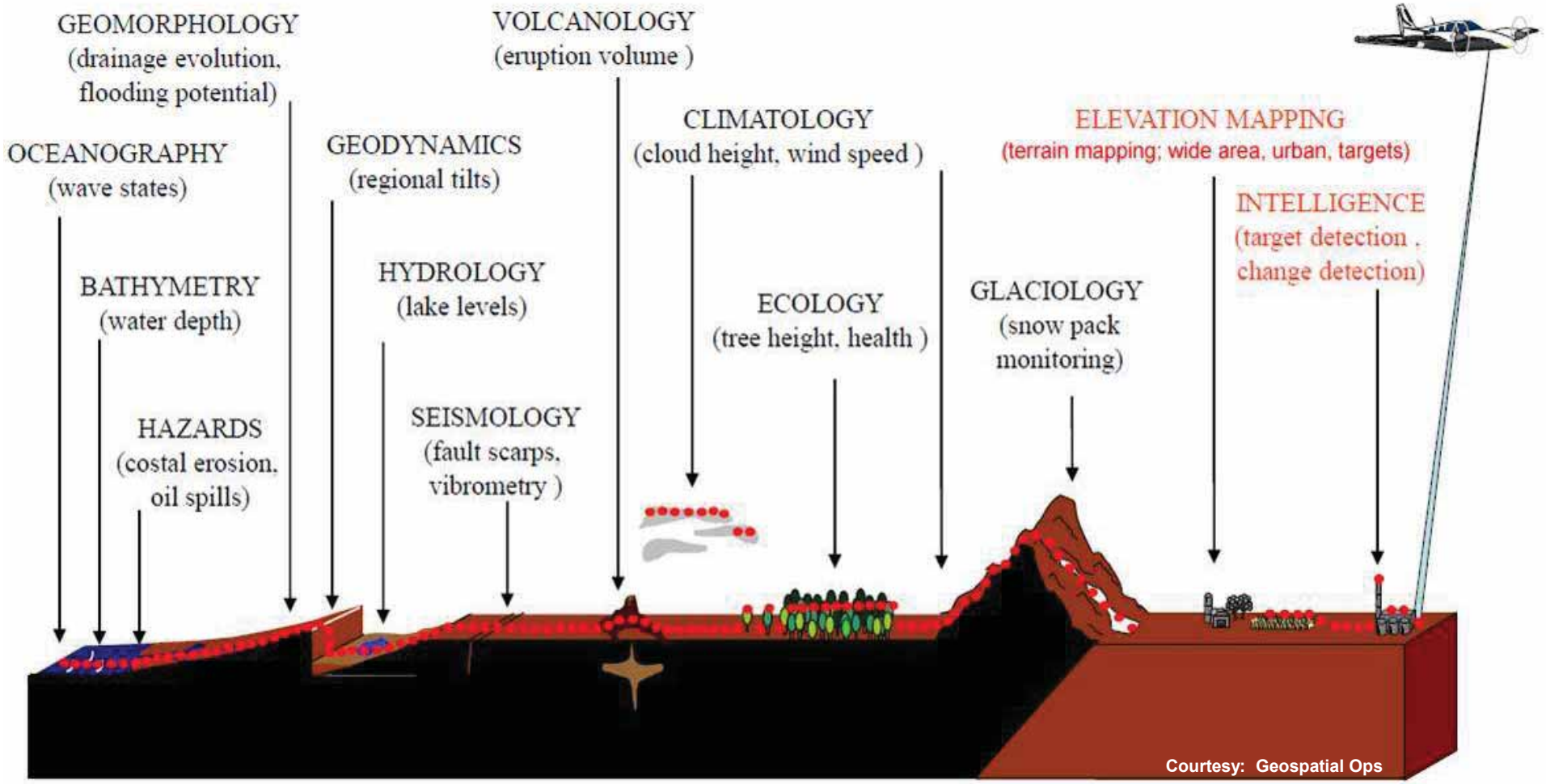
Transforming Spatial and Predictive Analysis

Trend: Advanced Analysis Tools and GIS Integration



LiDAR: Not Simply for Visualization

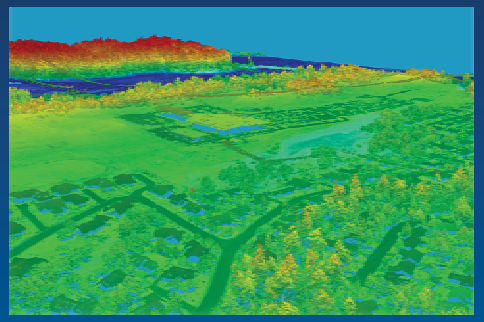
A Source for GIS Information that Drives a Variety of Applications



Approaches to Deriving LiDAR Information

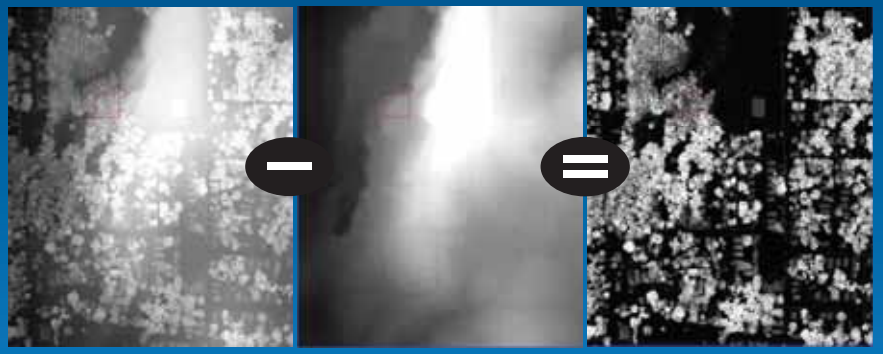
Visual Interpretation: 3D visualization

- Manual process, but familiar and expedient



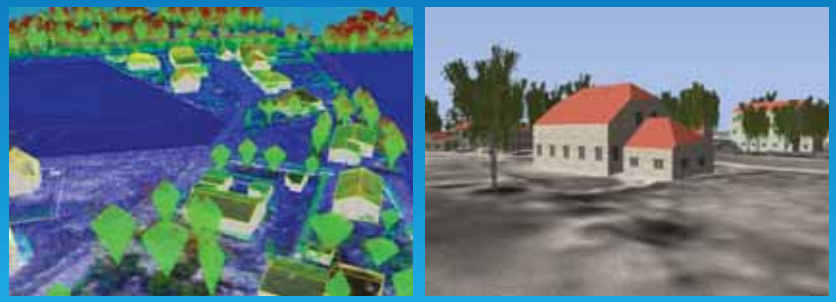
Features Interpreted from Derivative Raster Products

- Multi-step process
- Feature delineations from interpolated height values
- Use results with object-based FX



Features Extracted Directly from Point Clouds

- Requires thicker point clouds
- Based on 3D morphological filters
- Proprietary or custom algorithms



Results of LiDAR Processing Methods:
Products that Enable GIS Analysis

Classified Point Cloud

- Per ASPRS LAS specifications

Terrain

- Digital Surface Model (Grid and TIN), Digital Elevation Model, Ground contours

Vegetation Extents, Individual Trees

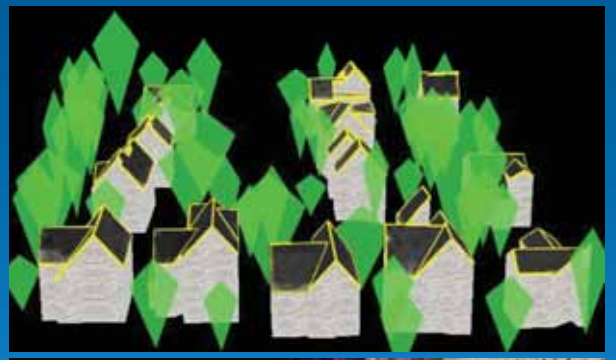
- Location, Elevation, Height, Radius

Structures

- Location, Perimeter Vectors, Roof Facets

Power Lines

- Power Line Vectors, Power Pole Locations, Power Line Attachment Points



Results of LiDAR Processing Methods:
Populating your GIS Using ArcGIS 10.1

Classified Point Cloud
- Per ASPRS LAS specifications

Terrain
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ArcGIS 10.1

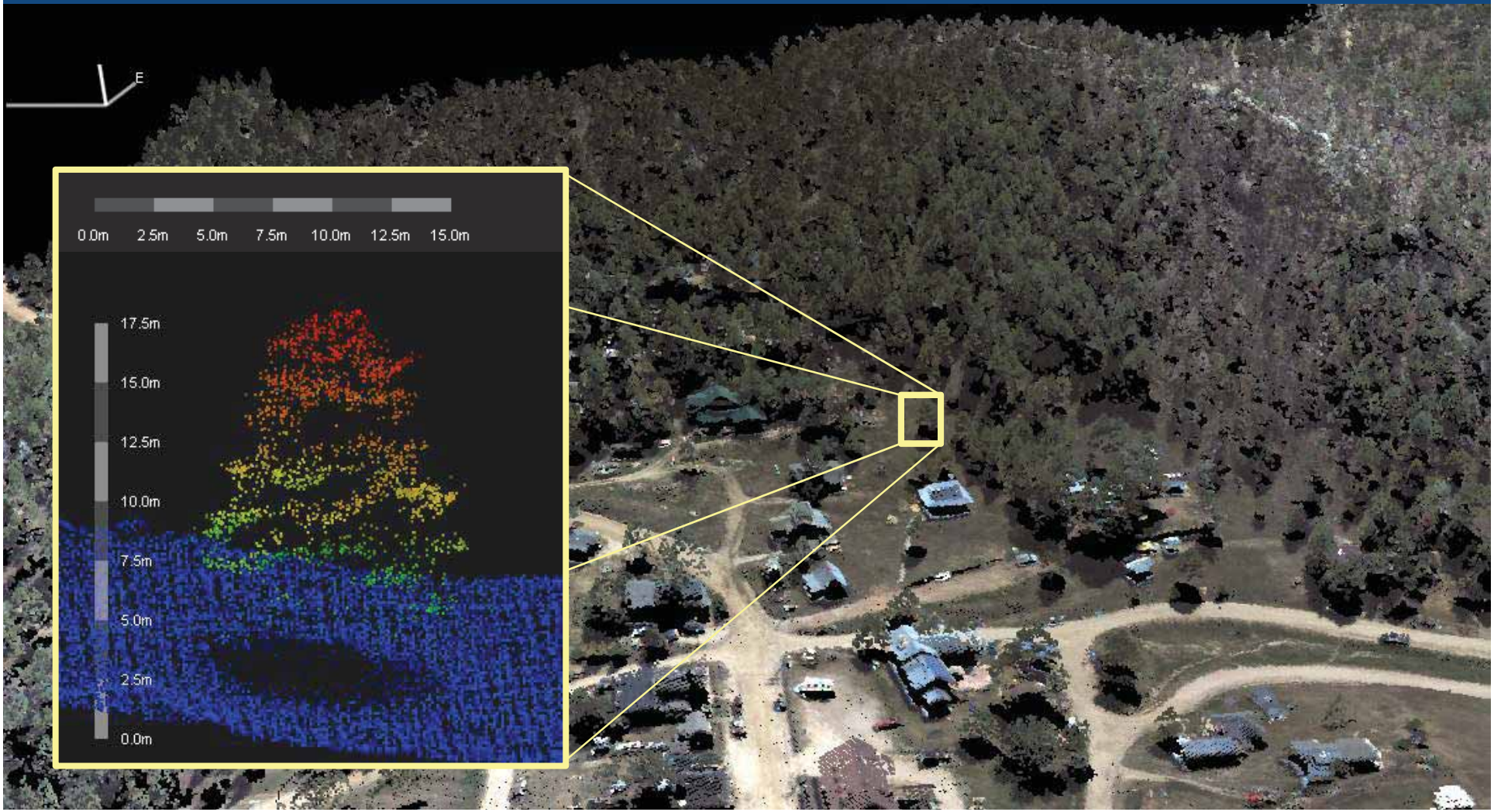
LAS Dataset

Terrain Dataset

Attributed Vectors

LiDAR for Forestry GIS

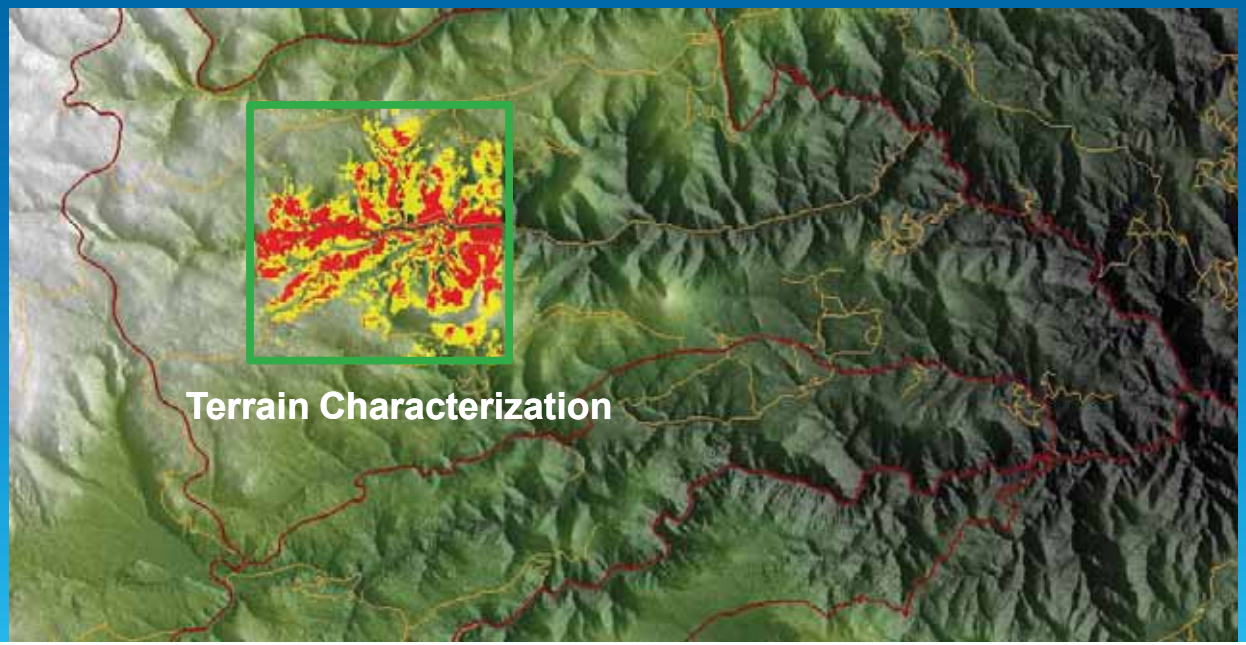
Visual Interpretation and Mensuration



LiDAR for Forestry GIS: Topography

Understand Terrain and Its Effects on Operations

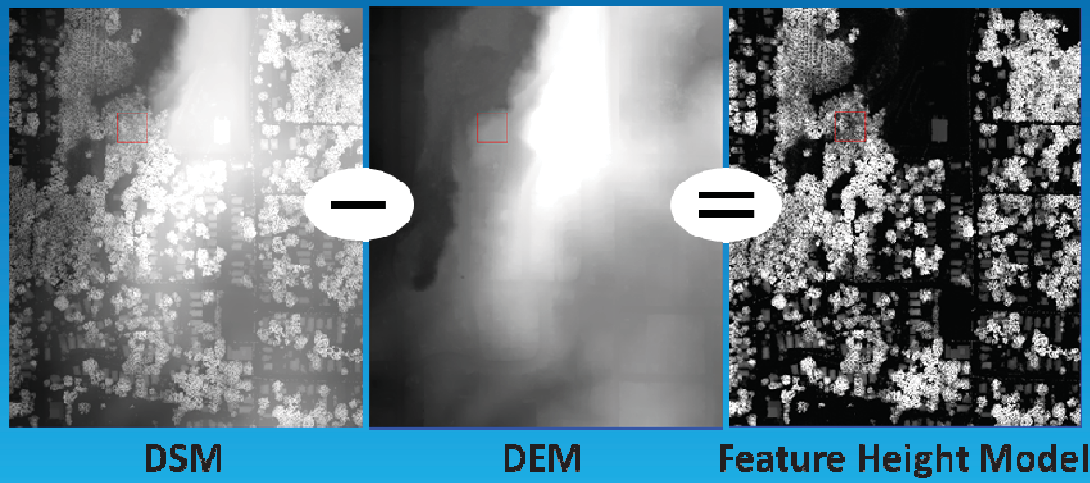
- Bare Earth DEMs for accurate foundational elevation
- Surface models for feature delineation, elevations
- Slope, aspect for mobility analysis, logistics
- Hydro assessment, avoid flood-prone areas



LiDAR for Forestry GIS: Vegetation

Assess Forest Health; Calc Biomass; Inventory

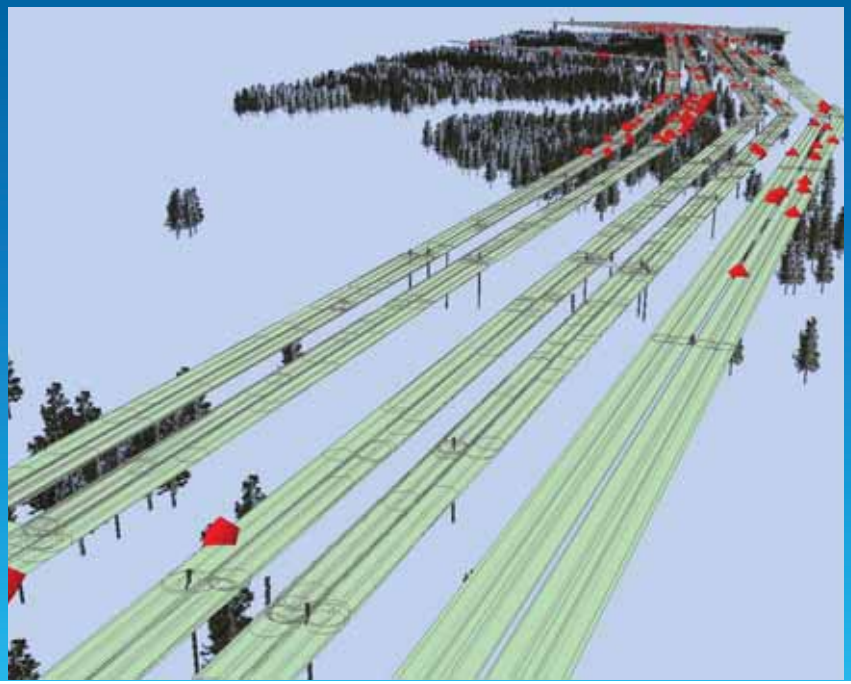
- Canopy Height Model for volumetric biomass estimates
- Canopy density measures using classified points
- Tree counts and locations
- Species identification?



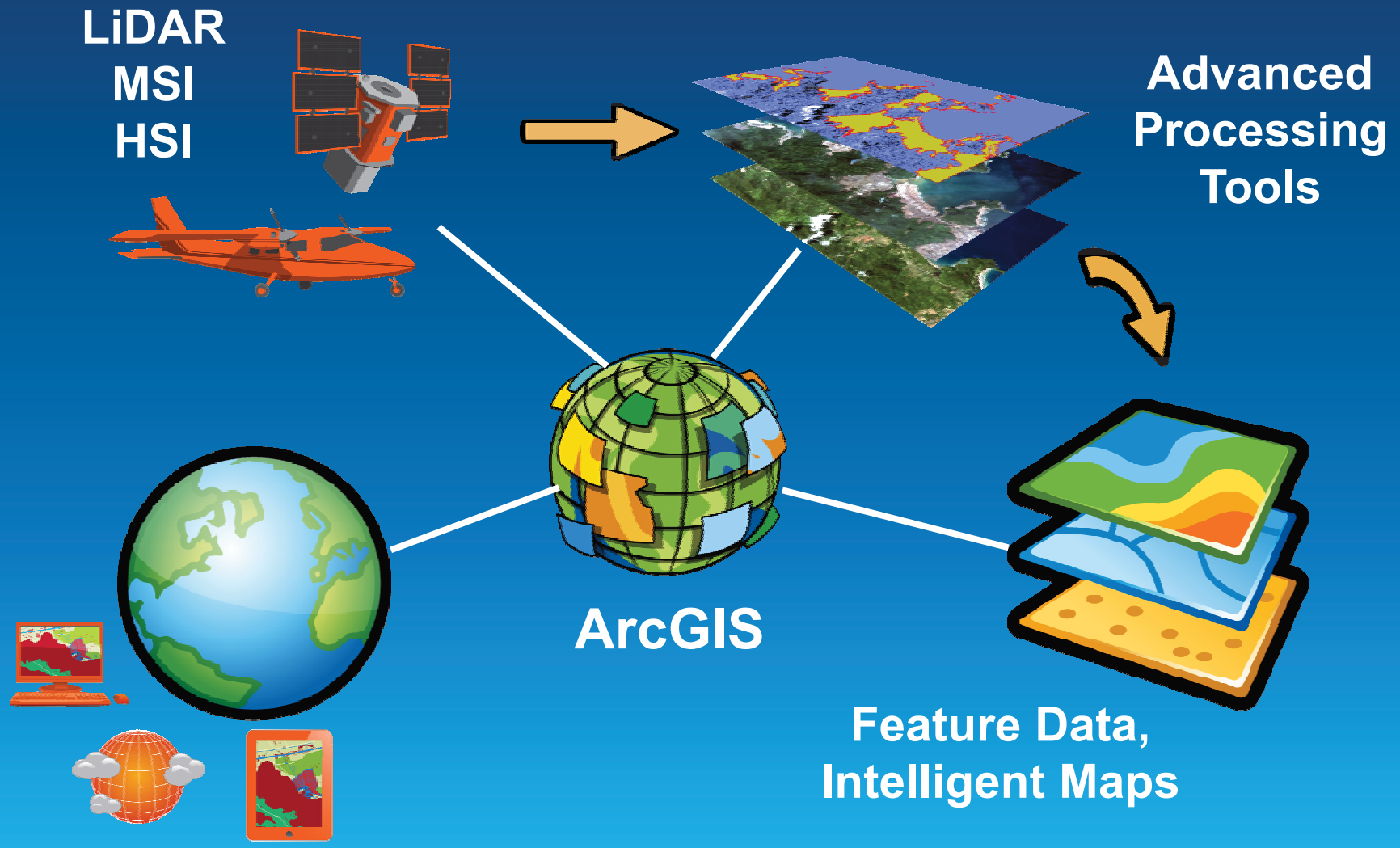
LiDAR for Forestry GIS: Encroachments

Identify Operational Risks and Liabilities

- Extraction of individual tree/structure features
- Above ground utility line delineations
- Access Road blockages



Integrating LiDAR Information into GIS: Multi-dimensional Decision Support



Cloud-based Decision Support
Online, On Demand LiDAR + GIS

App Developer

- ENVI
- IDL
- Python
- Java
- C++
- Others

Analytical Functions

- Biomass Calculator
- Canopy Measures
- Cutblock Analysis
- Encroachments
- Terrain Analysis
- Timber Volume
- Vegetation Health

Implementations: Standards-based

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Understanding our world.

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