

Airborne LiDAR stakeholder Forum

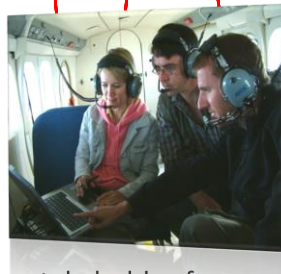
University of Lethbridge



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University of Lethbridge stakeholder forum
Lethbridge, July 8th – 9th, 2013



Before we begin.....

- Name tags / Breakouts
- Questionnaire / Report
- Breaks, Lunch, BBQ
- Many Thanks
 - Govt Alberta (Barry, Shane, Todd)
 - Airborne Imaging (Jocelyn, Martin)
 - Chris Picken, Penny Pickles & Laura Chasmer
 - Everyone for participating!!!
 - National / International guest speakers

Martin Isenburg, Tanya Ramond, Olaf Niemann, Vladimir Kadatskiy, Mike Leslar, Tristan Goulden, Patrick Adda, Philippe Lamothe



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Rationale for the Forum

Alberta most proactive LiDAR adopter in Canada
BUT large data coverage under-exploited

Objectives:

- To inform university training & applied research
- To enhance LiDAR **value** & **accessibility** for all stakeholders
- To address public sector **needs** while developing private sector **opportunities**



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Forum Outline – The talks

Monday July 8th

9:00	Welcome	David Hill, U Lethbridge	
9:05	Introduction	Chris Hopkinson, U Lethbridge	
9:30	Hardware 1 - LiDAR technology	Mike Leslar, Optech	
10:00	Hardware 2 - Airborne LiDAR	Vladimir Kadatskiy, Riegl USA	
10:30	BREAK		
11:00	Operations 1 - Industry perspective -	Martin Maric, Airborne Imaging	
11:20	Operations 2 - University perspective -	Olaf Niemann, U Victoria	
11:55	Operations 3 - National monitoring perspective -	Tanya Ramond, NEON	
12:30	LUNCH		
13:30	Data processing LAsTools -	Martin Isenburg, rapidlasso GmbH	
13:50	Research 1 - Error modeling -	Tristan Goulden, Dalhousie U	
14:10	Research 2 - Effects mapping errors -	Patrick Adda, U New Brunswick	
14:30	Research 3 - Land classification -	Laura Chasmer, U Lethbridge, WLU	
14:50	BREAK		
15:10	Provincial Govt activities -	Barry White & Shane Patterson, Govt Alberta	
15:50	Federal Govt guidelines -	Philippe Lamothe & Darren Jansen, NRCan, Ottawa	
16:30	Adjourn		
17:30	Please join us for a BBQ at the Student Union. Free burgers & cash bar!		

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Forum Outline – The chat

Tuesday July 9th

9:00 Intro - Chris Hopkinson
 9:10 The need for data and reporting **standards**
 9:25 'Standards' panel discussion (GoA, NRCan, Airborne Imaging, rapidlasso, NEON)
 10:15 Open Q & A

10:35 **BREAK**

11:00 Which sectors most need lidar procedural **best practices** and what are they?
 11:15 Breakout group discussion
 12:00 Feedback

12:30 **LUNCH**

13:30 Lidar **data centres**: do we need them?
 13:45 'Data centres' panel discussion (Tesera, Airborne Imaging, GoA, NRCan, UVic)
 14:35 Open Q & A

15:00 **BREAK**

15:20 What are the **training** and/or certification needs of the lidar community?
 15:35 Breakout group discussion
 16:20 Feedback

16:50 **Wrap Up**

Plus some topical discussion on flood mapping

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The 'rest' of the workshop

Wednesday July 10th

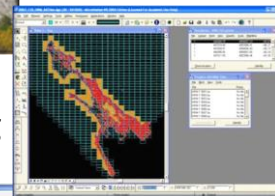
Field trip to Frank slide



Thursday July 11th

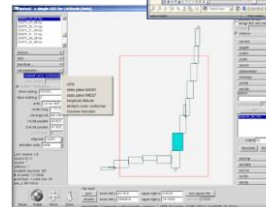
LiDAR processing basics:

- Terrascan project set up & point processing
- Raster modeling in Surfer



Friday July 12th

LAStools LiDAR project processing



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Lidar forum registration

Registrant details

SurveyMonkey®

Home My Surveys Survey Services

59%

* 1. Will you be attending the University of Lethbridge lidar stakeholder forum on July 8th and 9th?

☐

* 2. Please provide your contact details

Name

Email

Phone number

* 3. Level of lidar experience

Years of experience

* 4. Work sector

* 5. Within which market sector/s or application area/s do you mostly work?
(Check any that apply)

☐ Environment

☐ Natural Resources

☐ Emergency Management

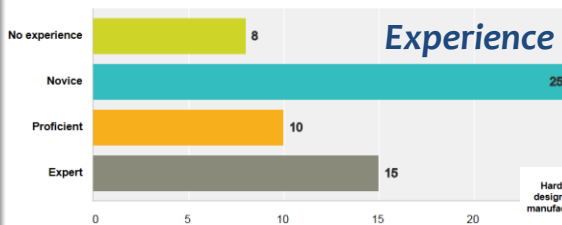
☐ Energy

☐ Civil Engineering

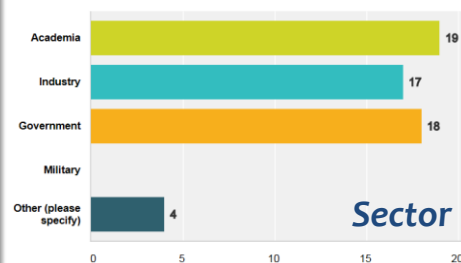
Survey sent to industry & govt practitioners & users. Mostly in Alberta.

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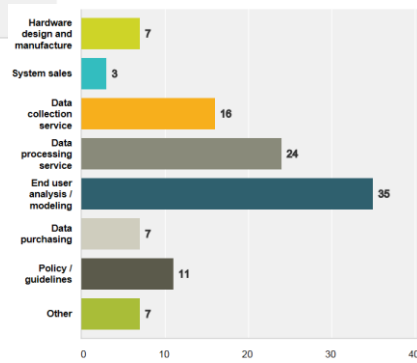
Respondent Profile



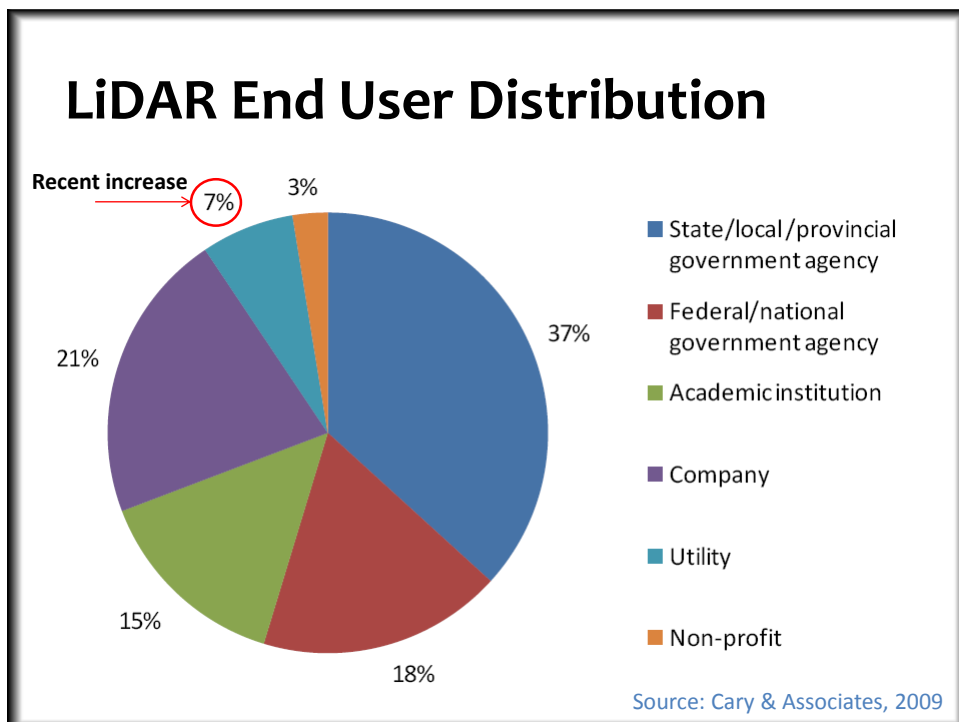
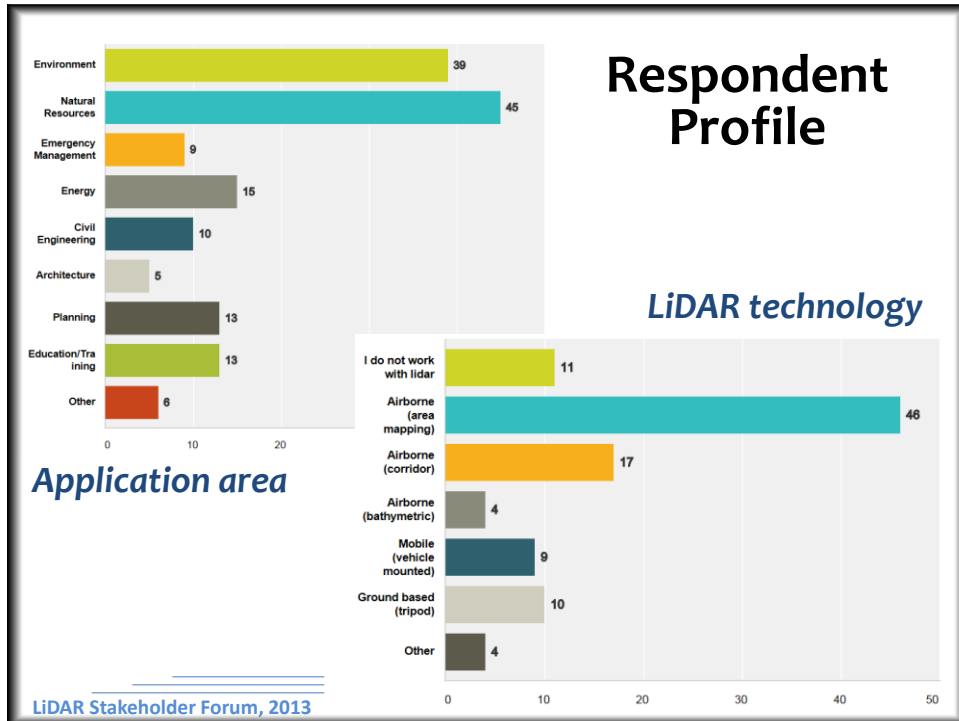
60 responses
51 participants



Stakeholder role



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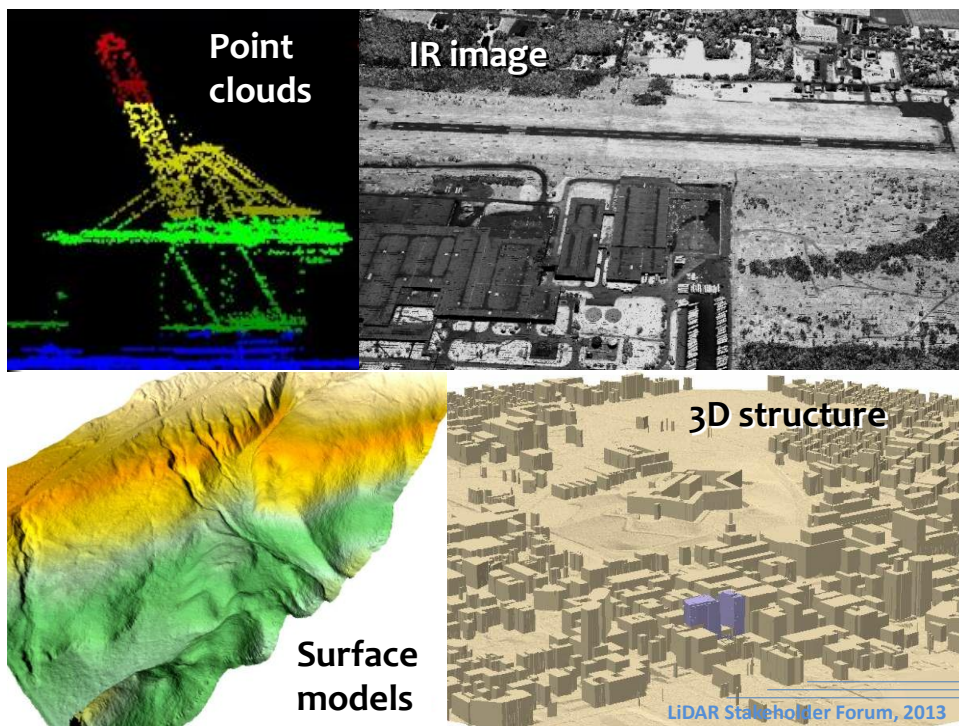


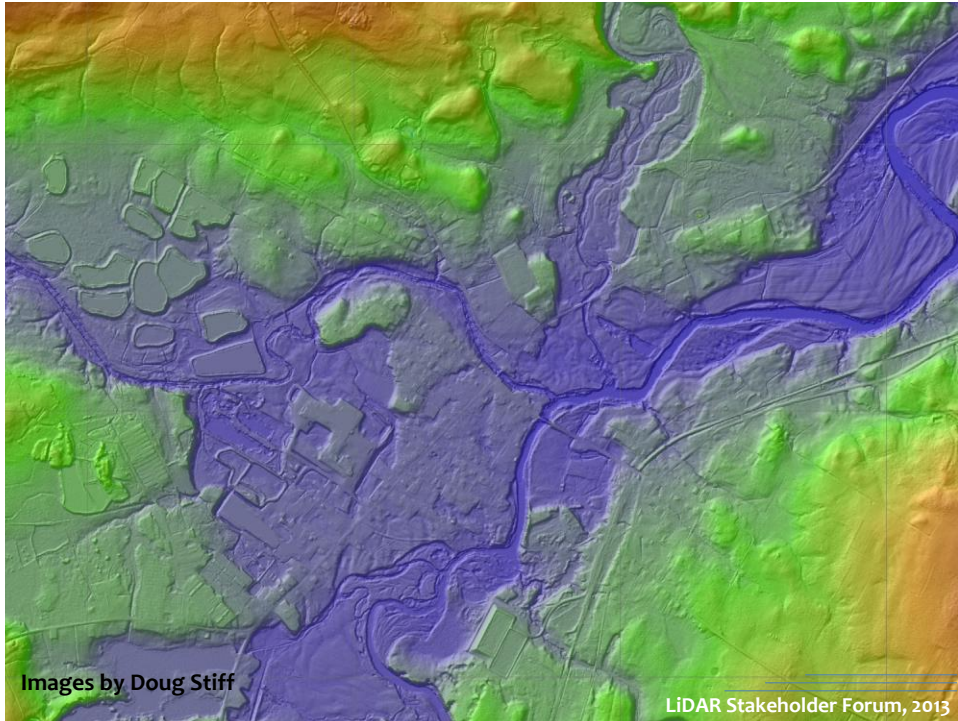
Dollar benefits of top 10 BUs in USA

BU No	Business Use Name	Annual Dollar Benefits	
		Conservative Benefits	Potential Benefits
14	Flood Risk Management	\$295M/yr	\$502M/yr
21	Infrastructure and Construction Management	\$206M/yr	\$942M/yr
1	Natural Resources Conservation	\$159M/yr	\$335M/yr
8	Agriculture and Precision Farming	\$122M/yr	\$2B/yr
2	Water Supply and Quality	\$85M/yr	\$156M/yr
16	Wildfire Management, Planning & Response	\$76M/yr	\$159M/yr
9	Geologic Resource Assess/Hazard Mitigation	\$52M/yr	\$1B/yr
5	Forest Resources Management	\$44M/yr	\$62M/yr
3	River and Stream Resource Management	\$38M/yr	\$87M/yr
18	Land Navigation and Safety	\$0.2M/yr	\$7B/yr
TOTALS FOR 27 BUSINESS USES		~\$1.18B/yr	~\$13.B/yr

 **\$1.18B/yr only if all FA's receive the QL and Update Frequency specified** 

Source: Sugarbaker, Snyder & Maune
Presented at 2012 ILMF, Denver





59 W x 49 H x 58 D cm
55 kg without shipping case

25 W x 66 H x 32 D cm
20 kg without shipping case

ALTM

ALS Technology

Decimetre accuracy DEM

Buildings & infrastructure

3D vegetation structure

100 km² to 500 km² per hour

- 1 - Differential GPS
- 2 - Inertial Measurement Unit
- 3 - Electro-optical LiDAR system
- 4 - Scanner
- 5 - Aircraft platform & offsets
- 6 - Computer processing system

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1. GPS (Global Positioning System)

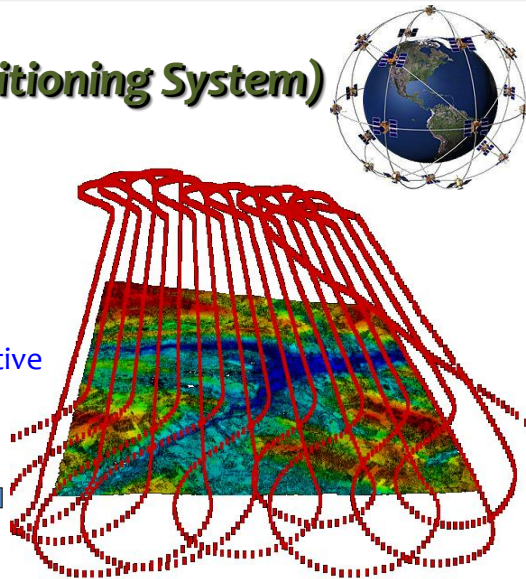
Kinematic GPS trajectory

Aircraft receiver

Base receiver

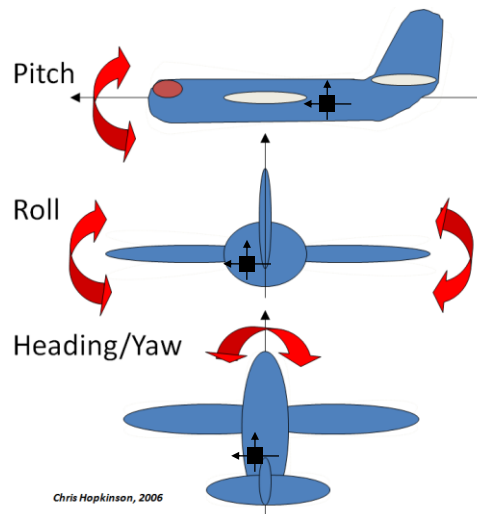
Good GPS data essential

All ground coordinates relative to trajectory



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2. Inertial Measurement Unit

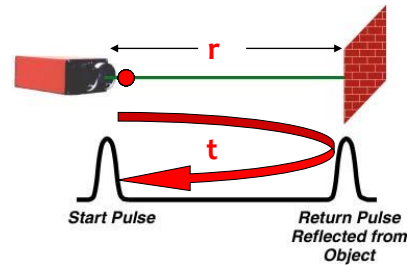


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3. LiDAR

Light Detection And Ranging



LASER pulse emitted and reflection timed
Measures distance from source to object

$$r = (c \times t) / 2$$

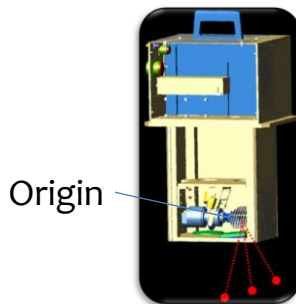
r = range

c = speed of light

t = time ← critical parameter

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4. Scanner system



Origin

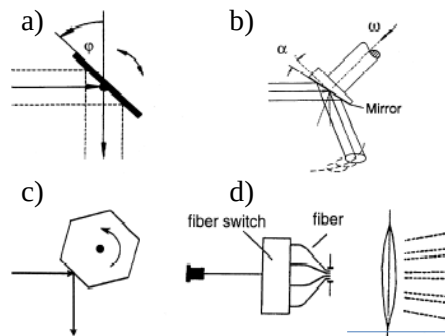


W = Swath Width (Meter)
H = Altitude (Meter)
Q = Scan Angle (Degree)

$$W = 2H \tan Q$$

Typical scanning mechanisms:

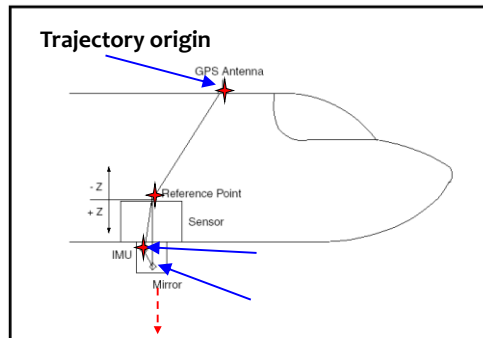
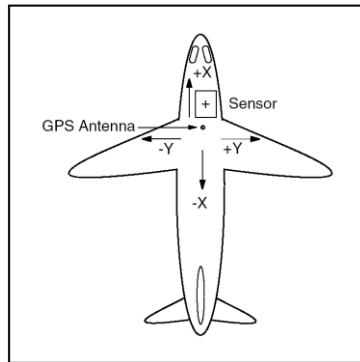
- a) oscillating mirror;
- b) nutating mirror;
- c) polygon mirror;
- d) fiber scanner



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5. Platform offsets

External antenna
Internal IMU &
Scanner mirror



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Multiple return capability

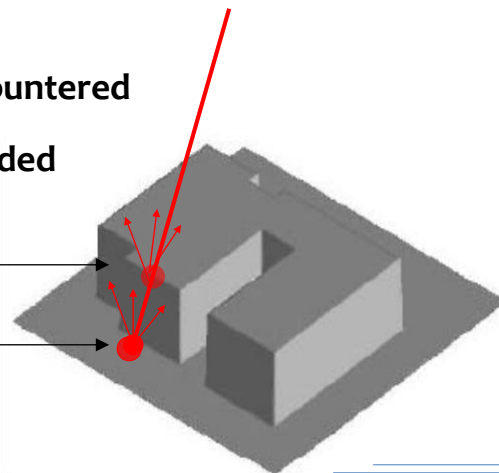
Single pulse emitted

Multiple surfaces encountered

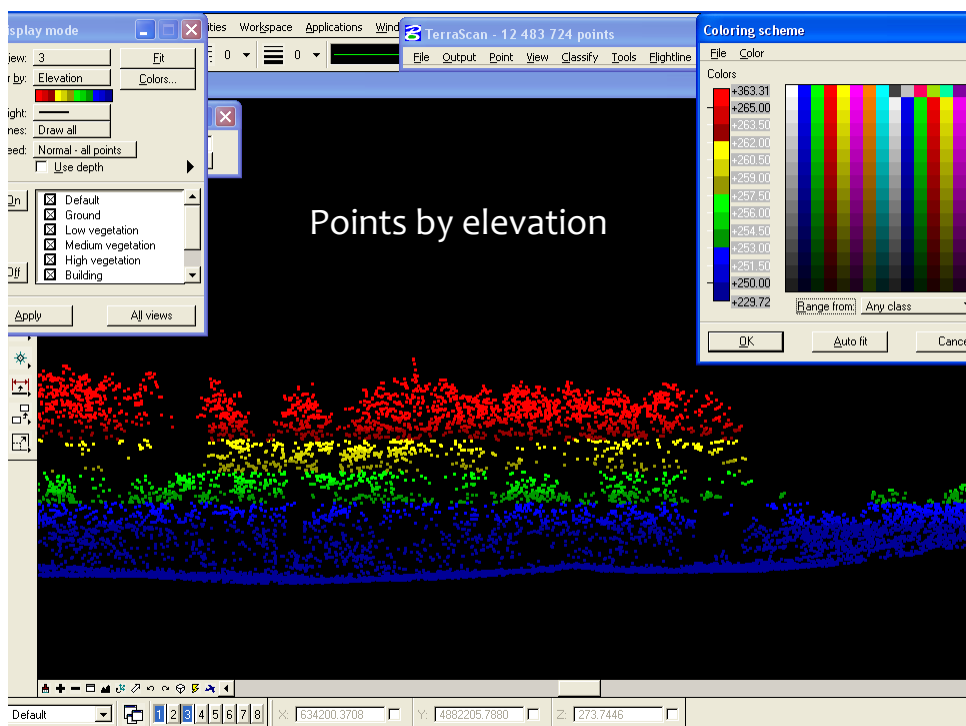
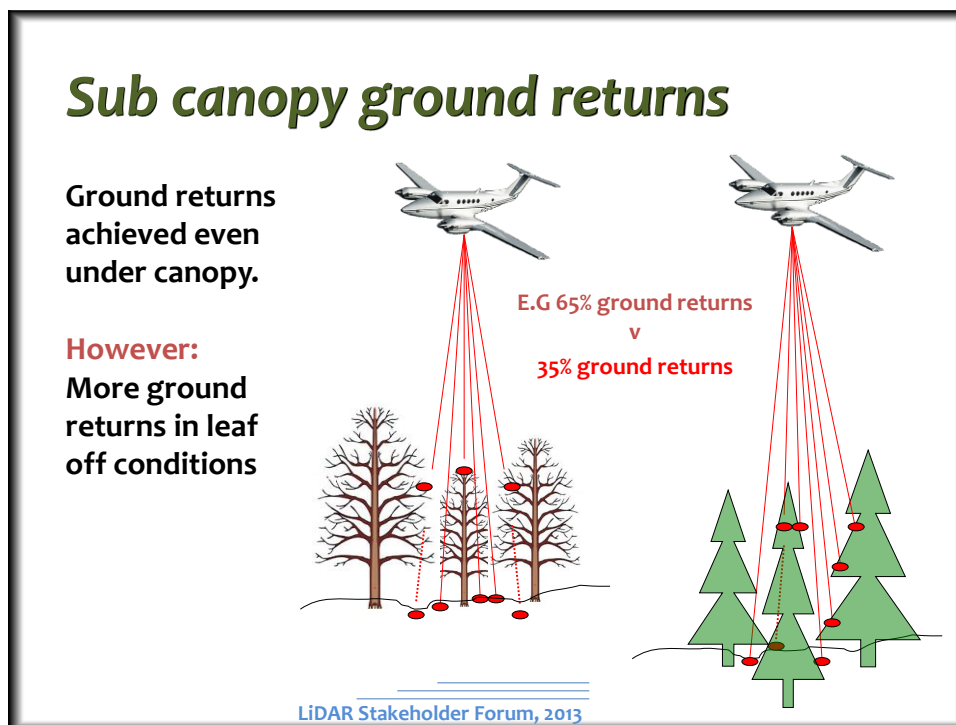
Multiple returns recorded

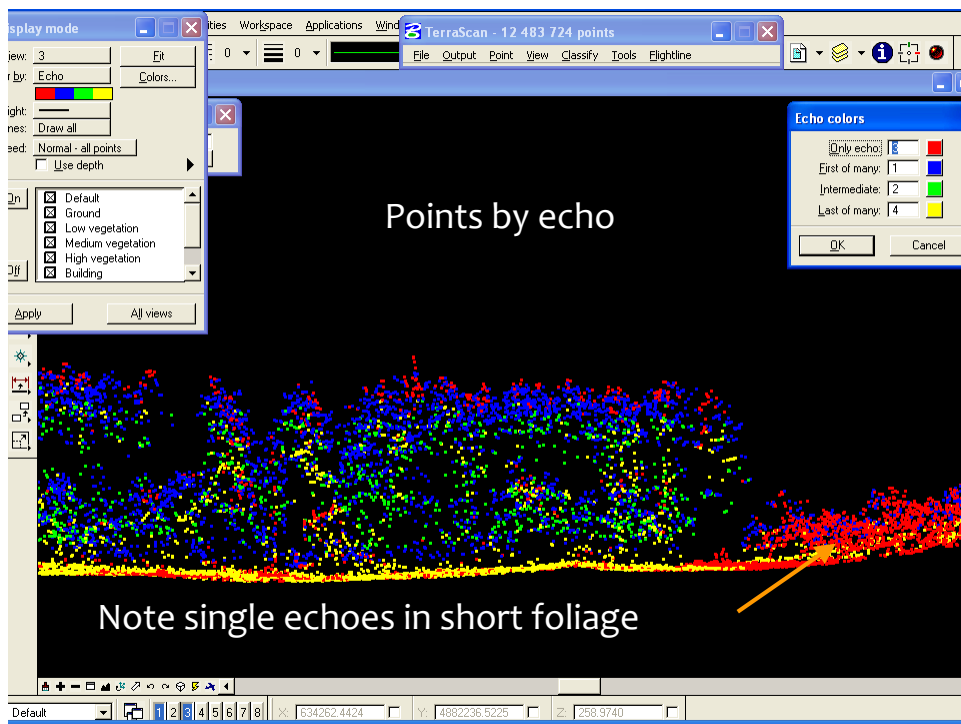
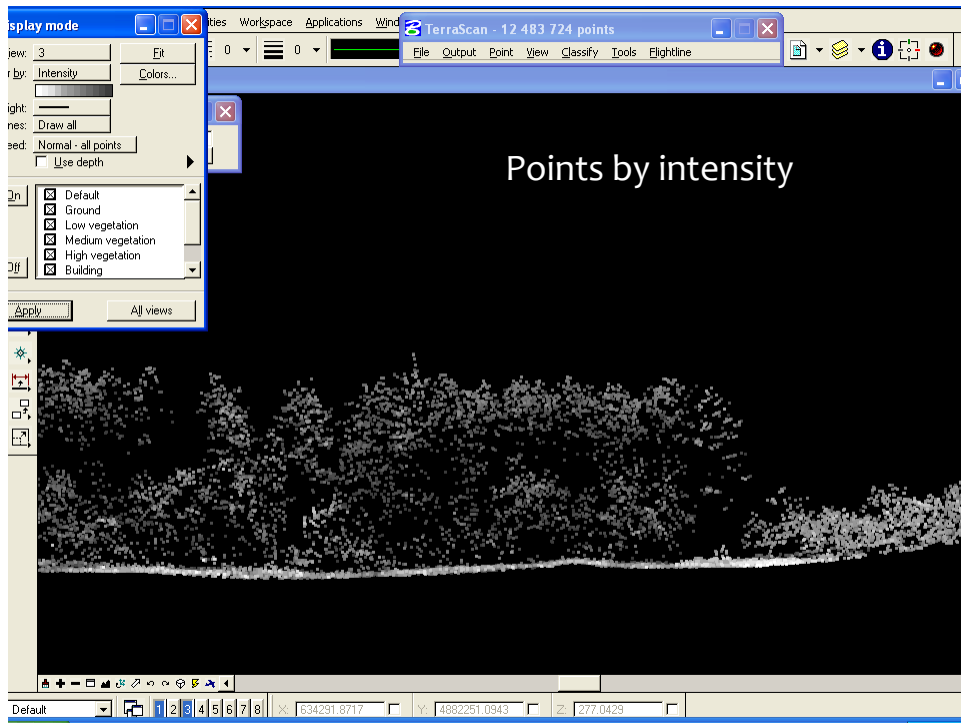
First Return

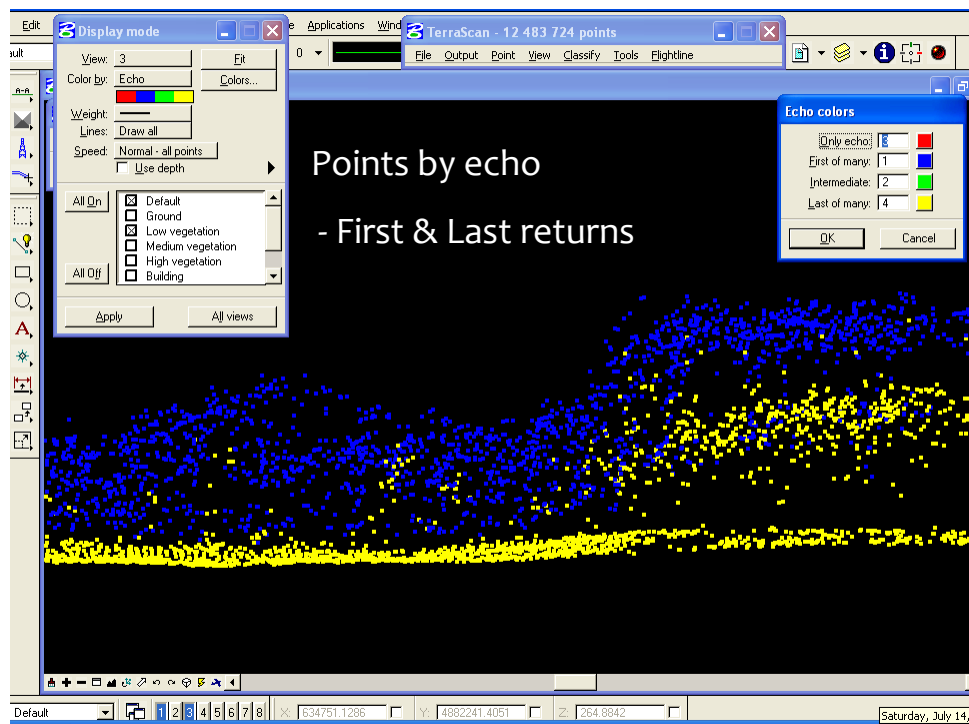
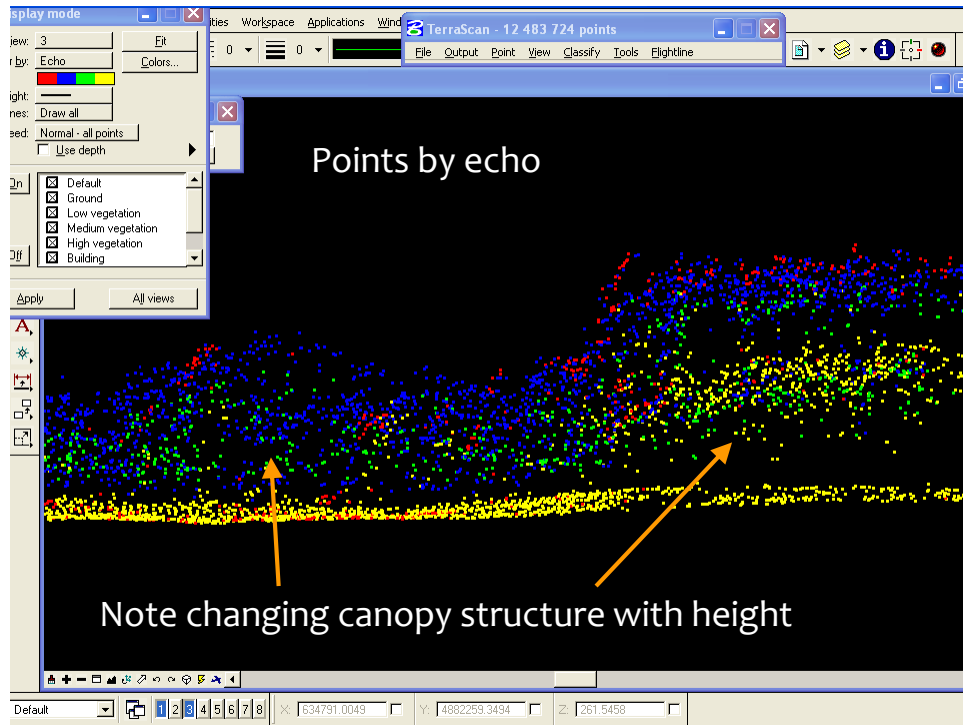
Last Return

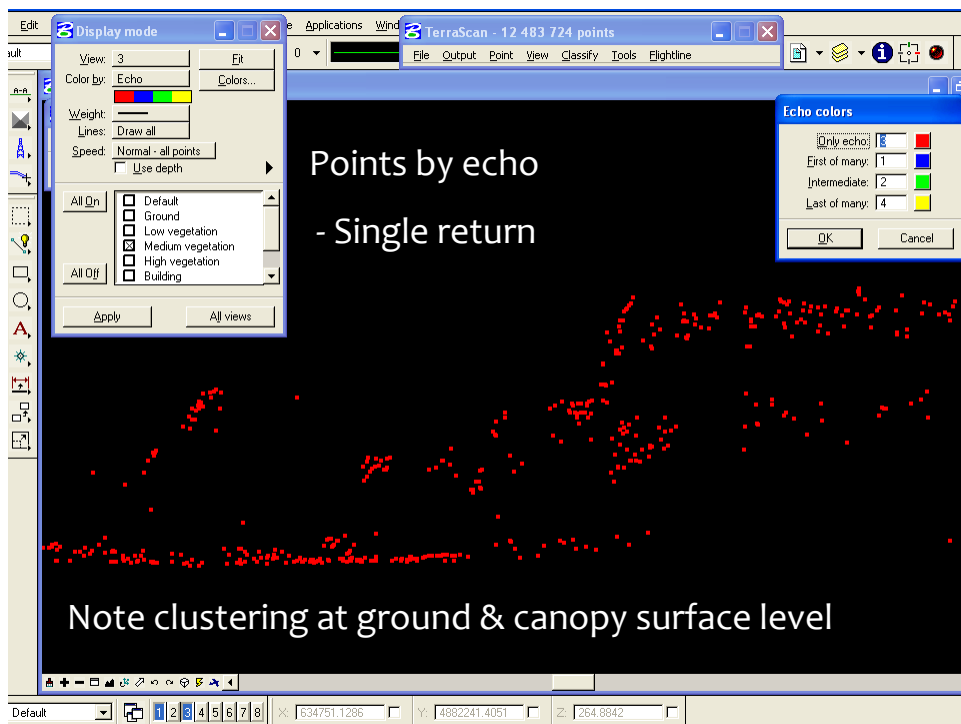
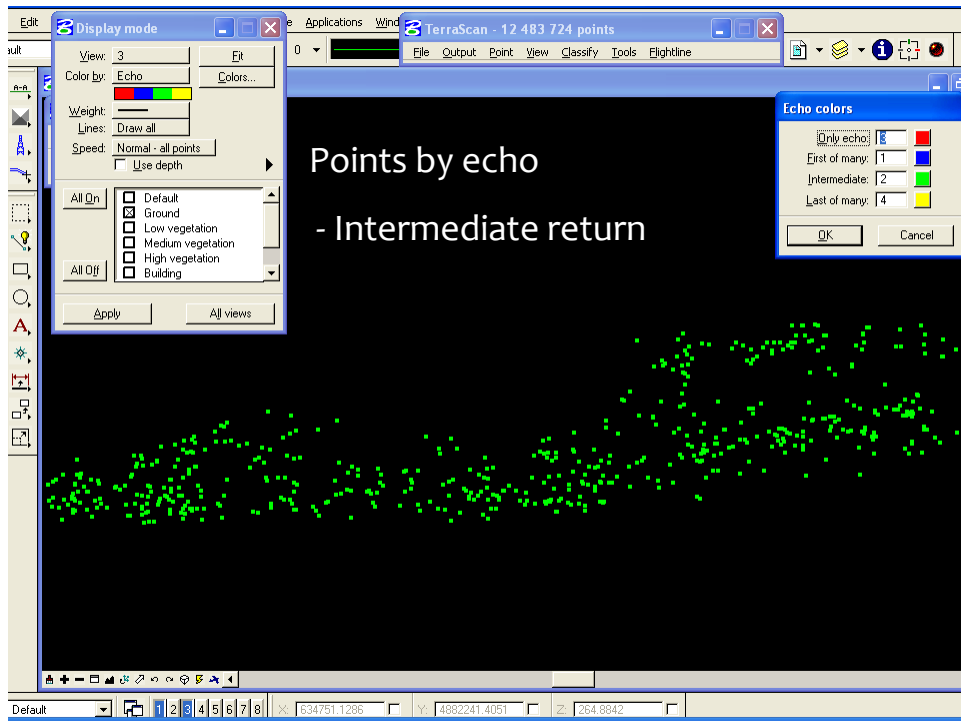


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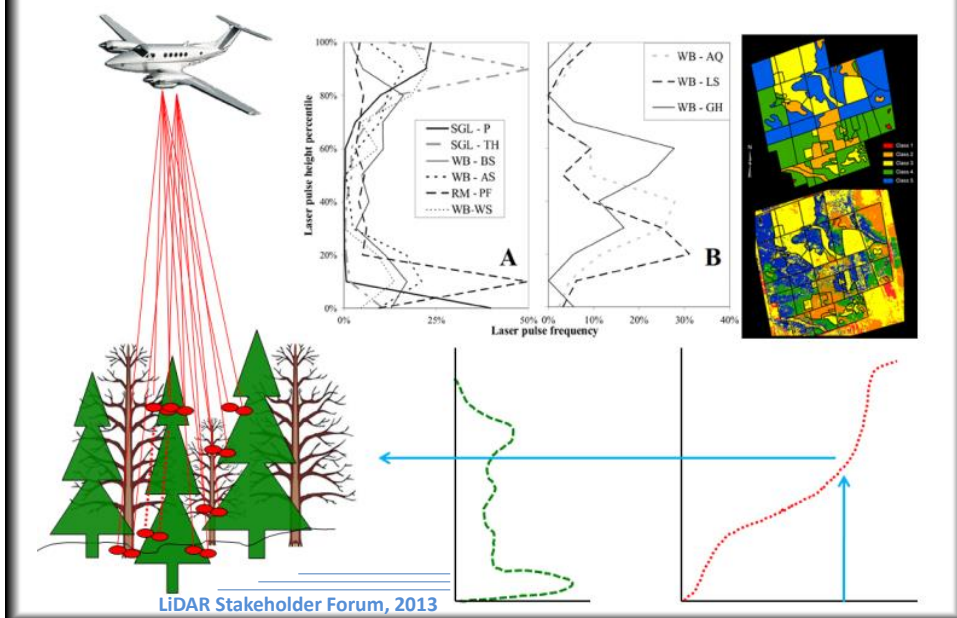




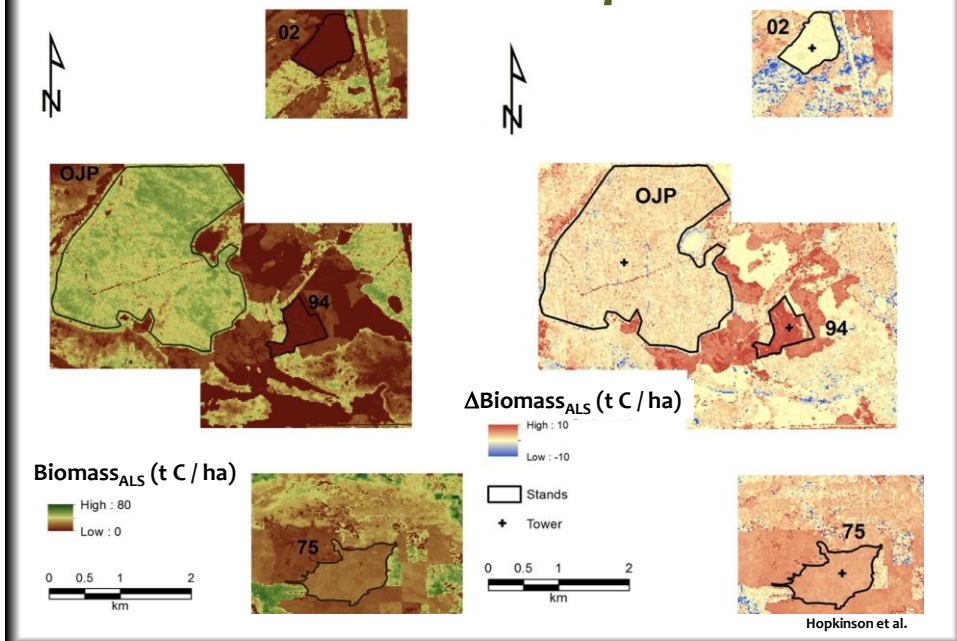




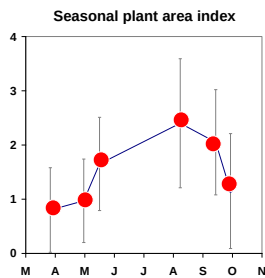
Forest attributes: biomass, LAI etc



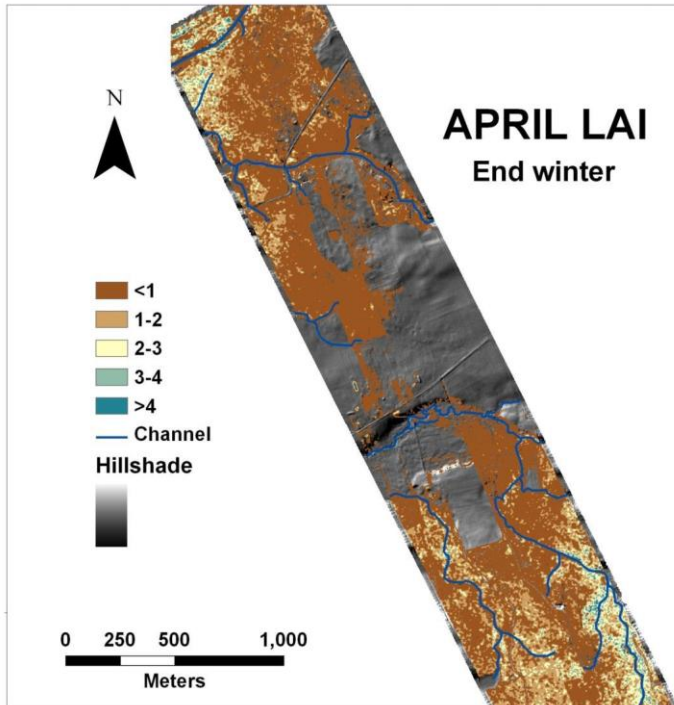
Biomass maps



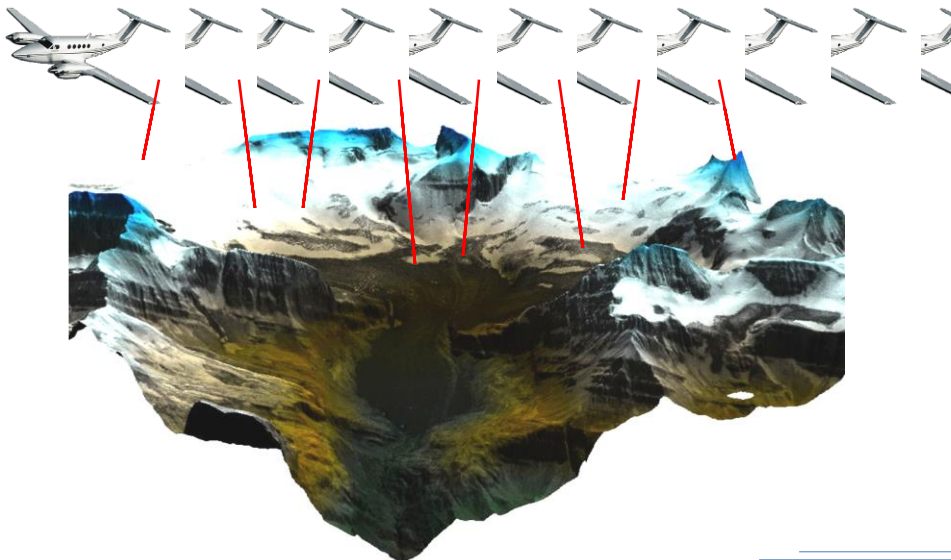
LAI Model



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Thank you!



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