

GLAS Cloud Statistics and Their Implications for a Hybrid Mission

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Main Points

- Integration times
- Multiple cloud layers
- Correlation of clouds with targets
- Attenuation by cirrus
 - GADS statistics

Integration Times

- Assume 100 shot integration (for example)
- Assume different PRFs and thus integration distances
- What is the distribution of sequences of various fractions of the 100 shots down to various levels in the atmosphere?

Multiple cloud layers

- What fraction of the time are multiple cloud layers detected?
- Mostly important for assessing coherent DWL performance. Perhaps DD aerosol.

GLAS Derived Cloud and Aerosol Statistics

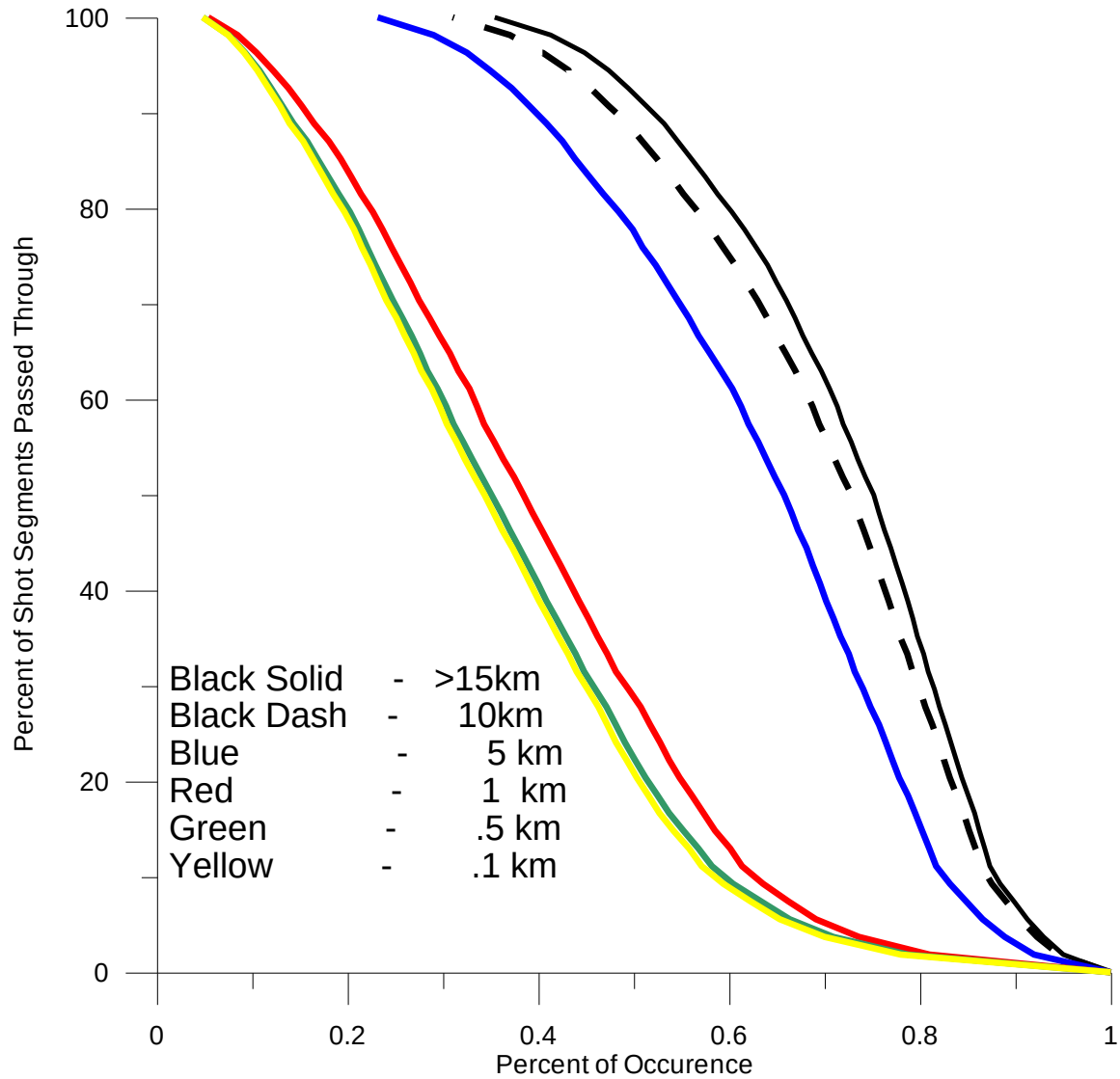
Product Name	# shots averaged	Horizontal Resolution (km)*	Vertical Resolution (m)
Low	160	27.2	~70
Medium	40	6.8	~70
High	8	1.36	~70
Full	1	.170	~70

Summary Cloud Penetration Statistics

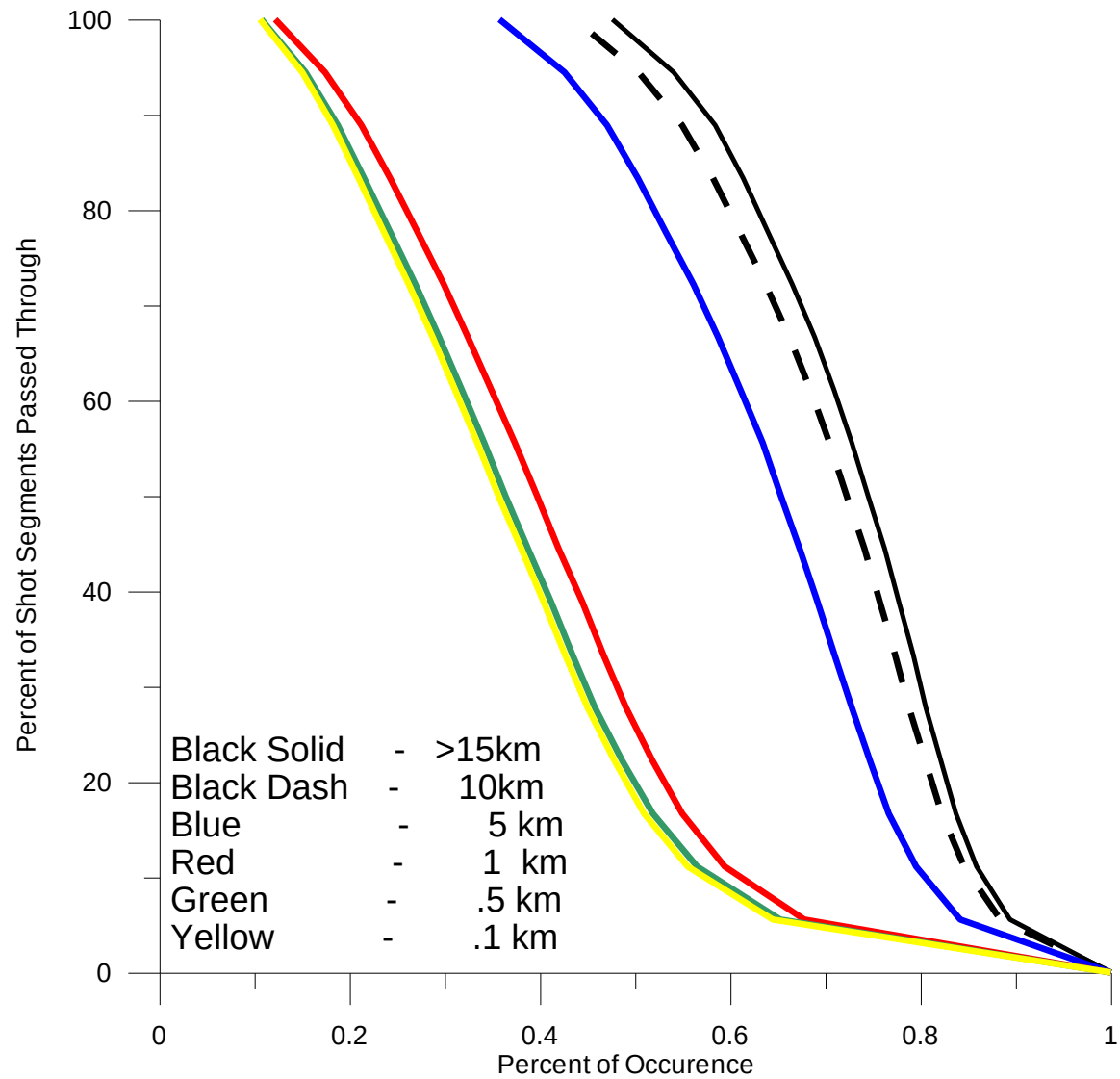
Resolution	Cloud and Ground	Cloud and No Ground	No Cloud and Ground	No Cloud and No Ground
Low	55.0%	25.0%	18.7%	1.3%
Low (532 only)	54.9%	25.0%	18.9%	1.2%
Medium	36.2%	37.0%	22.5%	4.3%
Medium (532 only)	26.7%	28.5%	32.0%	12.9%
High	15.8%	33.2%	28.8%	22.2%
Full	14.6%	20.1%	14.3%	51.0%

Number of cloud layers	Low (all surfaces)	Low (land surfaces)	Low – 532 (all surfaces)	Low – 532 (land surfaces)
0 (only 1064 nm layers)			27.7	14.7
1	24.5	16.1	51.8	55.5
2	48.1	48.1	14.9	21.7
3	13.3	15.7	4.3	6.2
4	9.2	13.0	1.0	1.5
5	3.0	4.3	0.2	0.3
6	1.4	1.8	0.04	0.04
7	0.4	0.7	0.006	0.005
8	0.13	0.2	0.005	0.004
9	0.06	0.06	0	0
10	0.01	0.01	0	0

HIGH RESOLUTION
ONE DAY - 54 Shots (~ 75km)



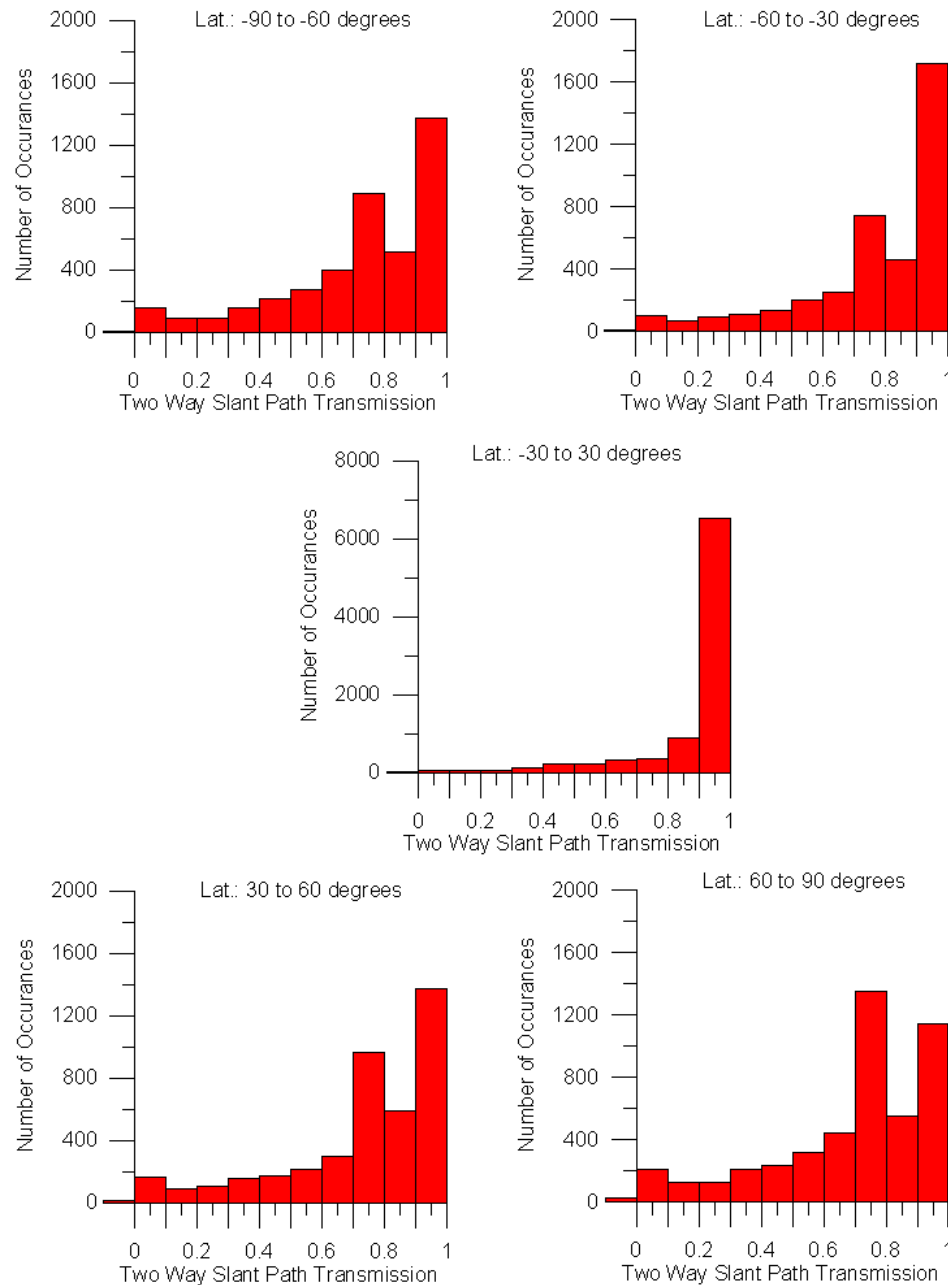
HIGH RESOLUTION
ONE DAY - 18 Shots (~ 25 km)



Proposed future analyses of GLAS data

- Correlation of clouds with Adaptive Targeting target areas
- Use of DWL cloud returns to spot “calibrate” CMVs
- Statistics on surface returns from ocean surface.
- Use of GLAS lidar coverage statistics to adjust OSSE simulations of space-based lidars.

Cirrus Transmission Statistics for a 24 hour DWL Simulation



Cirrus attenuation
Statistics based upon
Cloud optical properties
Of the T213 Nature Run

Aerosol LOS: 322102
Op. Cloud LOS: 10294
Cirrus LOS: 25701