

Simulating GWOS, ADM and NWOS: Coverage and accuracy trades

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WG on Space-Based Lidar Winds
Monterey, CA
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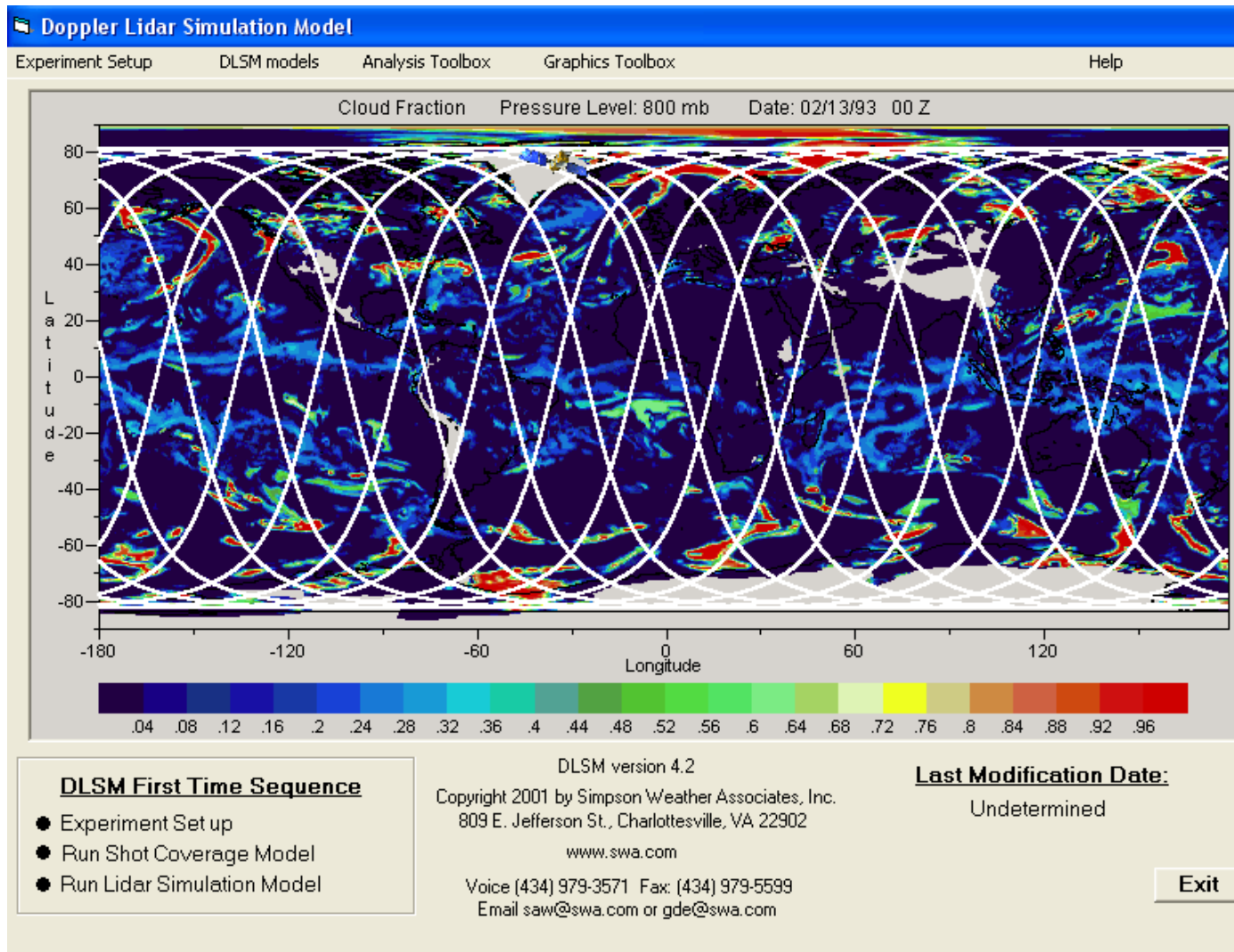
Overview

- Simulations for OSSEs and instrument design trades (e.g. IDL)
 - DLSSM
 - OSSEs
- GWOS
- NWOS
- ADM
- Summary

DLSM and OSSEs

- The DLSM has been fully upgraded to perform global simulations of the hybrid DWL
- OSSEs for the hybrid are planned at NCEP using the new ECMWF T513 and T799 nature runs
- Hybrid DWL OSSEs are in progress using the T213 nature run at SIVO

Doppler Lidar Simulation Model



Requirements

	GWOS	Nex-Gen (NWOS)
Vertical depth of regard (km)		
Vertical resolution		
Tropopause to 20 km	4	3
Top of BL to tropopause	2	1
Surface to top of BL	1	.5
Horizontal resolution (km)	350	350
Minimum # of tracks	2	4
# of perspectives within target volume	2	2
Horizontal component error (m/s)		
Above BL	3	3
Within BL	2	2

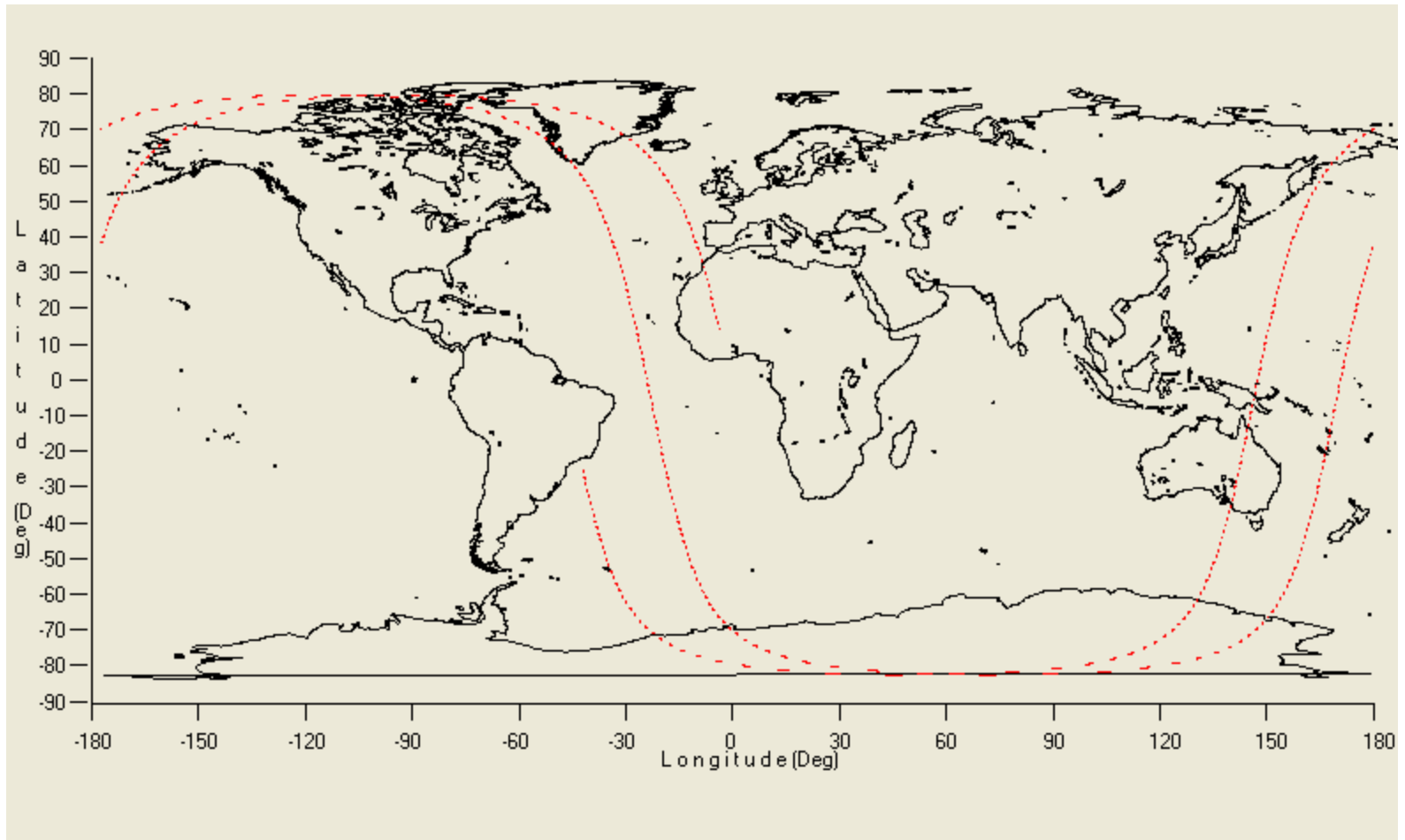
Instrument parameters

Parameter	GWOS Coherent	GWOS Direct	NWOS Coherent	NWOS Direct	ADM
Orbit altitude (km)	400	400	824	824	410
Energy/pulse (J)	.25	.8 (.36)	2.3/.25	15.2/1.52	.26 (.12)
PRF (Hz)	5	100	5/440	100/1000	100
Aperture (m)	.5	.5	.5 (A)	.5 (B)	1.5
Optical eff	.51	.36	.51	.36	
Heterdyne mixing eff	.36		.36		
Detector eff	.8	.6	.8	.6	
Integration time (sec)	12	12	6	6	7
Misalignment loss	.42		.42		
Beam split	.	.4		.4	
Filter throughput		.17		.17	
Edge sensitivity		.0075		.0075	
Conversion eff		.45		.45	
Background filter		.5		.5	
Wallplug eff	.014	.092		.092	.031
Power required (Watts)	90	869			850

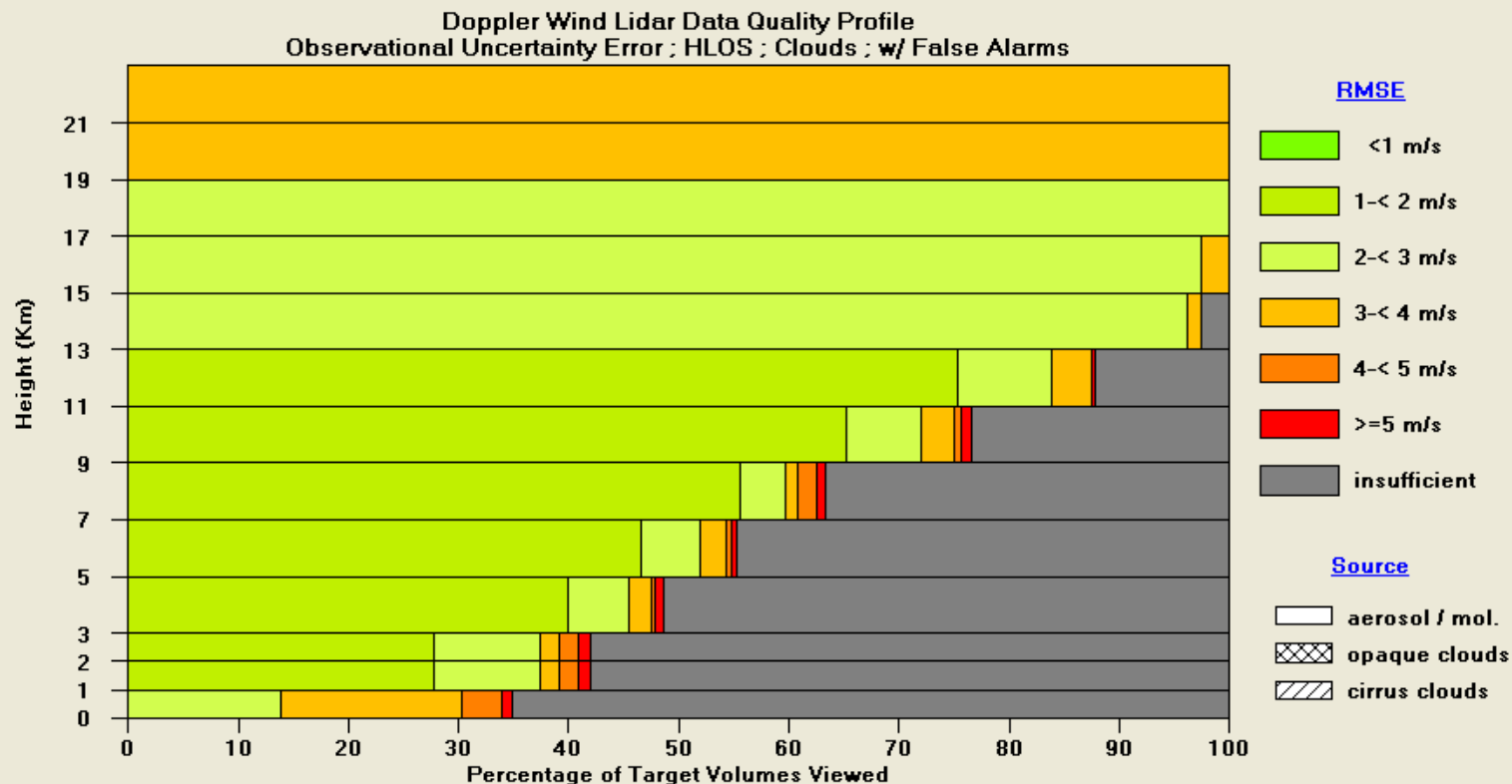
A: scaling factor = 3.1

B: scaling factor 4.3

ADM coverage



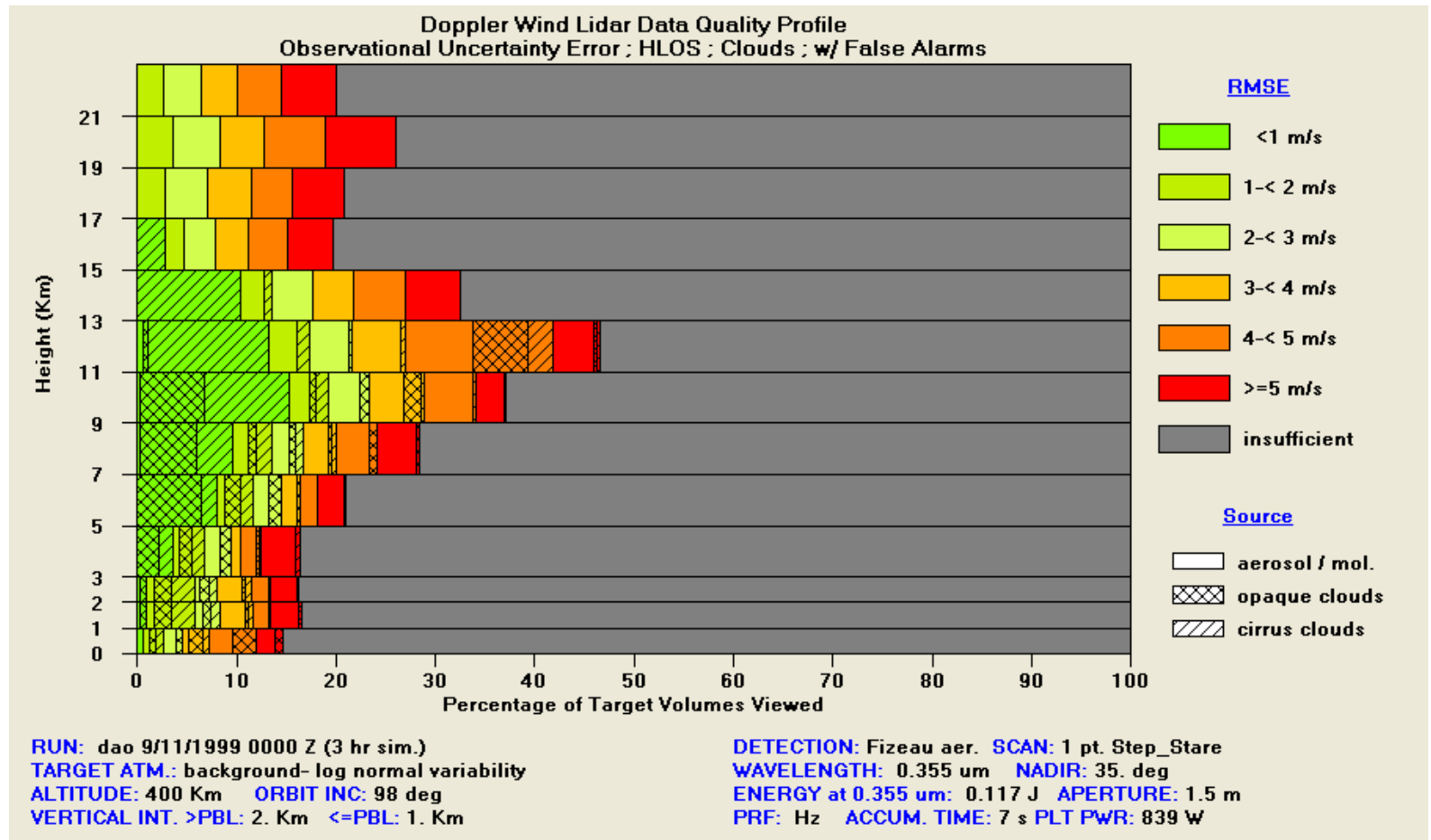
ADM Molecular



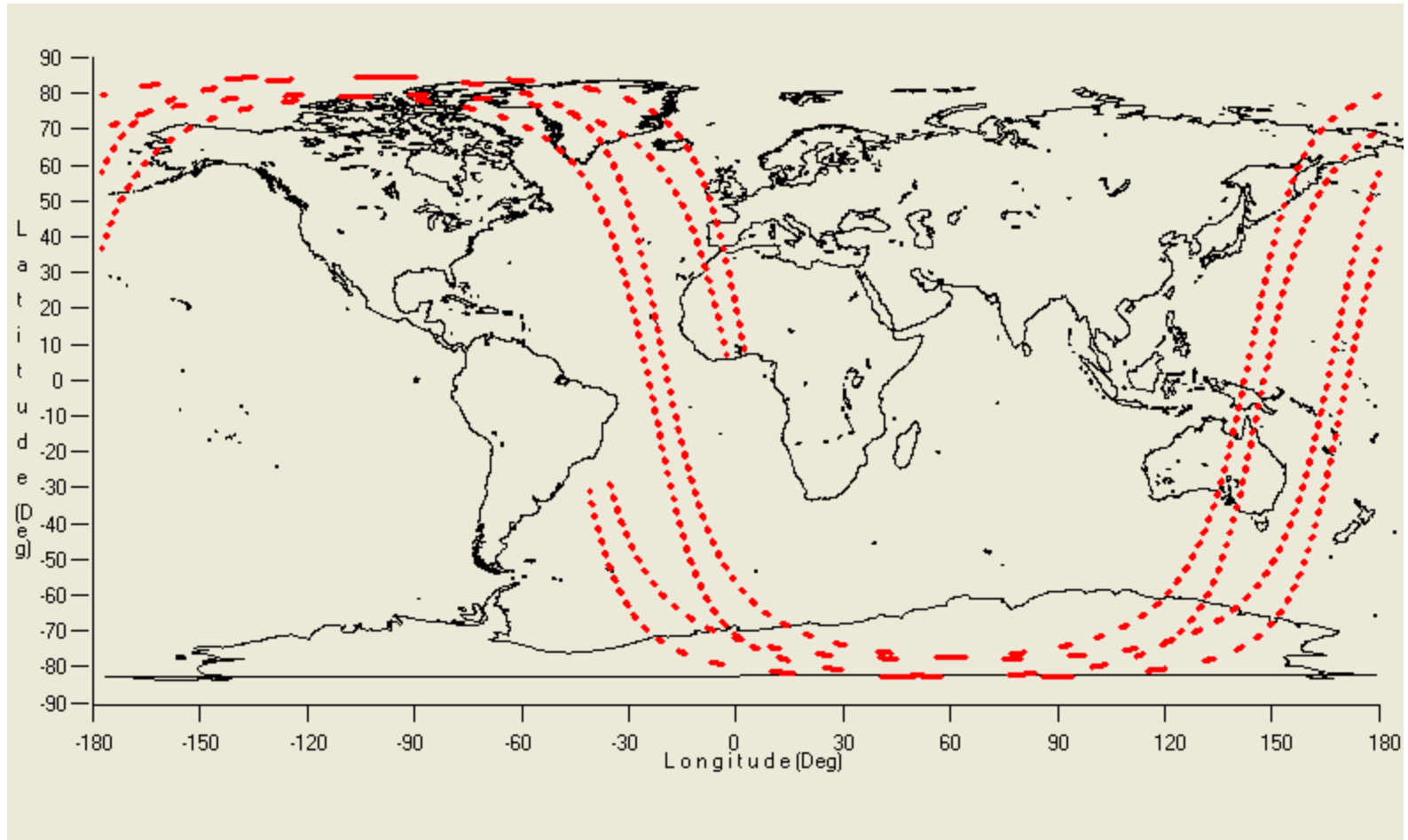
RUN: dao 9/11/1999 0000 Z (3 hr sim.)
TARGET ATM.: background- log normal variability
ALTITUDE: 400 Km **ORBIT INC:** 98 deg
VERTICAL INT. >PBL: 2. Km **<=PBL:** 1. Km

DETECTION: Double-edge mol. **SCAN:** 1 pt. Step_Stare
WAVELENGTH: 0.355 um **NADIR:** 35. deg
ENERGY at 0.355 um: 0.117 J **APERTURE:** 1.5 m
PRF: Hz **ACCUM. TIME:** 7 s **PLT PWR:** 839 W

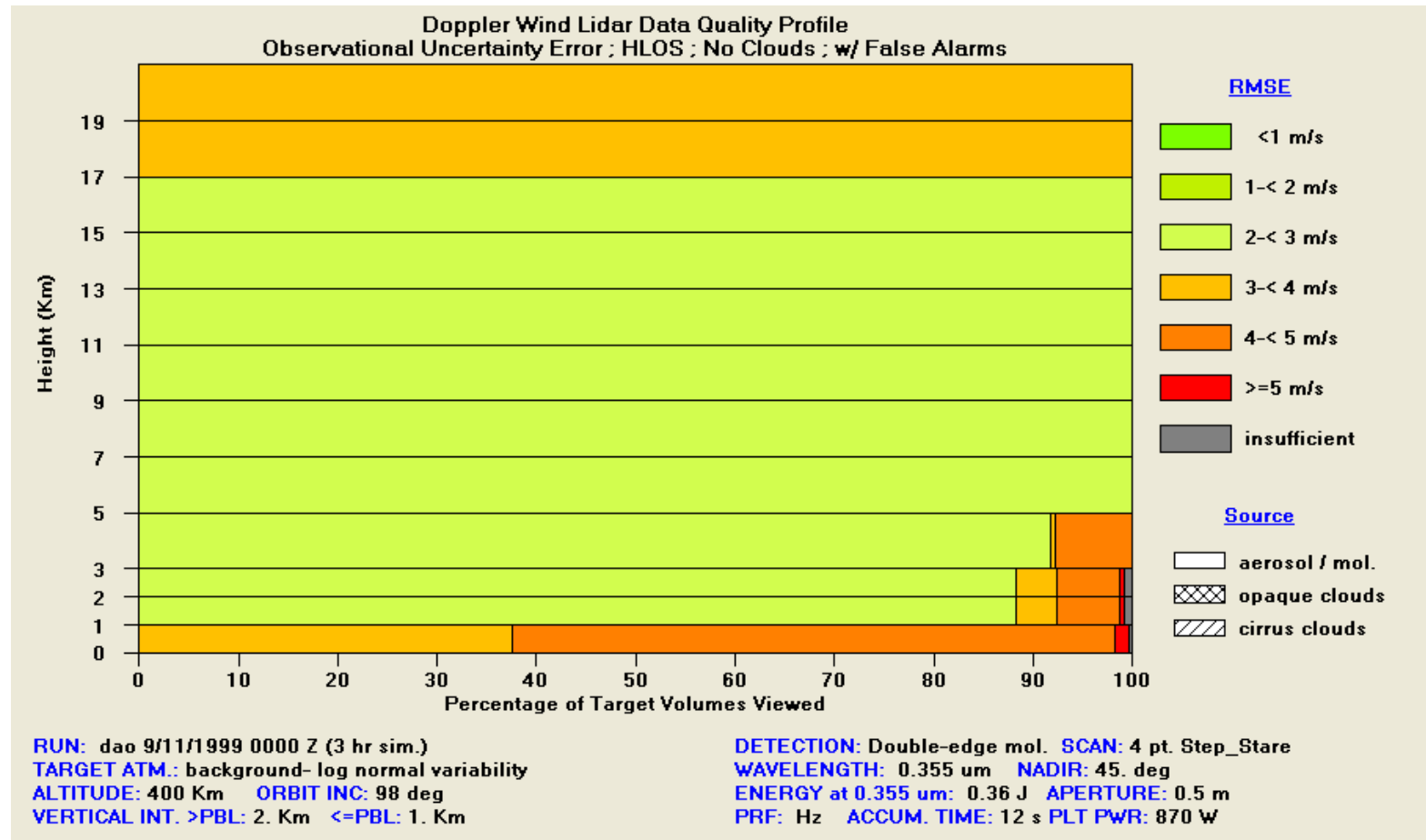
ADM aerosol



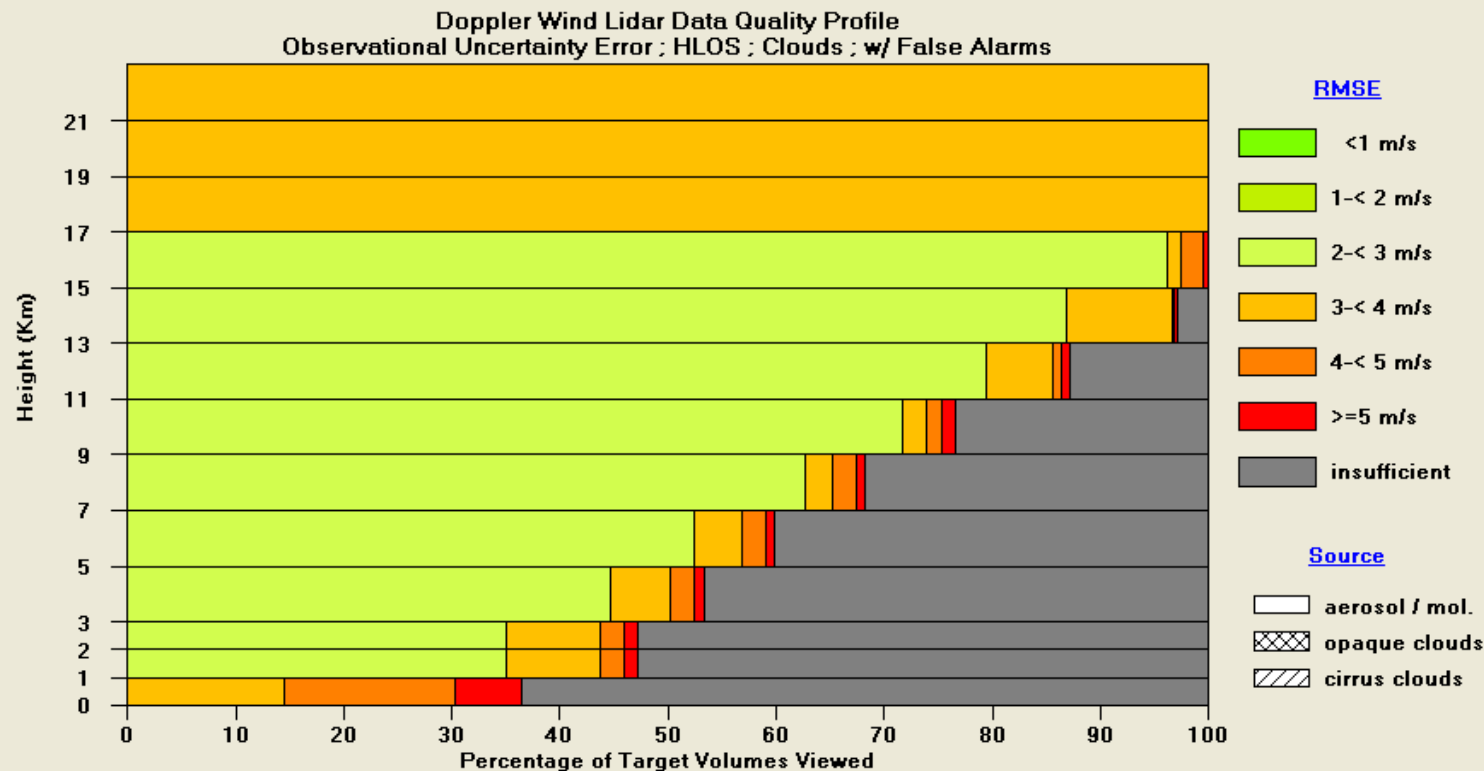
GWOS 4 beam coverage



GWOS Molecular (no cloud)



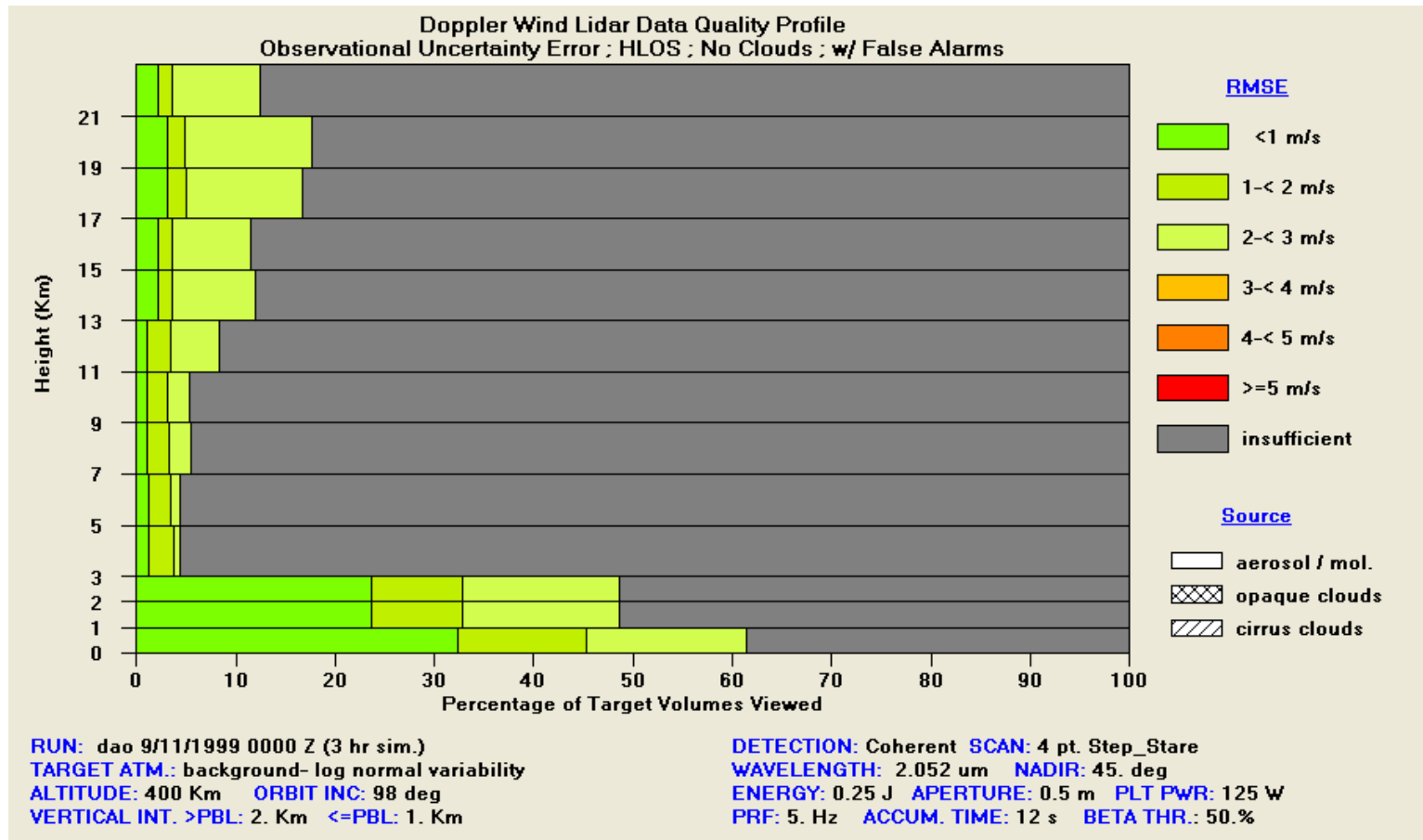
GWOS Molecular



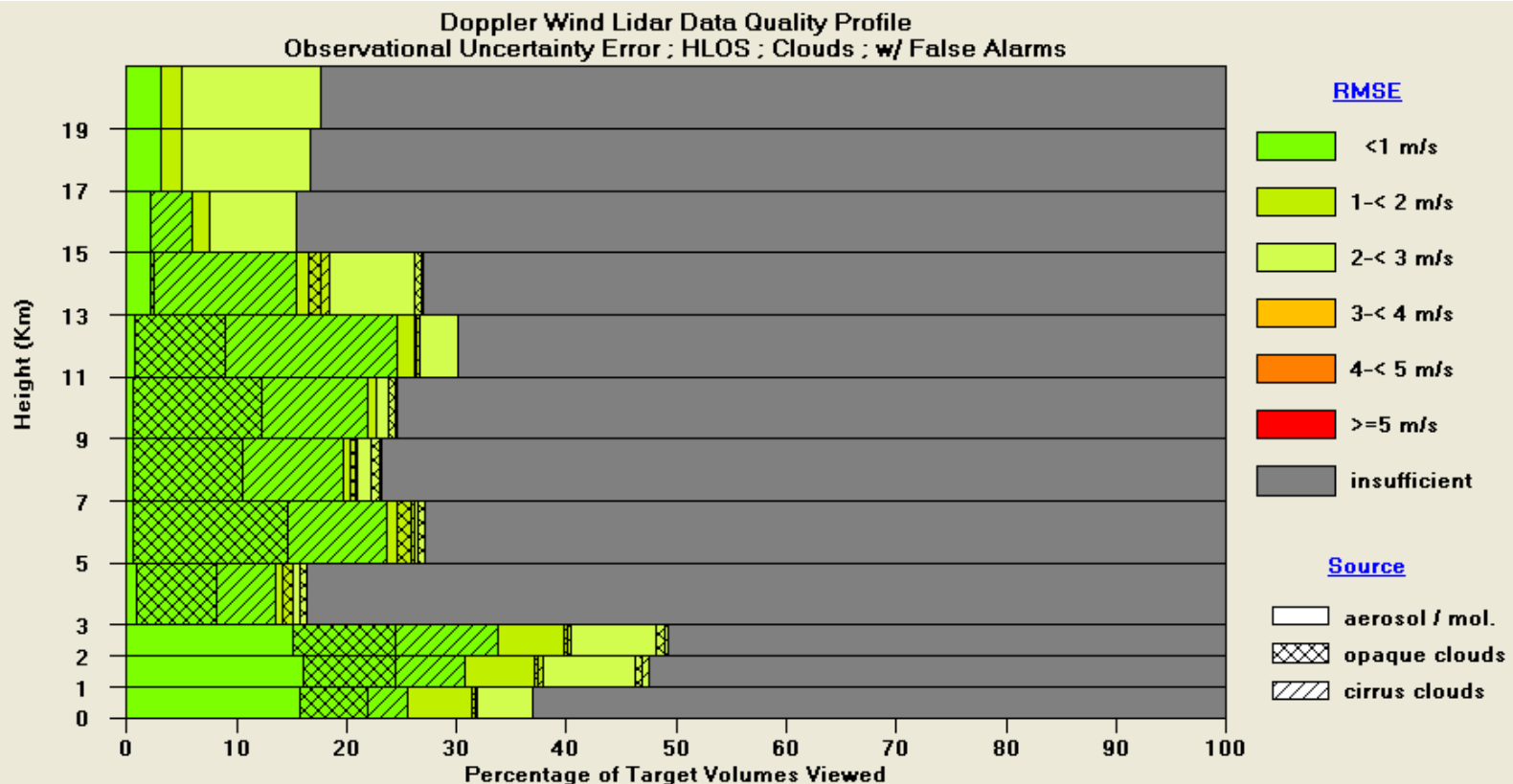
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TARGET ATM.: background- log normal variability
ALTITUDE: 400 Km **ORBIT INC:** 98 deg
VERTICAL INT. >PBL: 2. Km <=PBL: 1. Km

DETECTION: Double-edge mol. **SCAN:** 4 pt. Step_Stare
WAVELENGTH: 0.355 um **NADIR:** 45. deg
ENERGY at 0.355 um: 0.36 J **APERTURE:** 0.5 m
PRF: 100 **ACCUM. TIME:** 12 s **PLT PWR:** 870 W

GWOS Aerosol (no cloud)



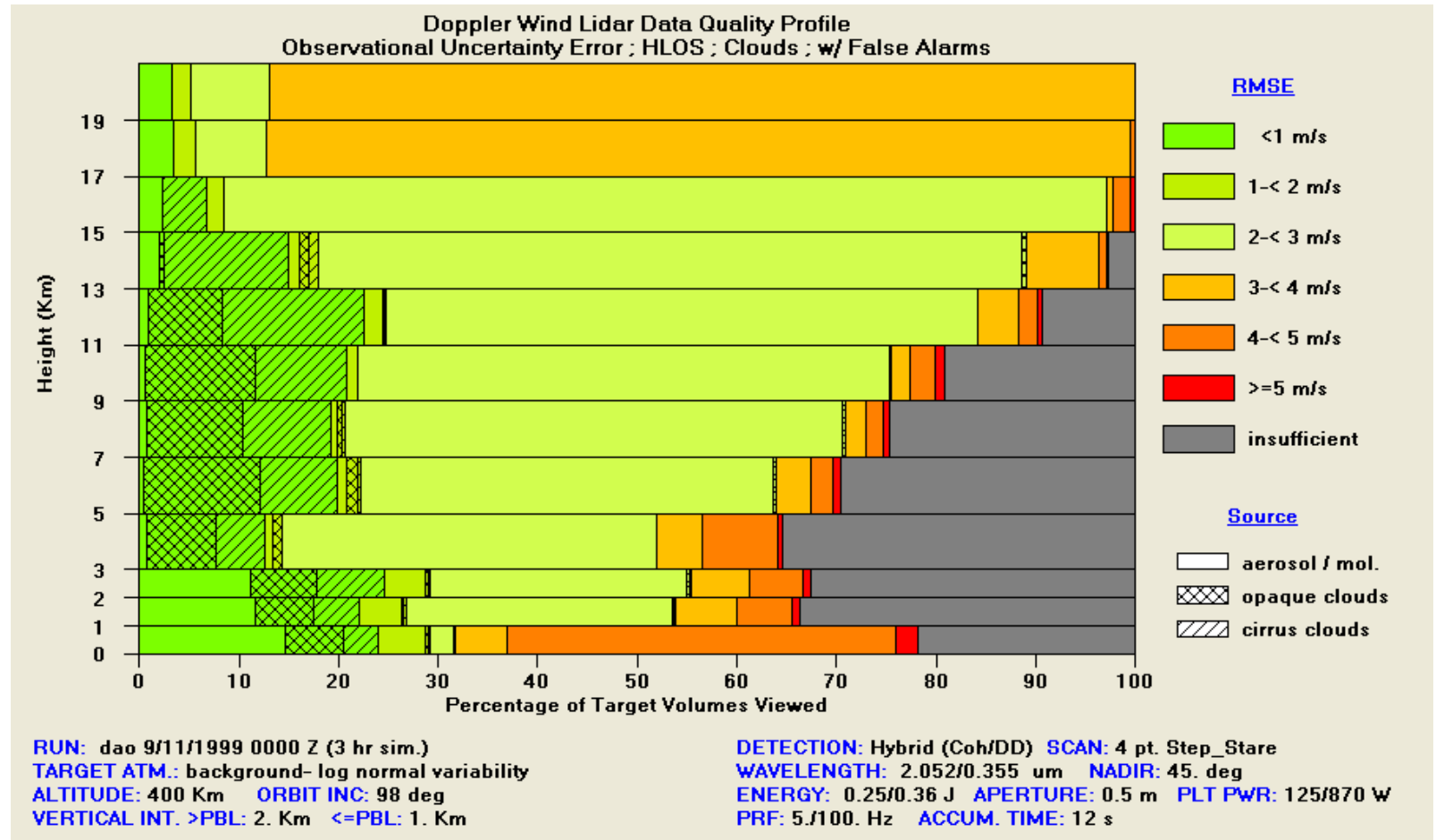
GWOS Aerosol



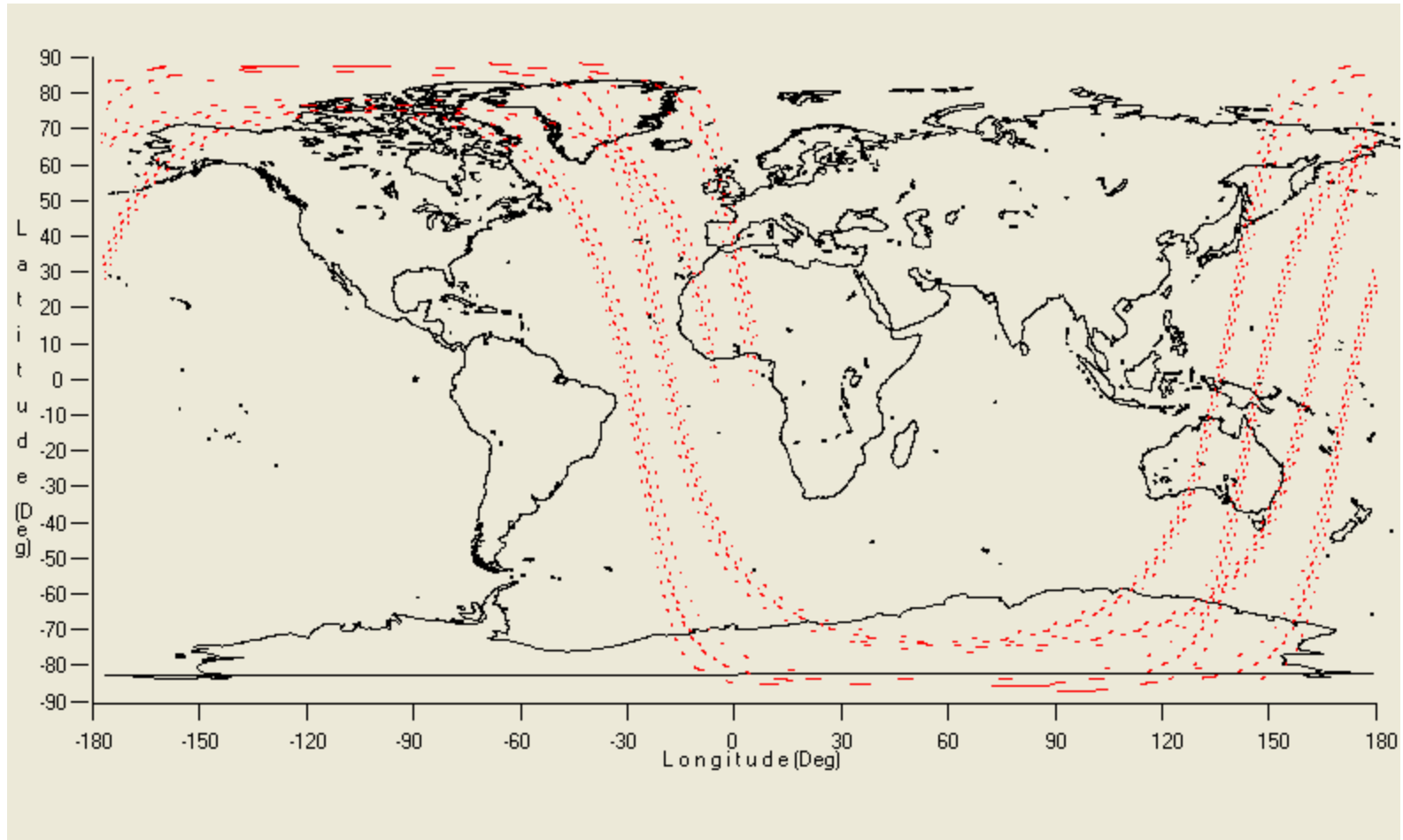
RUN: dao 9/11/1999 0000 Z (3 hr sim.)
 TARGET ATM.: background- log normal variability
 ALTITUDE: 400 Km ORBIT INC: 98 deg
 VERTICAL INT. >PBL: 2. Km <=PBL: 1. Km

DETECTION: Coherent SCAN: 4 pt. Step_Stare
 WAVELENGTH: 2.052 um NADIR: 45. deg
 ENERGY: 0.25 J APERTURE: 0.5 m PLT PWR: 125 W
 PRF: 5. Hz ACCUM. TIME: 12 s BETA THR.: 50.%

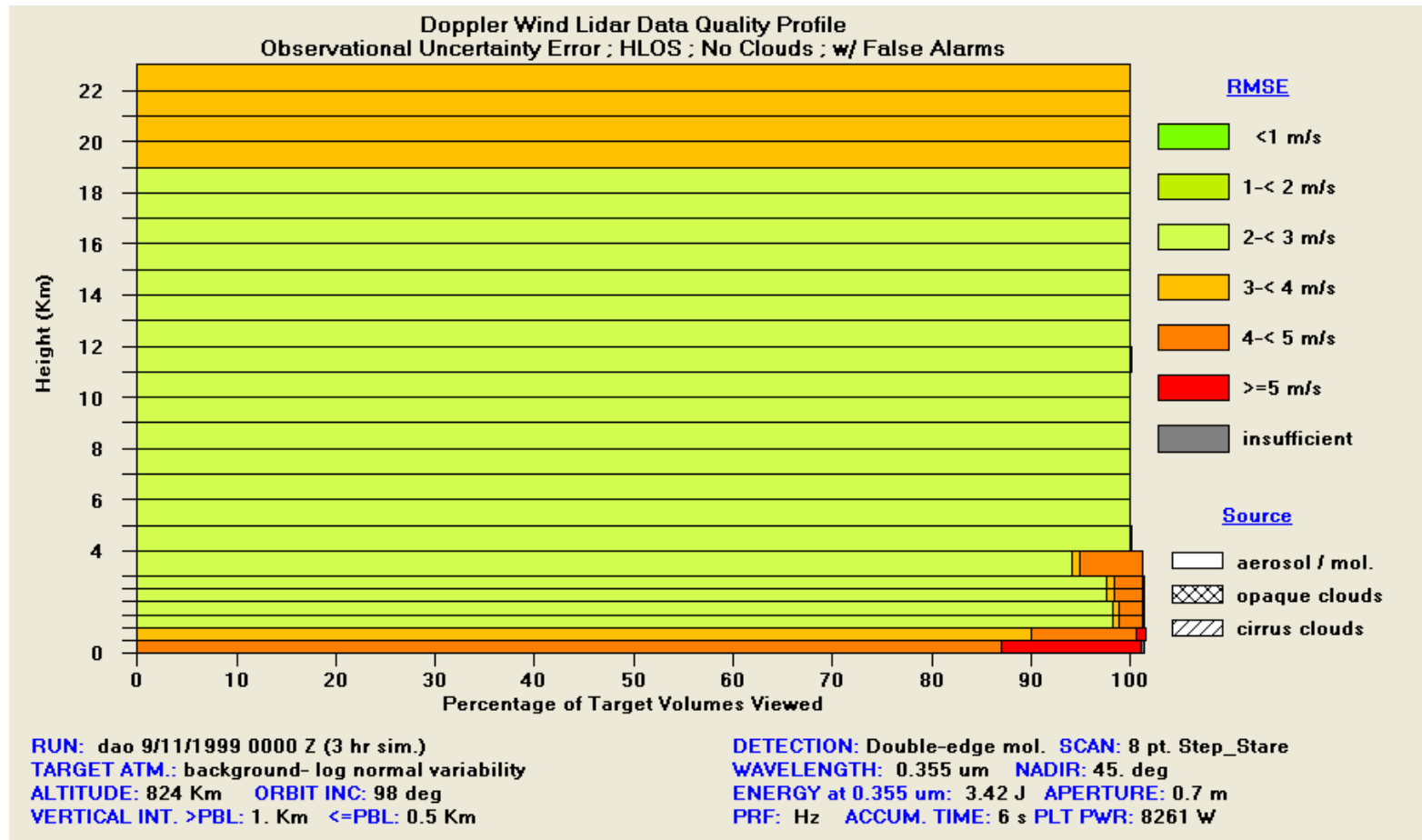
GWOS Hybrid



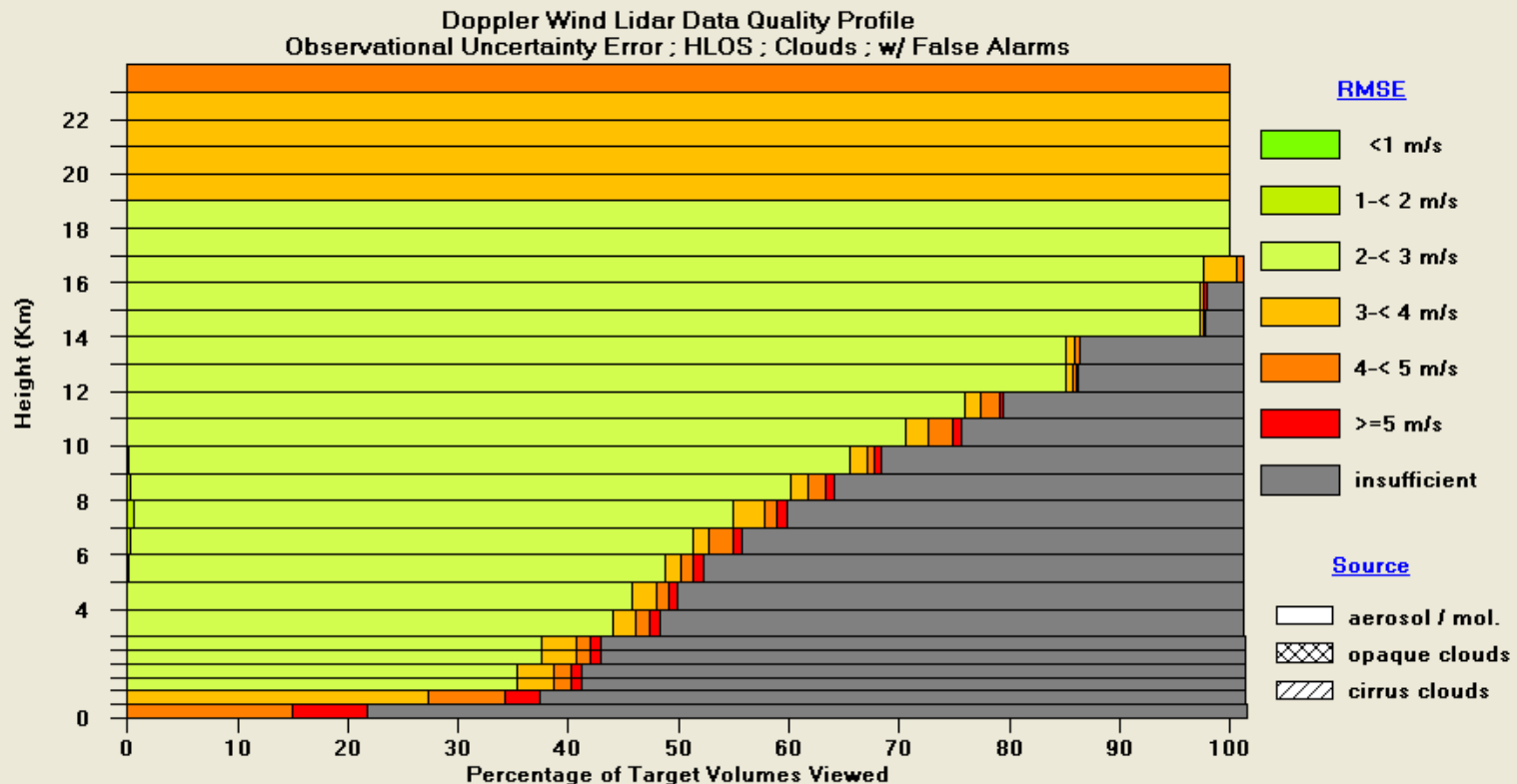
NWOS 8 beam coverage



NWOS Molecular (no cloud)



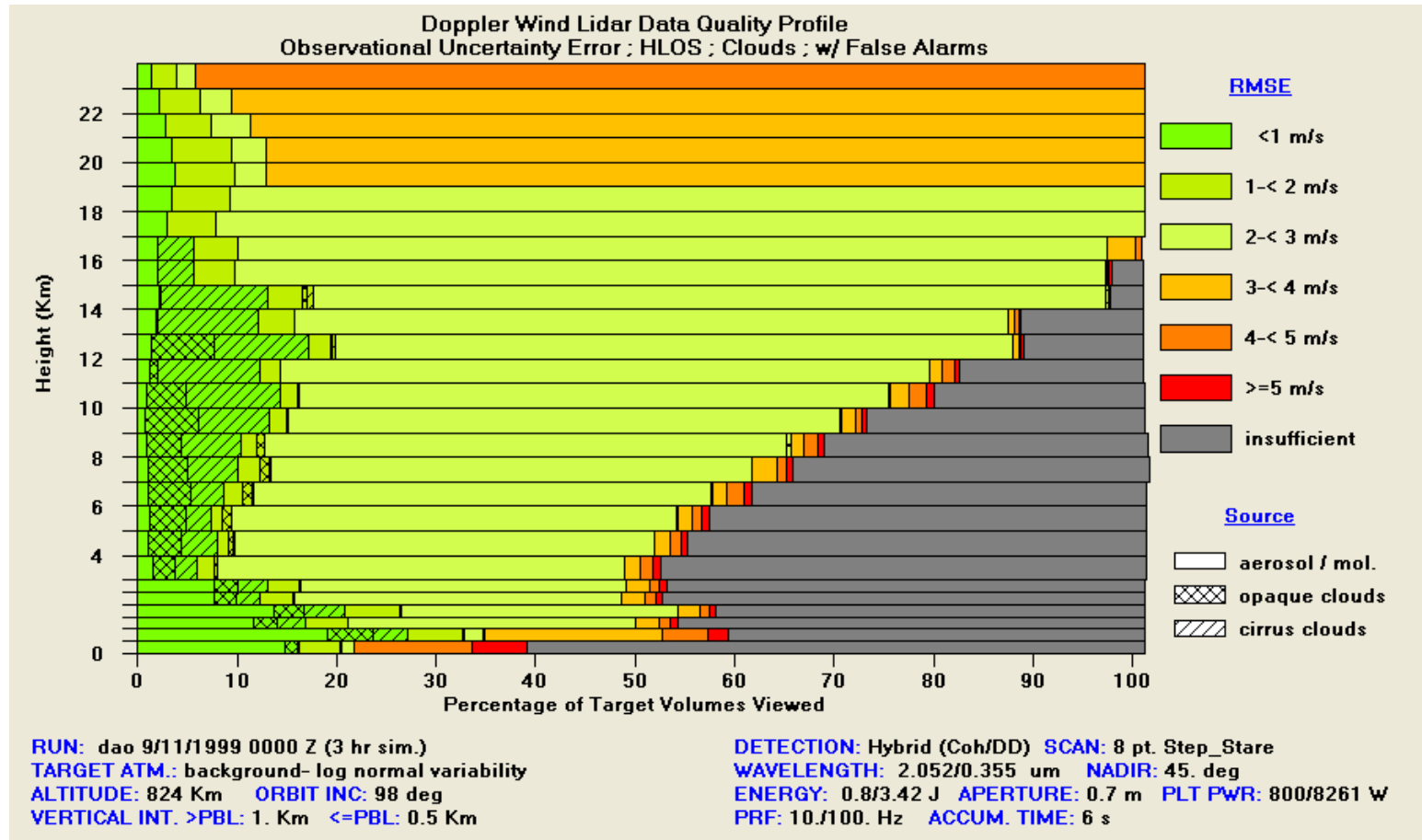
NWOS Molecular



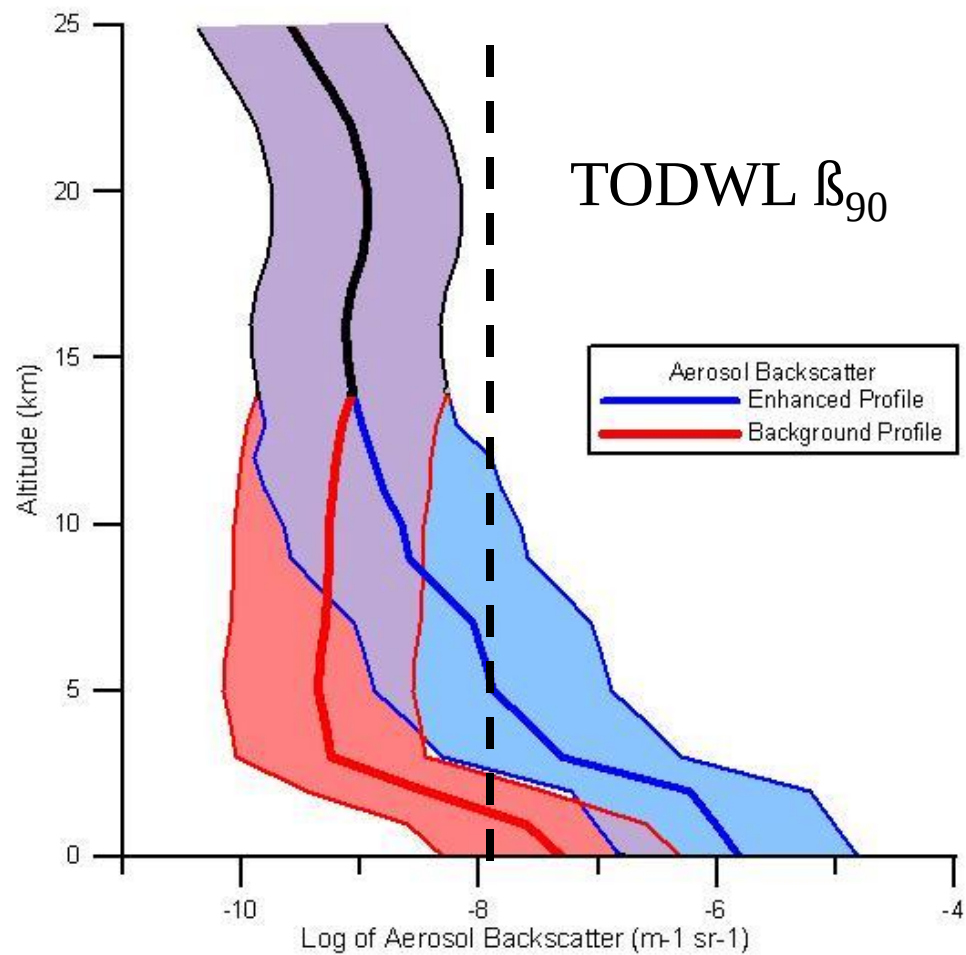
RUN: dao 9/11/1999 0000 Z (3 hr sim.)
TARGET ATM.: background- log normal variability
ALTITUDE: 824 Km **ORBIT INC:** 98 deg
VERTICAL INT. >PBL: 1. Km <=PBL: 0.5 Km

DETECTION: Double-edge mol. **SCAN:** 8 pt. Step_Stare
WAVELENGTH: 0.355 um **NADIR:** 45. deg
ENERGY at 0.355 um: 3.42 J **APERTURE:** 0.7 m
PRF: 100 **ACCUM. TIME:** 6 s **PLT PWR:** 8261 W

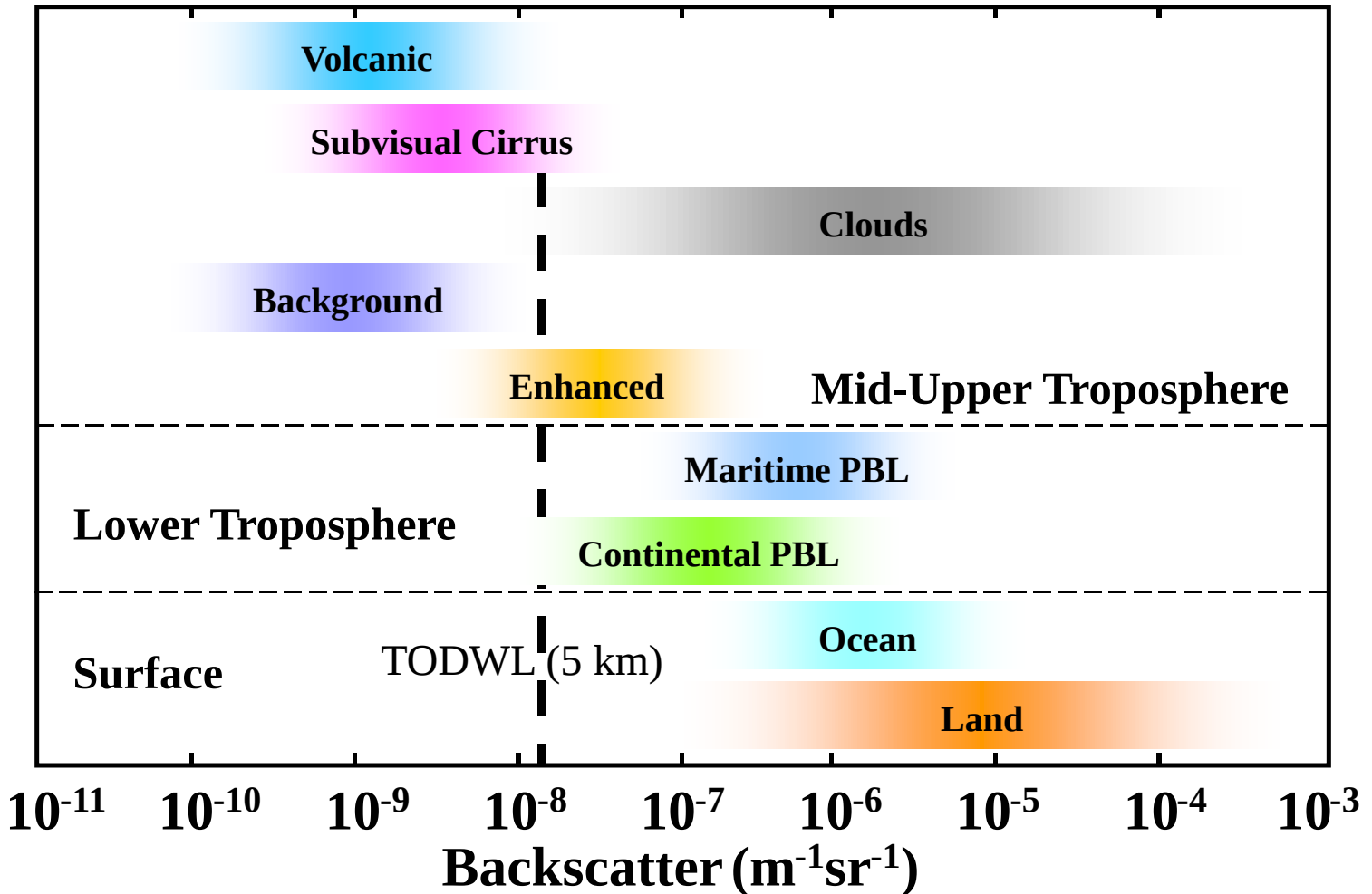
NWOS Hybrid (background)



Lidar Simulation Model Bracket Aerosol Backscatter Profiles



Natural Variability of 2 μm Backscatter



Summary

- Ready for “realistic DWL” OSSEs
- Need consensus on NWOS instrument parameters
- SIVO OSSEs are moving forward
- NCEP OSSEs are in preparation
- NASA ROSES07 funding likely for ADM follow-on OSSEs