

PolarWinds 2015: Dropsondes, DAWN and Polar WRF Comparisons in Barrier Jet along the East Coast of Greenland

S. Greco and G. D. Emmitt
Simpson Weather Associates

K. Hines
Ohio State University

Working Group on Space-based Lidar Winds
3-4 November, 2015

Polar Winds & ADM Cal/Val Team

- Emmitt, Greco and Godwin, SWA
- Michael Kavaya, NASA/LaRC
 - Grady Koch
- Bruce Gentry and H. Chen, NASA/GSFC
- John Cassano, CU
- Keith Hines, OSU
- Dave Winker, NASA/LaRC

Science (PolarWinds)

- Tip Jet
 - Two visits; one ideal; the other was confounded by clouds and weaker than model predicted.
- Marginal Ice
 - Four visits; one failure due to clouds; other two were ideal
- Katabatic flows
 - Two visits; two ideal
- Iceland flow splitting
 - One experiment; successful

Mission Summary

(51 hours not including ferry hours)

Date	Mission	DC-8	Falcon	Drops	DAWN	TWiLiTE
5/11	Iceland flow splitting with NE BL winds	x		3/5	x	x
5/13	TDS underflight(DLR/NASA) and Greenland CIZ (NASA)	x	x	5/6	X	X
5/15	Upper level jet between Iceland and Scotland	x	x	10/12	X	X
5/16	ADM cal/val over Greenland ice cap; CIZ and Kat-winds	x	x	8/10	X	x
5/17	CALIPSO, MODIS, ASCAT underflights; CIZ;Tip jet	x		8/9	X	X
5/19	Upper level jet over southern Greenland; Tip jet	x	x	7/8	X	X
5/21	Barrier jet	x		7/11	X	X
5/23	Katabatic flows off Greenland east coast; ADM cal/val CIZ	x	x	15/19	X	
5/24	Baffin Strait ice edge west coast of Greenland; rolls	x		11/12	X	
5/25	Upper level jet south of Iceland	x	x	5/6	X	X

**May 21, 2015 – Barrier Wind Case
Campaign 2**

Operational Real-Time Model Forecasts

Polar Winds NWP

Fcst: 21.00 h

Temperature

Geopotential height

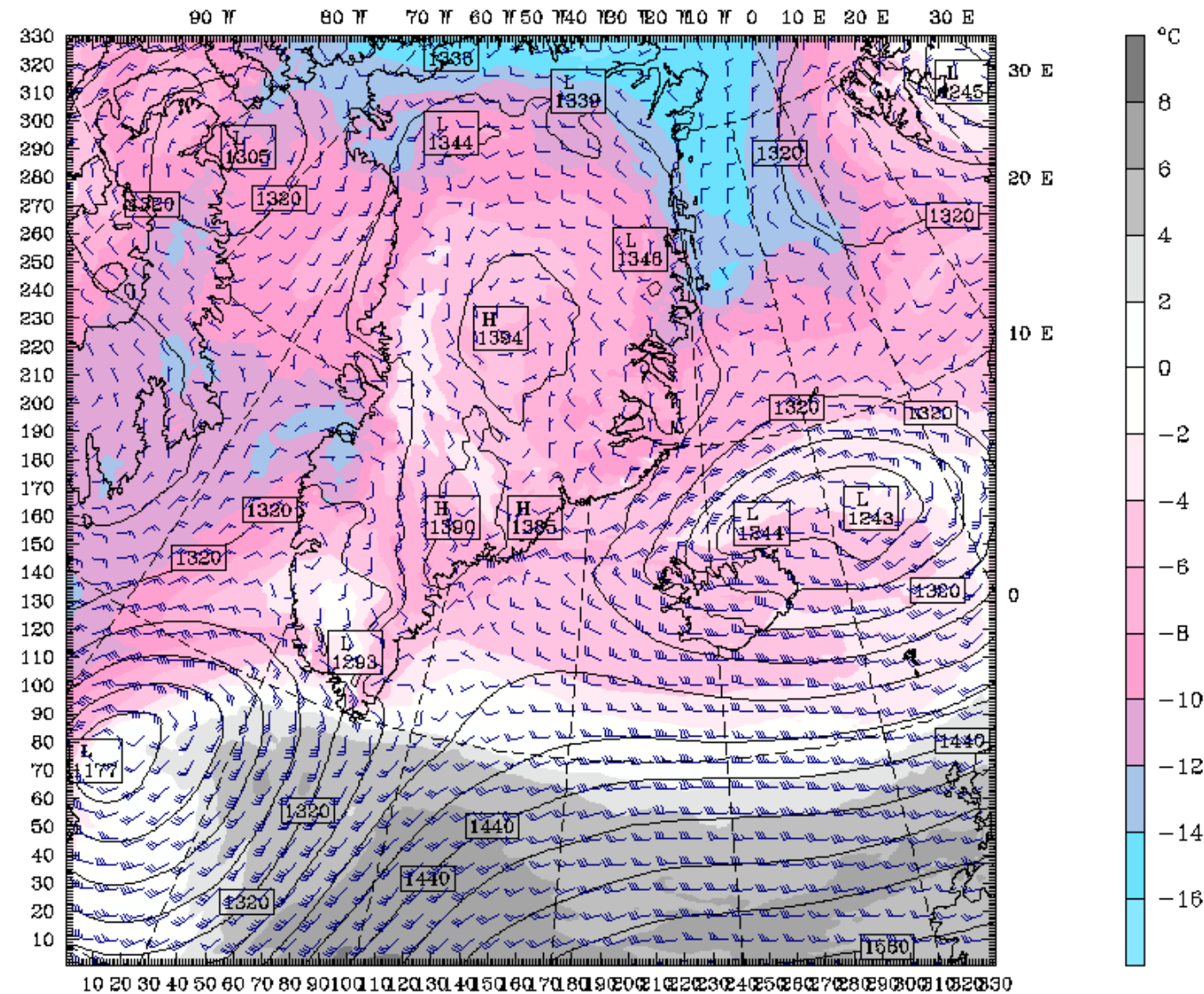
Horizontal wind vectors

Valid: 2100 UTC Thu 21 May 15 (2100 LST Thu 21 May 15)

at pressure = 850 hPa

at pressure = 850 hPa

at pressure = 850 hPa



10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330

BARB VECTORS: FULL BARB = 10 kts

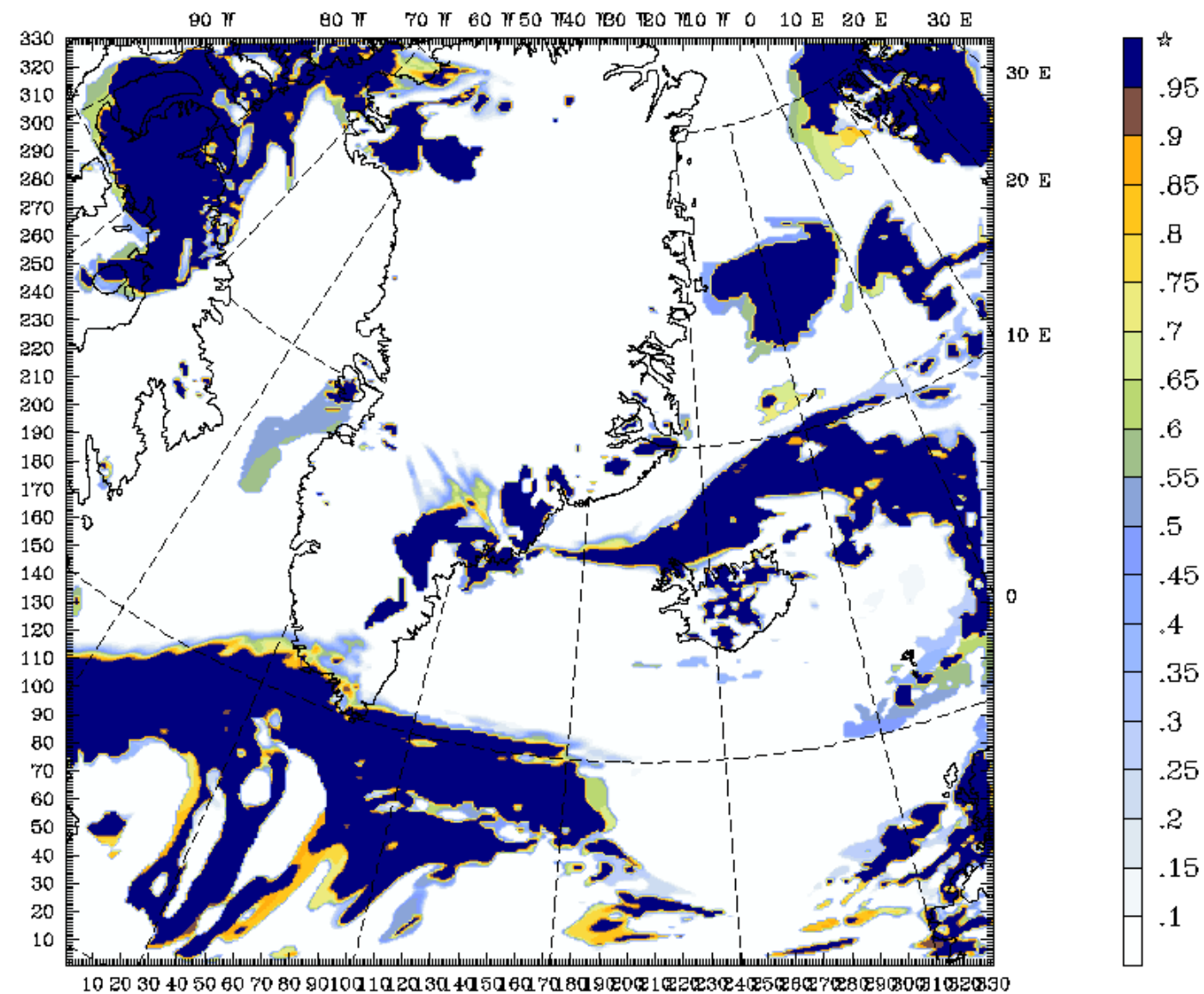
CONTOURS: UNITS=m LOW= 1200.0 HIGH= 1580.0 INTERVAL= 30.000

Model Info: V3.6.1 G3 MYJ PBL Morrison Noah LSM 10 km, 47 levels, 60 sec

LW: RRTMG SW: RRTMG DIFF: simple KM: 2D Smagor

Polar Winds NWP
Fest: 21.00 h
CLOUD FRACTION

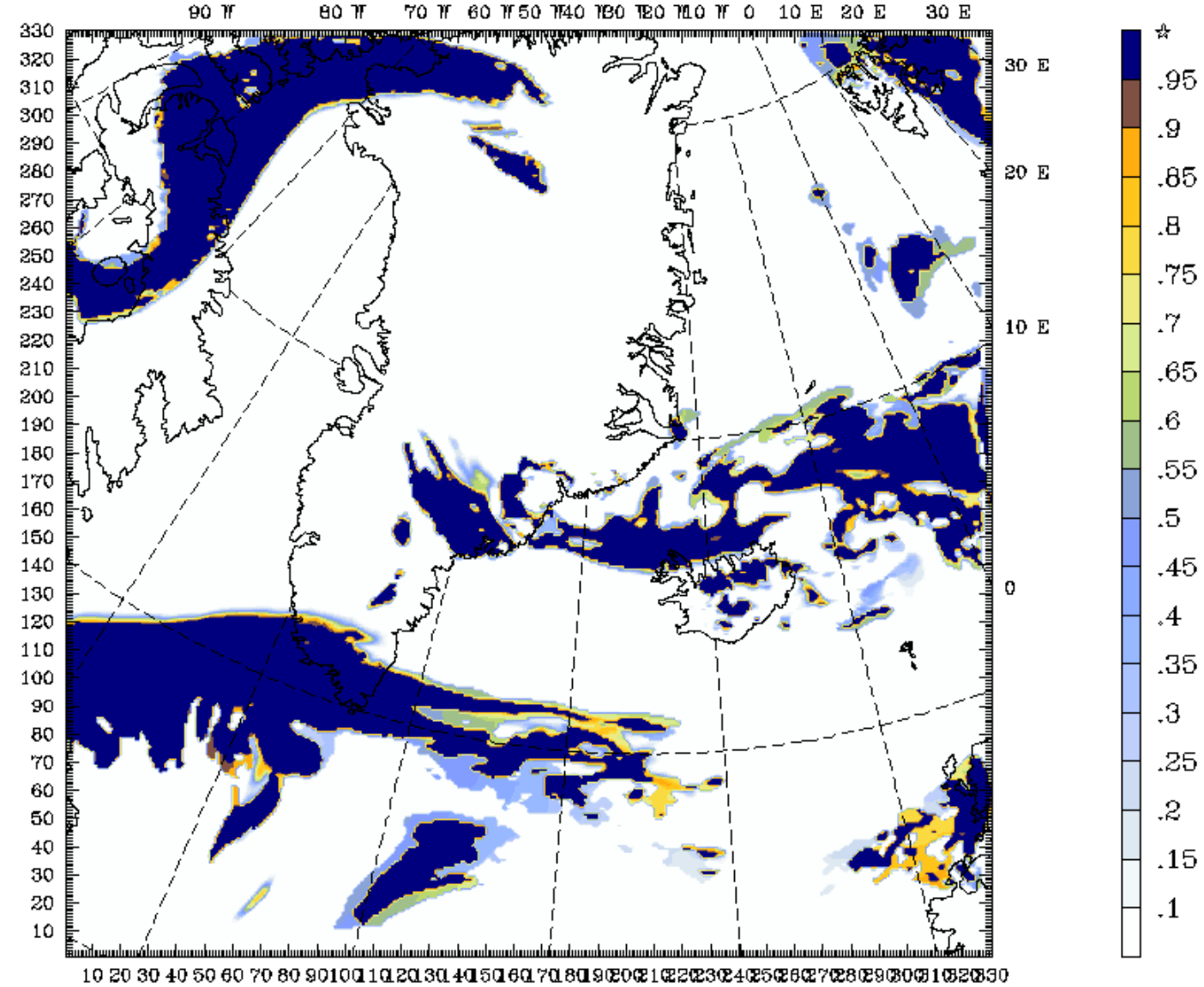
Init: 0000 UTC Thu 21 May 15
Valid: 2100 UTC Thu 21 May 15 (2100 LST Thu 21 May 15)
at pressure = 850 hPa



Model Info: V3.6.1 G3 MYJ PBL Morrison Noah LSM 10 km, 47 levels, 60 sec
LW: RRTMG SW: RRTMG DIFF: simple KM: 2D Smagor

Polar Winds NWP
Fest: 21.00 h
CLOUD FRACTION

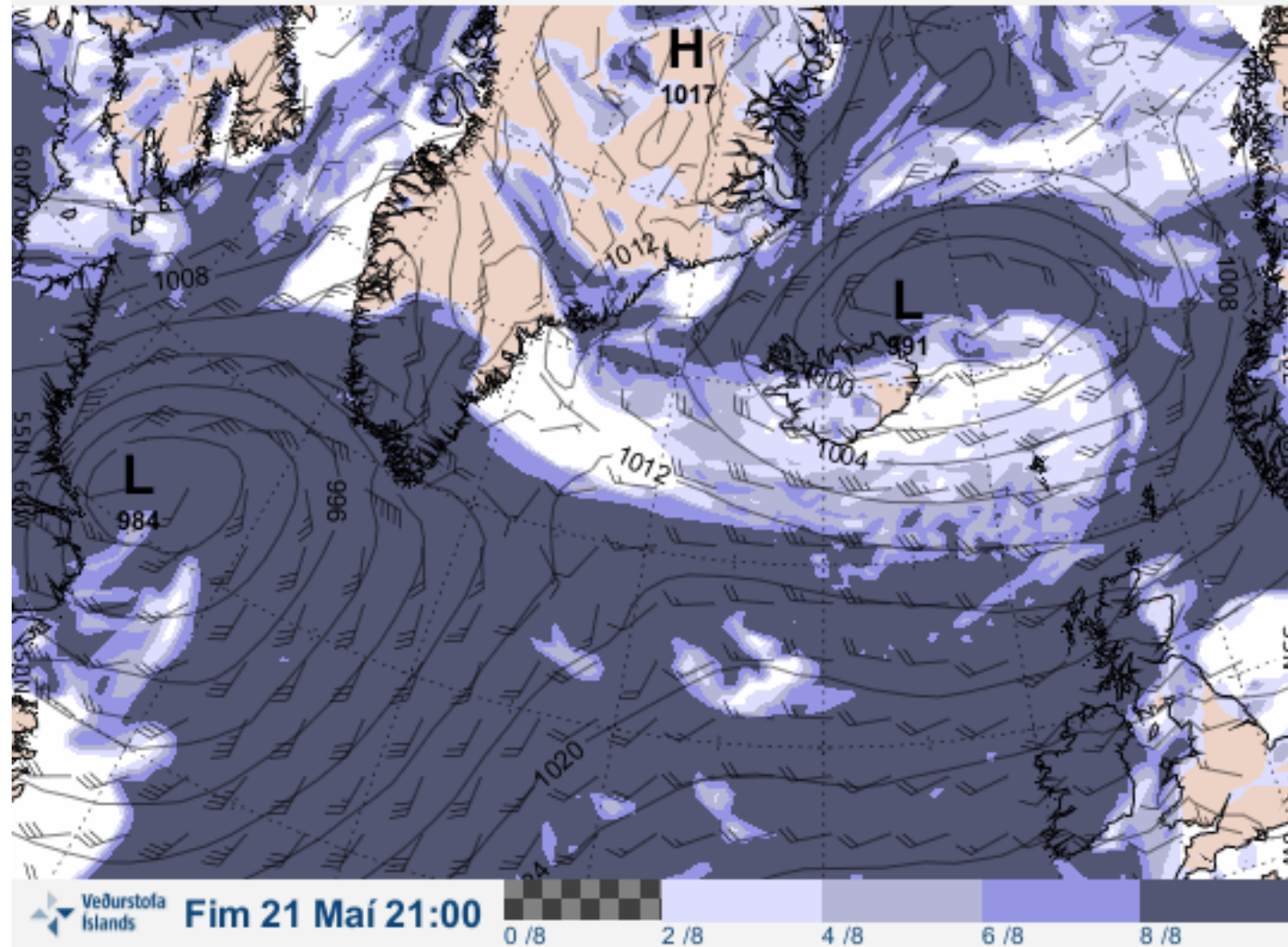
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at pressure = 700 hPa



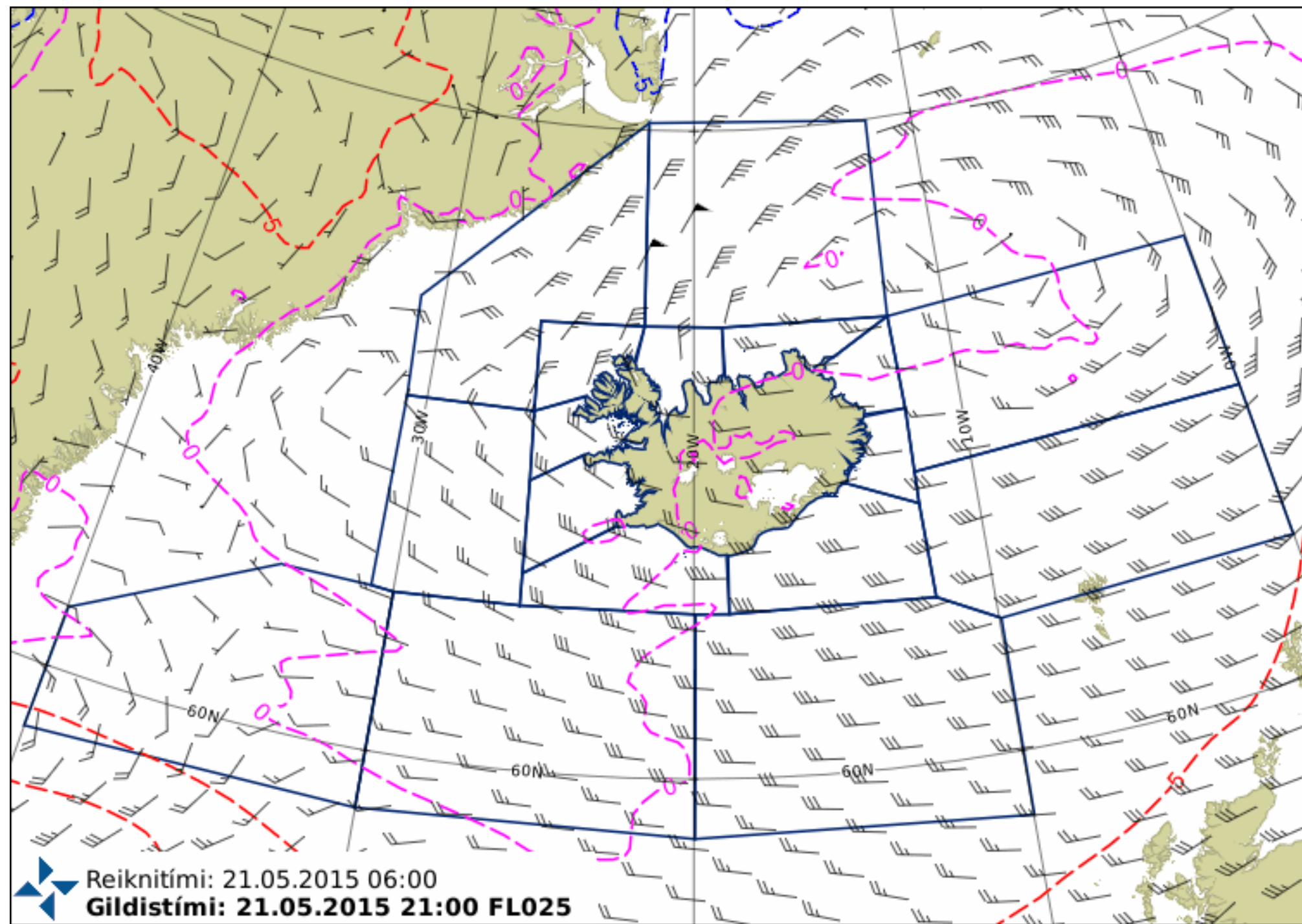
Model Info: V3.6.1 G3 MYJ PBL Morrison Noah LSM 10 km, 47 levels, 60 sec
LW: RRTMG SW: RRTMG DIFF: simple KM: 2D Smagor

Lág- og miðskýjahúla, vindur í 100 m hæð og loftþrýstingur (hPa)

ECMWF/ECM 0.125: 21.05.2015 00:00 UTC (+21)

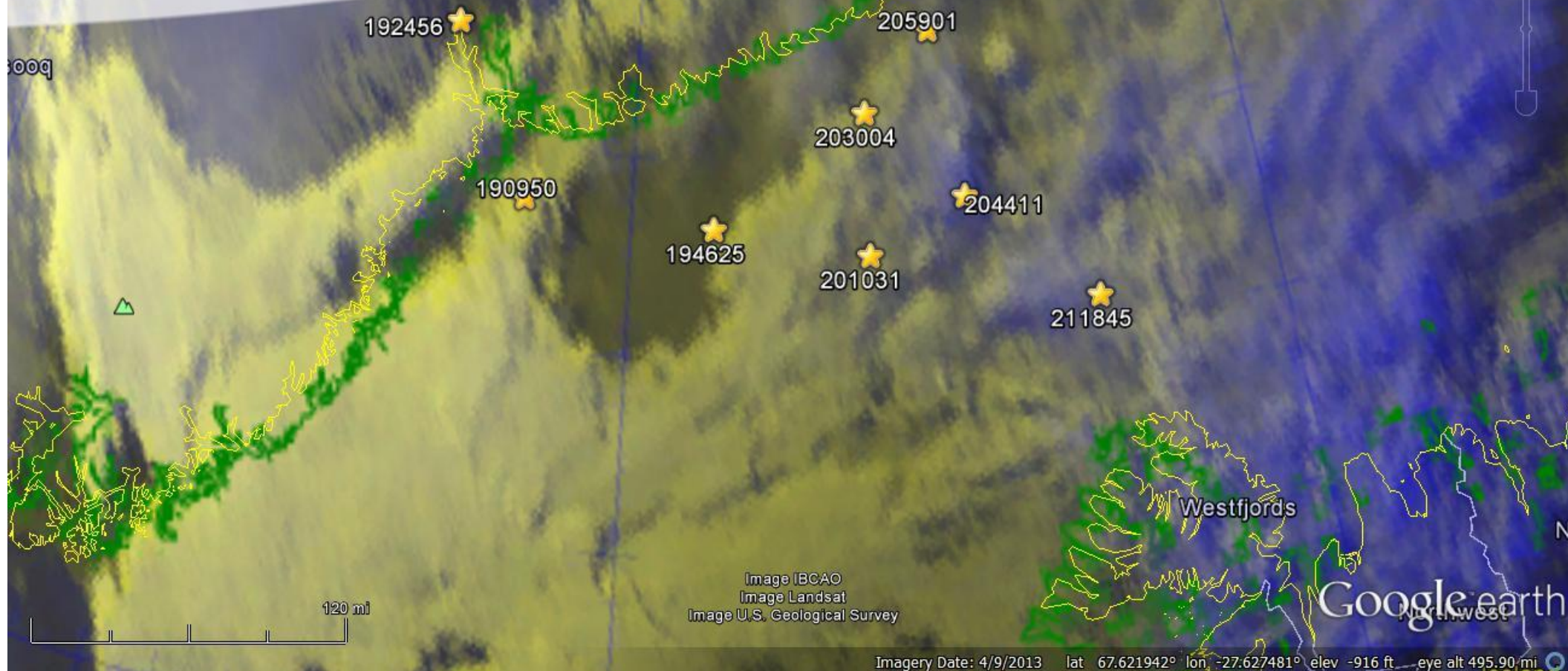


Fim 21 Maí 21:00



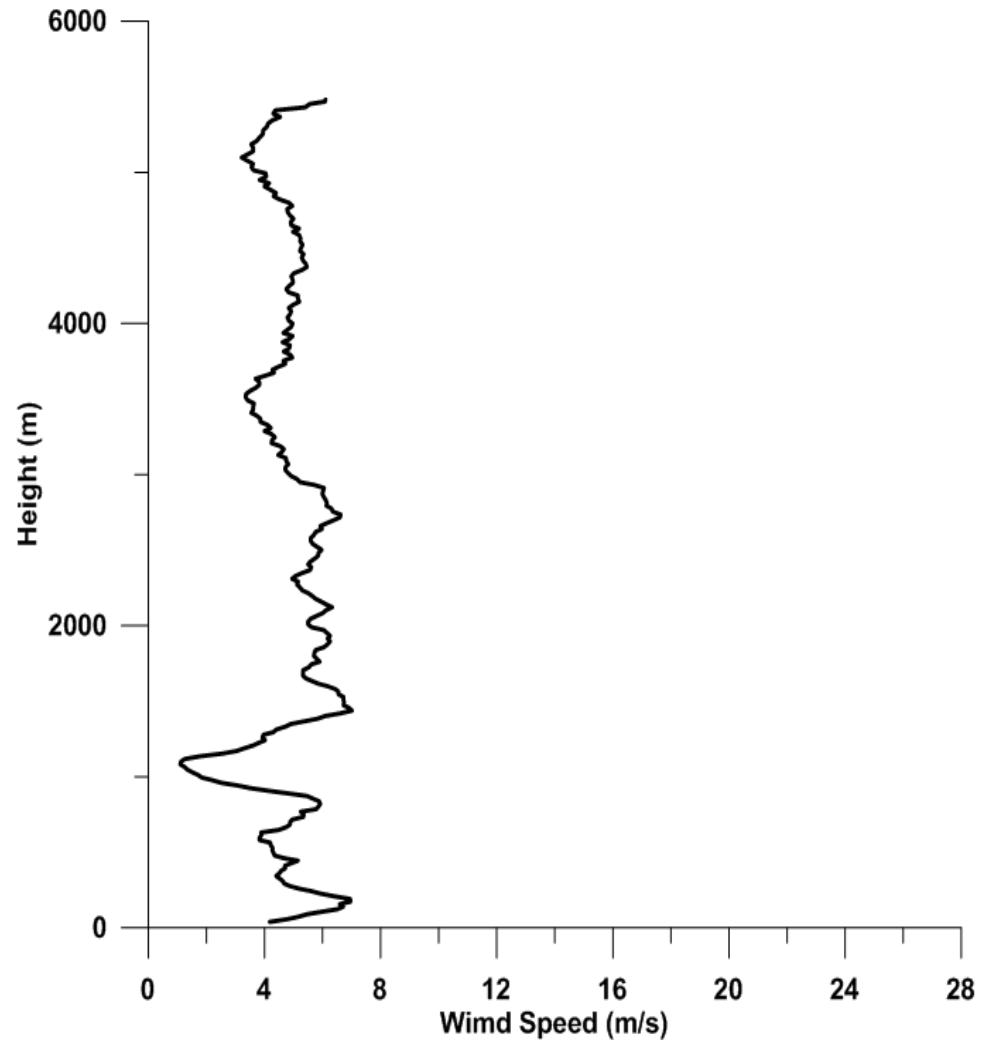
Dropsonde Locations

MSG-SEVIRI
Gervilitmynd (skerpt með HRV)
2015.05.21 21:00

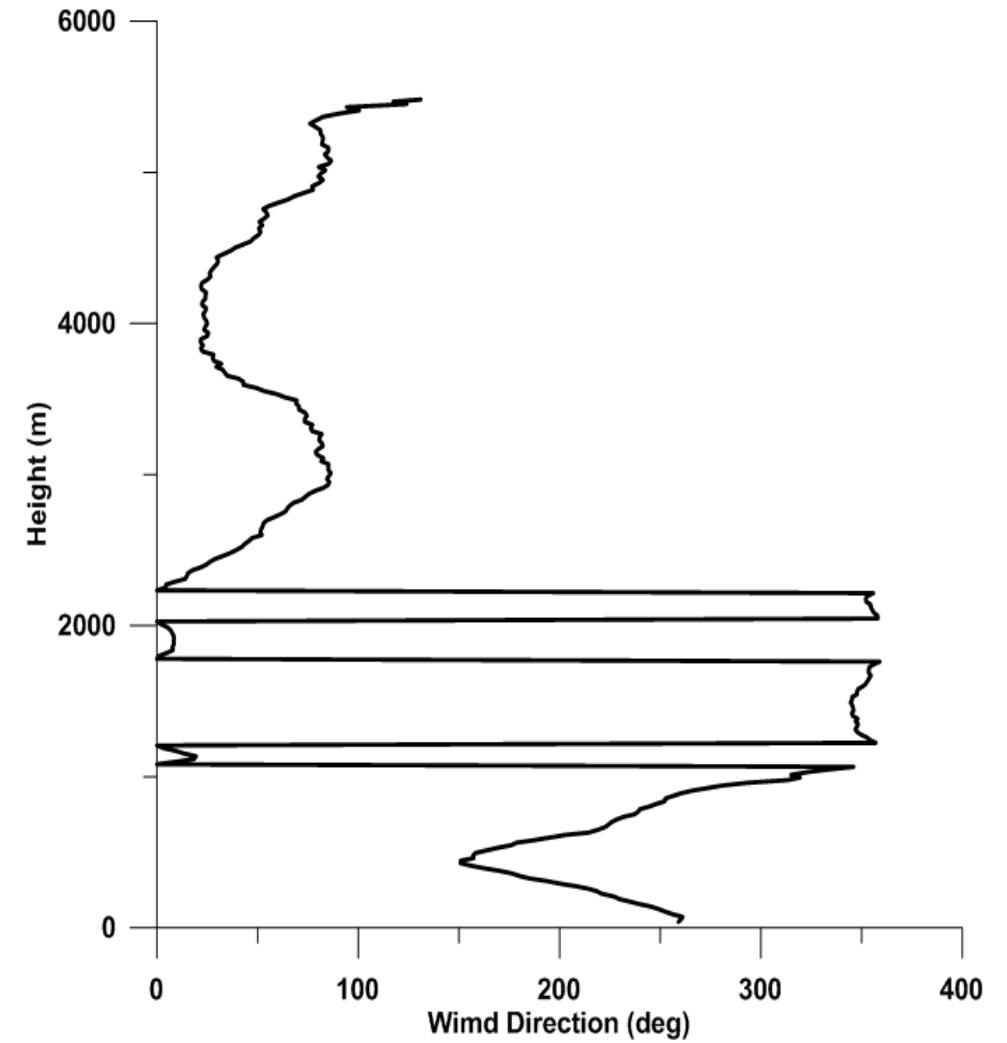


Dropsonde Profiles

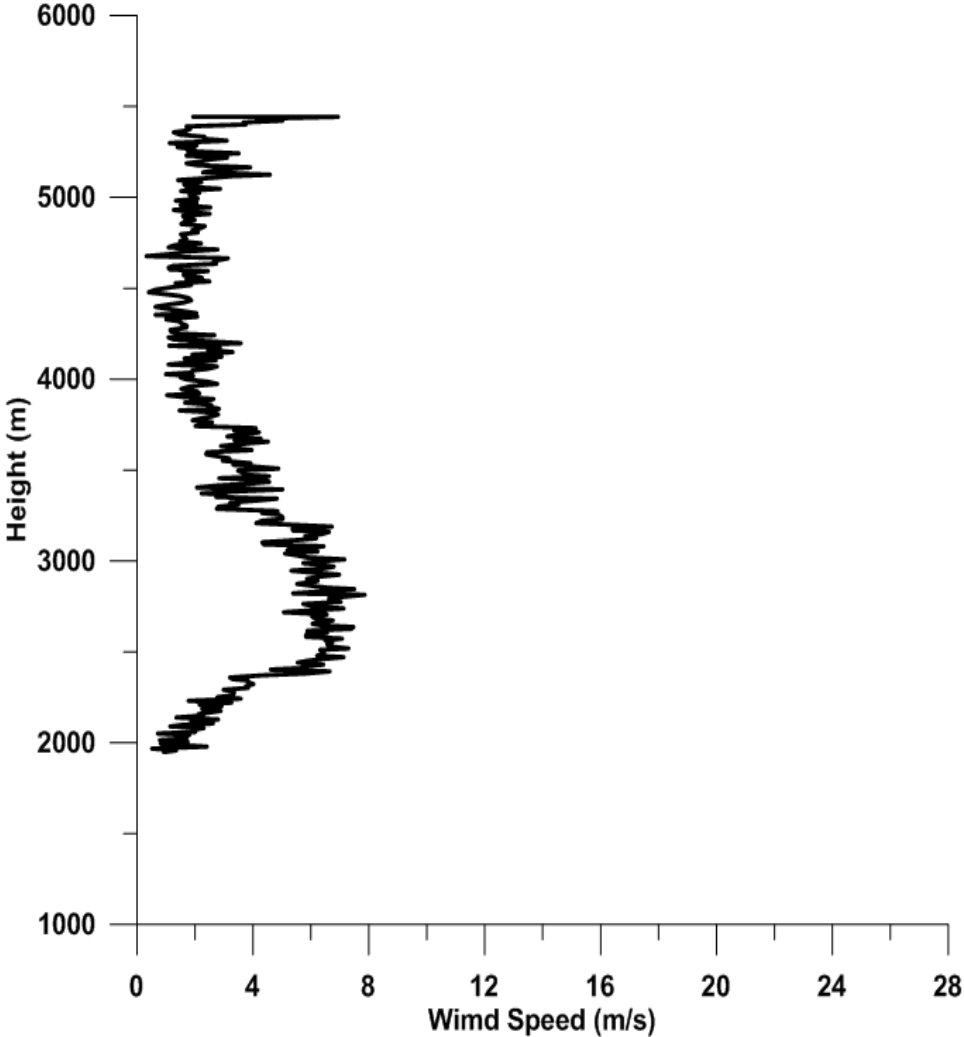
Drop_20150521_190950 Wind Speed (m/s)



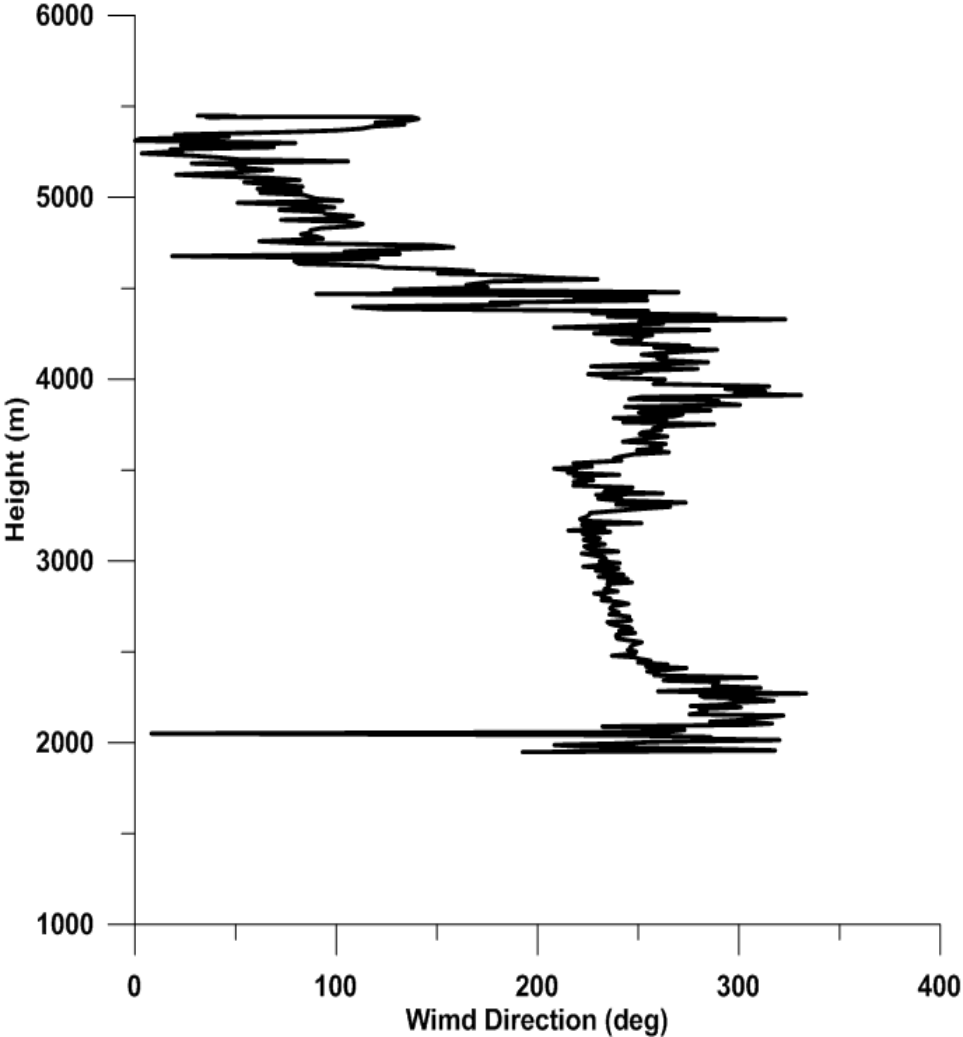
Drop_20150521_190950 Wind Direction (deg)



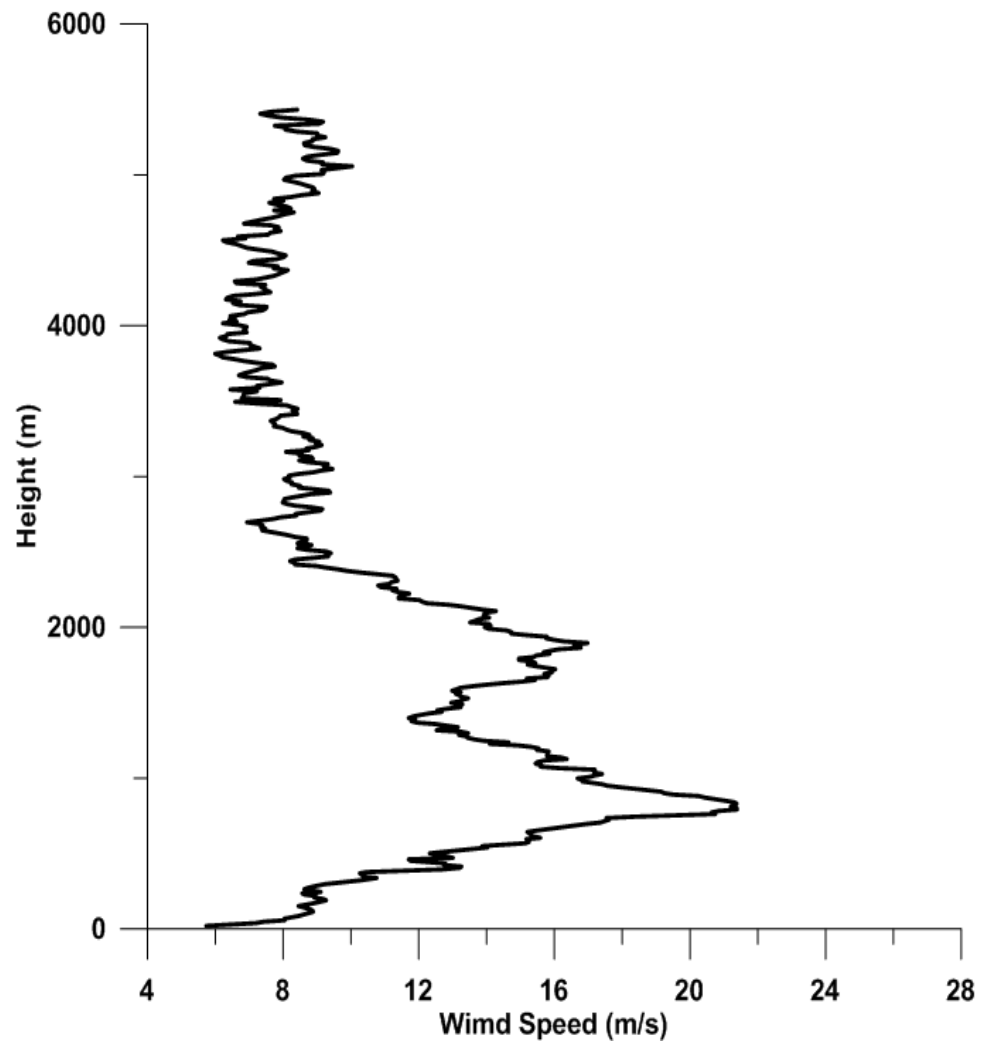
Drop_20150521_192456 Wind Speed (m/s)



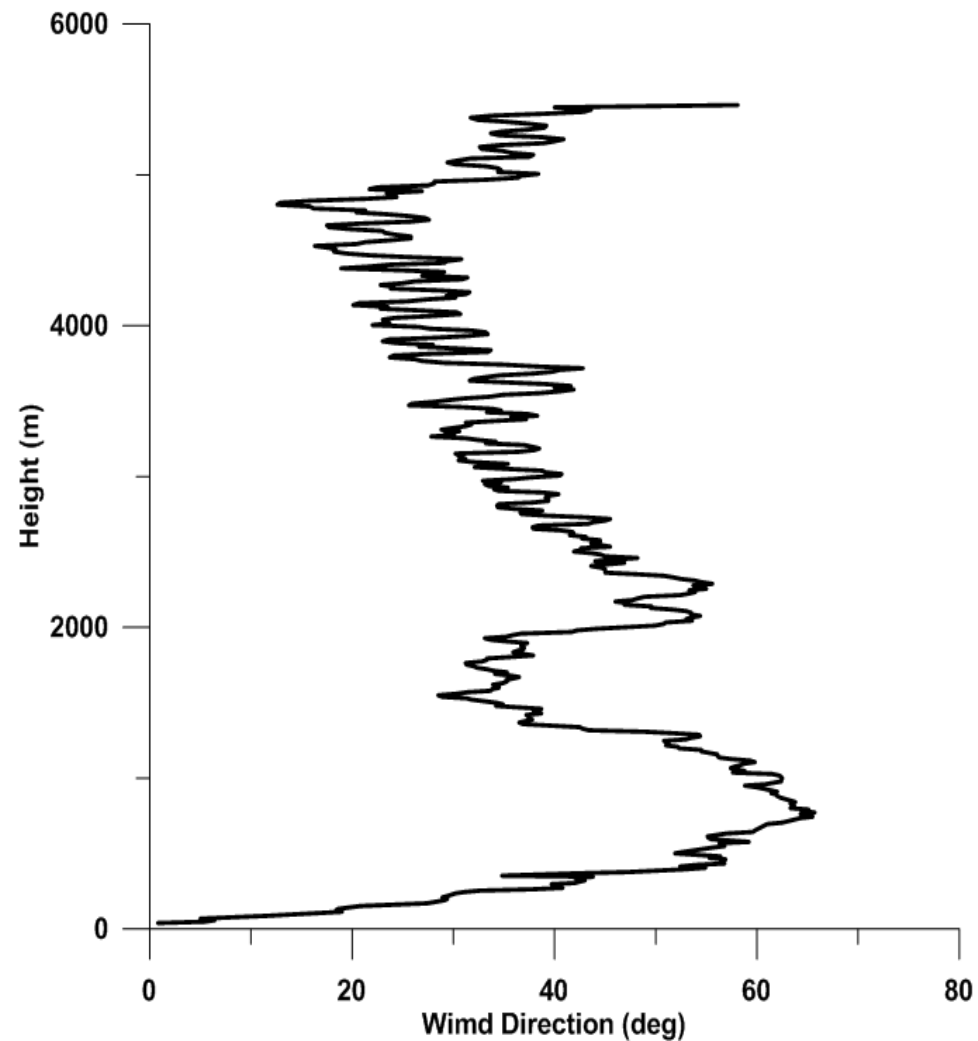
Drop_20150521_192456 Wind Direction (deg)



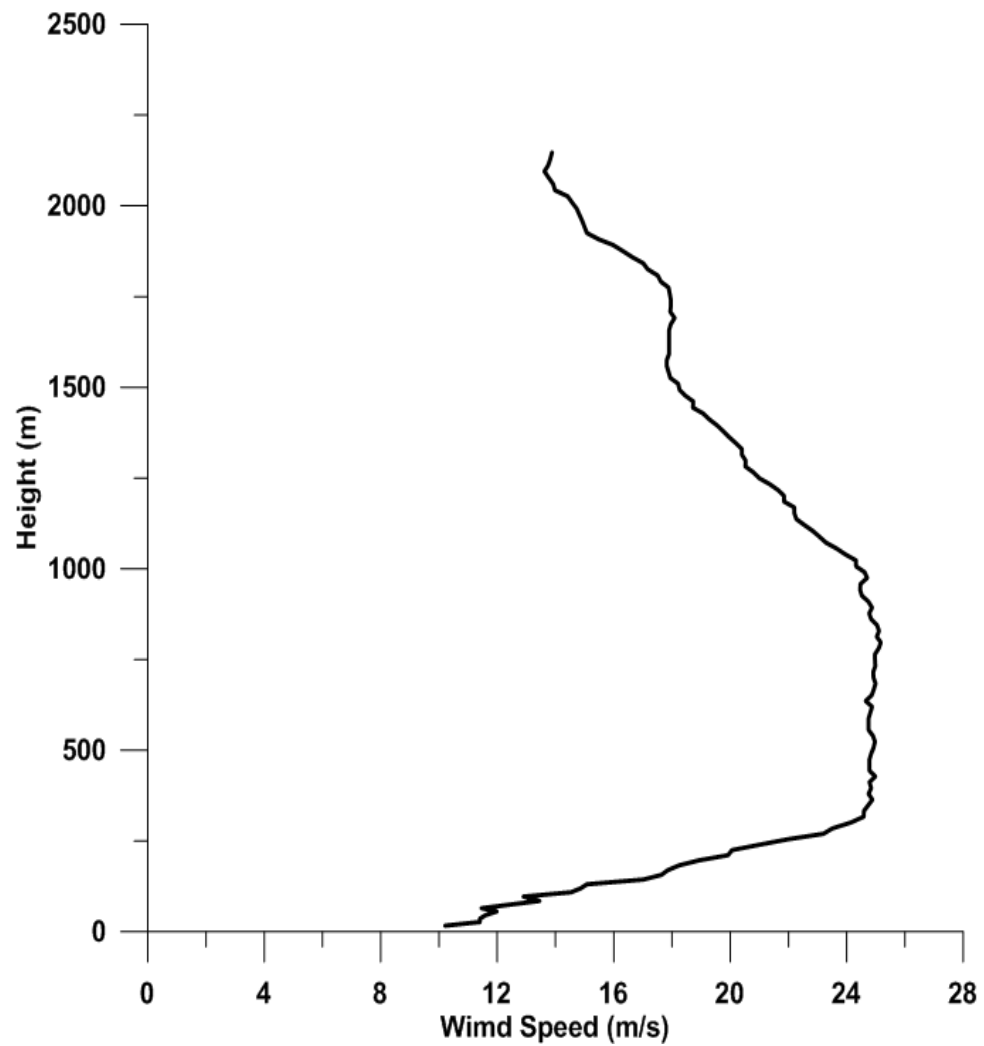
Drop_20150521_194625 Wind Speed (m/s)



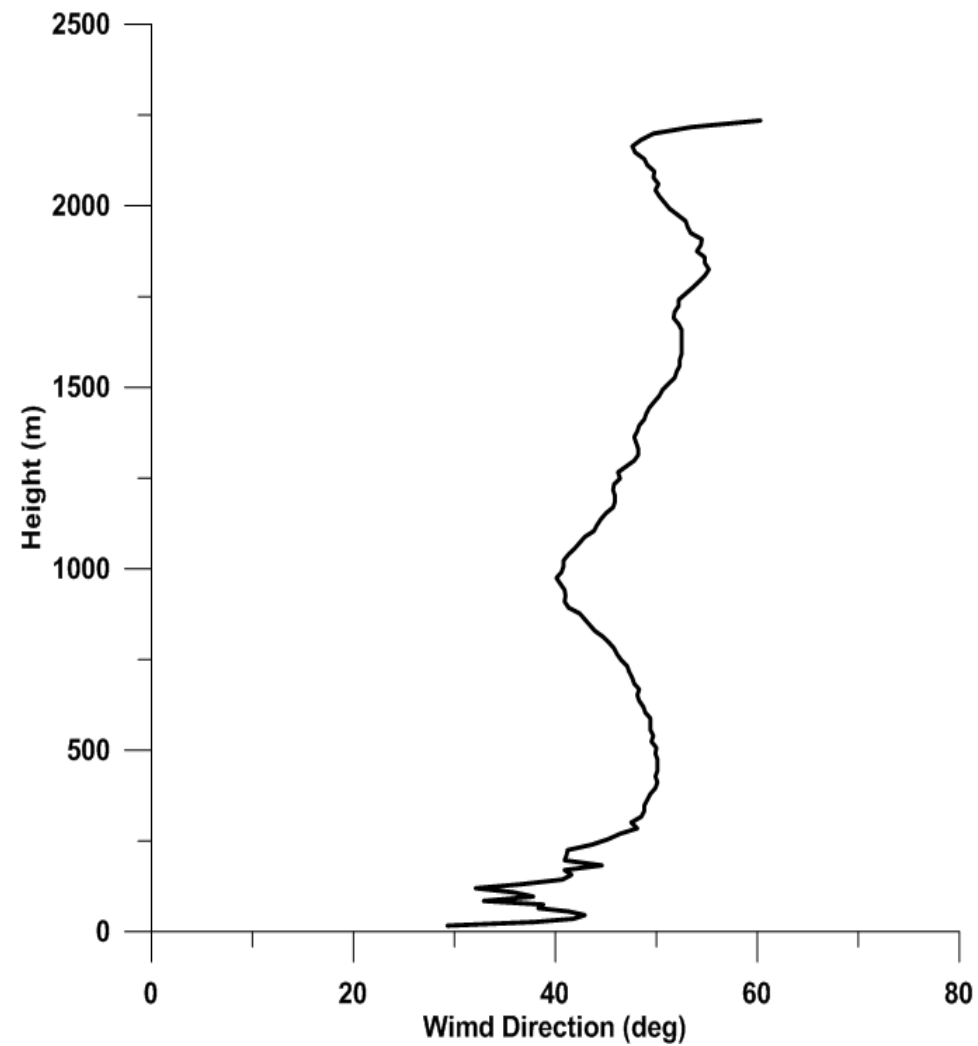
Drop_20150521_194625 Wind Direction (deg)



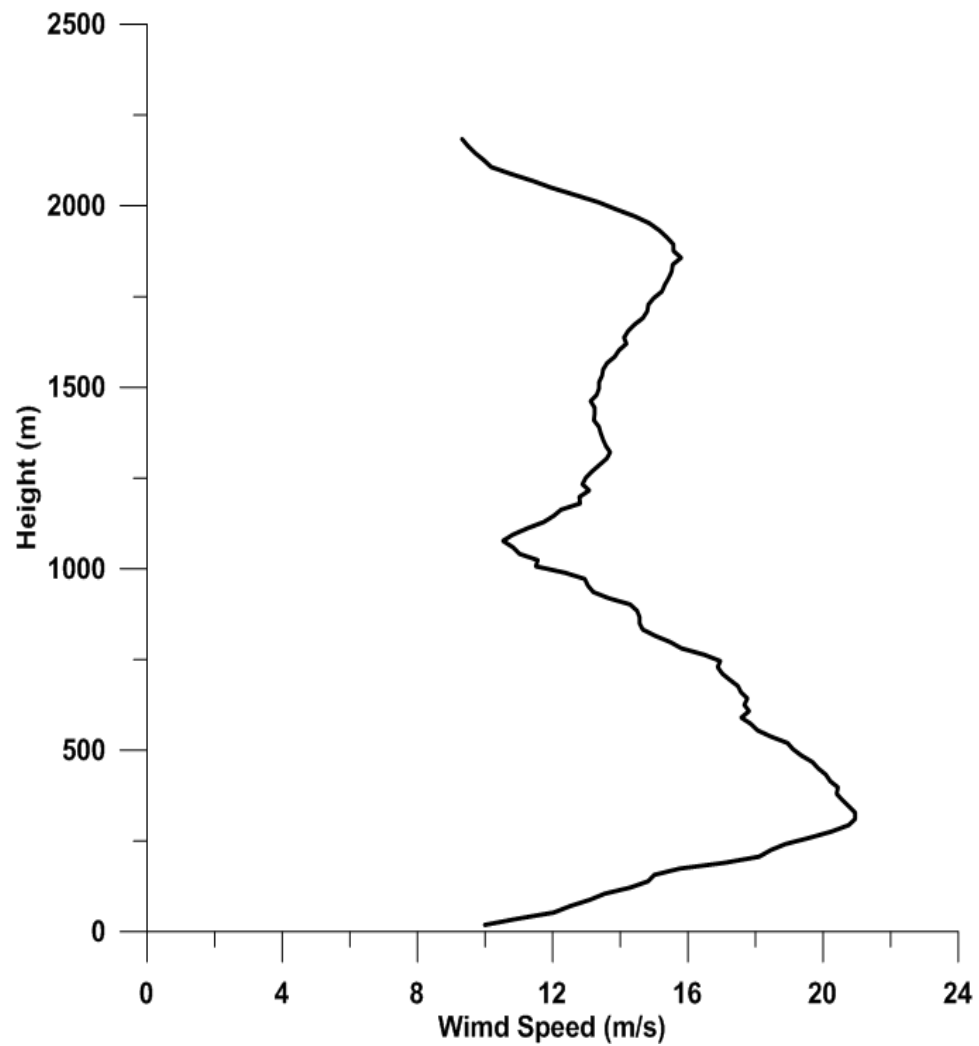
Drop_20150521_201031 Wind Speed (m/s)



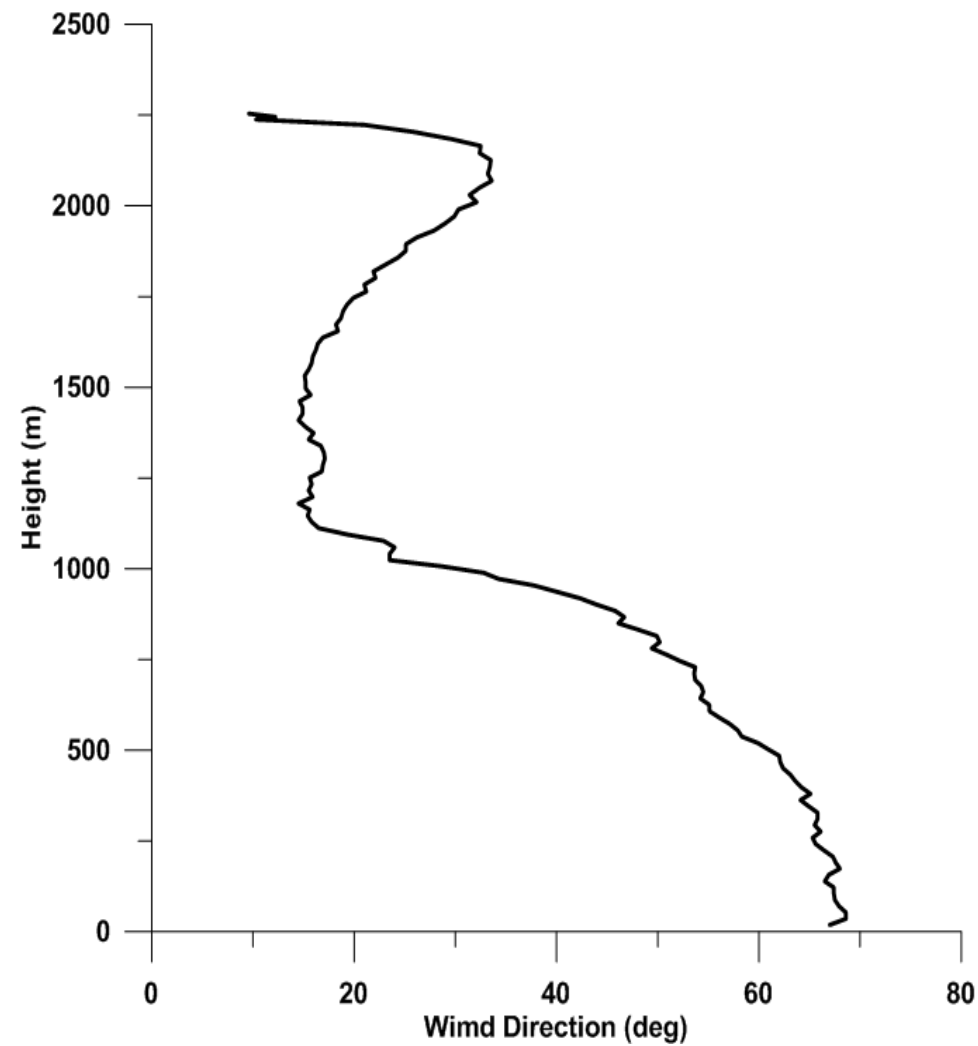
Drop_20150521_201031 Wind Direction (deg)



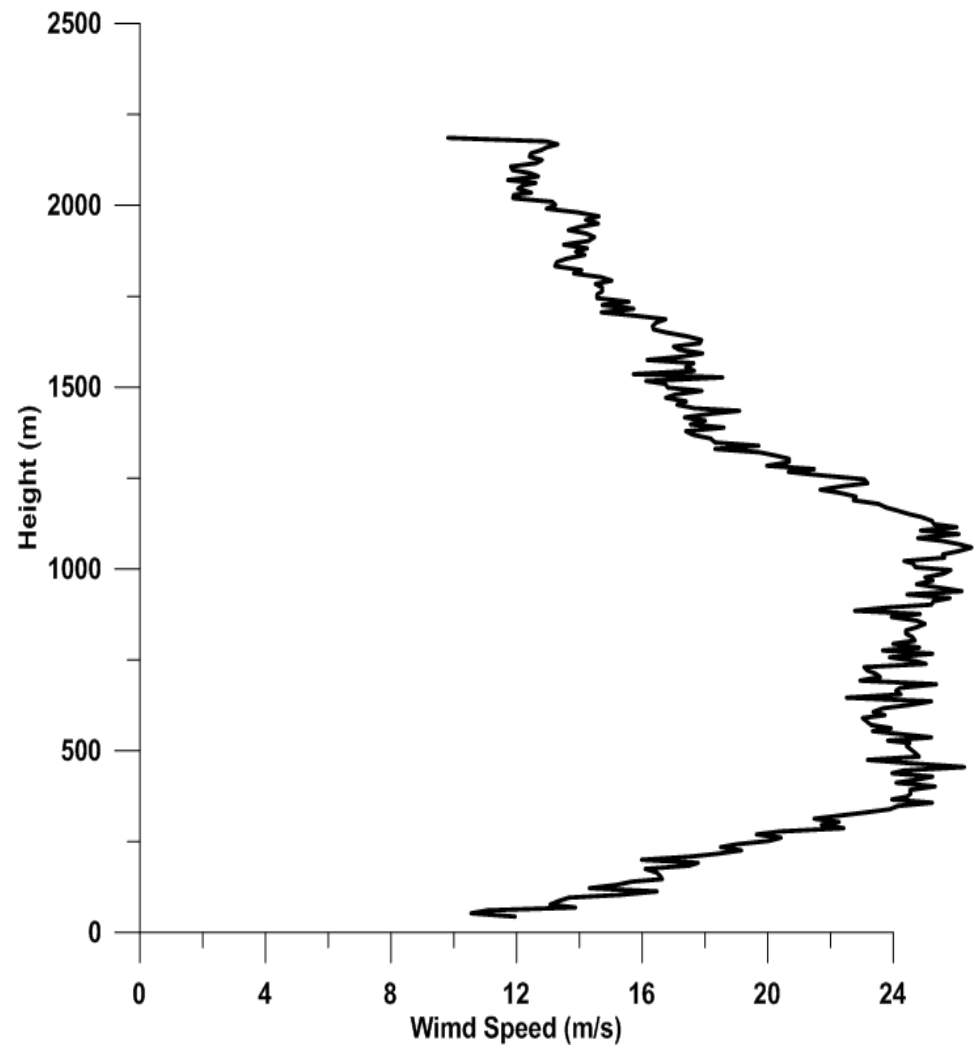
Drop_20150521_203004 Wind Speed (m/s)



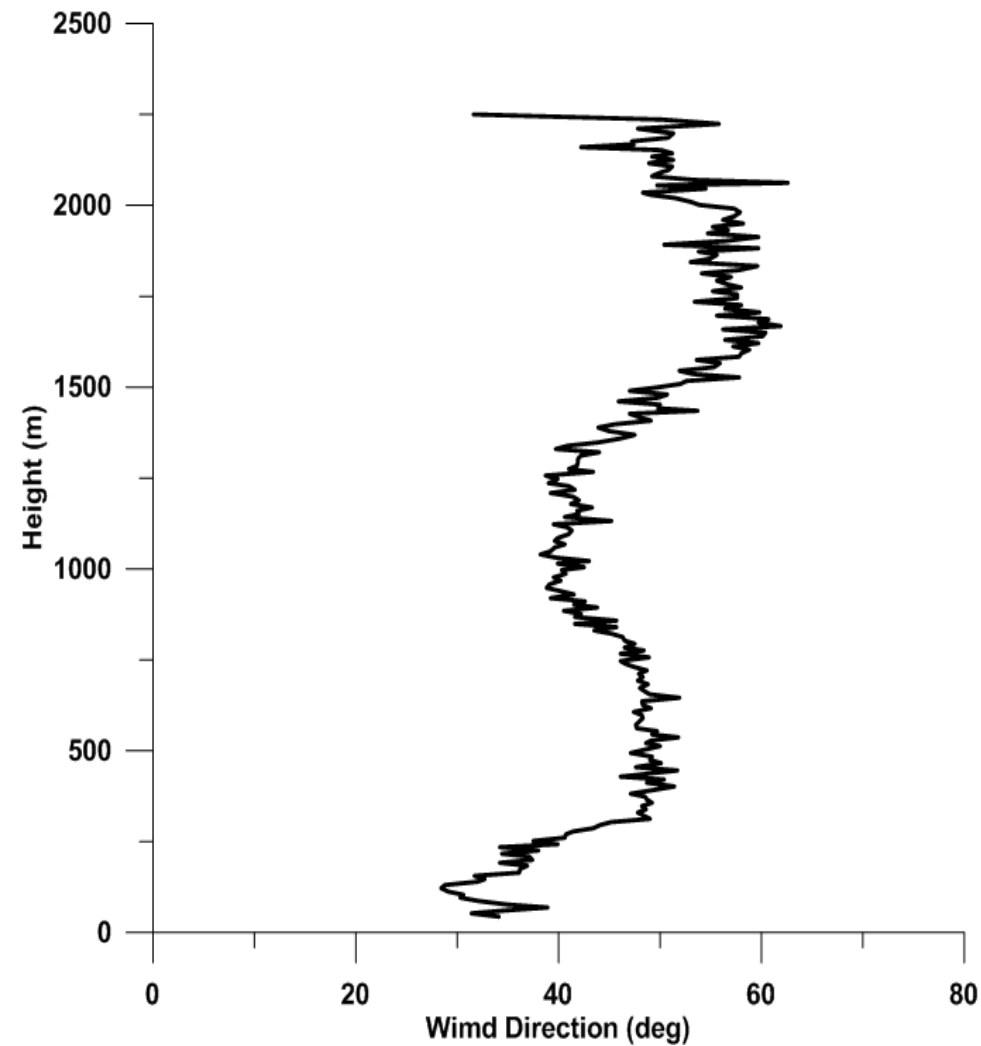
Drop_20150521_203004 Wind Direction (deg)



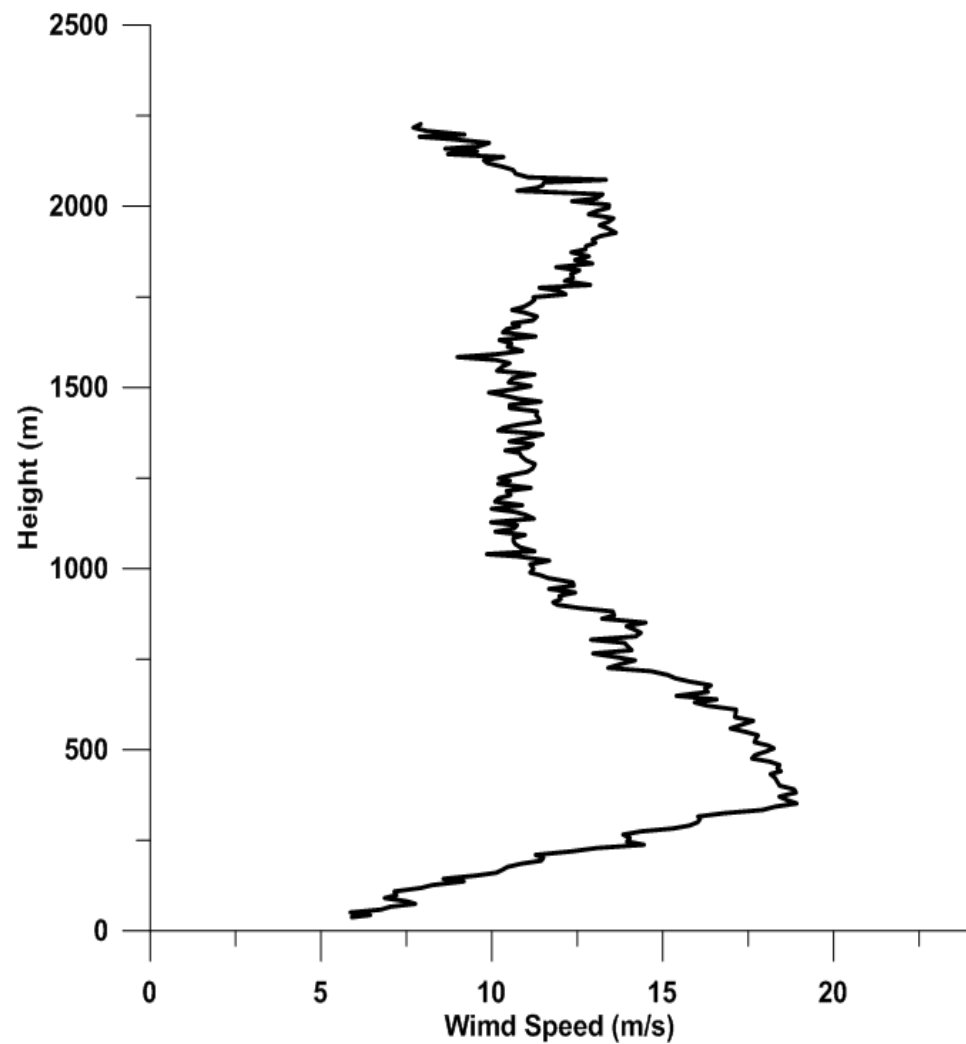
Drop_20150521_204411 Wind Speed (m/s)



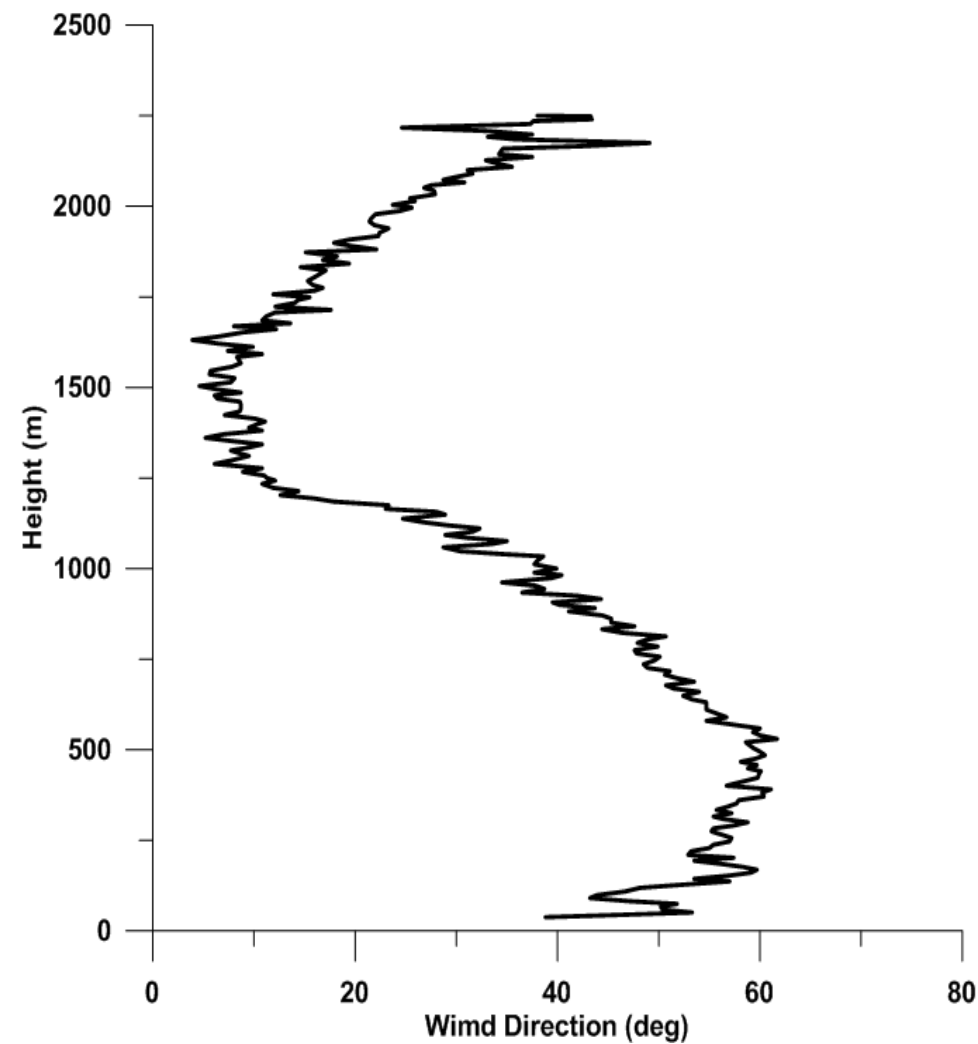
Drop_20150521_204411 Wind Direction (deg)



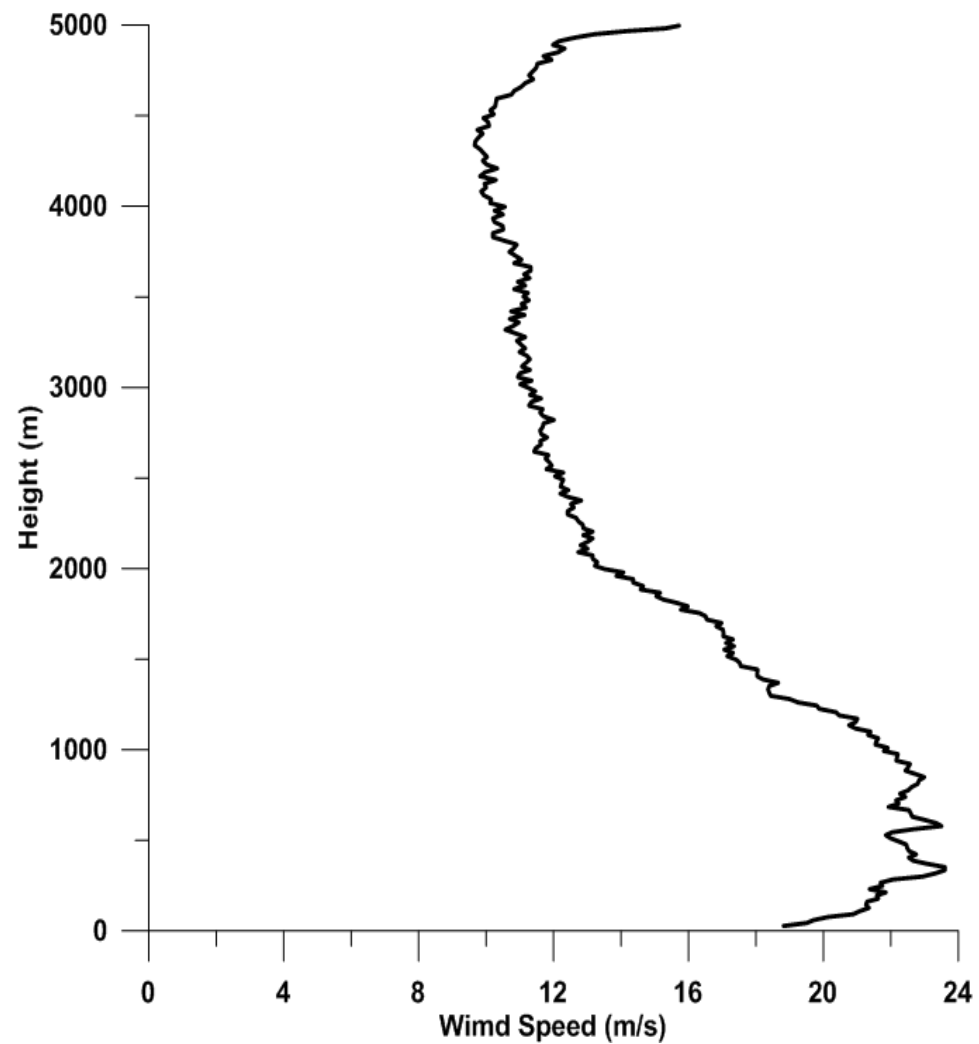
Drop_20150521_205909 Wind Speed (m/s)



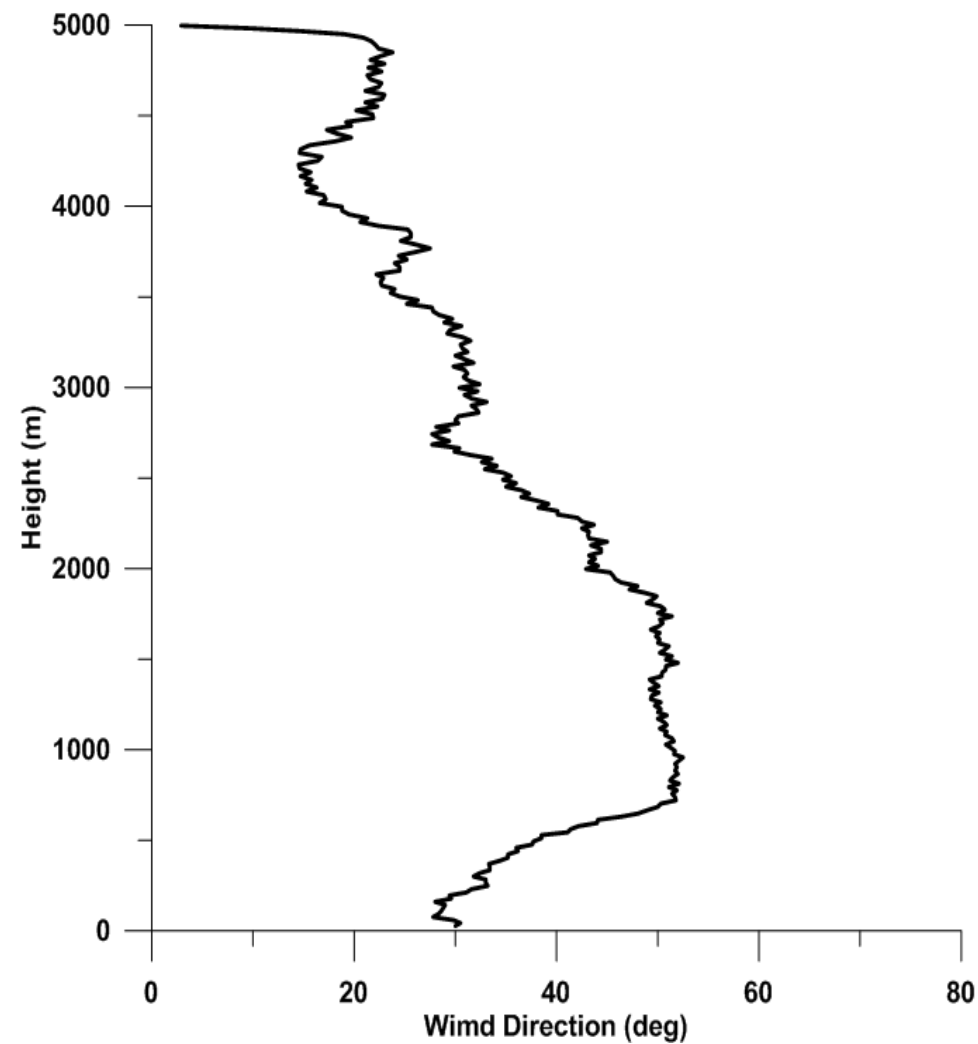
Drop_20150521_205909 Wind Direction (deg)



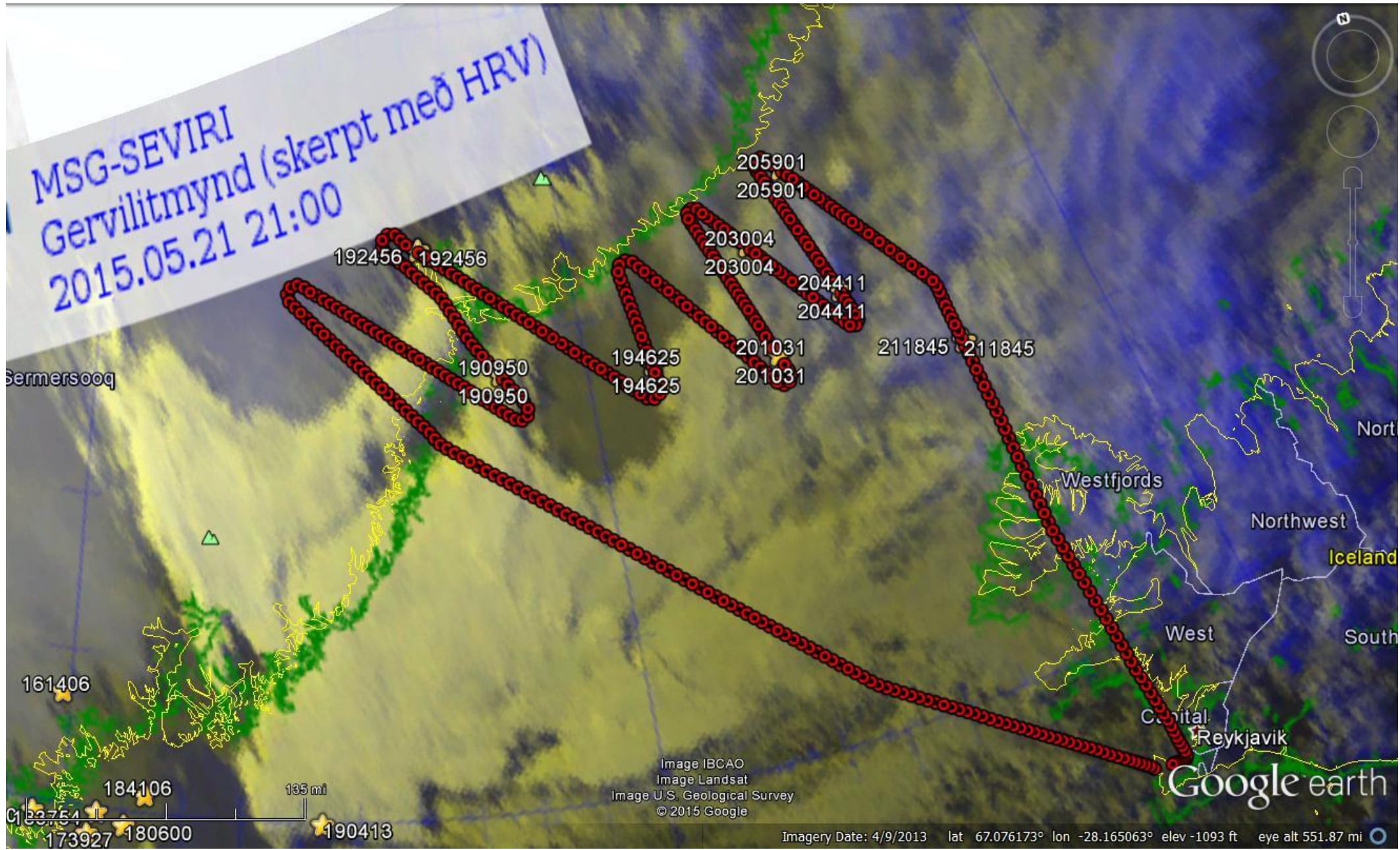
Drop_20150521_211845 Wind Speed (m/s)



Drop_20150521_211845 Wind Direction (deg)

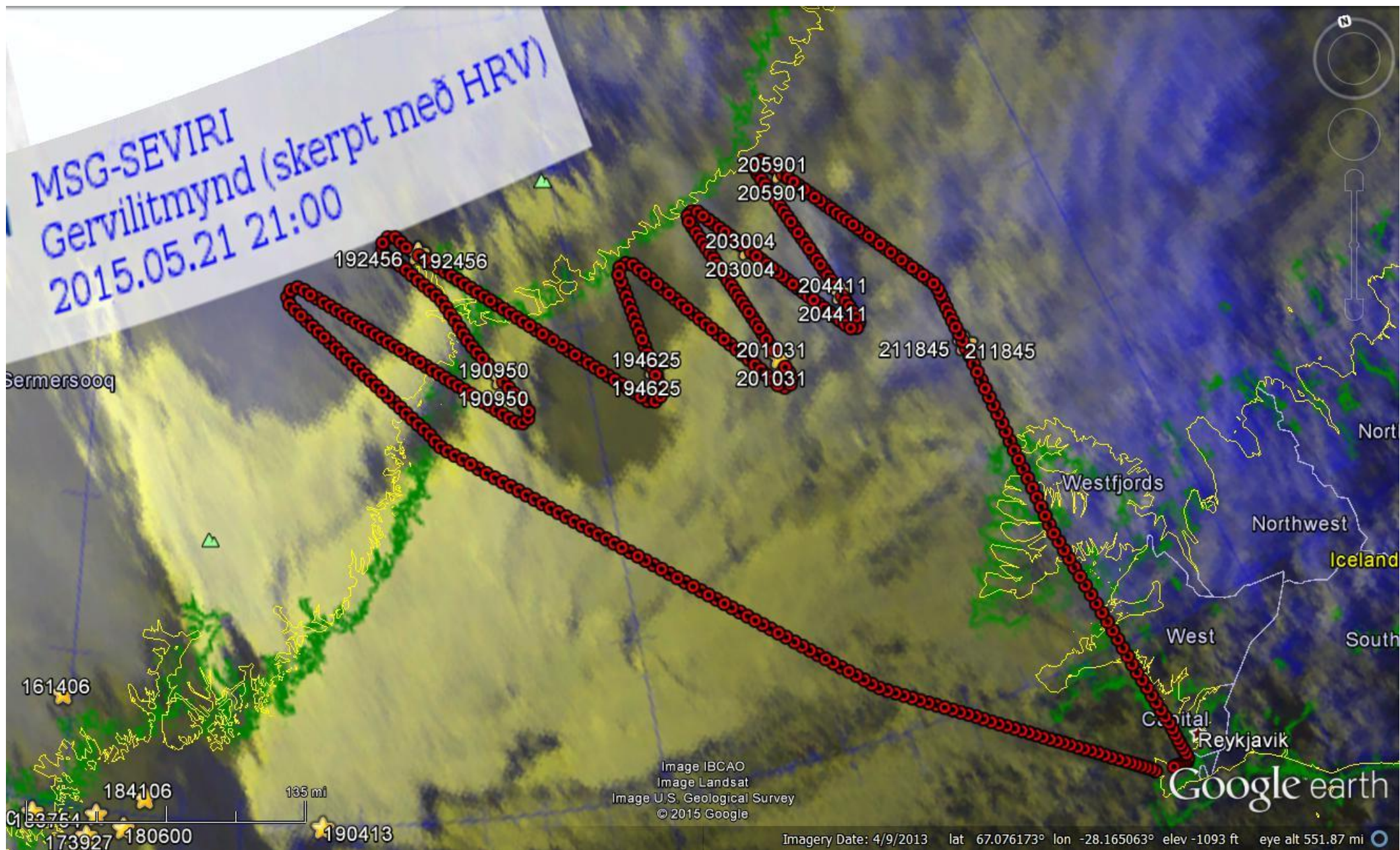


Dropsonde and DAWN Locations

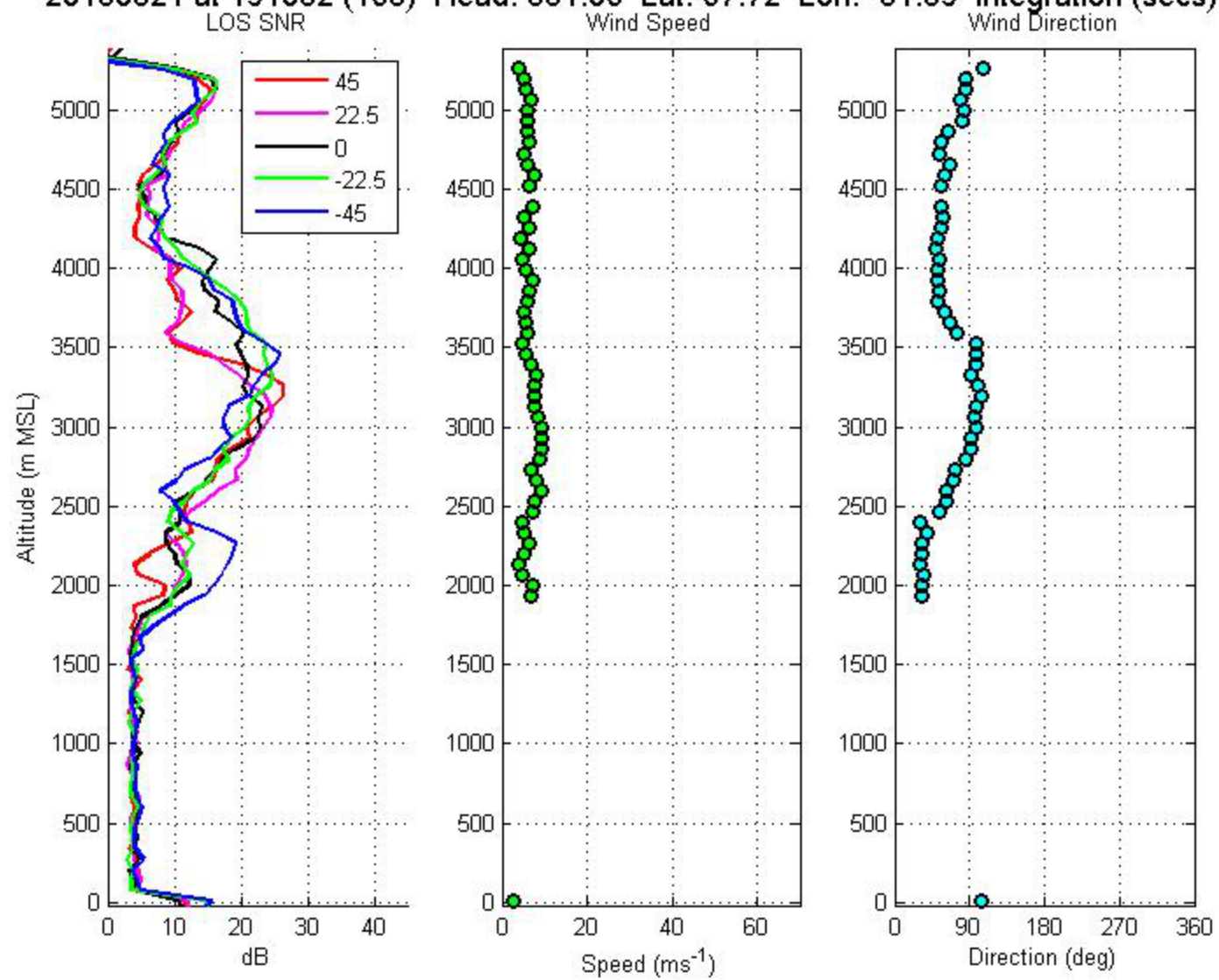


DAWN Profiles

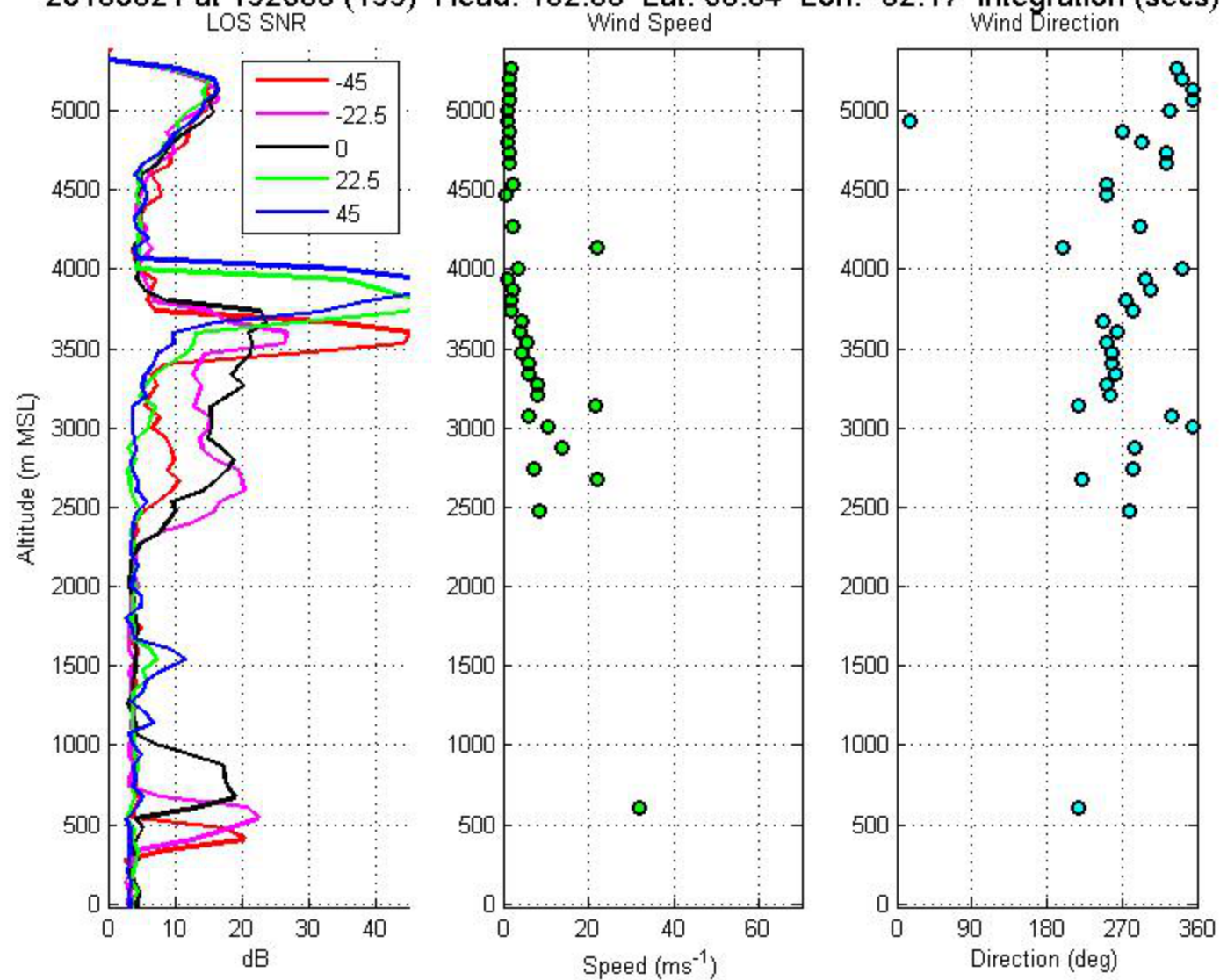
Near Each Dropsonde



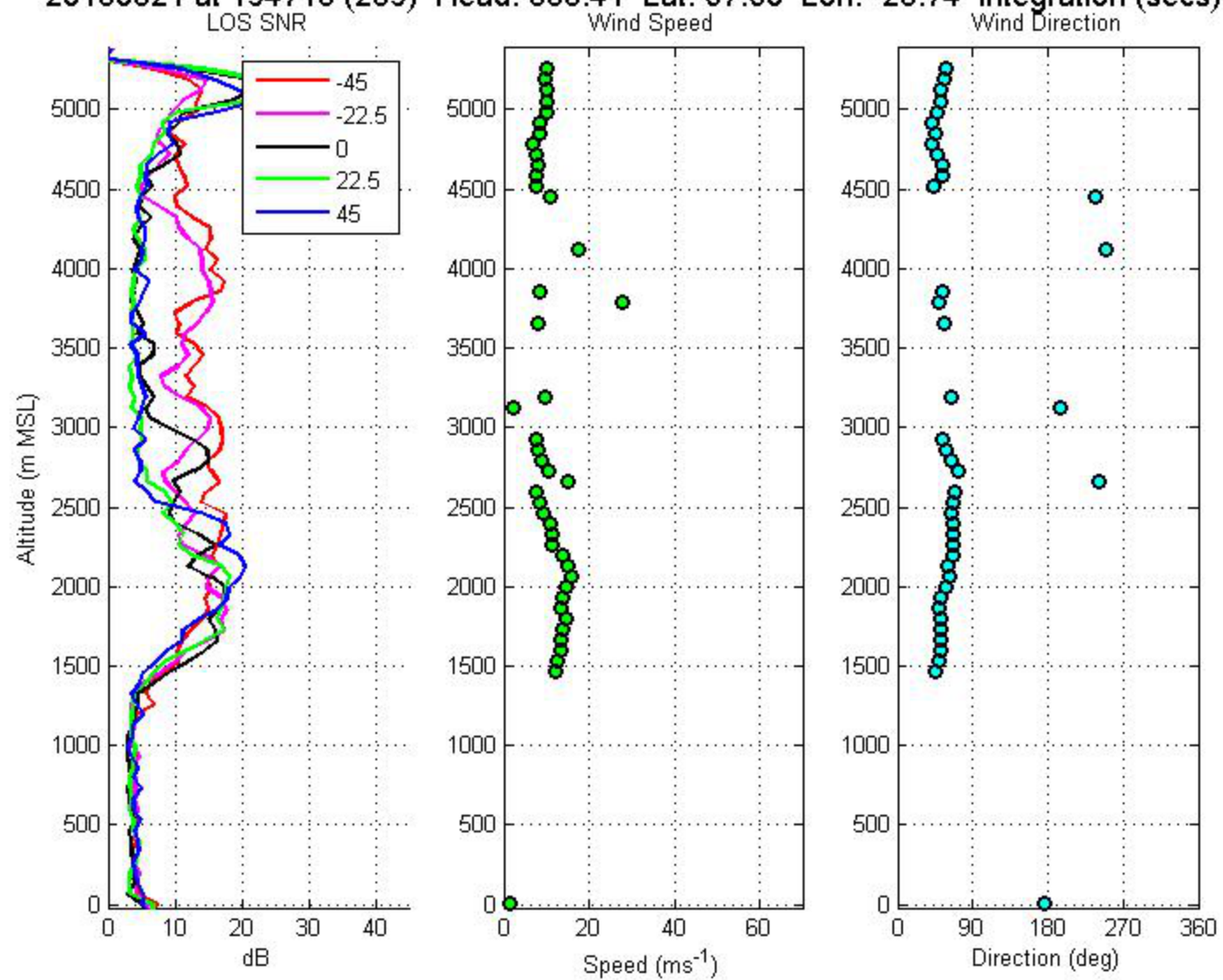
20150521 at 191032 (168) Head: 331.06 Lat: 67.72 Lon: -31.39 Integration (secs): 4



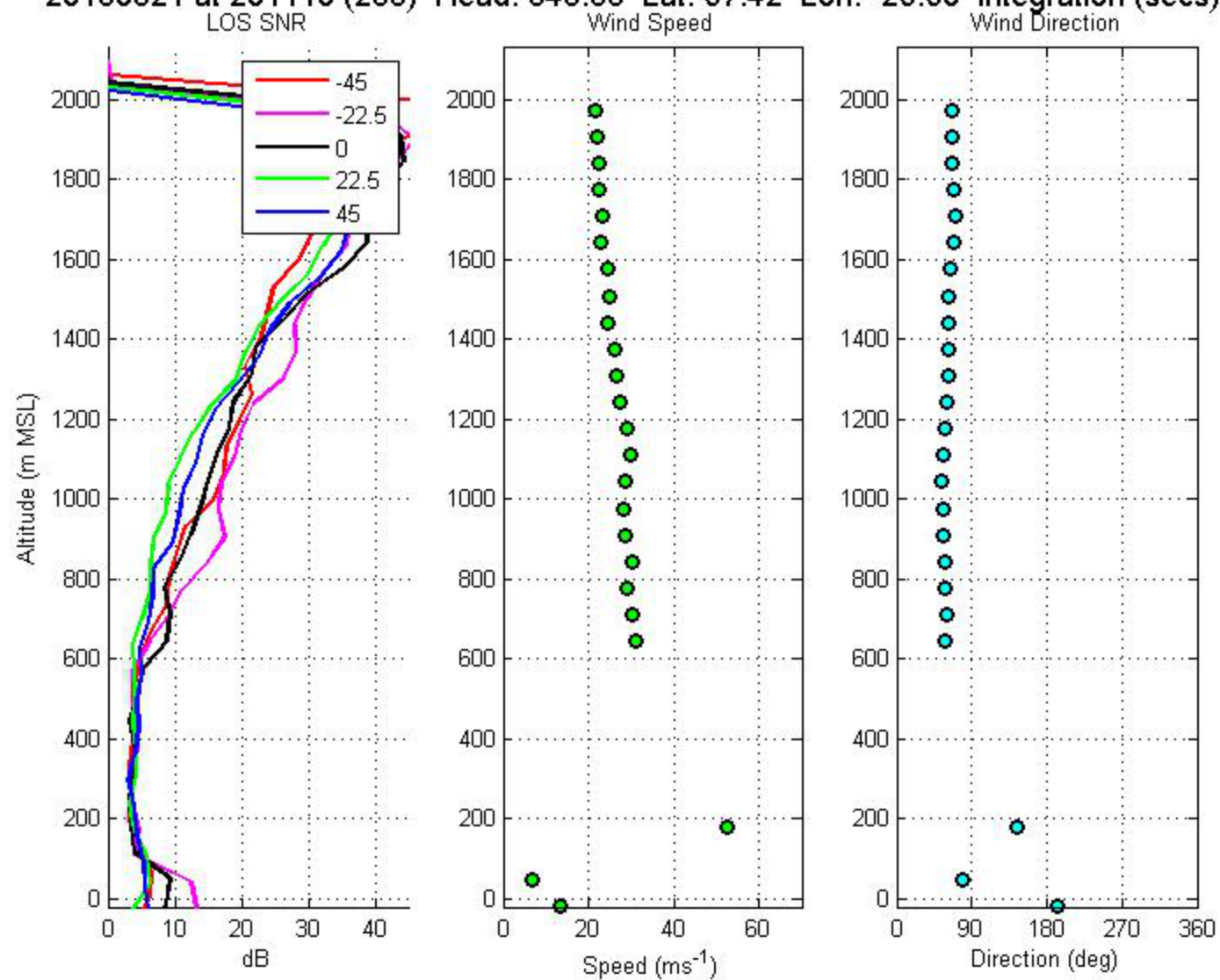
20150521 at 192635 (199) Head: 132.38 Lat: 68.54 Lon: -32.17 Integration (secs): 4



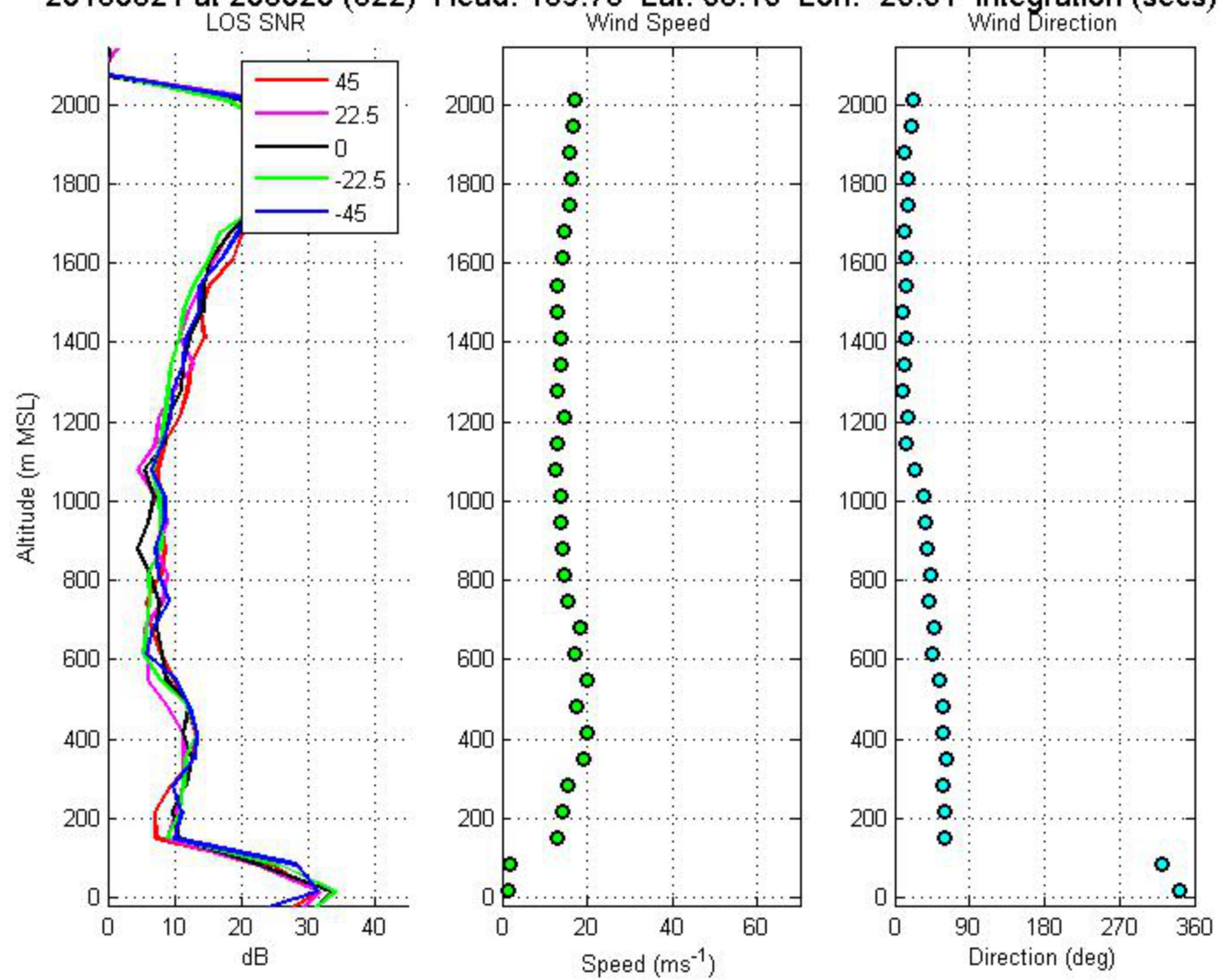
20150521 at 194718 (239) Head: 355.41 Lat: 67.60 Lon: -28.74 Integration (secs): 4



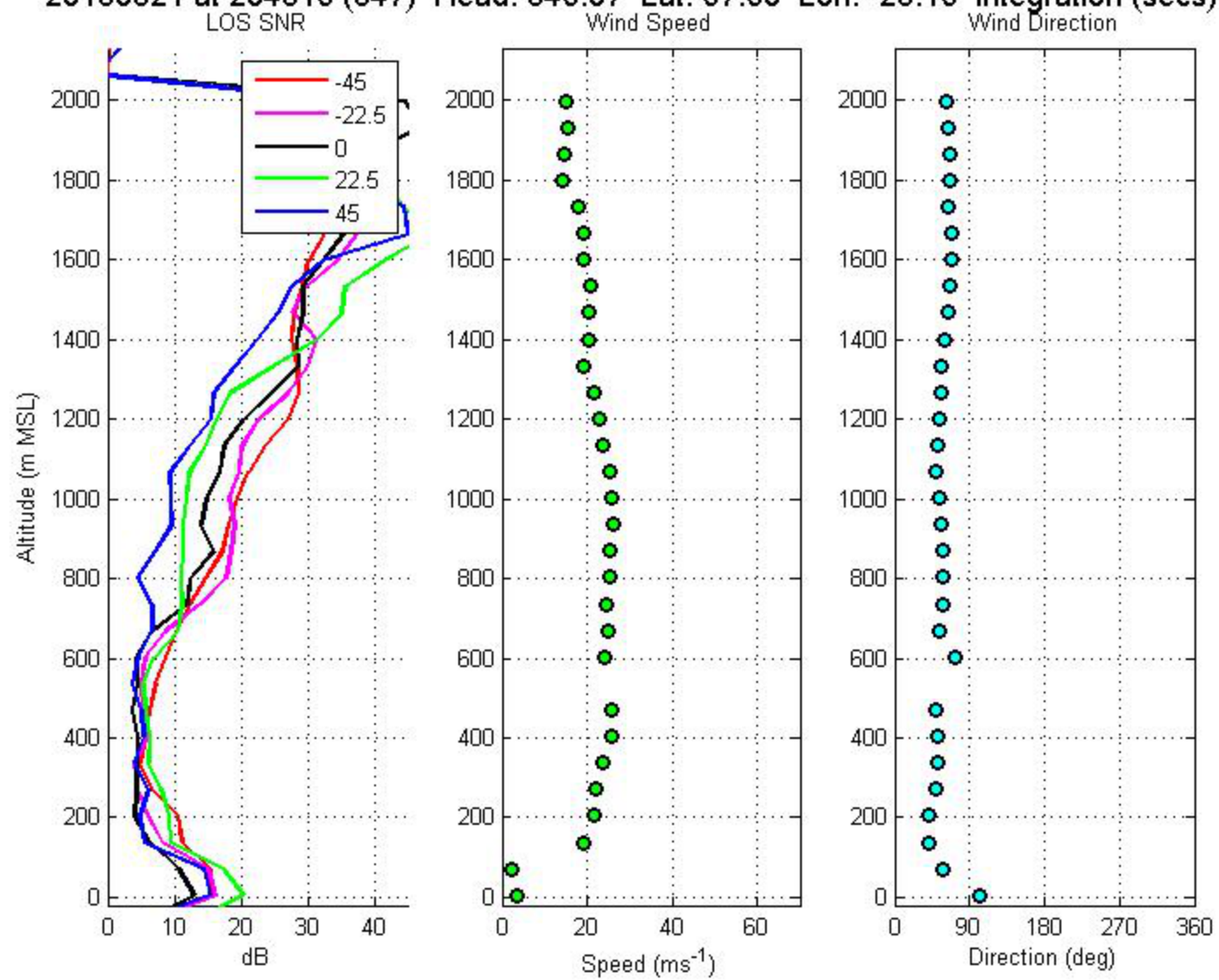
20150521 at 201110 (285) Head: 345.35 Lat: 67.42 Lon: -26.60 Integration (secs): 4



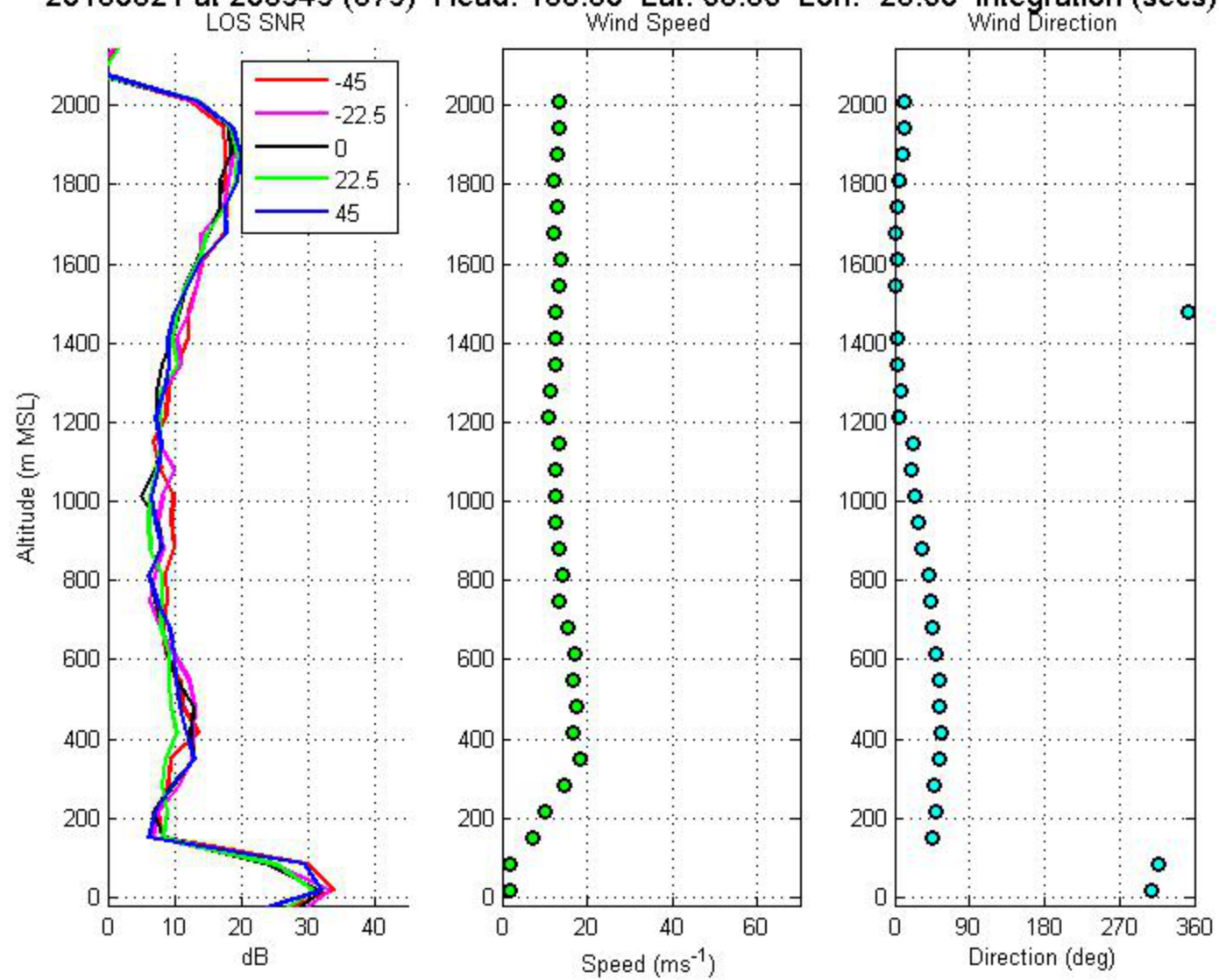
20150521 at 203020 (322) Head: 139.78 Lat: 68.16 Lon: -26.61 Integration (secs): 4



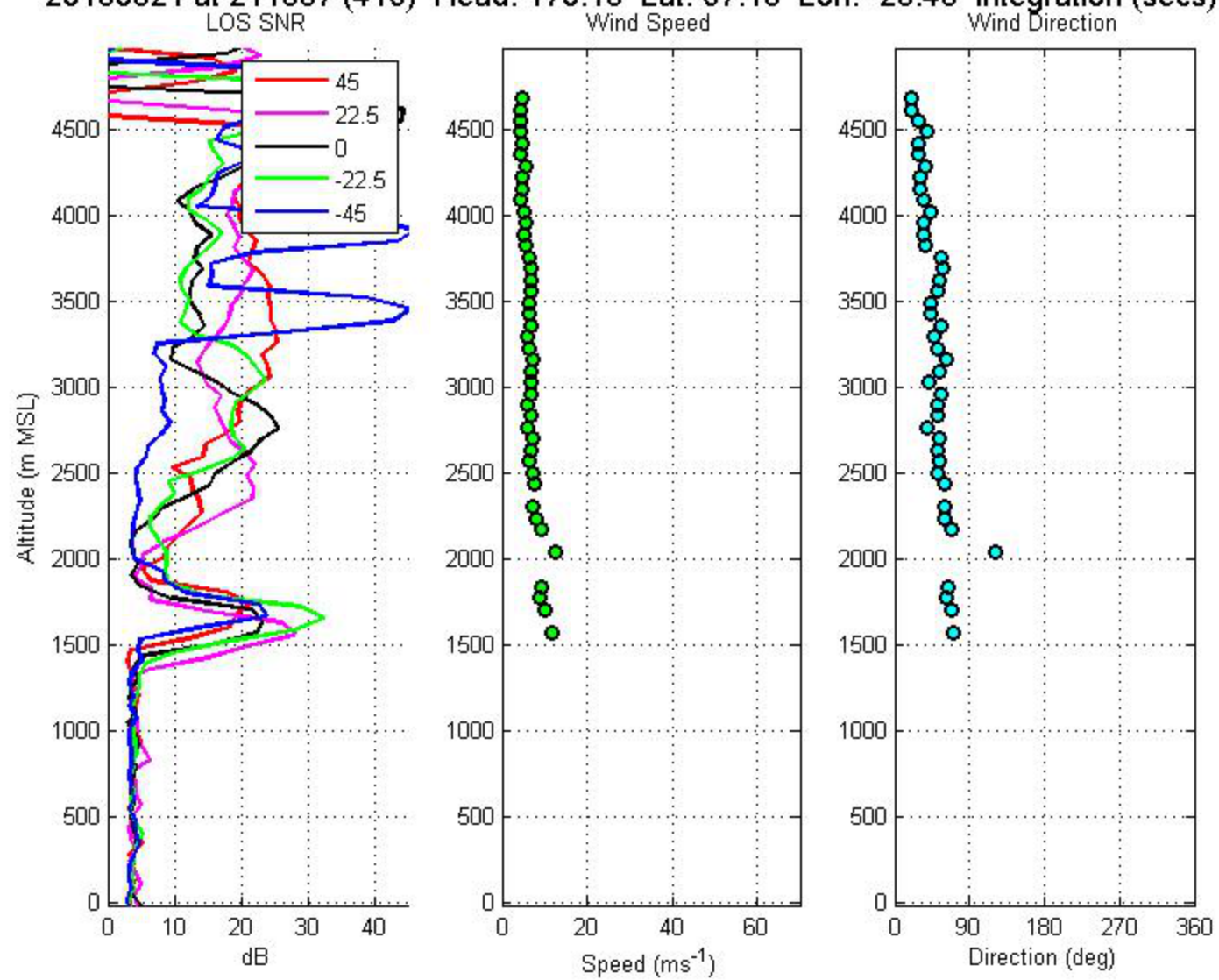
20150521 at 204316 (347) Head: 346.07 Lat: 67.60 Lon: -25.16 Integration (secs): 4



20150521 at 205949 (379) Head: 138.80 Lat: 68.56 Lon: -25.60 Integration (secs): 4



20150521 at 211857 (416) Head: 170.18 Lat: 67.15 Lon: -23.48 Integration (secs): 4



Model and Model Profile

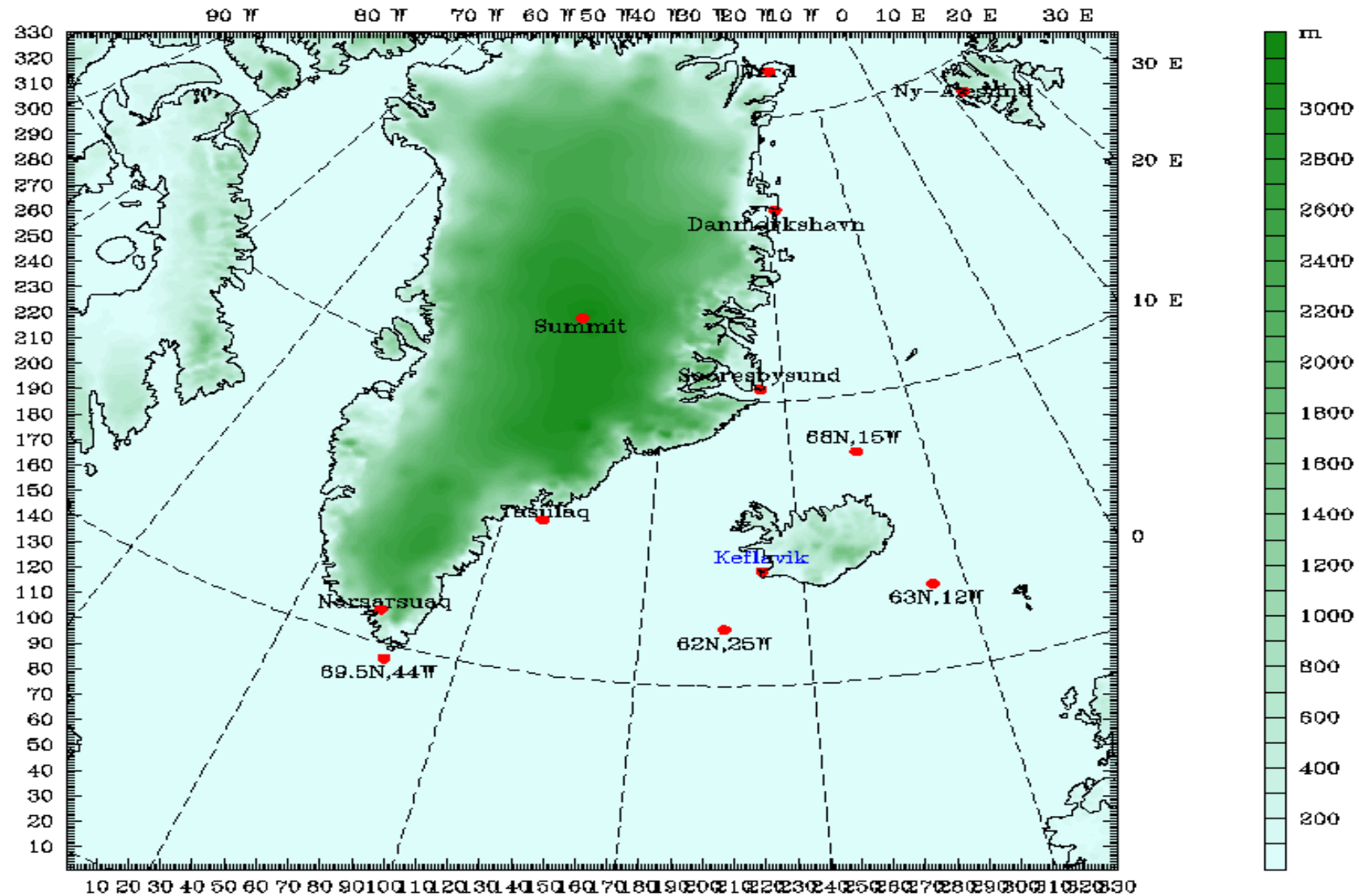
Polar Winds Model Specifications

WRF 3.6.1 with OSU BPCRC polar optimizations (Polar WRF)

- 330 x 330 one-domain grid with 8 km spacing
- 48 layers: Lowest levels at 7 and 14 m; 8 layers at lowest 500 m;
- 60-sec time step; run with 20 tasks; 48-hr runs; output every 3 hr
- Morrison 2-moment microphysics
- RRTMG longwave and shortwave radiation
- Grell-3 cumulus parameterization
- MYJ Planetary boundary layer and surface boundary layer
- Noah Land surface model
- Fractional sea ice 1.5 m thick; albedo 0.82; 5 cm snow on sea ice
- Run TWICE a day with 00 & 12 UTC as its initial times
- IC and BC interpolated from the daily (00, 12Z) NCEP GFS

Polar Winds NWP
Fcst: 0.00 h
Terrain height AMSL

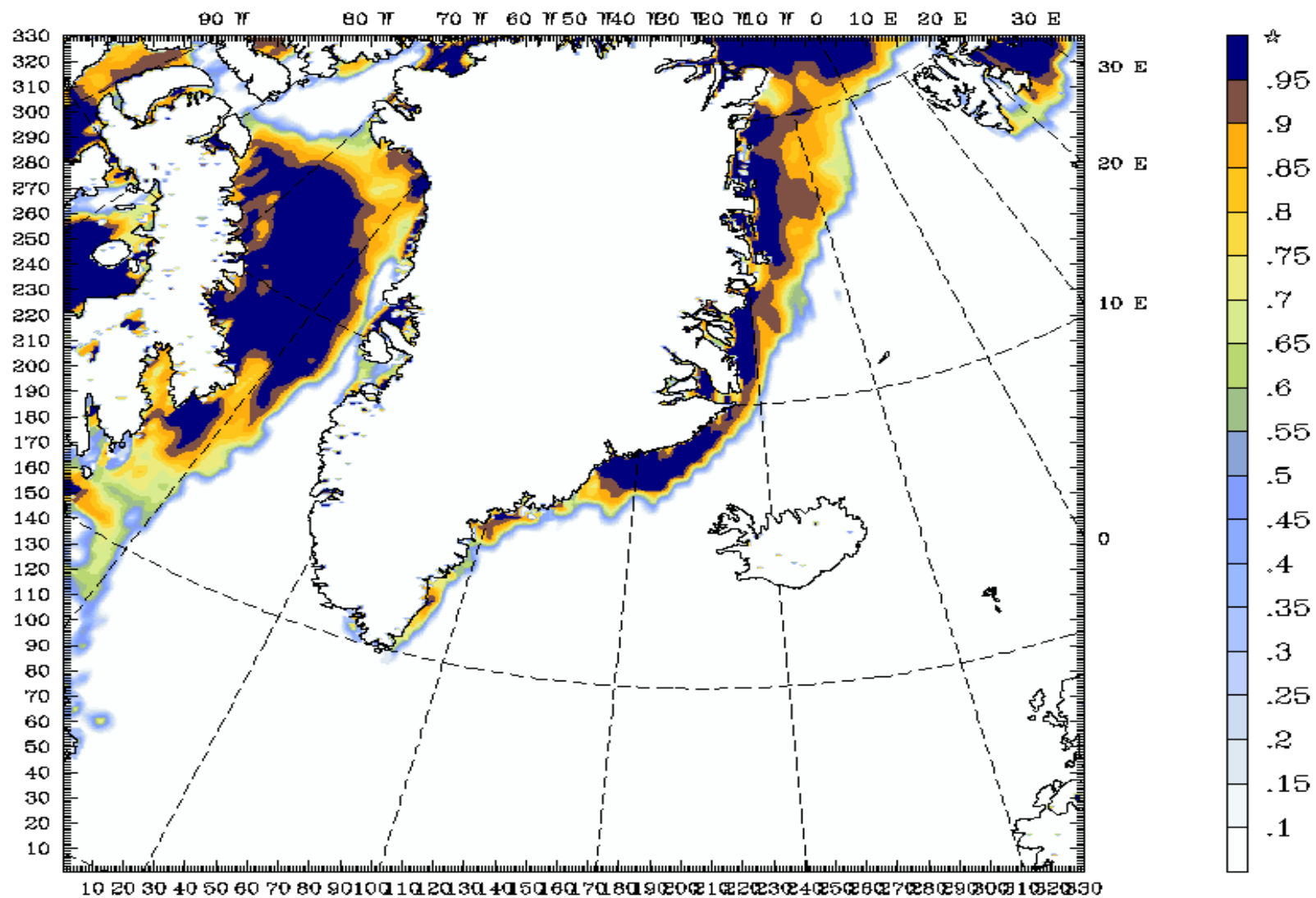
Init: 0000 UTC Fri 29 May 15
Valid: 0000 UTC Fri 29 May 15 (0000 LST Fri 29 May 15)



Model Info: V3.6.1 G3 MYJ PBL Morrison Noah LSM 10 km, 47 levels, 60 sec
LW: RRTMG SW: RRTMG DIFF: simple KM: 2D Smagor

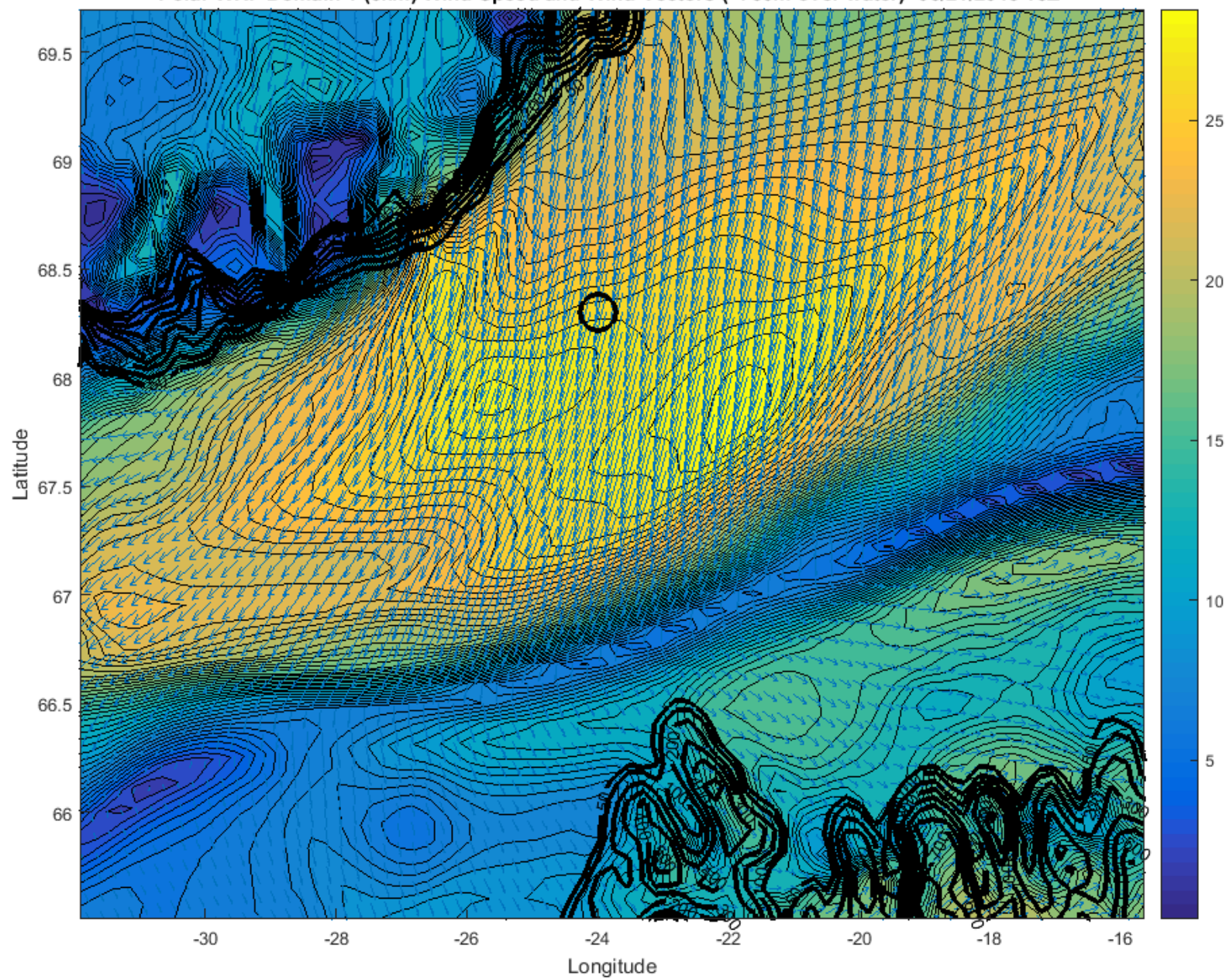
Polar Winds NWP
Fcst: 0.00 h
SEA ICE FLAG

Init: 0000 UTC Fri 29 May 15
Valid: 0000 UTC Fri 29 May 15 (0000 LST Fri 29 May 15)



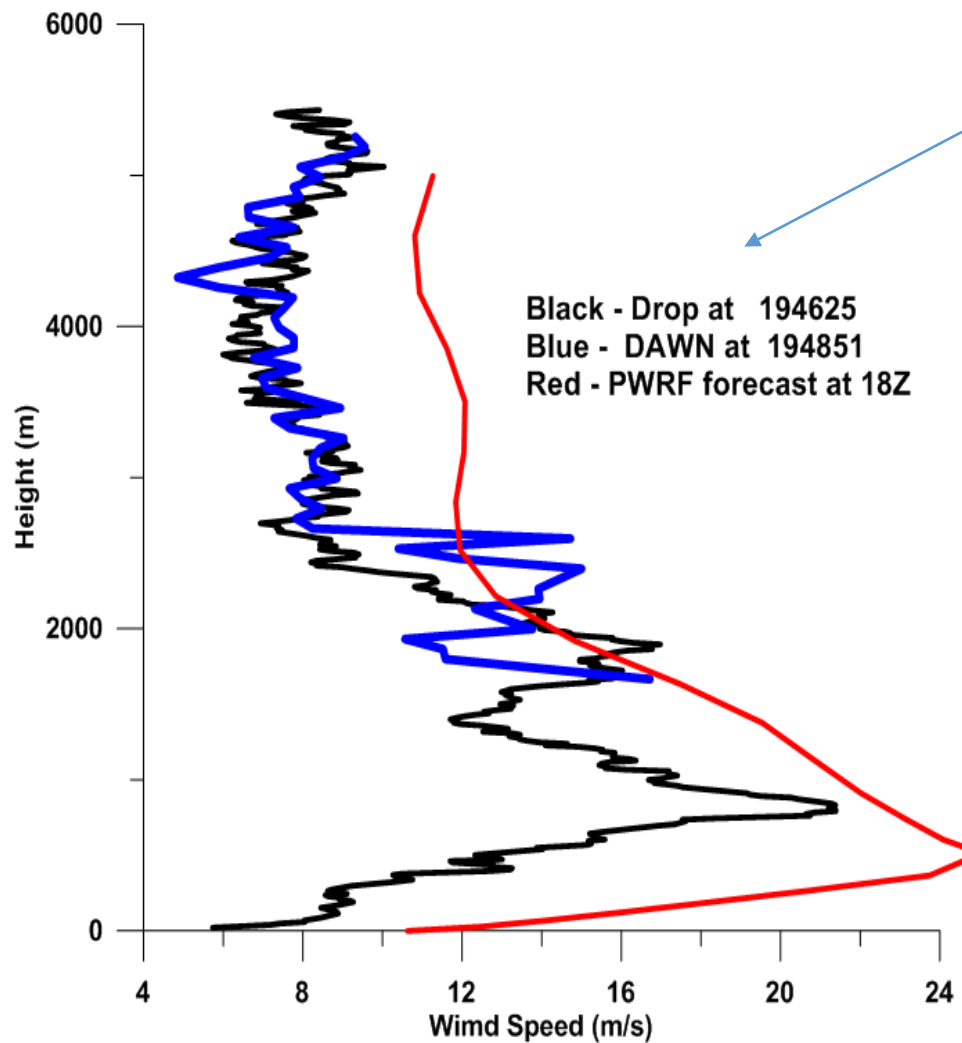
Model Info: V3.6.1 G3 MYJ PBL Morrison Noah LSM 10 km, 47 levels, 60 sec
LW: RRTMG SW: RRTMG DIFF: simple KM: 2D Smagor

Polar WRF Domain 1 (8km) Wind Speed and Wind Vectors (~750m over water)- 05/21/2015 18Z

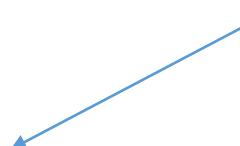


DAWN VS DROPSONDE VS PWRF

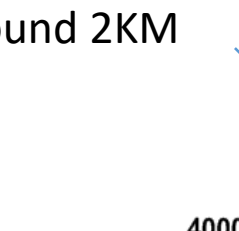
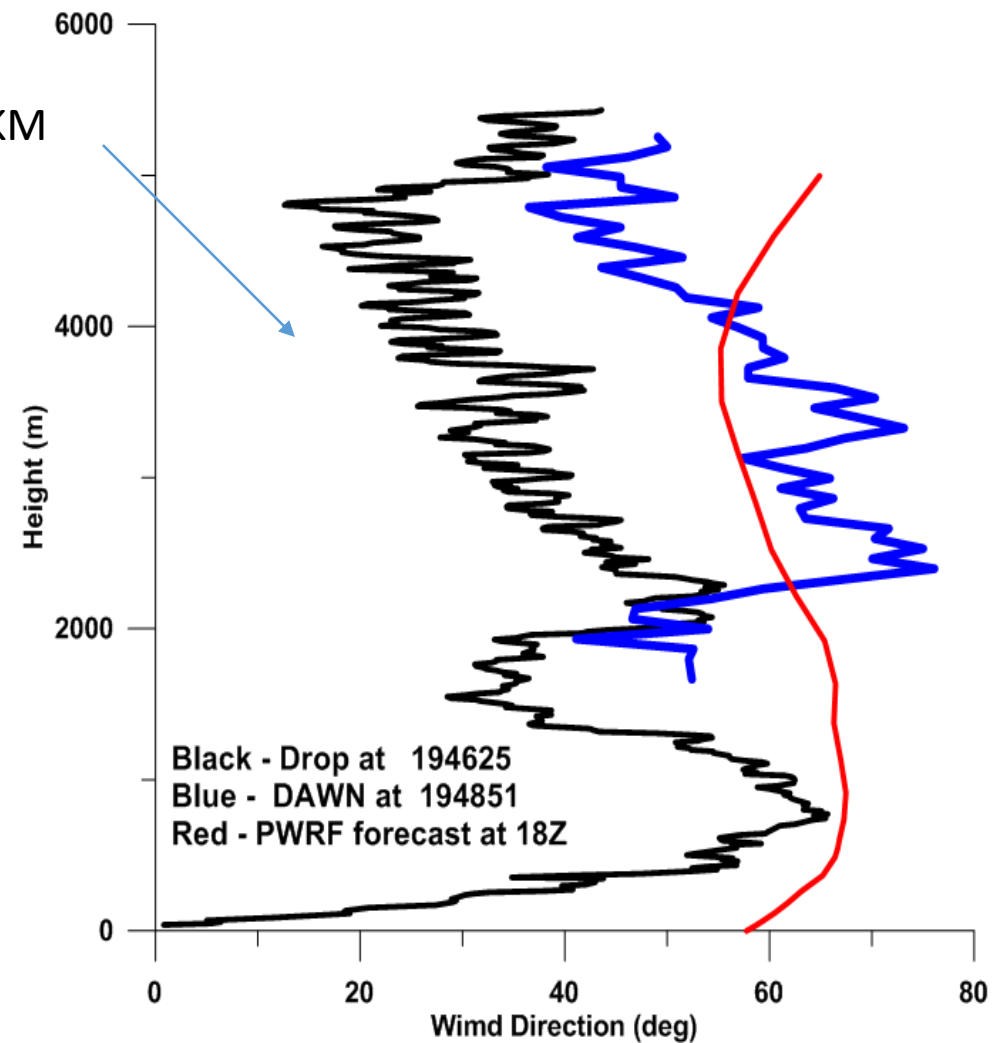
Drop_20150521_194625 Wind Speed (m/s)



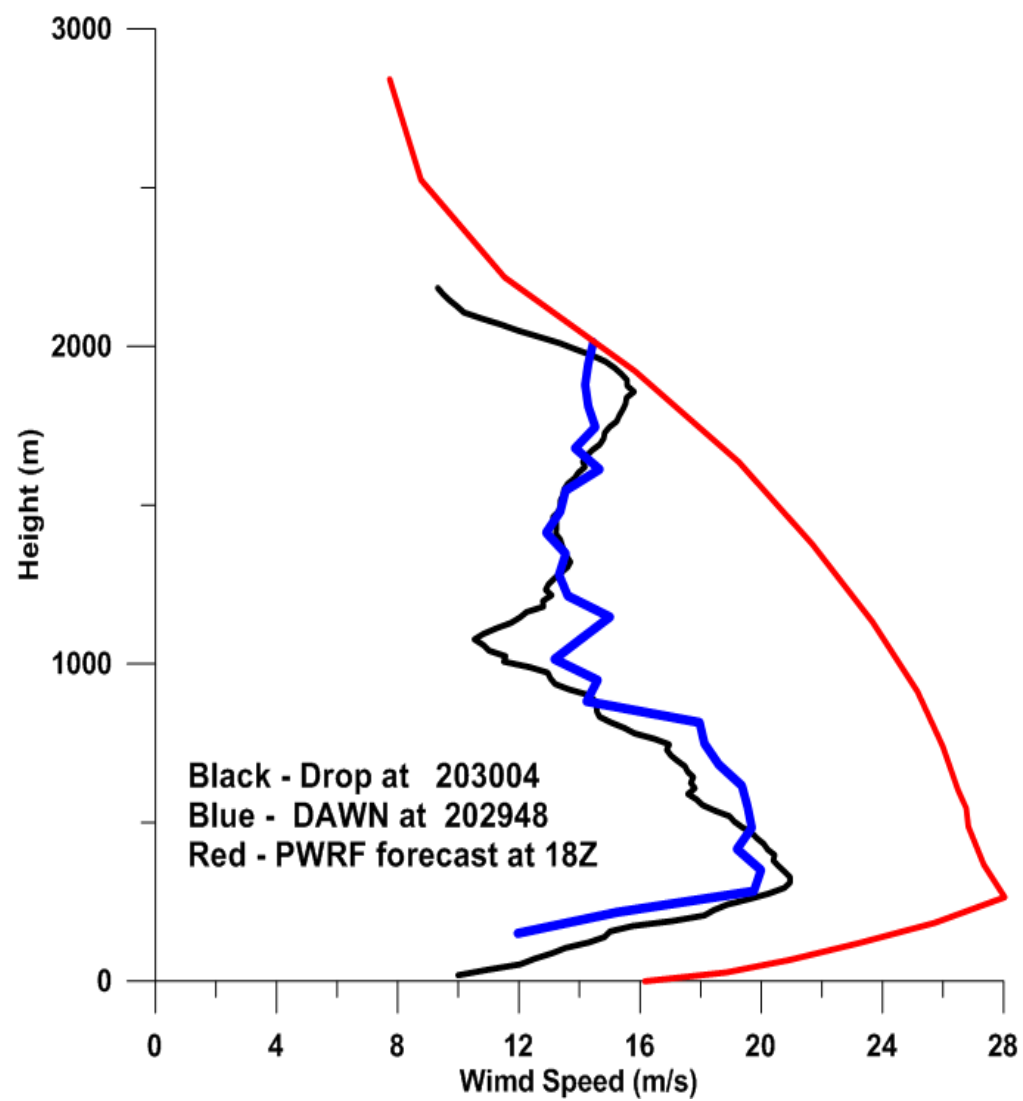
Clouds Around 2KM



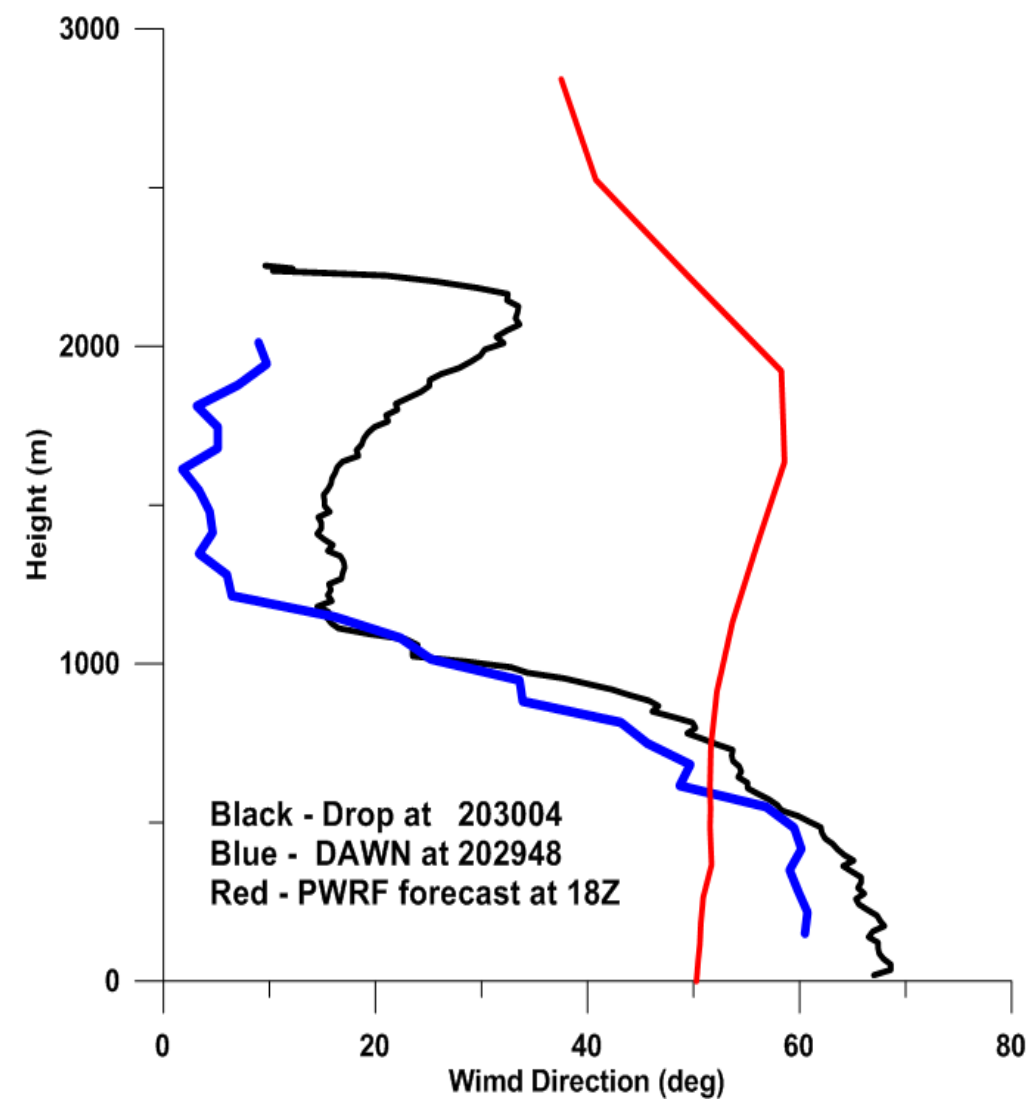
Drop_20150521_194625 Wind Direction (deg)



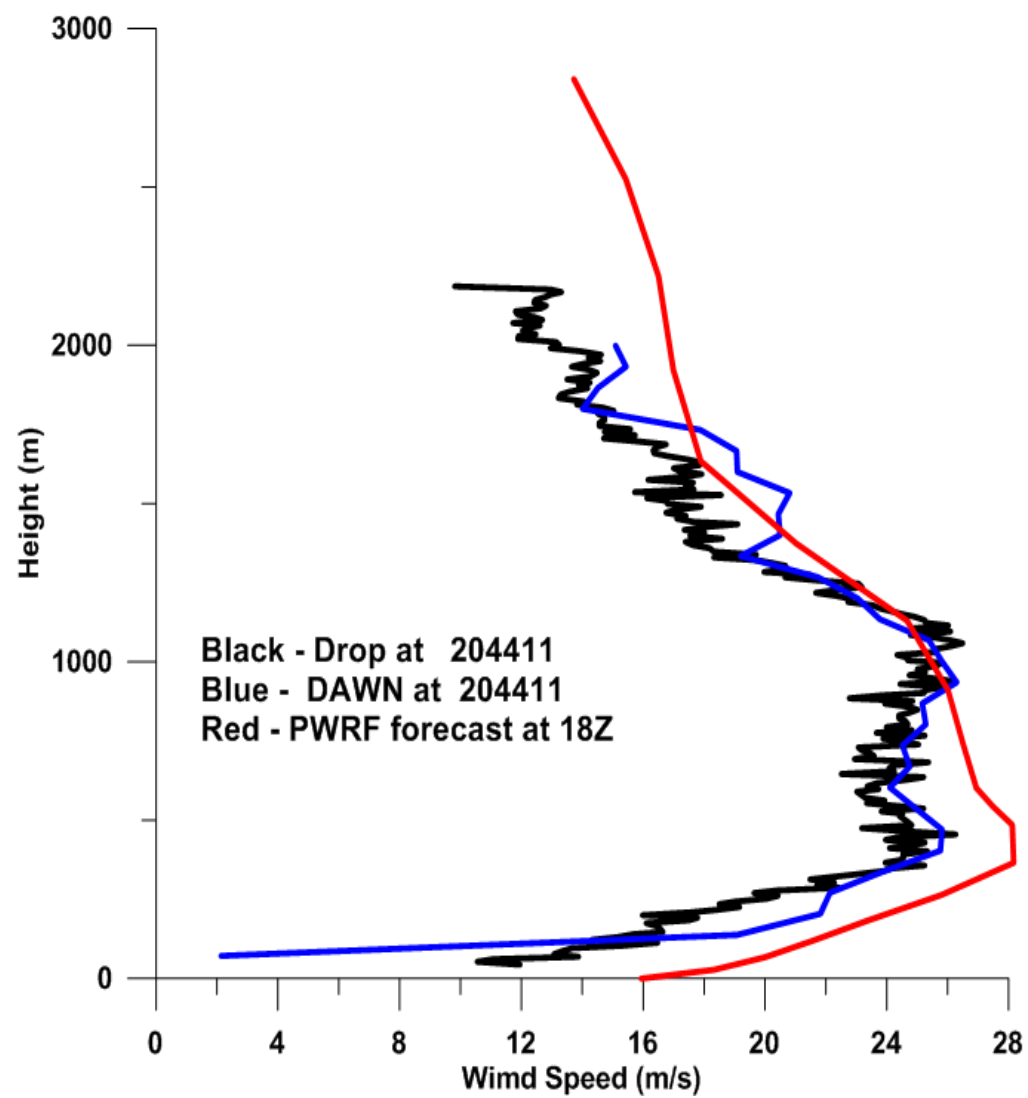
Drop_20150521_203004 Wind Speed (m/s)



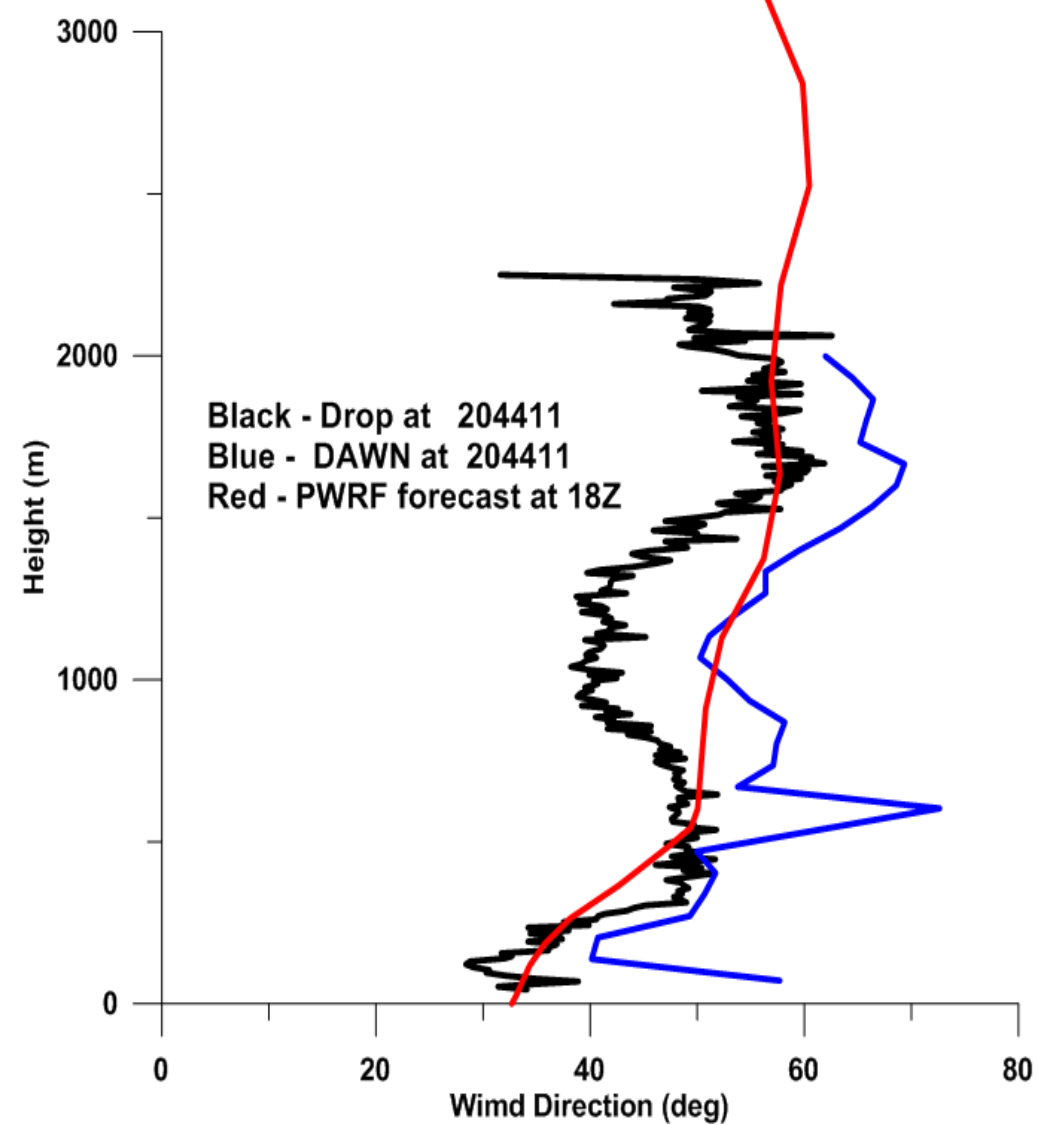
Drop_20150521_203004 Wind Direction (deg)



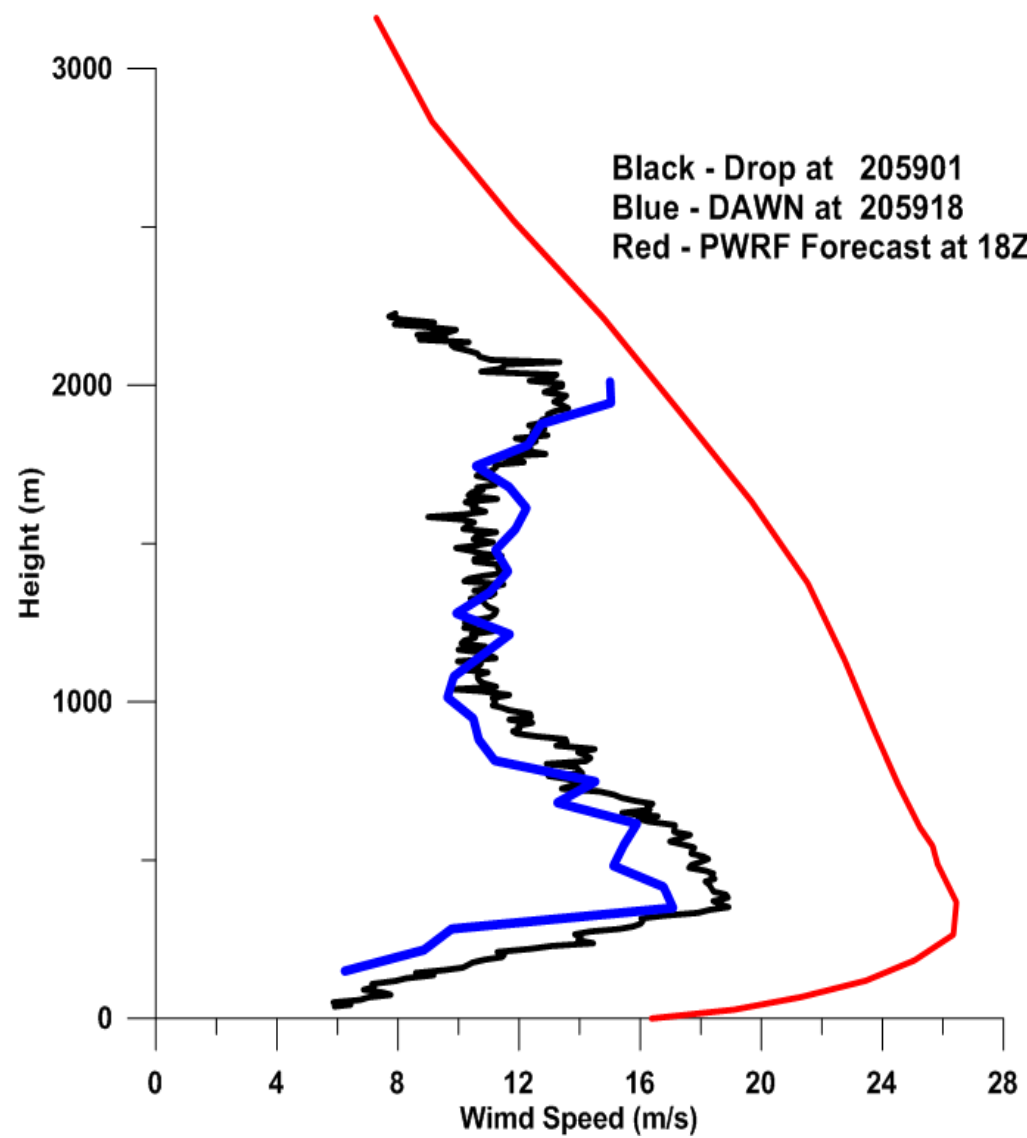
Drop_20150521_204411 Wind Speed (m/s)



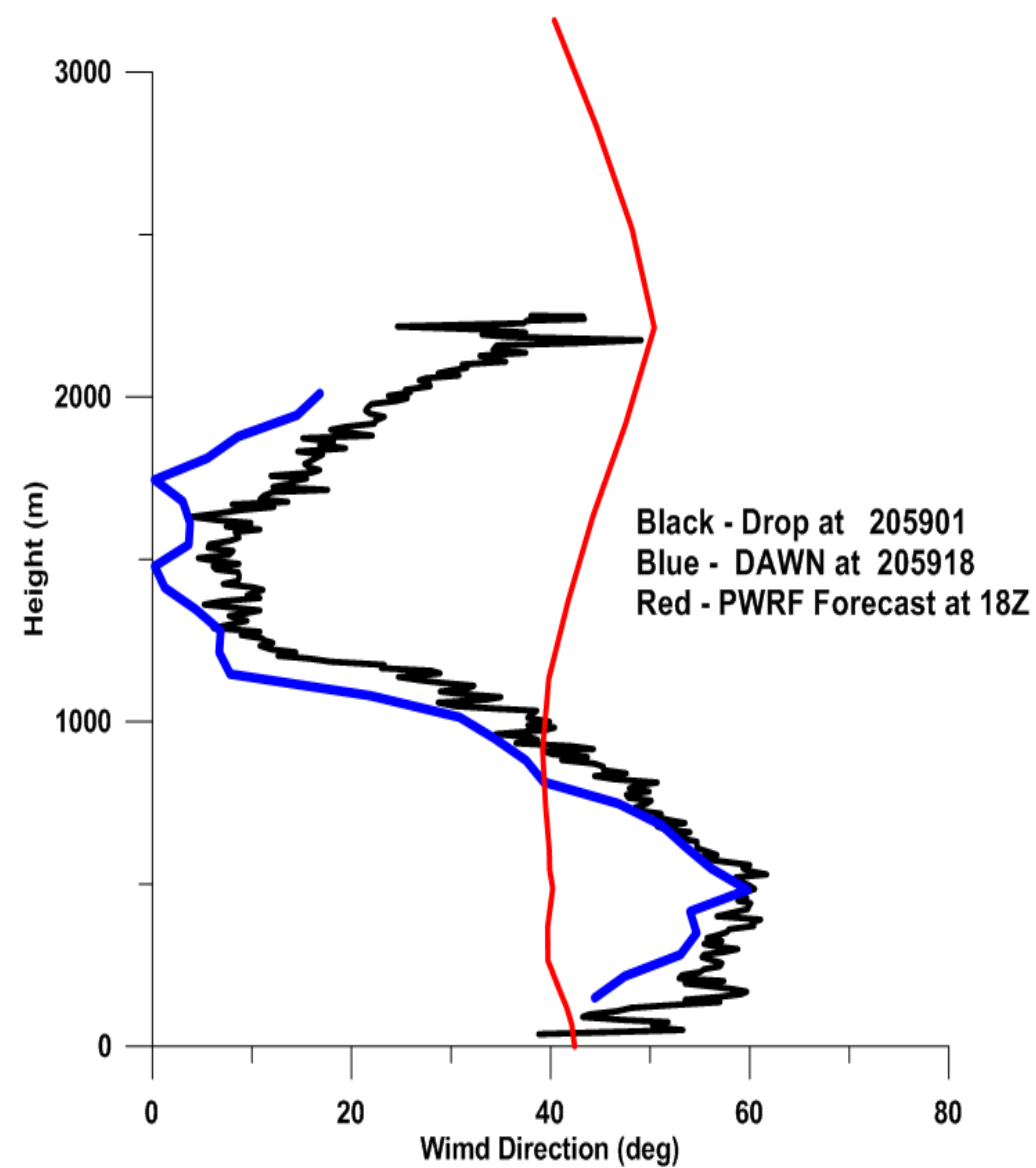
Drop_20150521_204411 Wind Direction (deg)



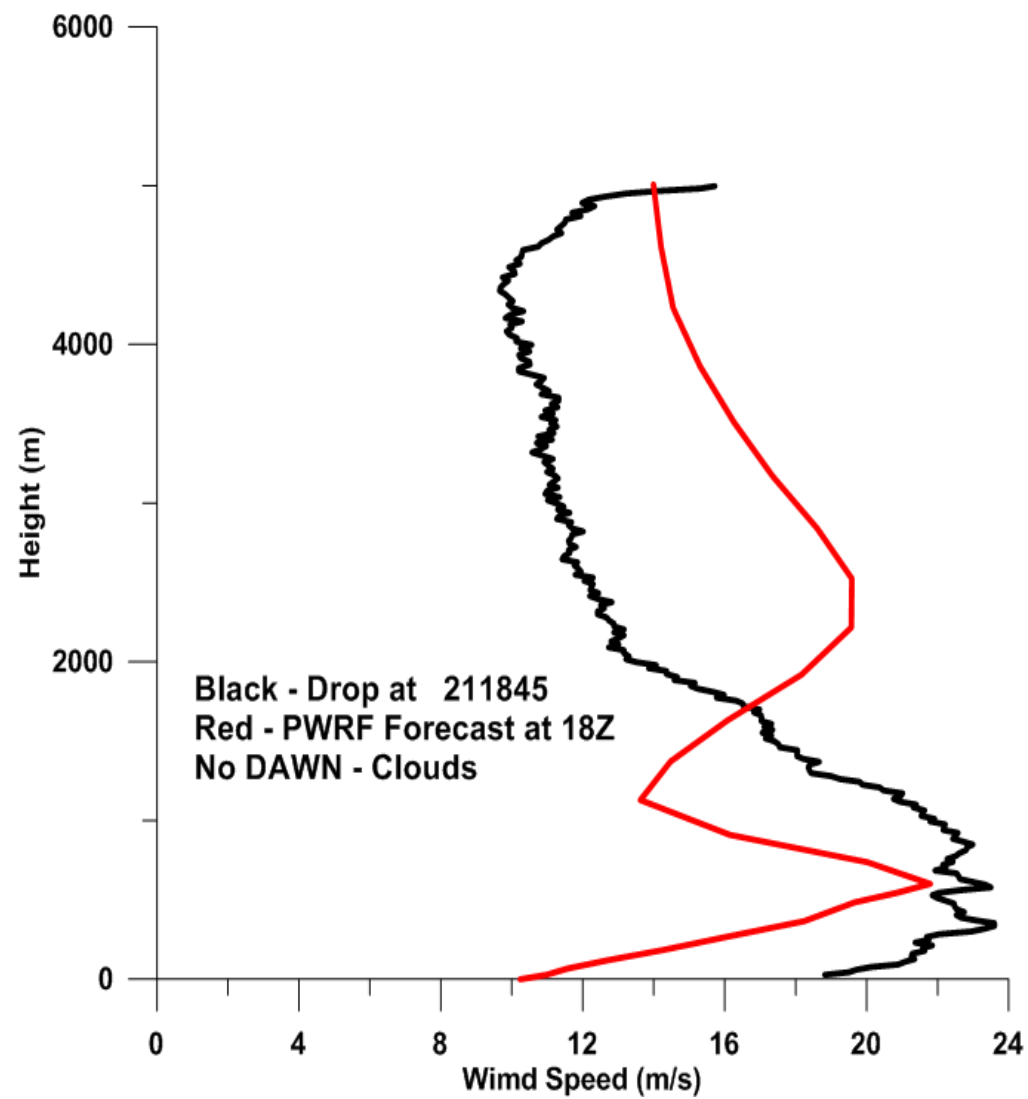
Drop_20150521_205909 Wind Speed (m/s)



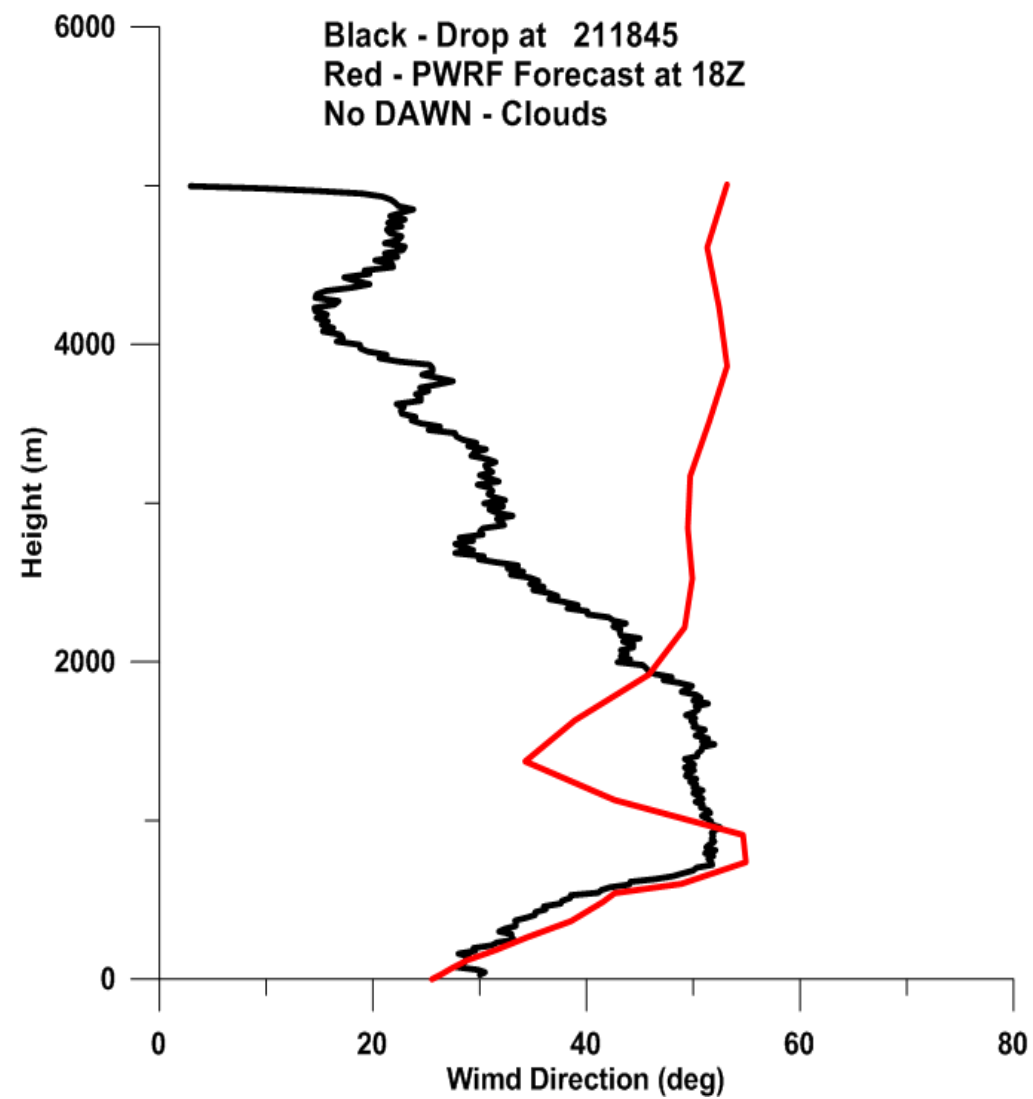
Drop_20150521_205909 Wind Direction (deg)



Drop_20150521_211845 Wind Speed (m/s)



Drop_20150521_211845 Wind Direction (deg)



Summary

- Great case studies for mesoscale model validation and parameterization improvement using both DAWN and Dropsonde data.
- Plans for Colorado University, Ohio State and SWA to conduct case studies for the following additional four situations:
 - May 11: Iceland flow splitting
 - May 16: Katabatic winds off Greenland
 - May 17/19: Greenland Tip Jet
 - May 23: Katabatic winds
 - May 24: Ice edge in Baffin Bay (cloud streets)
- Identify cases where the Falcon lidars provide observations relevant to the cases identified above.
- Collaborate with ESA/DLR on case studies of upper level jets on May 15, 19 and 25.