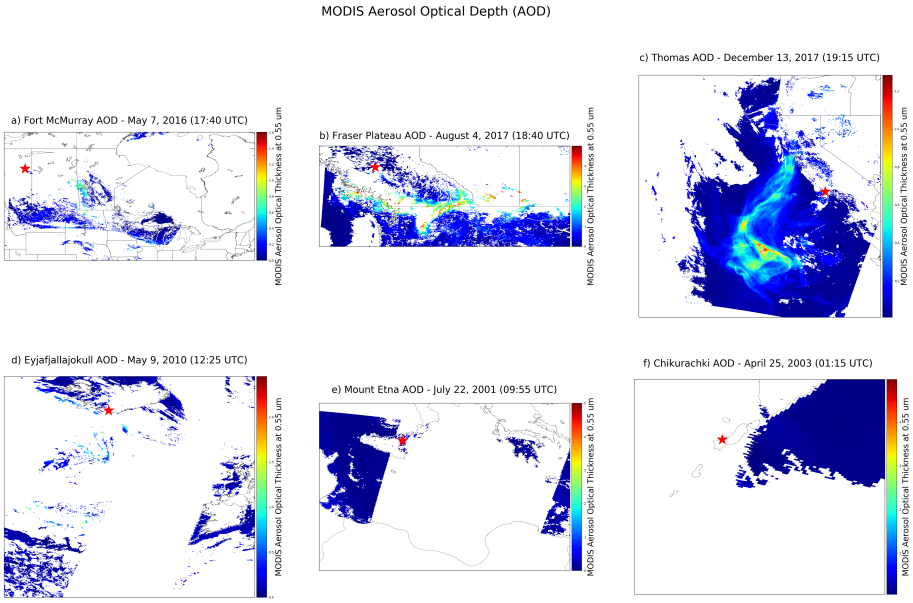
Supplemental Material

Figure 1

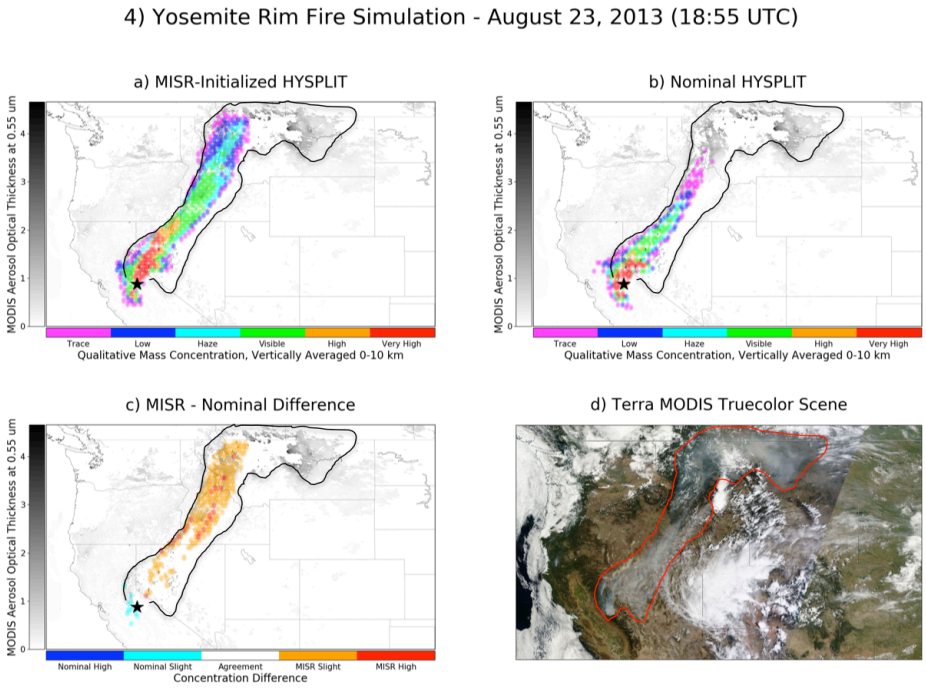


Yosemite Rim Fire Plume, August 2013

The Yosemite Rim Fire was also one of the simulations performed for this study but is temporarily being left in supplemental material. It is possible that the method used to convert BlueSky data into a HYSPLIT compatible format or the BlueSky data itself could be inaccurate since there was an older version of BlueSky in 2013. We are currently waiting on confirmation from the National Center for Environmental Prediction about whether we can call this simulation nominal. The analysis of the simulations that were performed can be found below.

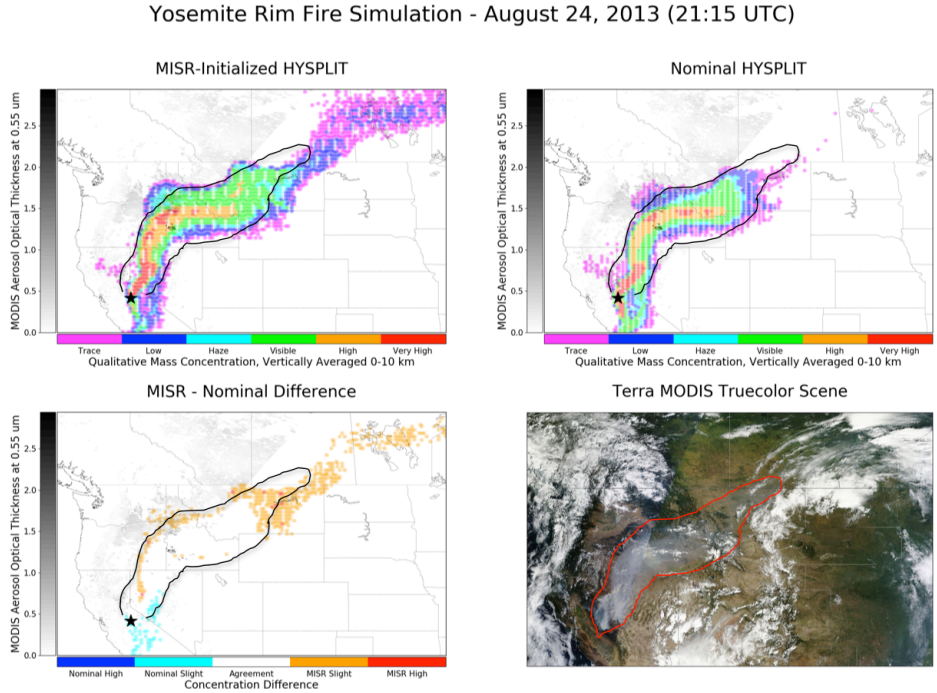
August 23rd, 2013, Day 1 of our Yosemite Rim Fire simulations, shows noticeable differences between the nominal and MISR-initialized plumes. Figure 2b shows the sounding at KRNO (August 24th, 2013 00 UCT) just north of Yosemite, which indicates that the PBL height is approximately 4.5 kilometers. The GDAS meteorological fields The MINX injection height was 6.2 kilometers and the HYSPLIT calculation placed the injection height at 3 kilometers. This case again indicates the importance of accurately initializing the smoke plume height, especially when it is above the top of the boundary layer. The wind shifts just above the PBL changing from 10 knots out of the west to 15-20 knots out of the south. As the nominal HYSPLIT simulation injects the smoke below the height where this occurs, Figure 4 shows that the plume does not extend nearly as far downwind as the MISR-initialized plume. In this case, the MISR-initialized plume reaches from the United States north beyond the border with Canada. Both the optical depth map and the visible imagery show a well defined, optically thick smoke plume

extending from Yosemite past the border and then looping back to the southeast. The nominal model simulation has visible smoke extending only to the southern border of Idaho, whereas the MISR-initialized run shows visible smoke reaching the border, in much better agreement with observations.

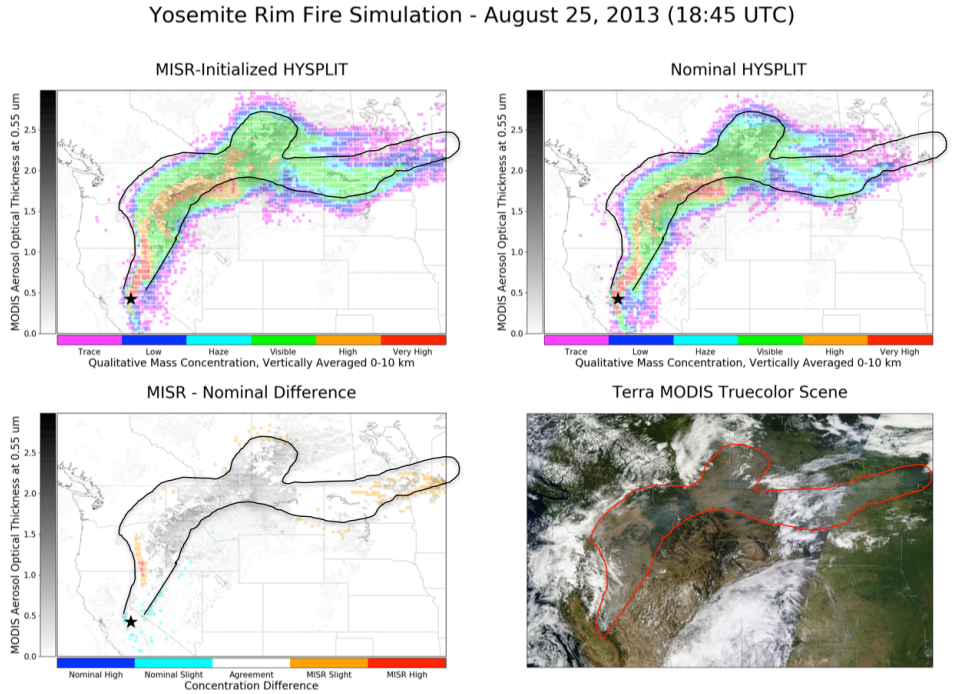


Additional Figures

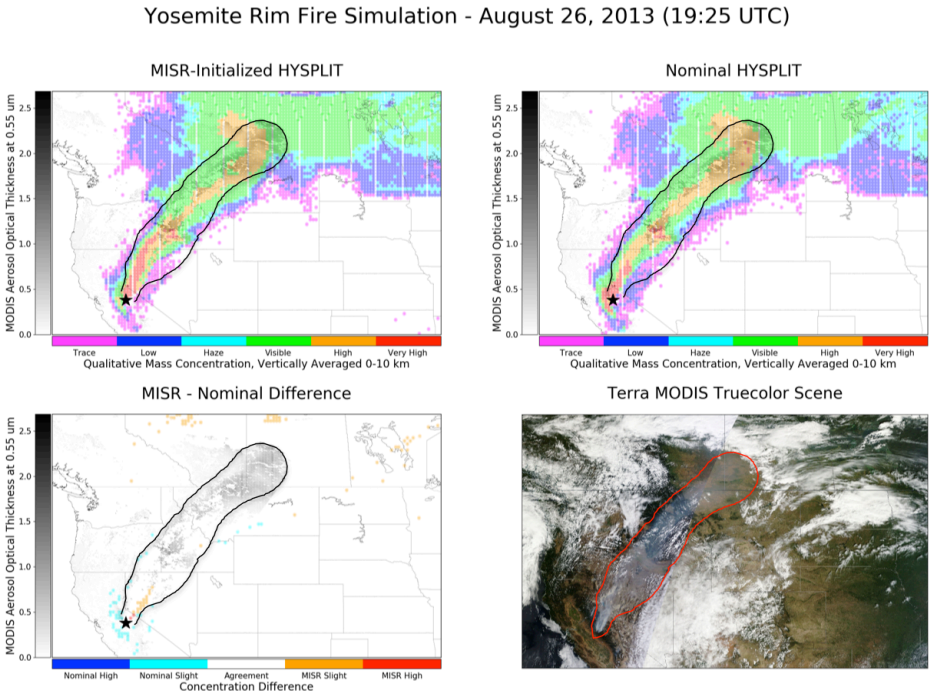
Yosemite


Yosemite Rim Fire Simulation - August 24, 2013 (21:15 UTC)
MISR-Initialized HYSPLIT
Nominal HYSPLIT
MODIS Aerosol Optical Thickness at 0.55 um
Trace
Low
Haze
Visible
High
Very High
Qualitative Mass Concentration, Vertically Averaged 0-10 km
MISR - Nominal Difference
Terra MODIS Truecolor Scene
Nominal High
Nominal Slight
Agreement
MISR Slight
MISR High
Concentration Difference

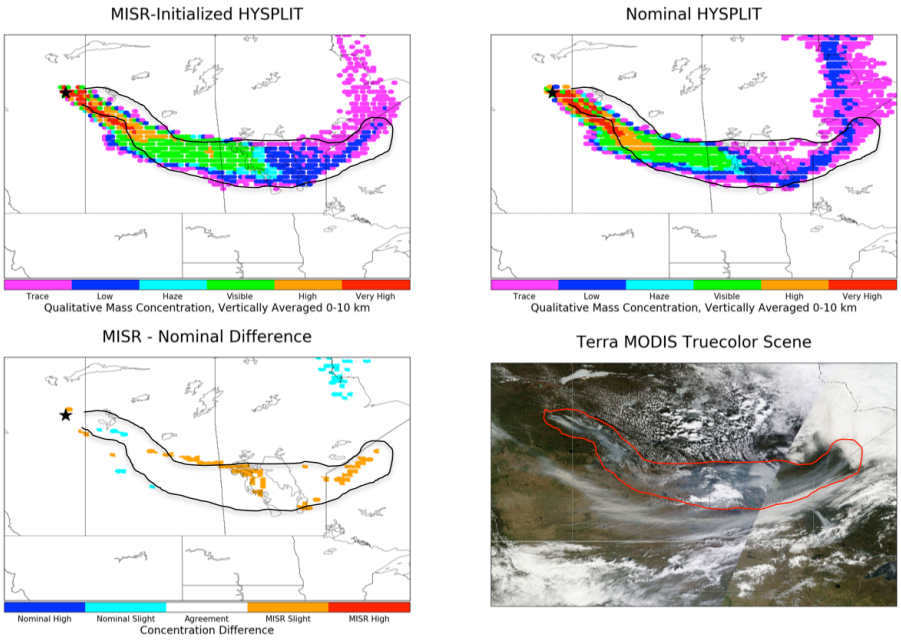
1
2


Yosemite Rim Fire Simulation - August 25, 2013 (18:45 UTC)
MISR-Initialized HYSPLIT
Nominal HYSPLIT
MODIS Aerosol Optical Thickness at 0.55 um
Trace
Low
Haze
Visible
High
Very High
Qualitative Mass Concentration, Vertically Averaged 0-10 km
MISR - Nominal Difference
Terra MODIS Truecolor Scene
Nominal High
Nominal Slight
Agreement
MISR Slight
MISR High
Concentration Difference

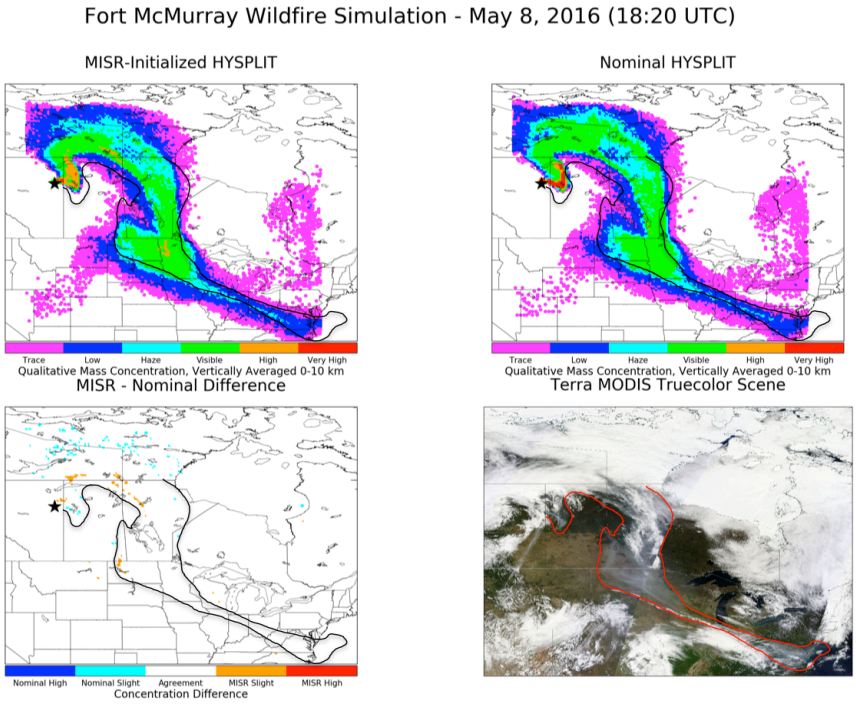
3
4



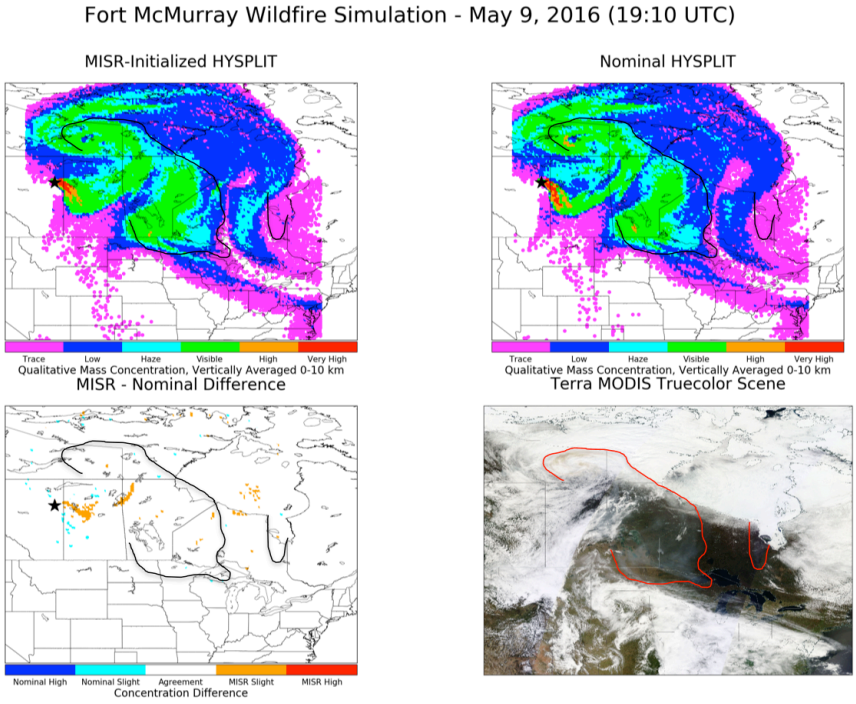
1
2
3 Fort McMurray
4



5
6

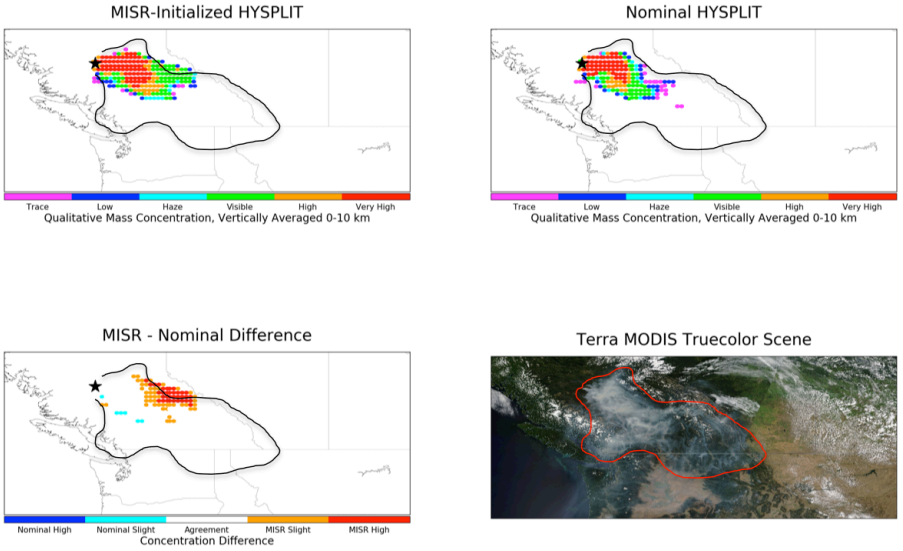


1
2



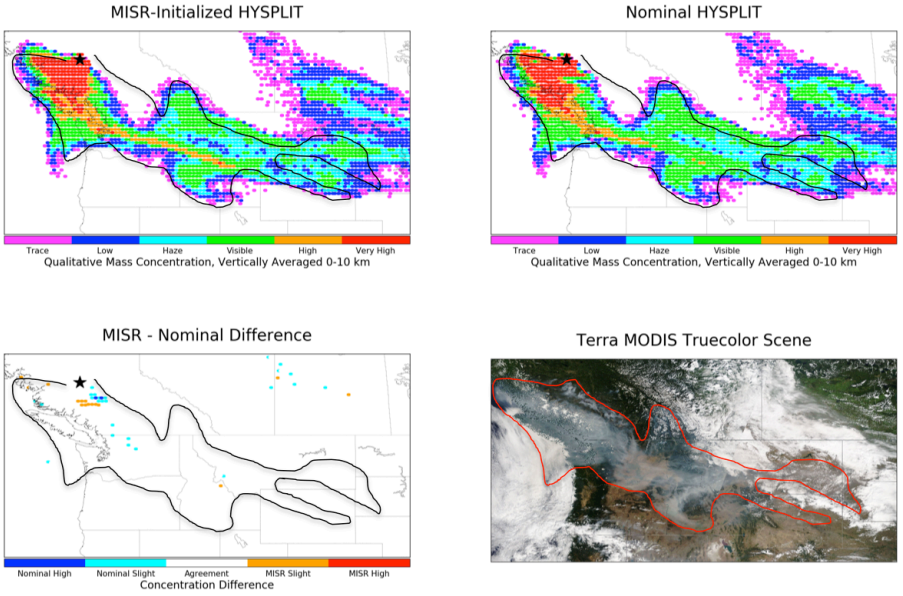
3
4
5 Fraser Plateau
6

Fraser Plateau Wildfire Simulation - August 3, 2017 (19:35 UTC)

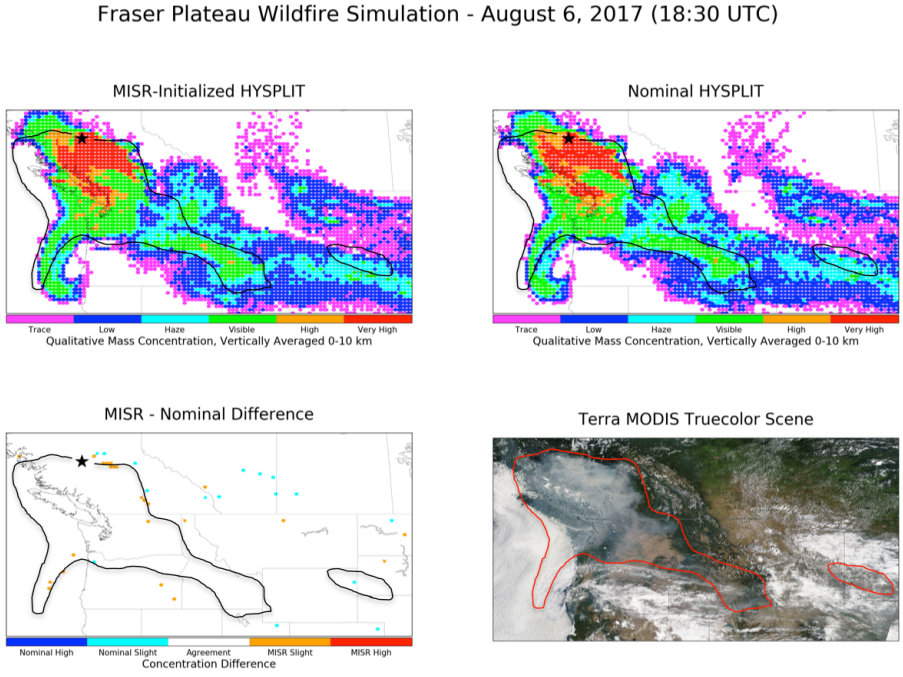


1
2

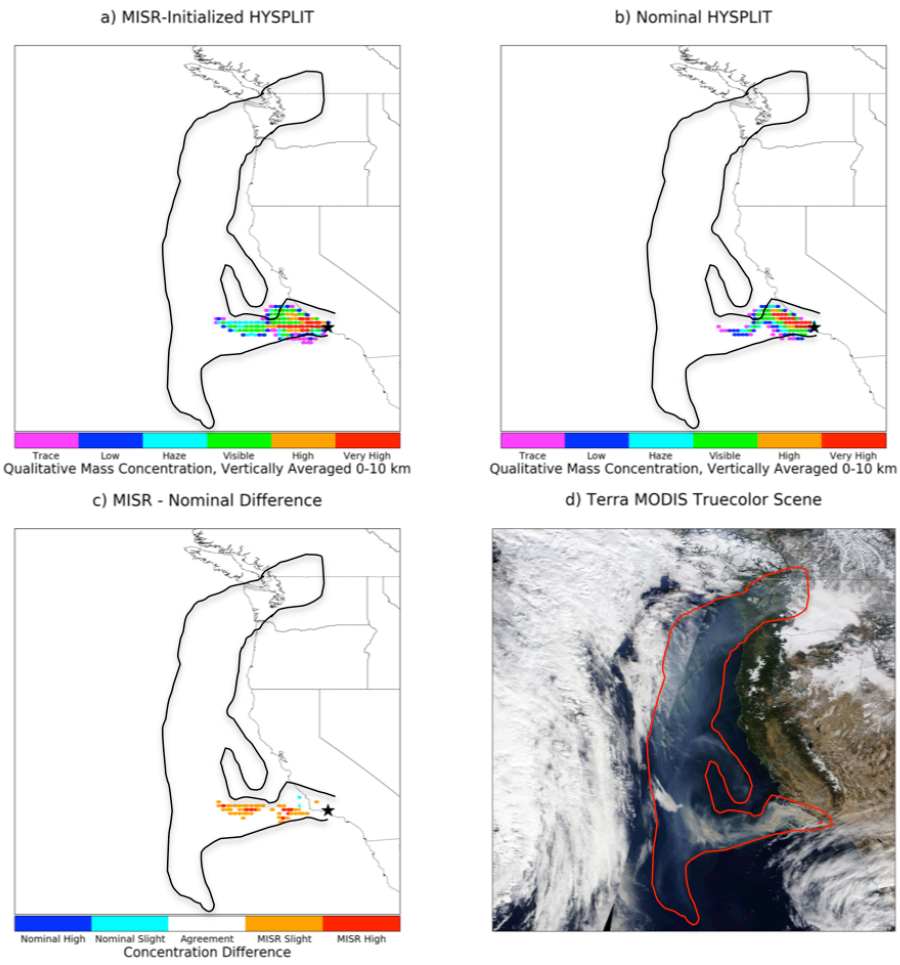
Fraser Plateau Wildfire Simulation - August 5, 2017 (21:10 UTC)



3
4

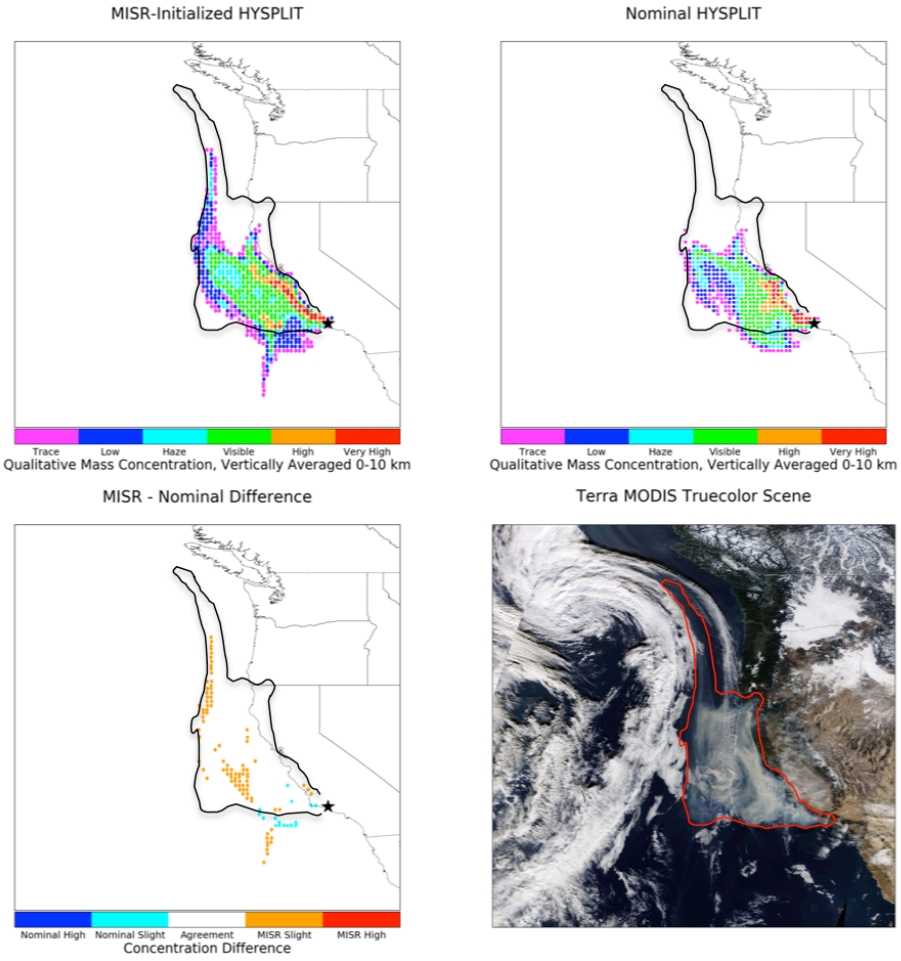


1
2
3 Thomas Fire
4

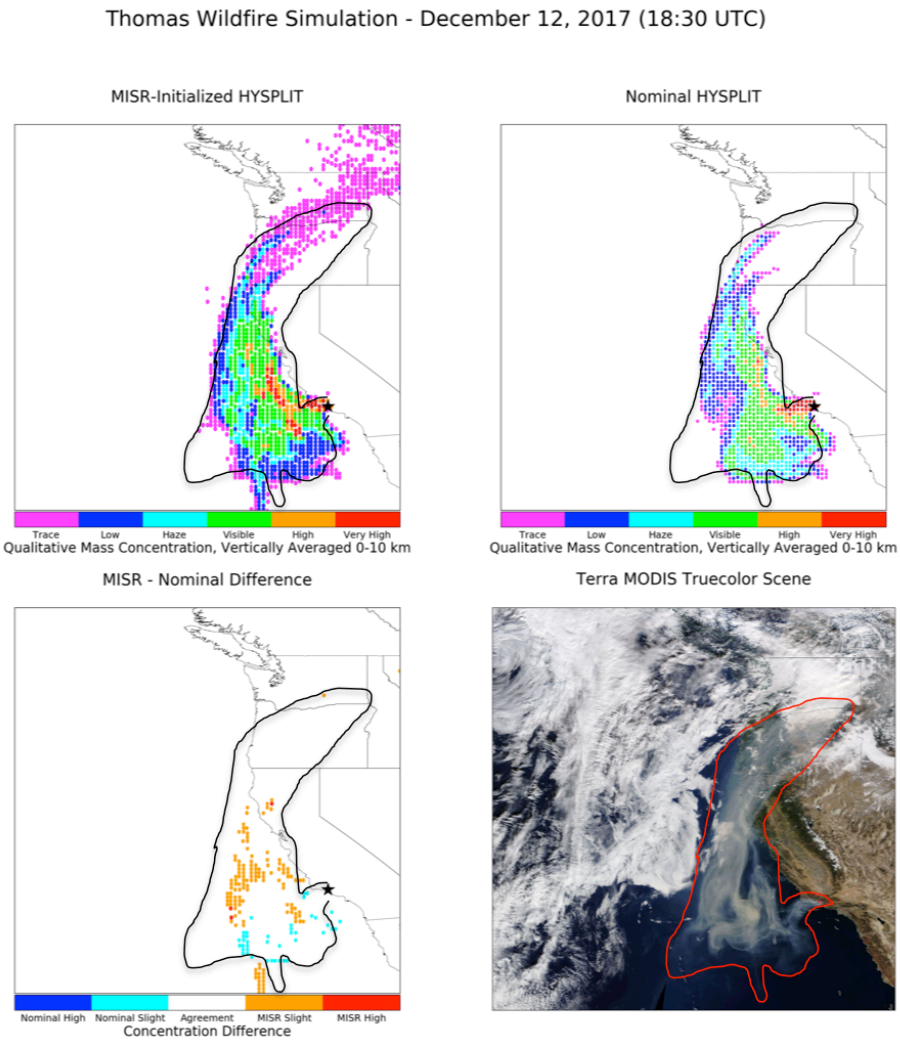

Thomas Wildfire Simulation - December 10, 2017 (18:45 UTC)
a) MISR-Initialized HYSPLIT
b) Nominal HYSPLIT
Trace
Low
Haze
Visible
High
Very High
Qualitative Mass Concentration, Vertically Averaged 0-10 km
c) MISR - Nominal Difference
d) Terra MODIS Truecolor Scene
Nominal High
Nominal Slight
Agreement
MISR Slight
MISR High
Concentration Difference

1
2

Thomas Wildfire Simulation - December 11, 2017 (19:25 UTC)

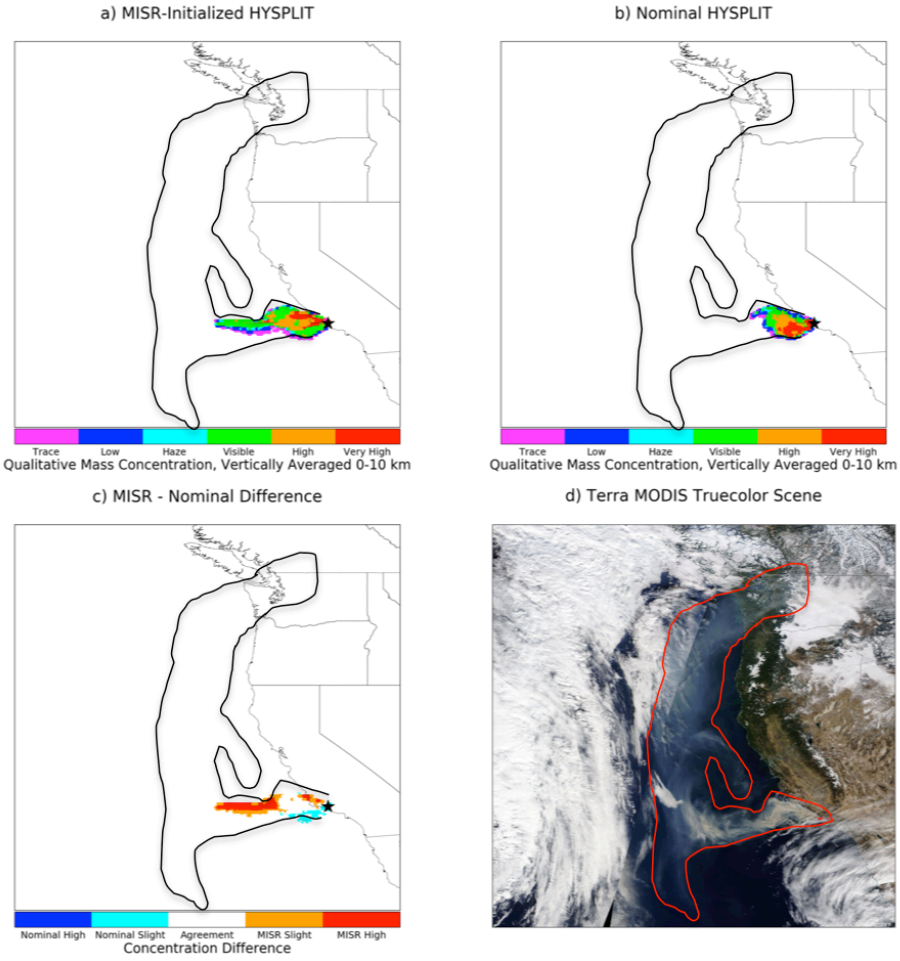


1
2



1
2
3 Thomas Fire with NAM12
4

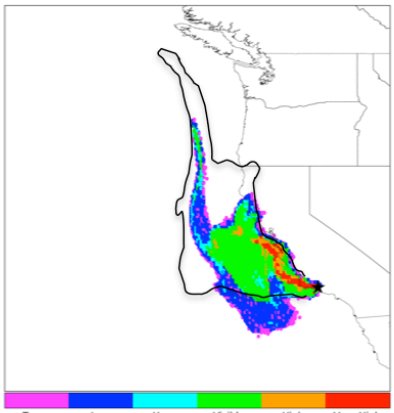
Thomas Wildfire Simulation (With NAM12) - December 10, 2017 (18:45 UTC)



1
2

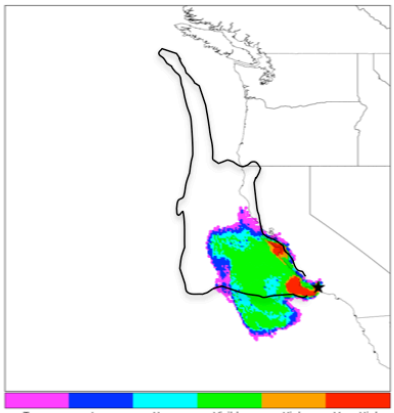
Thomas Wildfire Simulation (With NAM12) - December 11, 2017 (19:25 UTC)

MISR-Initialized HYSPLIT



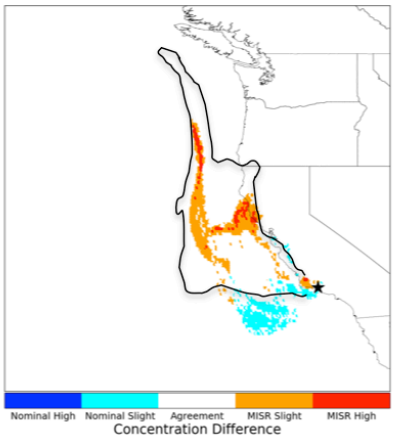
Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT



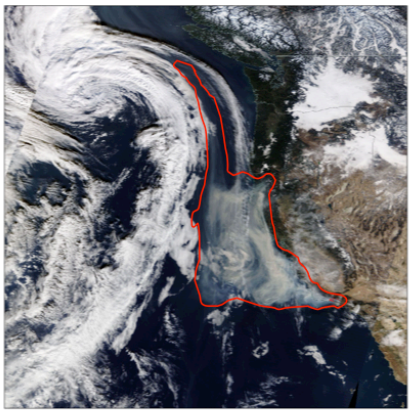
Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference

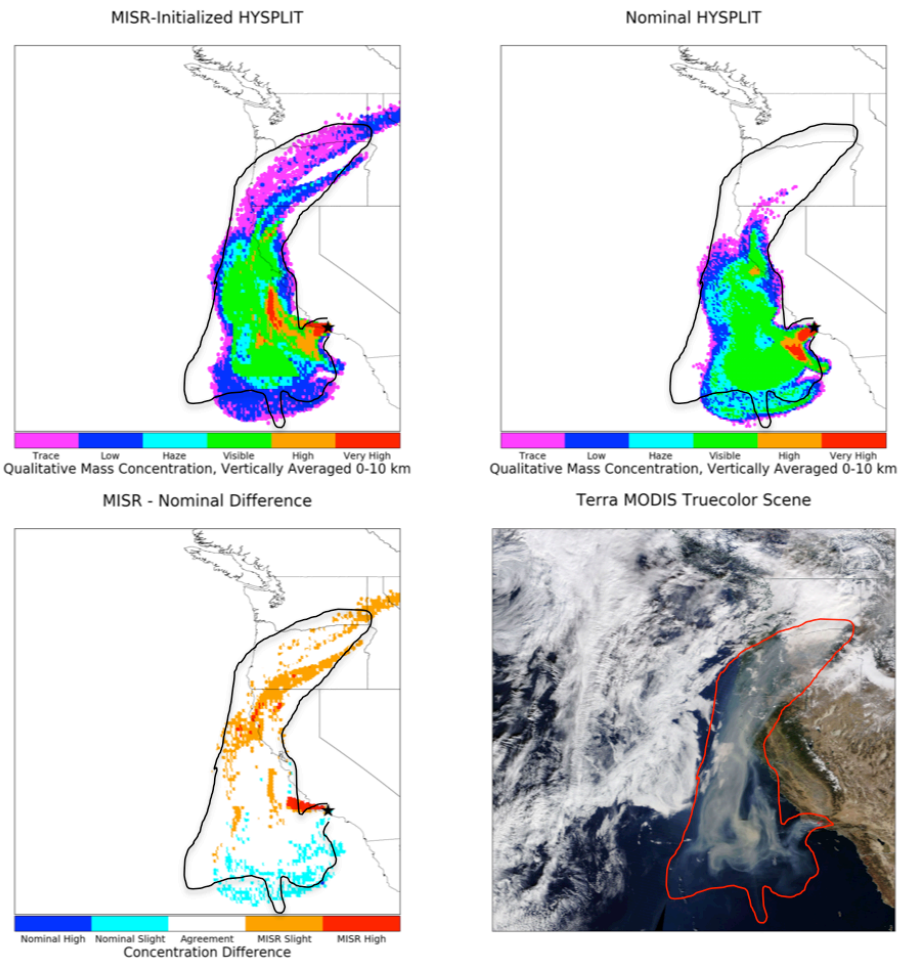


Concentration Difference

Terra MODIS Truecolor Scene



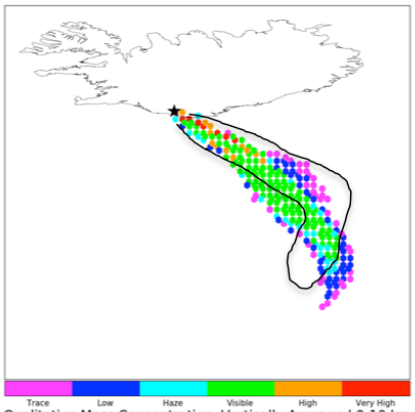
1
2



1
2
3 Eyjafjallajokull
4

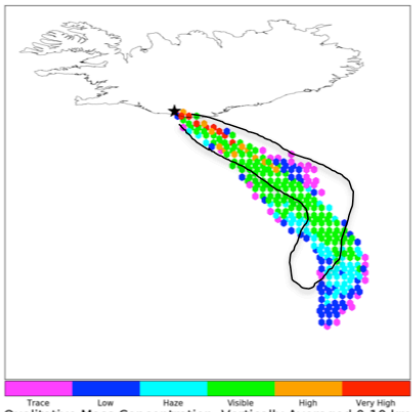
Eyjafjallajokull Eruption Simulation - May 7, 2010 (12:35 UTC)

MISR-Initialized HYSPLIT



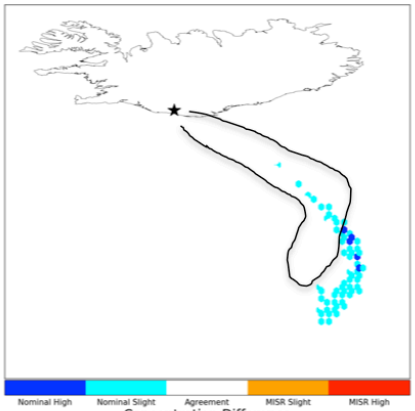
Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT



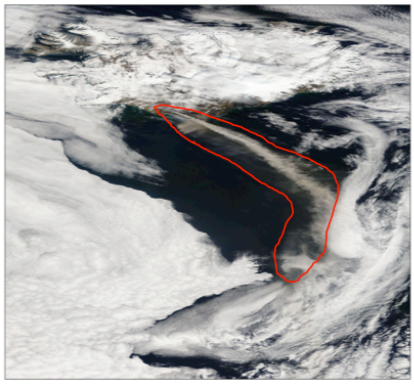
Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference



Concentration Difference

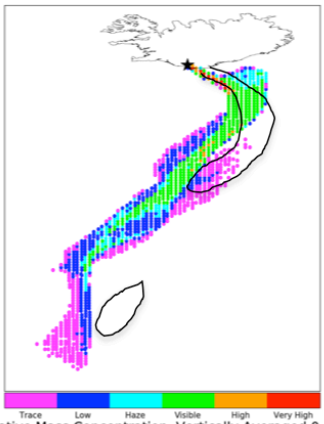
Terra MODIS Truecolor Scene



1
2

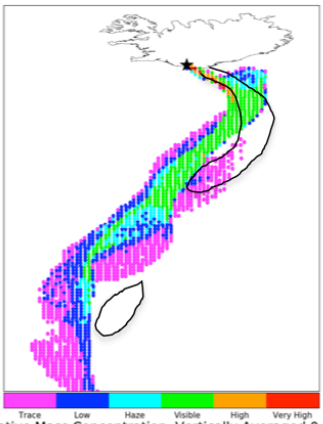
Eyjafjallajokull Eruption Simulation - May 8, 2010 (13:20 UTC)

MISR-Initialized HYSPLIT



Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT

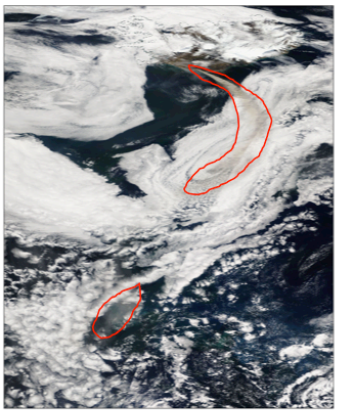


Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference

Concentration Difference

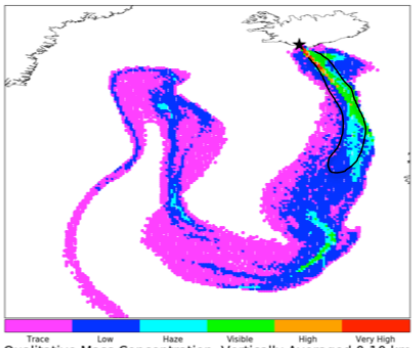
Terra MODIS Truecolor Scene



1
2

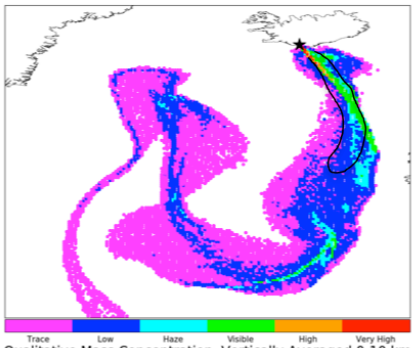
Eyjafjallajokull Eruption Simulation - May 10, 2010 (13:25 UTC)

MISR-Initialized HYSPLIT



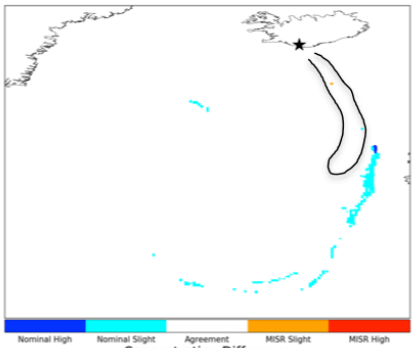
Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT



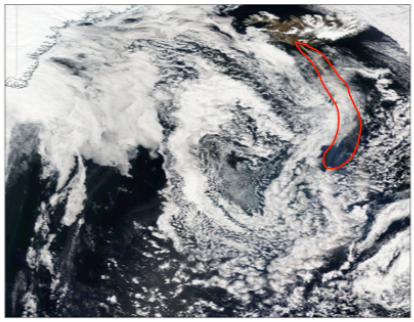
Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference



Concentration Difference

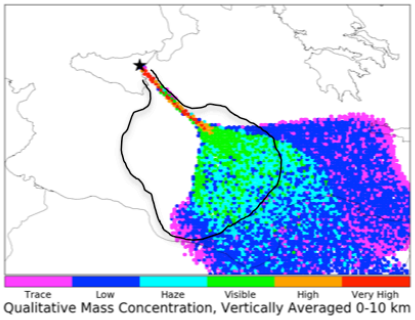
Terra MODIS Truecolor Scene



1
2
3 Etna
4

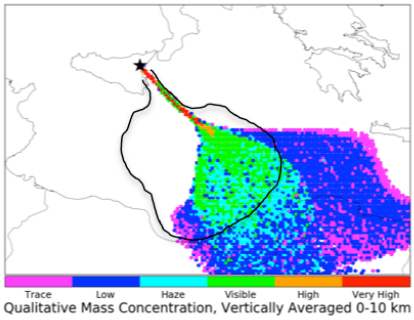
Mount Etna Eruption Simulation - July 23, 2001 (10:35 UTC)

MISR-Initialized HYSPLIT



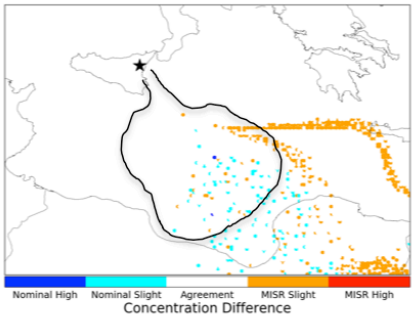
Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT



Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference



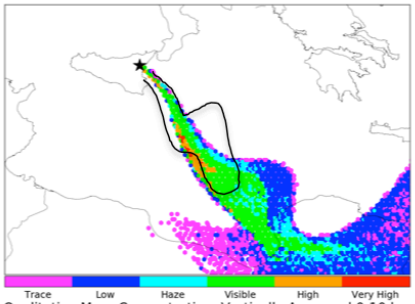
Concentration Difference

Terra MODIS Truecolor Scene

1
2

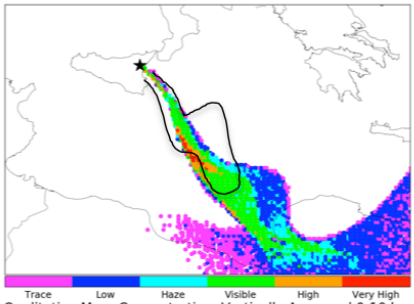
Mount Etna Eruption Simulation - July 24, 2001 (09:40 UTC)

MISR-Initialized HYSPLIT



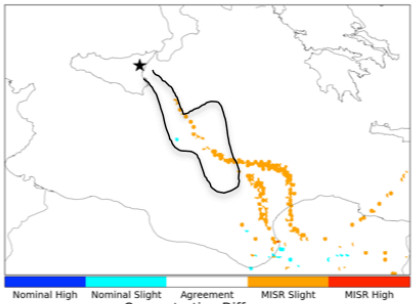
Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT



Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference



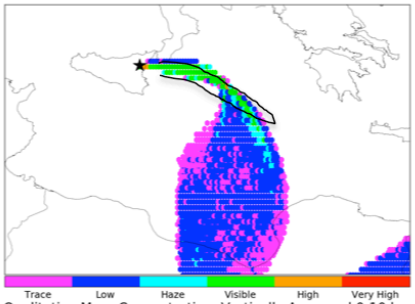
Concentration Difference

Terra MODIS Truecolor Scene

1
2

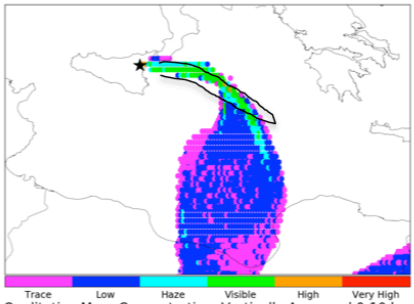
Mount Etna Eruption Simulation - July 25, 2001 (10:25 UTC)

MISR-Initialized HYSPLIT



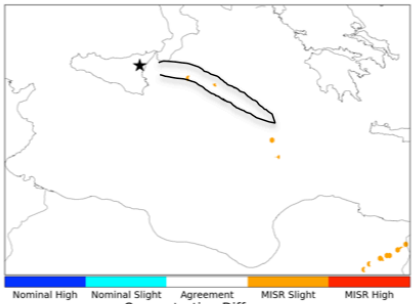
Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT



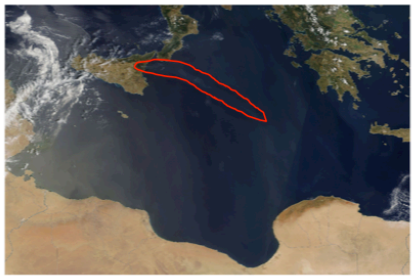
Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference



Concentration Difference

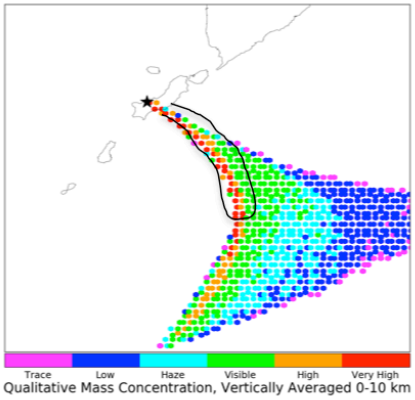
Terra MODIS Truecolor Scene



1
2
3 Chikurachki
4

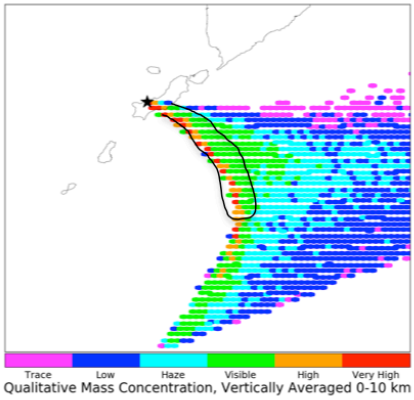
Chikurachki Eruption Simulation - April 22, 2003 (00:45 UTC)

MISR-Initialized HYSPLIT



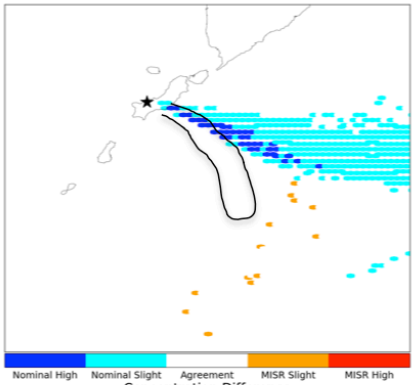
Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT



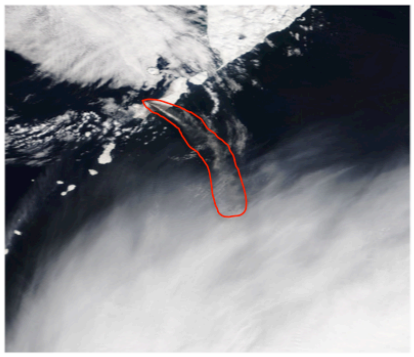
Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference



Concentration Difference

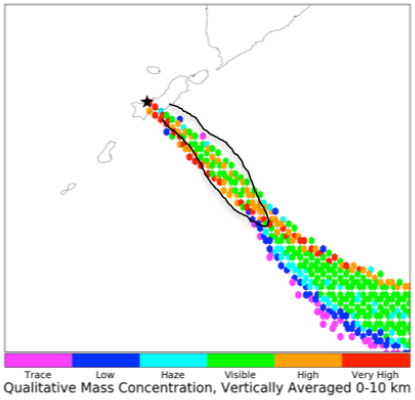
Terra MODIS Truecolor Scene



1
2

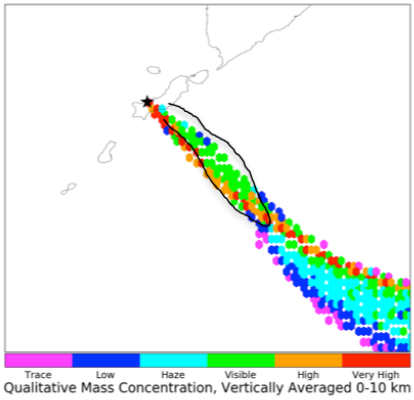
Chikurachki Eruption Simulation - April 23, 2003 (01:25 UTC)

MISR-Initialized HYSPLIT



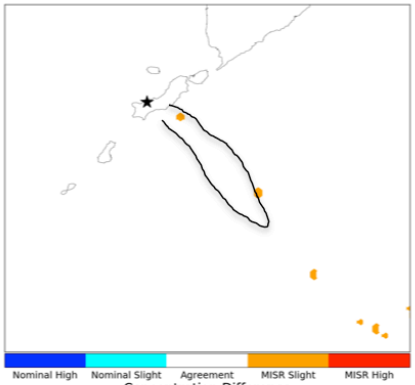
Qualitative Mass Concentration, Vertically Averaged 0-10 km

Nominal HYSPLIT



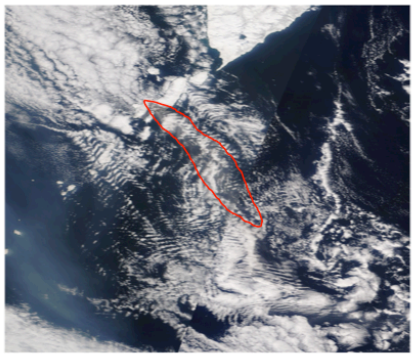
Qualitative Mass Concentration, Vertically Averaged 0-10 km

MISR - Nominal Difference

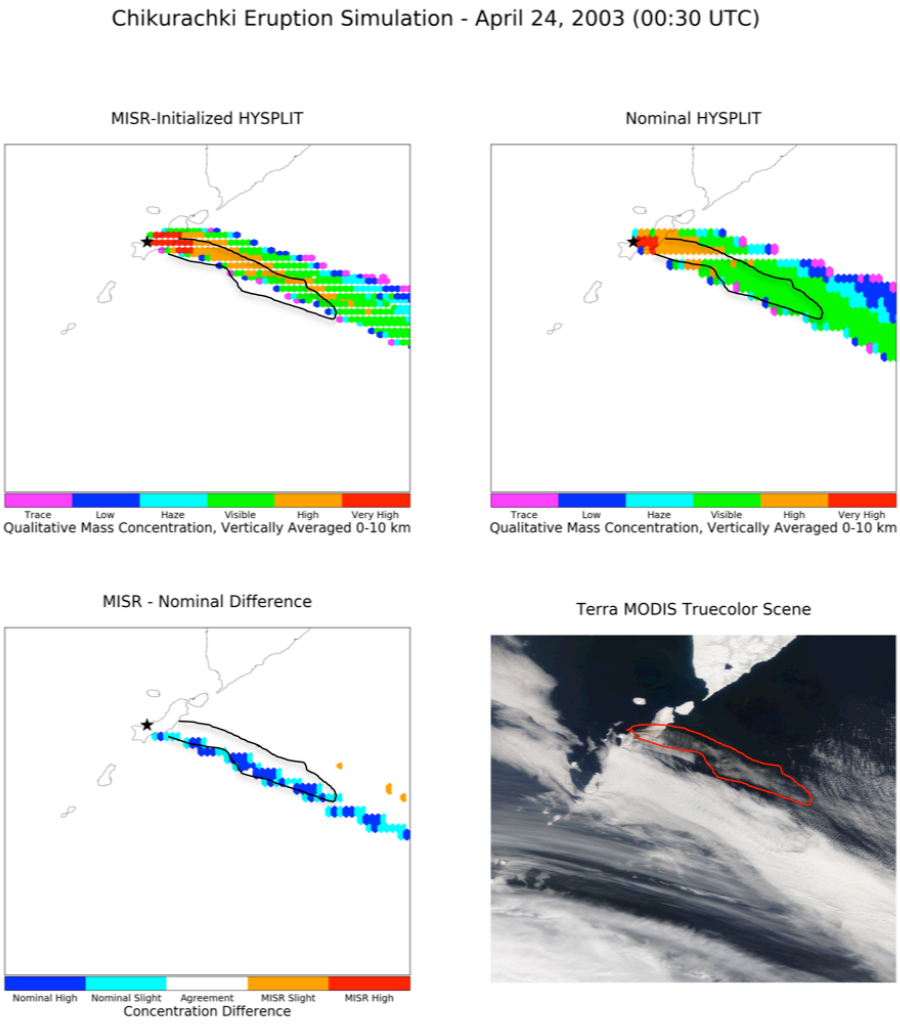


Concentration Difference

Terra MODIS Truecolor Scene

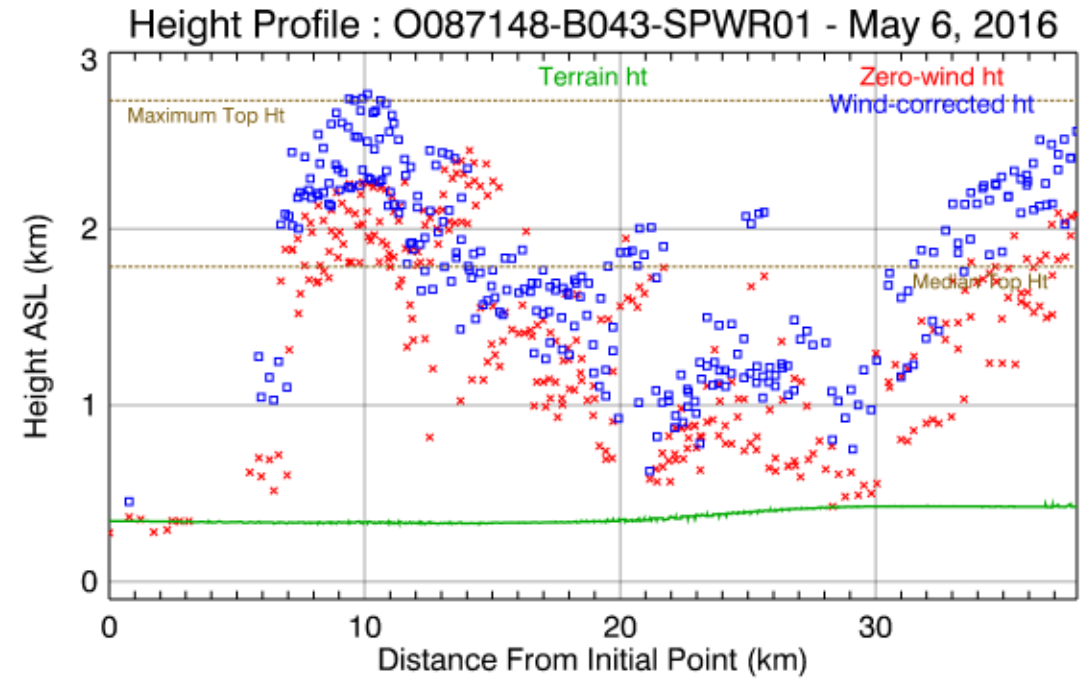


1
2

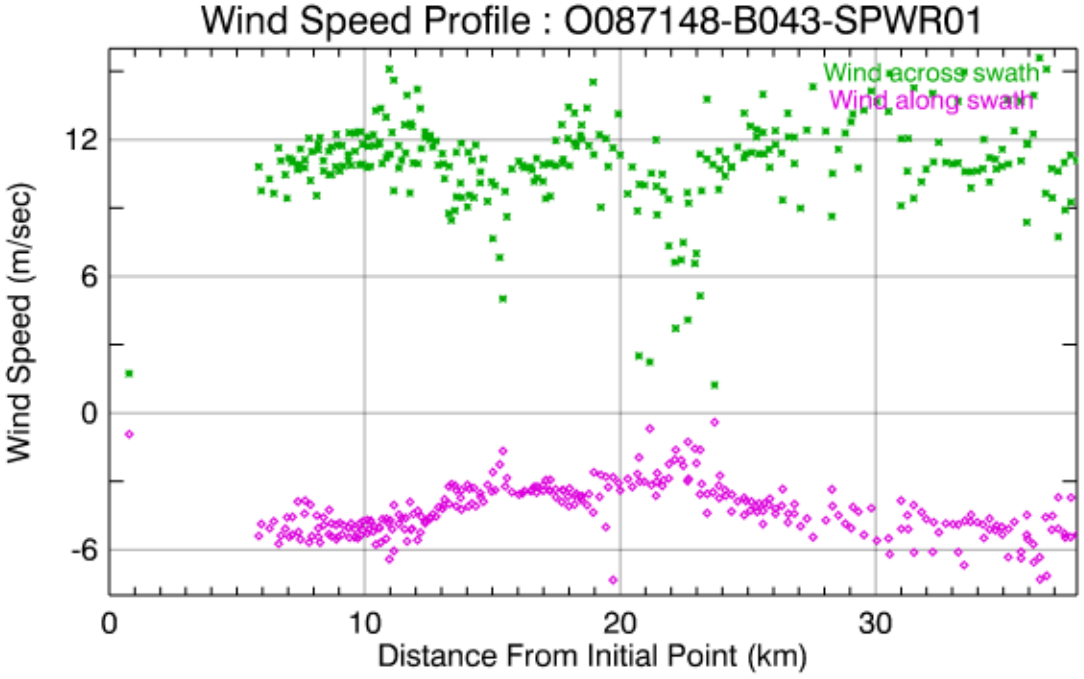


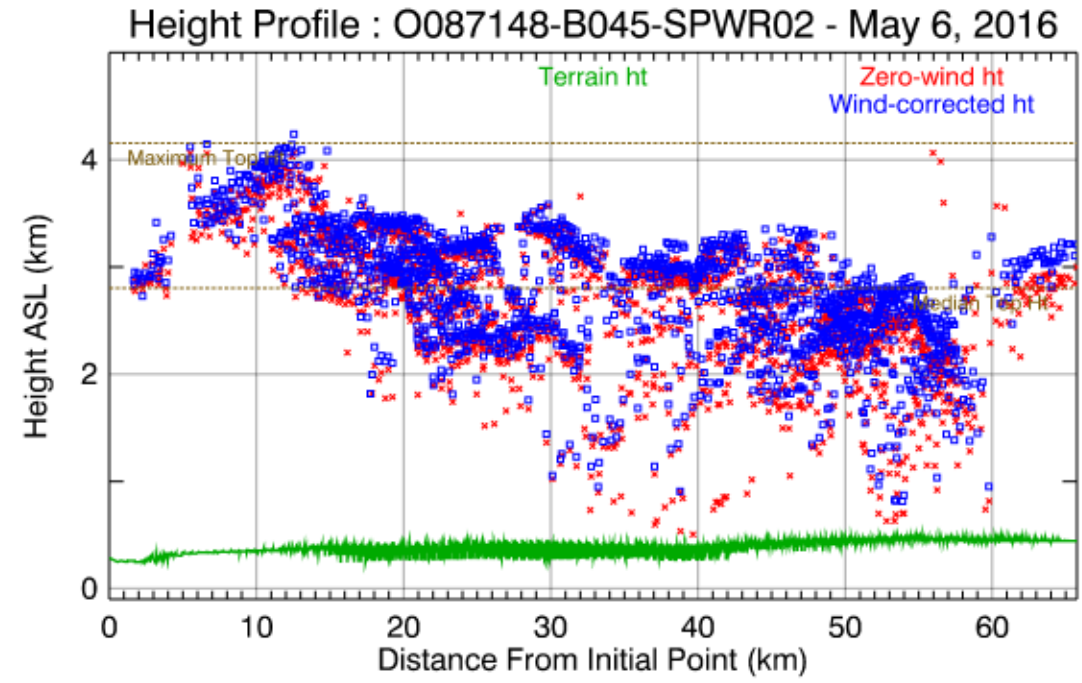
MINX Height and Wind Plots

Fort McMurray

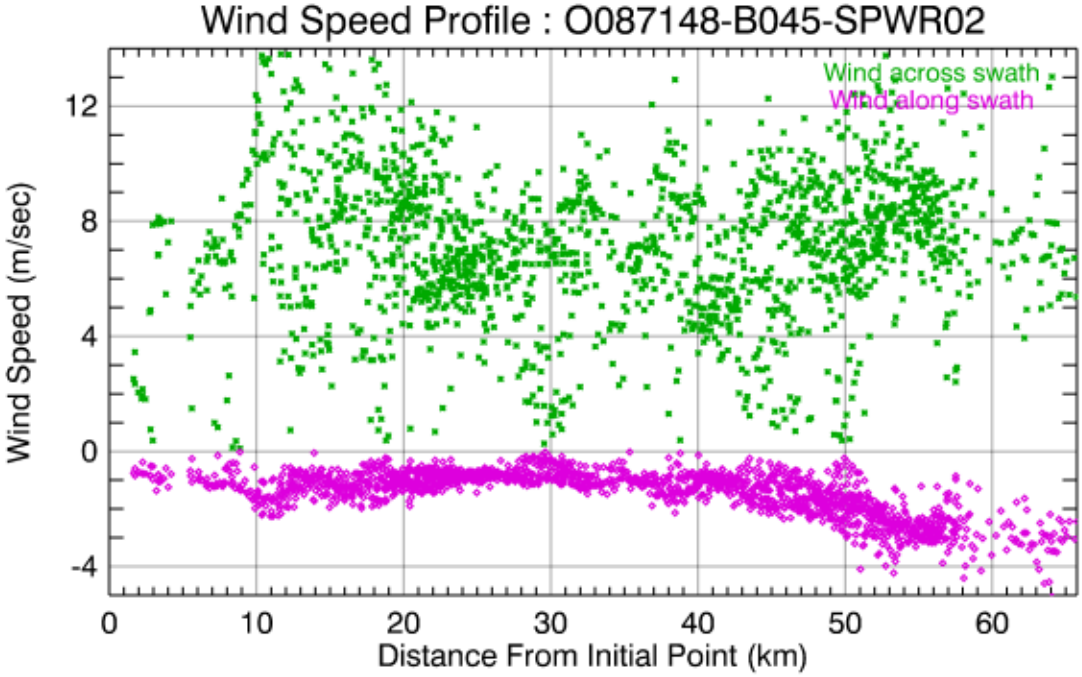


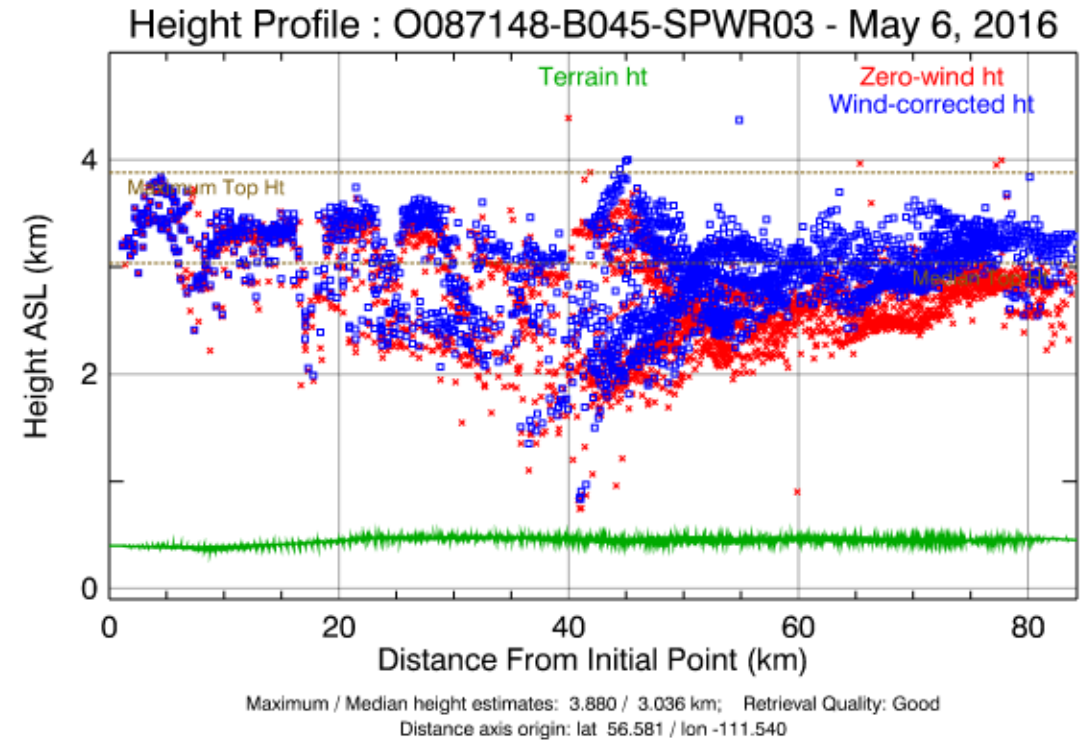
Maximum / Median height estimates: 2.728 / 1.786 km; Retrieval Quality: Good
Distance axis origin: lat 58.797 / lon -108.513



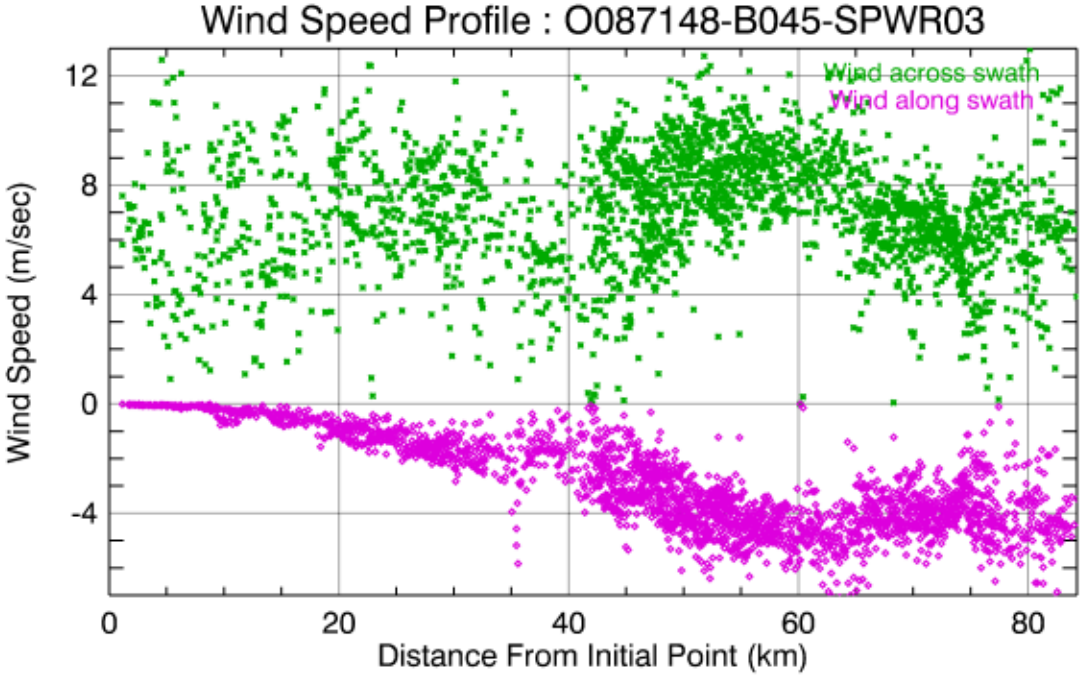


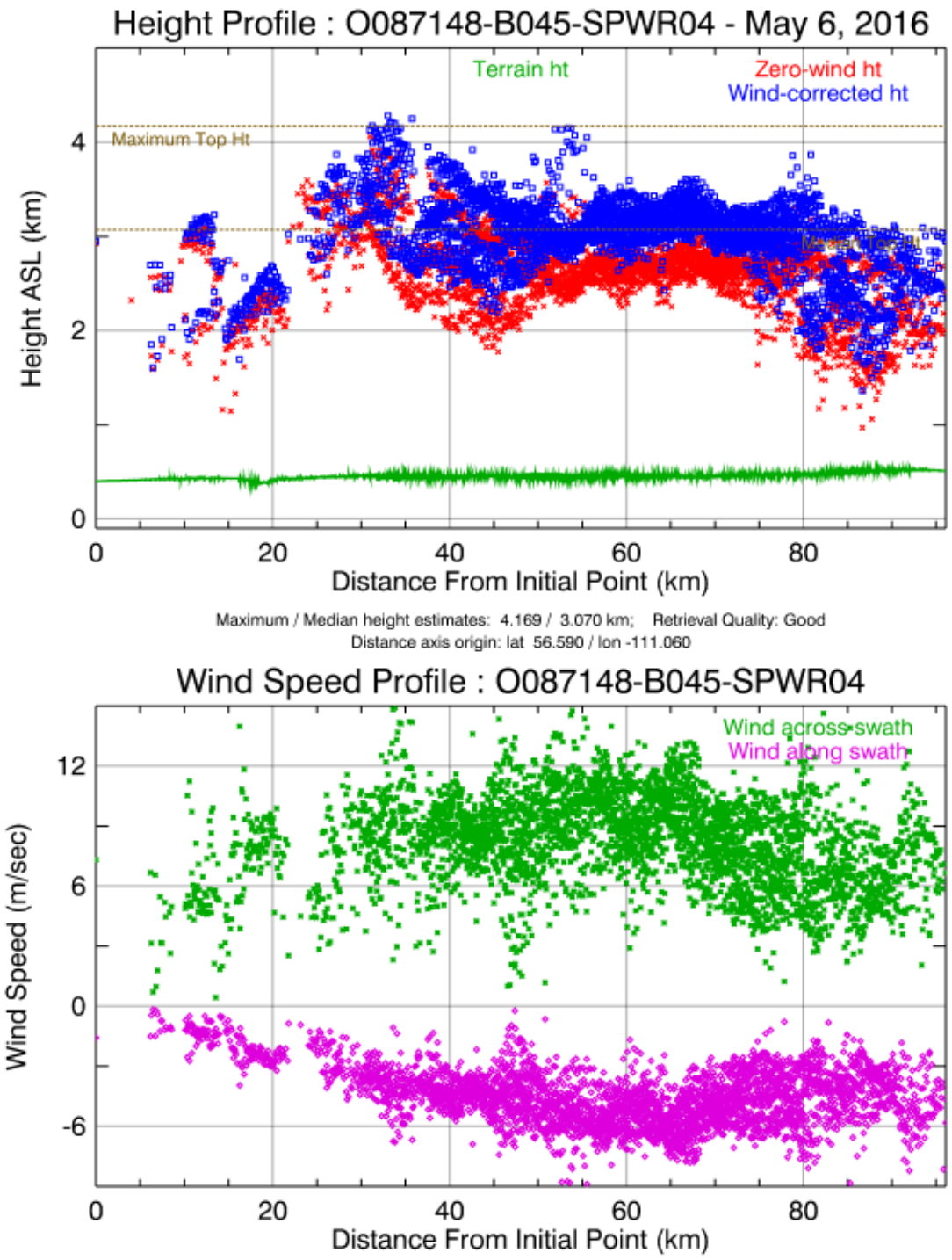
Maximum / Median height estimates: 4.156 / 2.804 km; Retrieval Quality: Good
Distance axis origin: lat 56.789 / lon -111.435



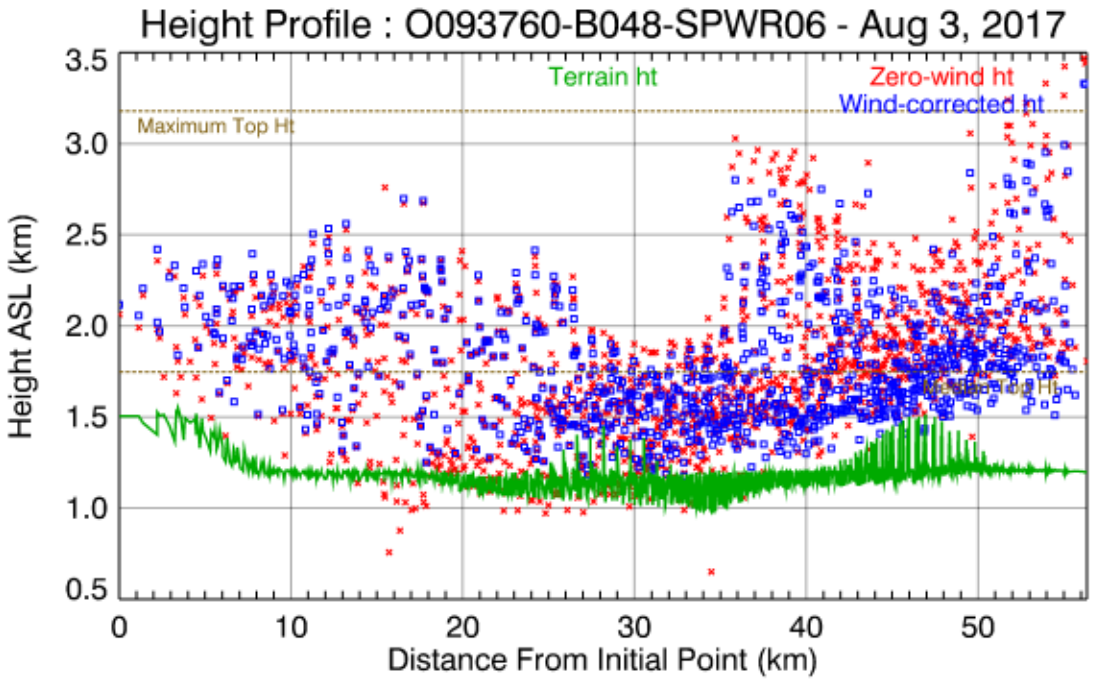


Maximum / Median height estimates: 3.880 / 3.036 km; Retrieval Quality: Good
Distance axis origin: lat 56.581 / lon -111.540

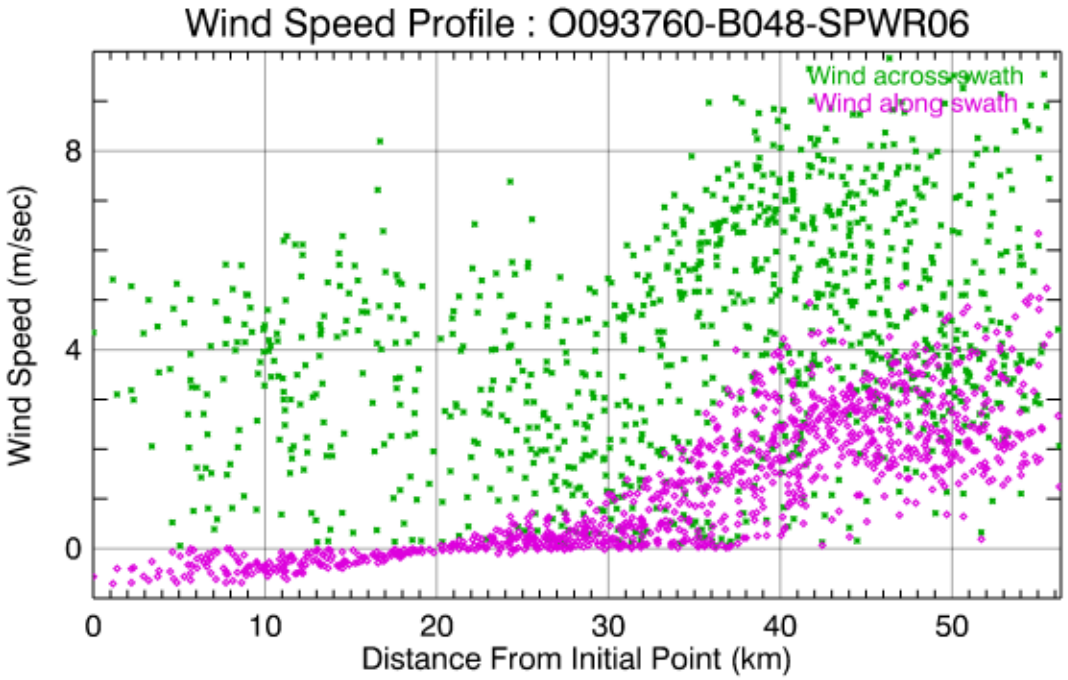


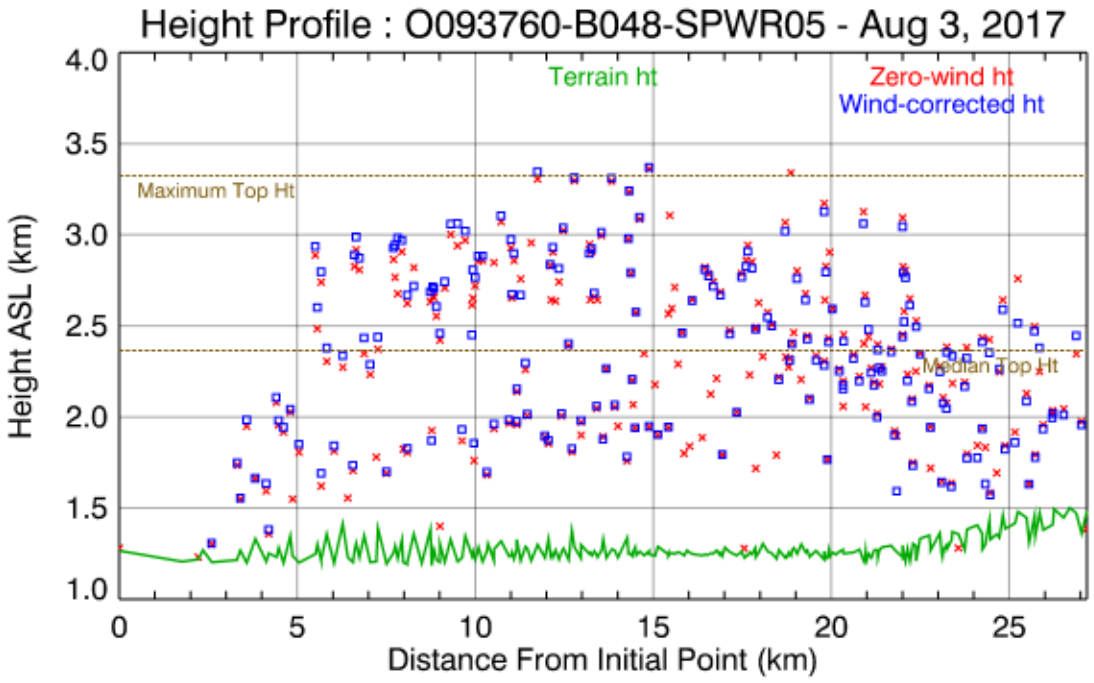


Fraser Plateau

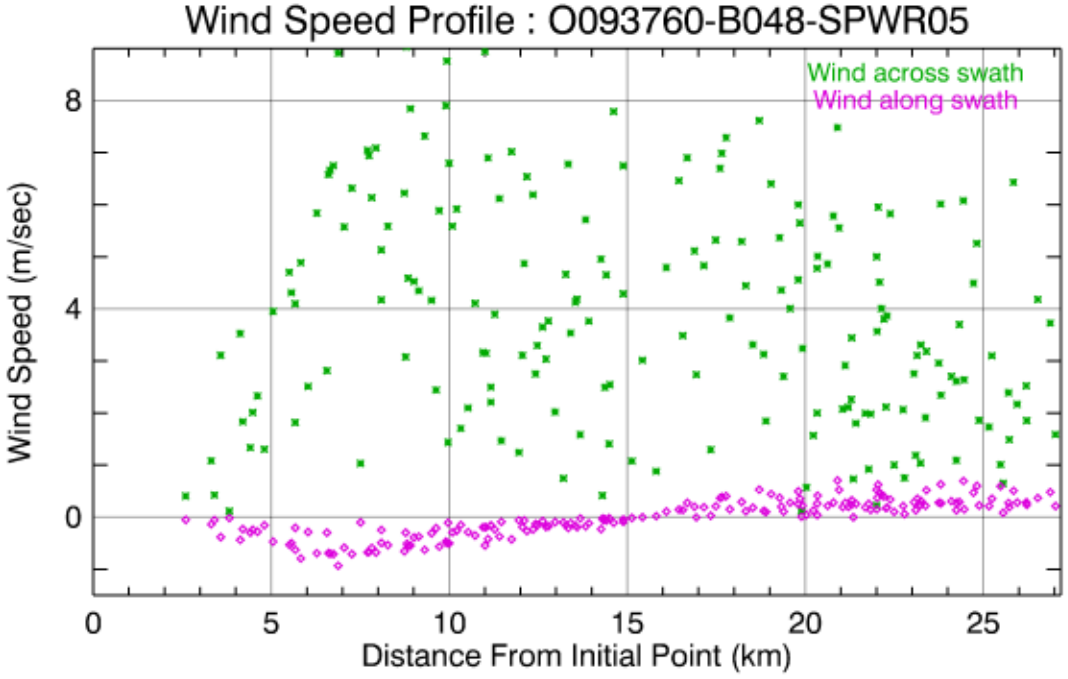


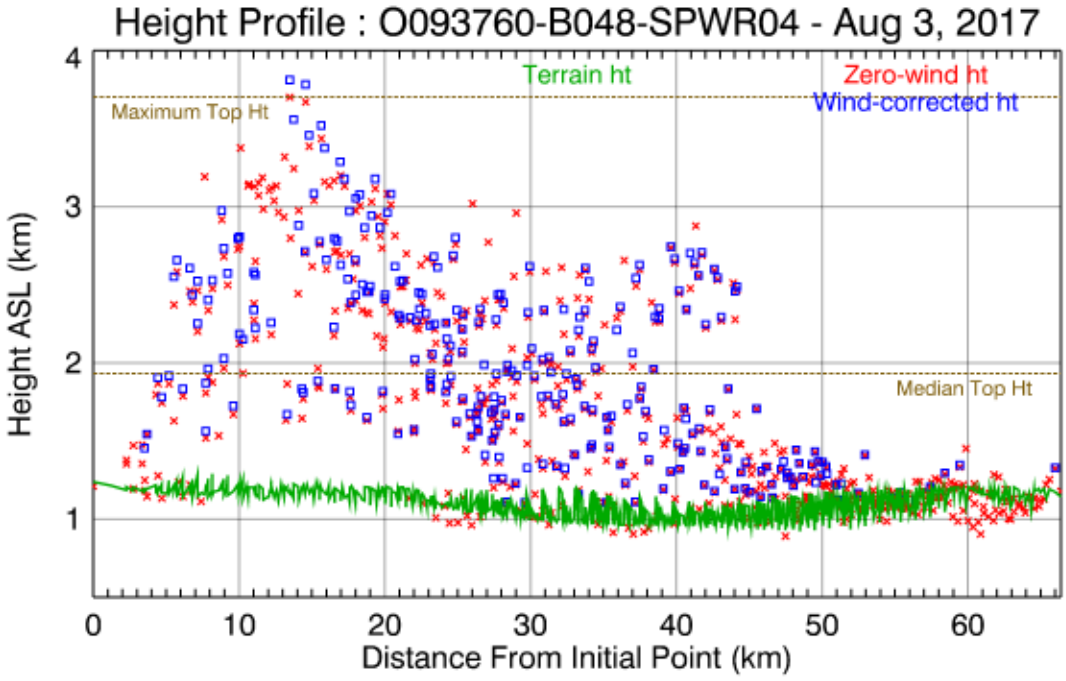
Maximum / Median height estimates: 3.179 / 1.746 km; Retrieval Quality: Good
Distance axis origin: lat 52.519 / lon -123.867



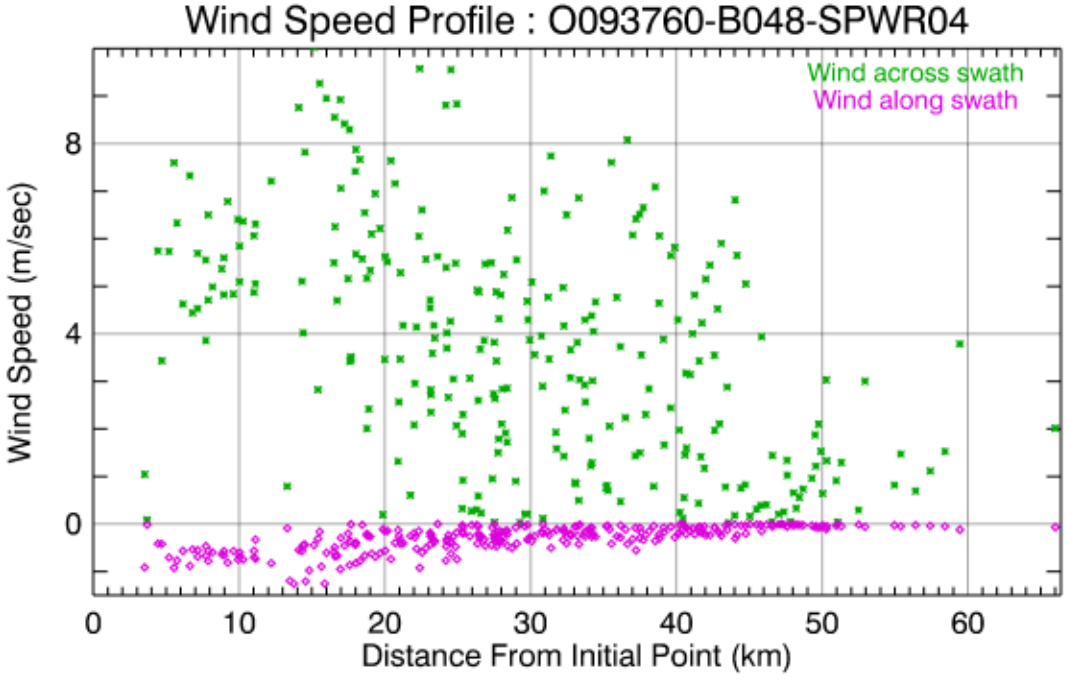


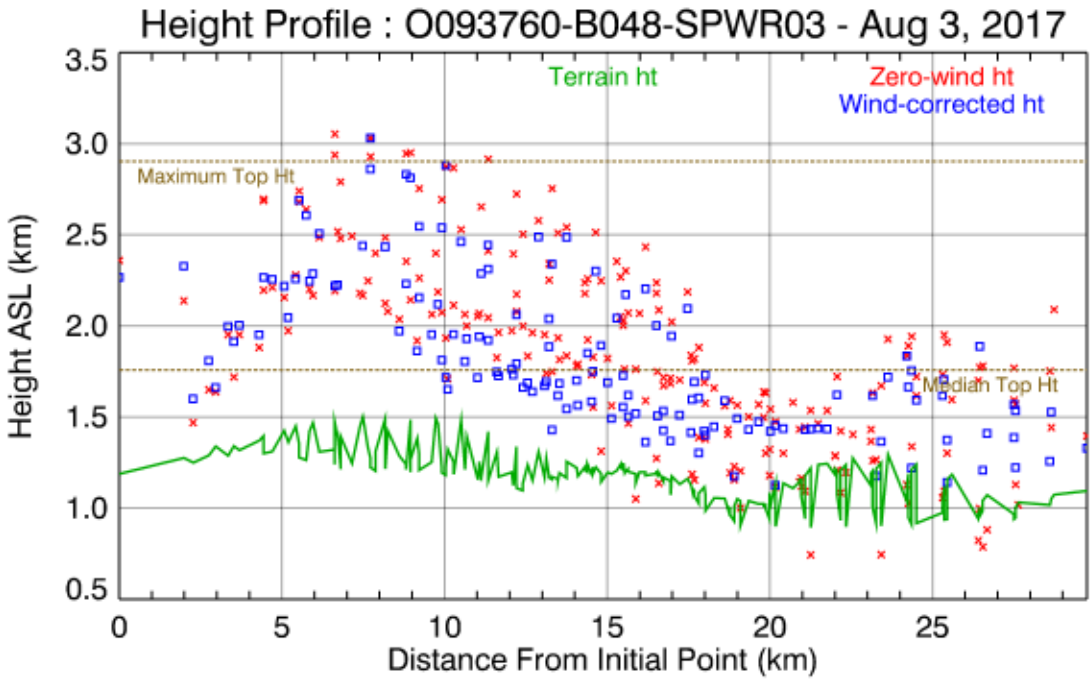
Maximum / Median height estimates: 3.324 / 2.364 km; Retrieval Quality: Good
Distance axis origin: lat 52.678 / lon -124.216



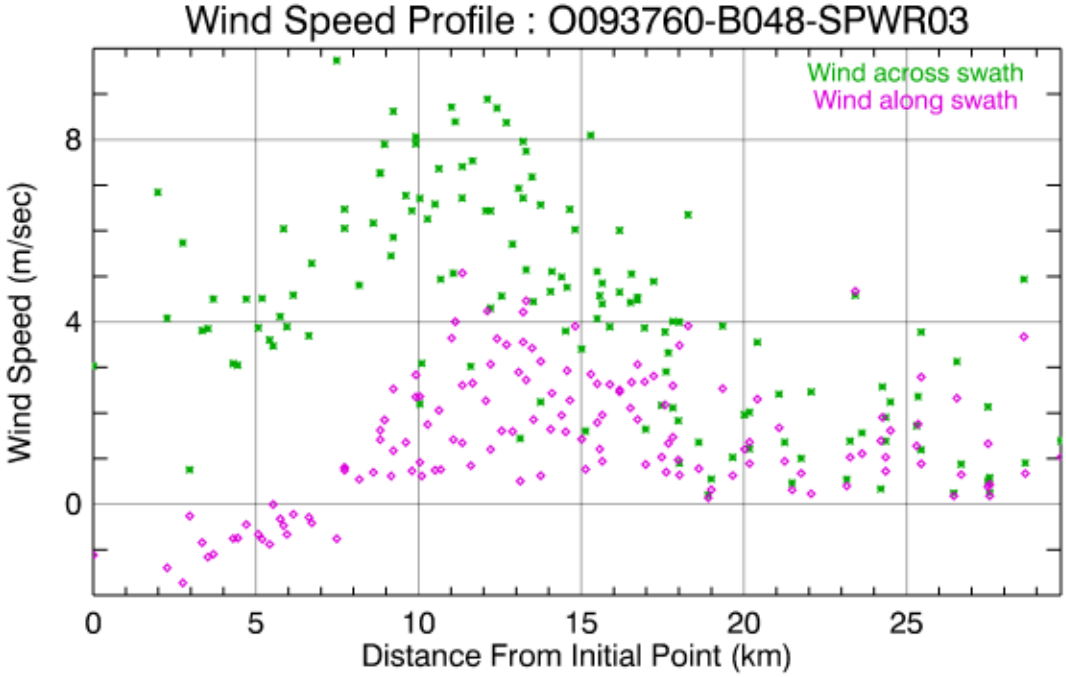


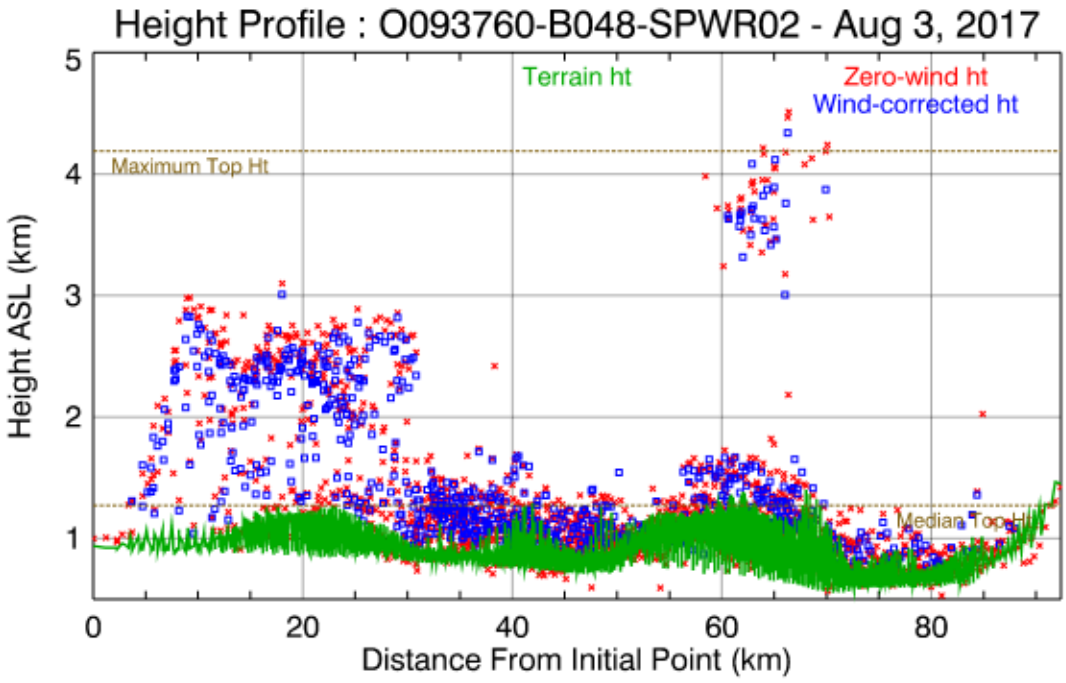
Maximum / Median height estimates: 3.703 / 1.933 km; Retrieval Quality: Good
Distance axis origin: lat 52.532 / lon -124.468



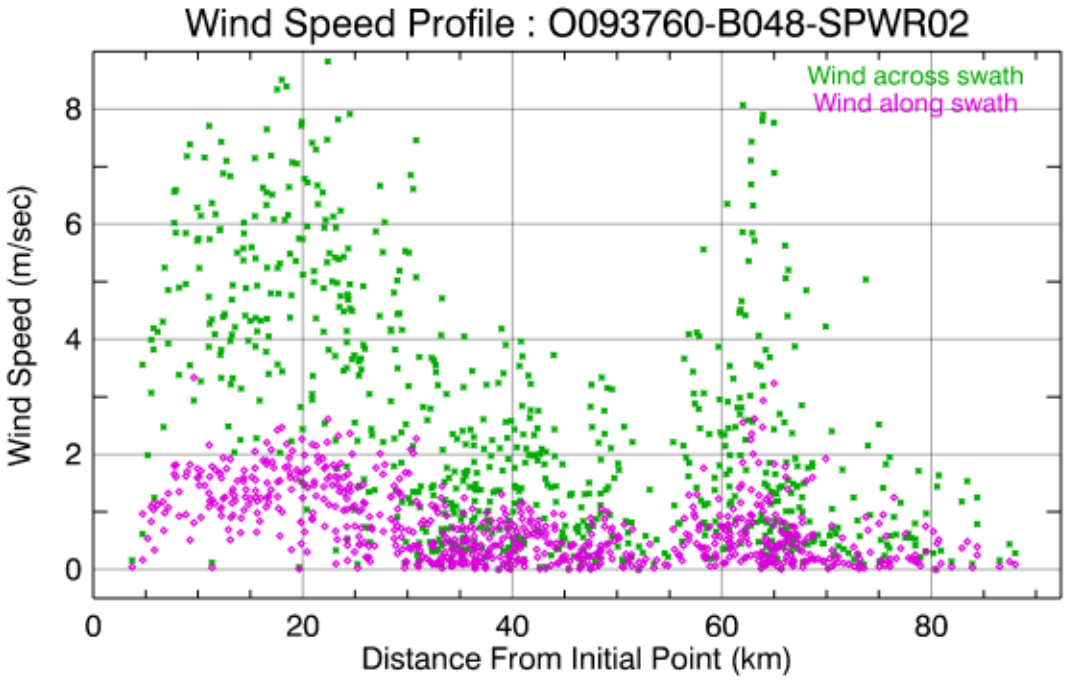


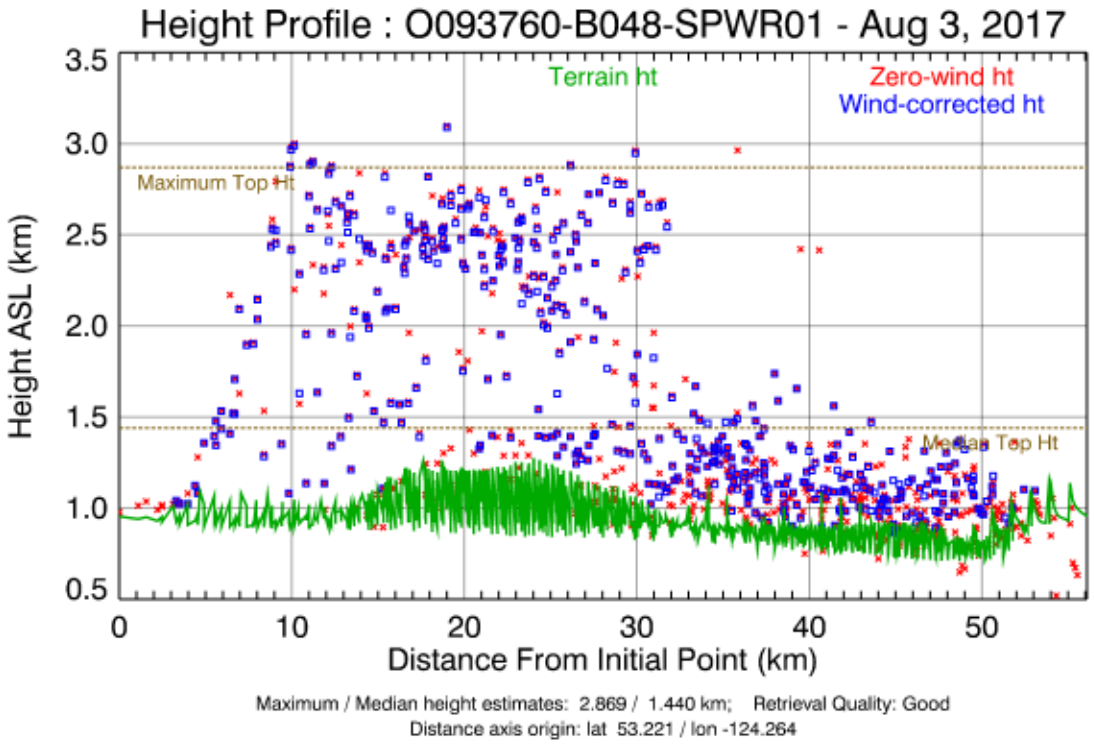
Maximum / Median height estimates: 2.904 / 1.758 km; Retrieval Quality: Good
Distance axis origin: lat 52.814 / lon -123.840

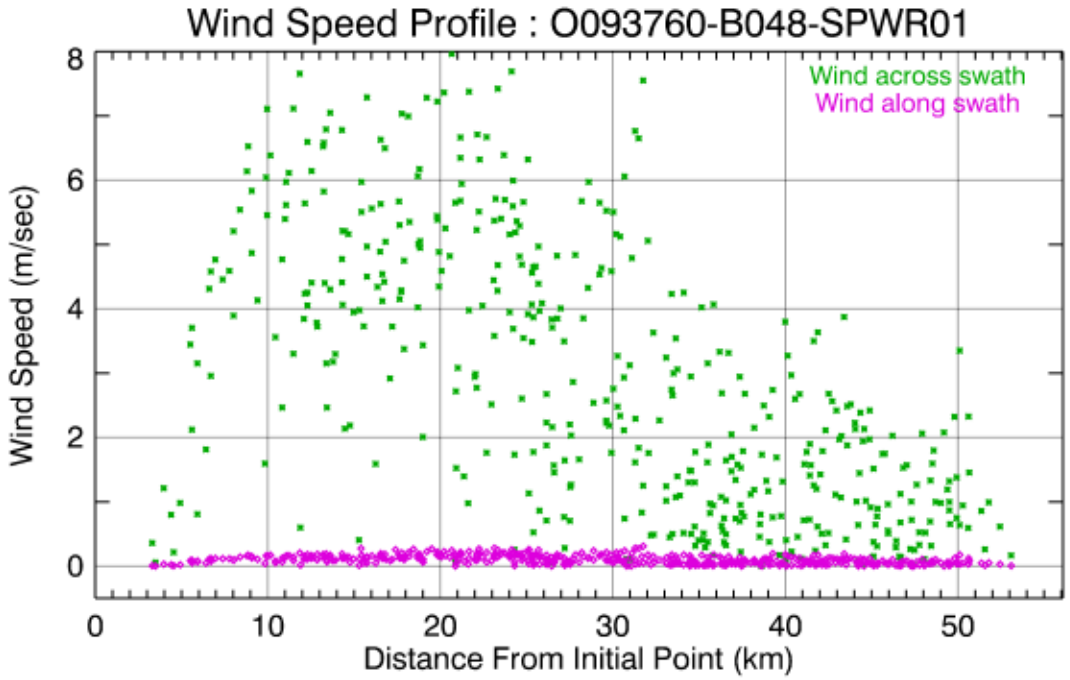




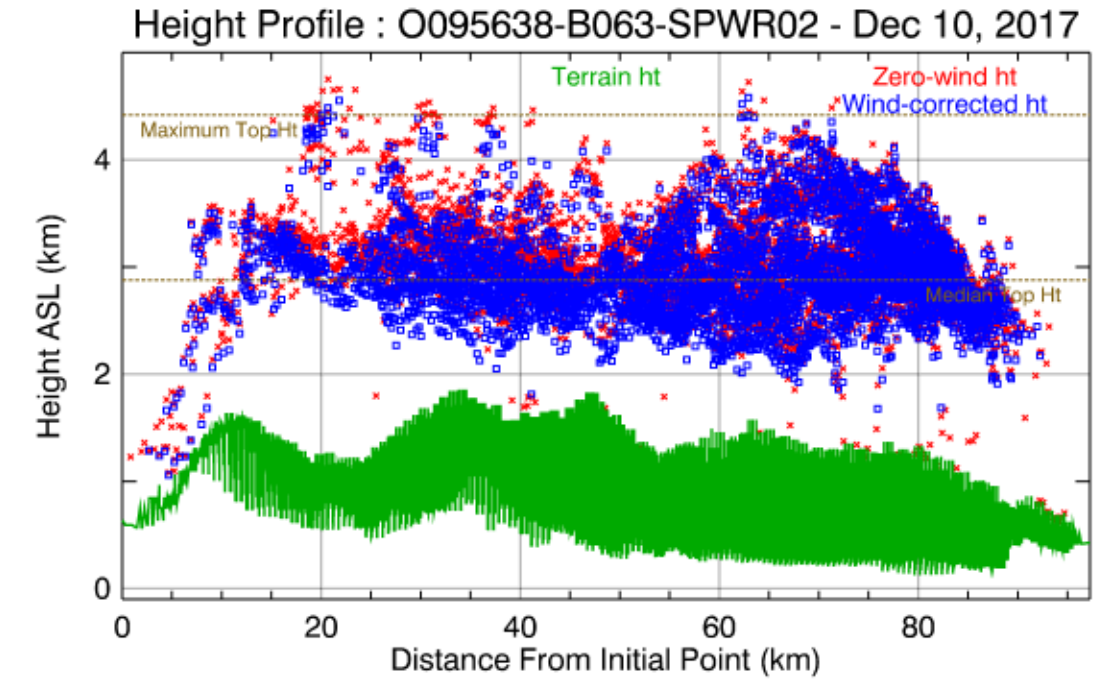
Maximum / Median height estimates: 4.188 / 1.271 km; Retrieval Quality: Good
Distance axis origin: lat 53.214 / lon -124.250



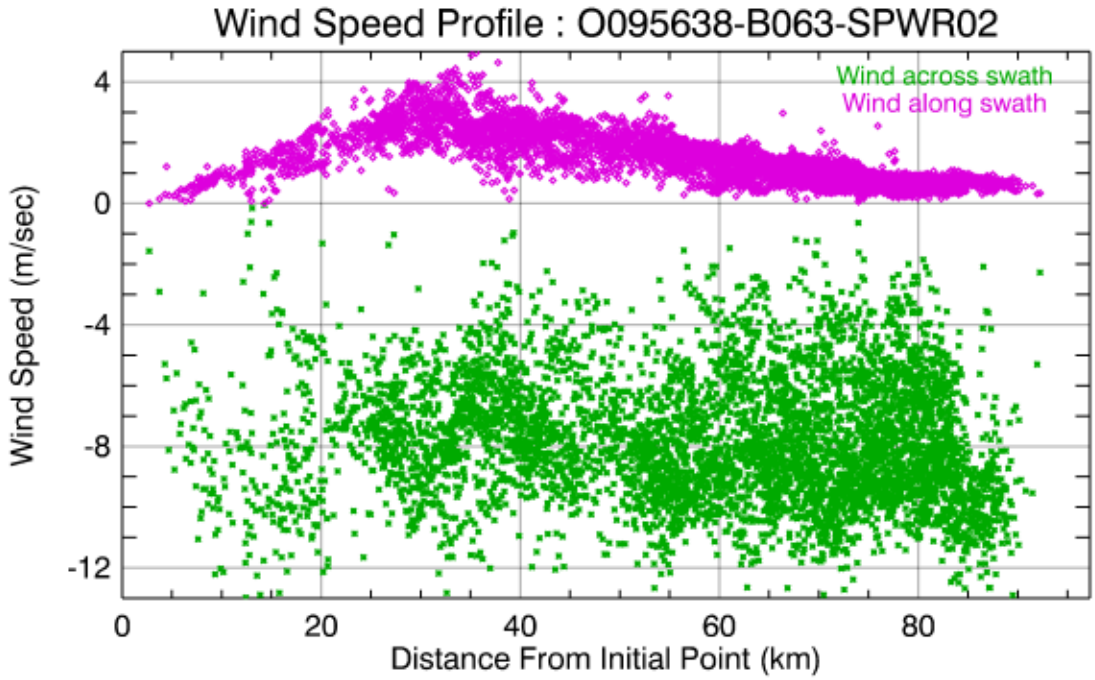

Height Profile : O093760-B048-SPWR01 - Aug 3, 2017
Terrain ht
Zero-wind ht
Wind-corrected ht
Maximum Top Ht
Median Top Ht
Height ASL (km)
Distance From Initial Point (km)
Maximum / Median height estimates: 2.869 / 1.440 km; Retrieval Quality: Good
Distance axis origin: lat 53.221 / lon -124.264

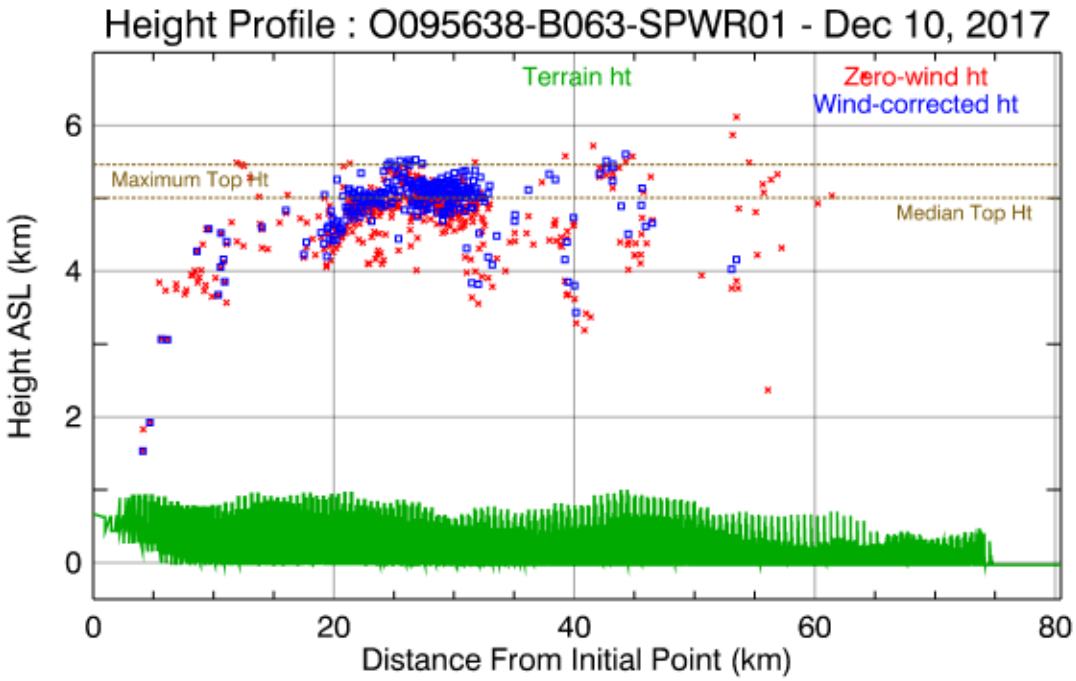

Wind Speed Profile : O093760-B048-SPWR01
Wind across swath
Wind along swath
Wind Speed (m/sec)
Distance From Initial Point (km)

Thomas Fire

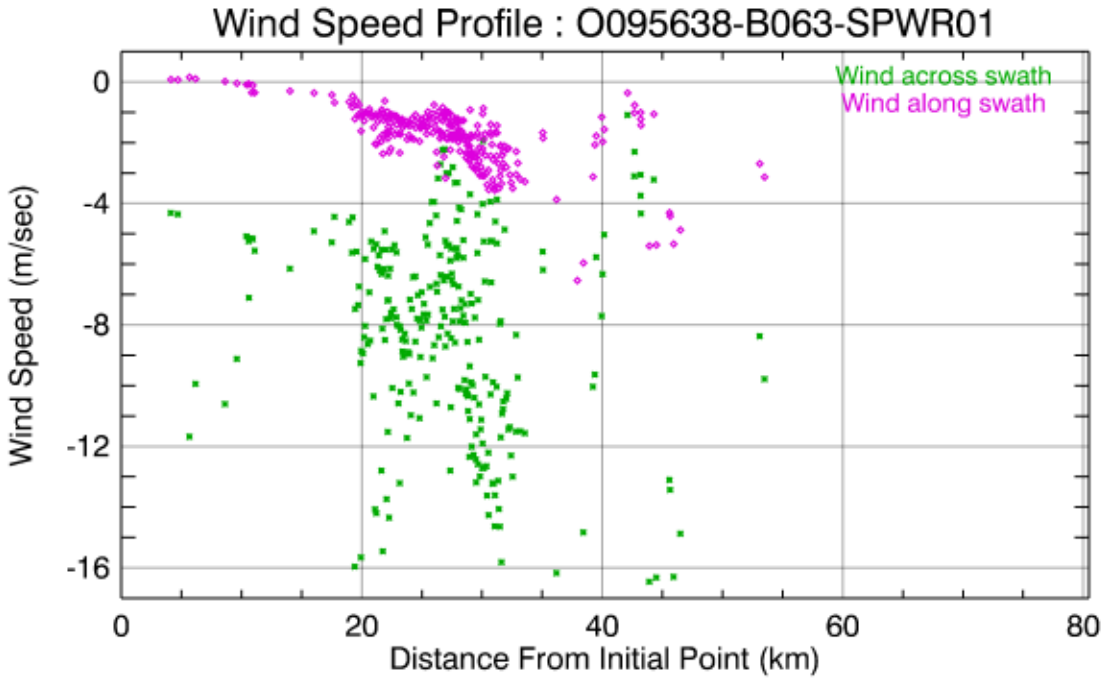


Maximum / Median height estimates: 4.417 / 2.878 km; Retrieval Quality: Good
Distance axis origin: lat 34.506 / lon -119.358

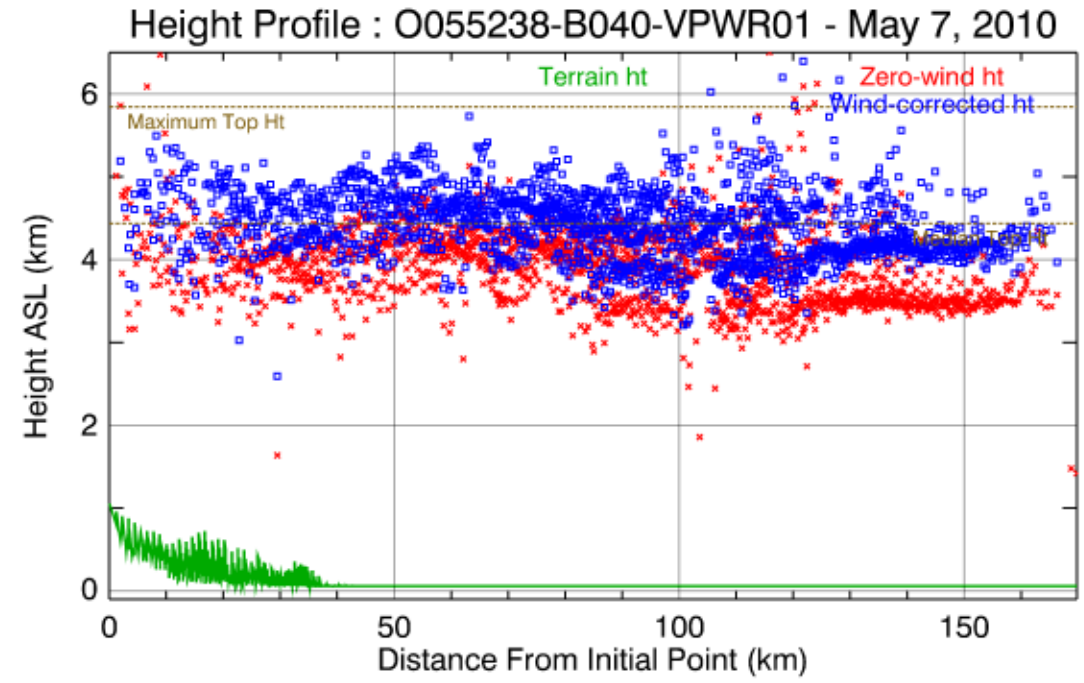


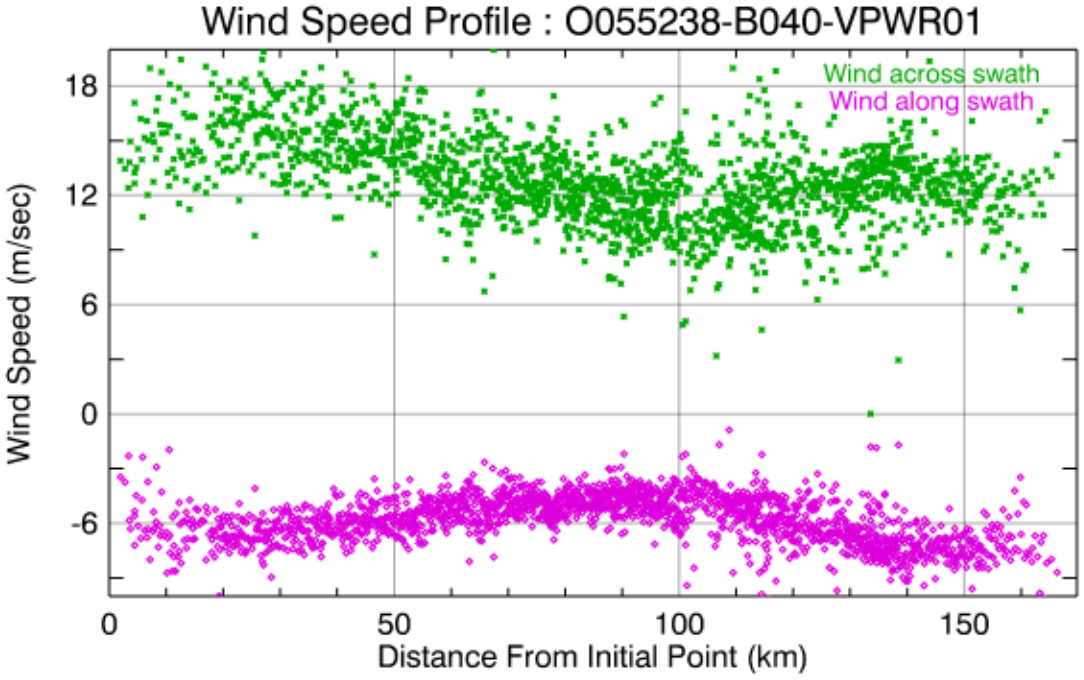


Maximum / Median height estimates: 5.461 / 5.006 km; Retrieval Quality: Poor
Distance axis origin: lat 34.450 / lon -119.504

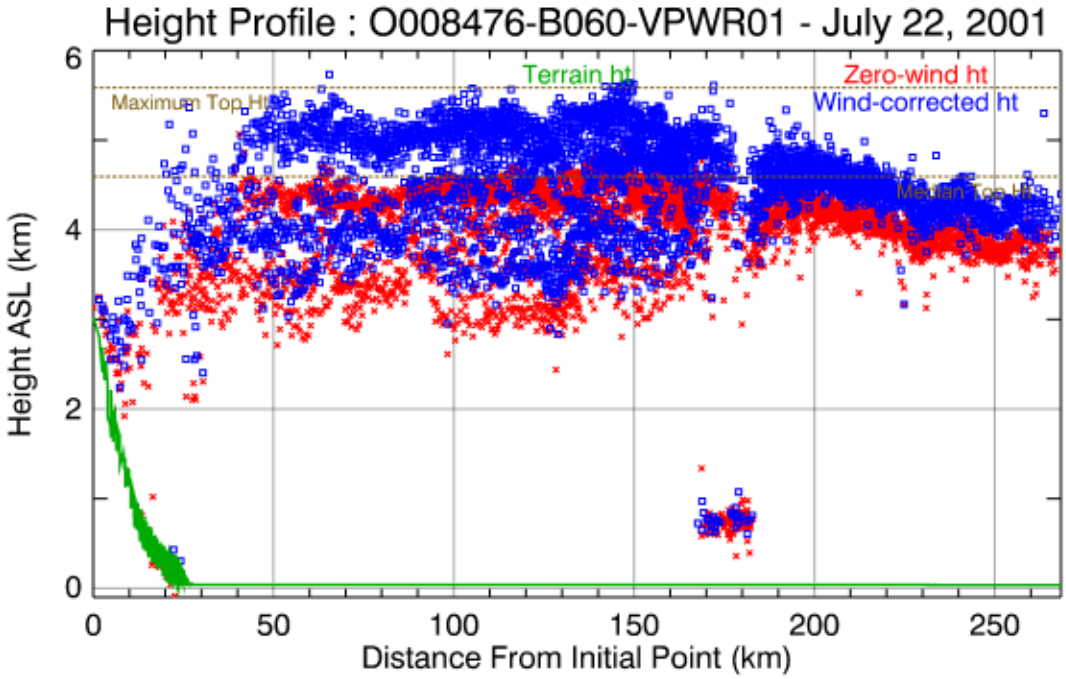


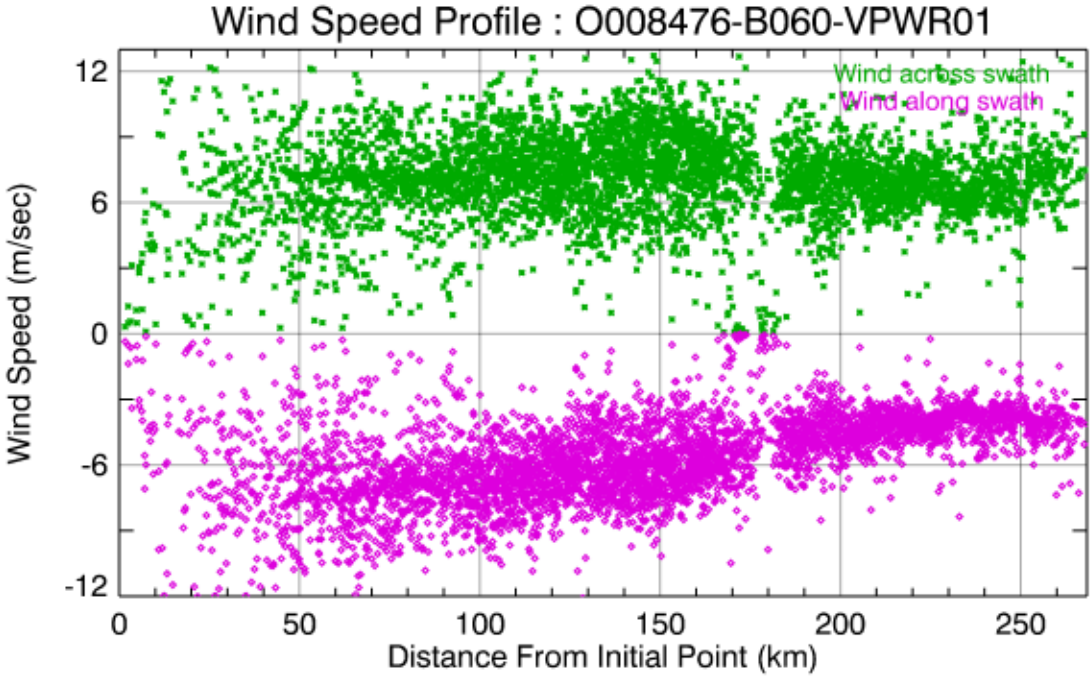
Eyjafjallajokull


Height Profile : O055238-B040-VPWR01 - May 7, 2010
Terrain ht
Zero-wind ht
Wind-corrected ht
Maximum Top Ht
Height ASL (km)
Distance From Initial Point (km)
Maximum / Median height estimates: 5.843 / 4.437 km; Retrieval Quality: Good
Distance axis origin: lat 63.602 / lon -19.542

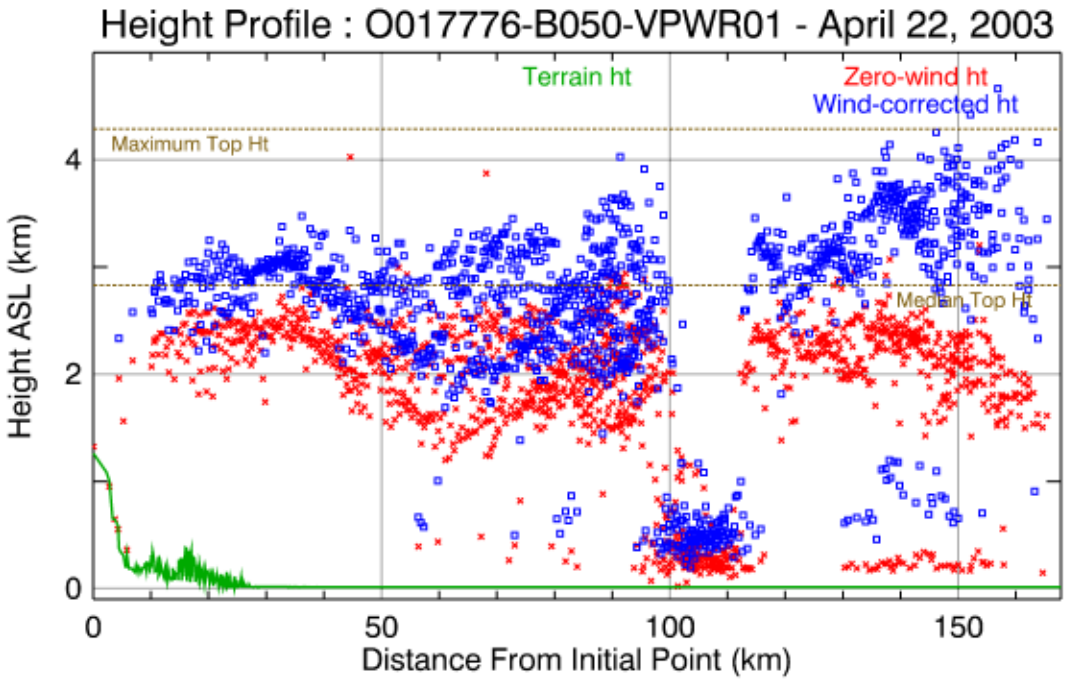
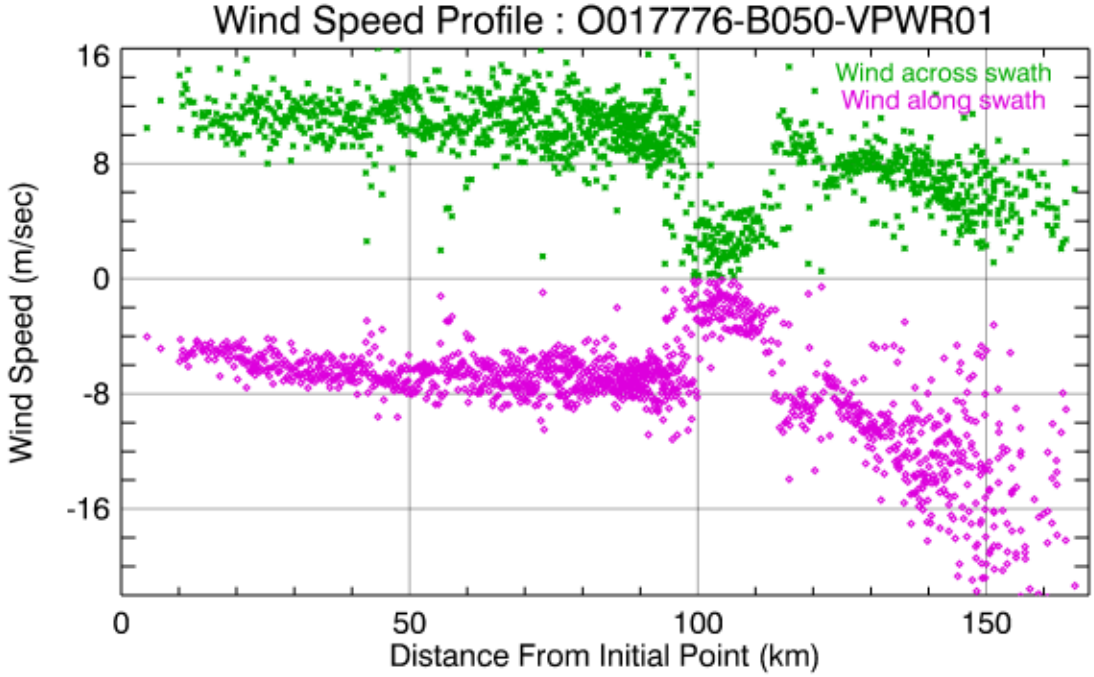

Wind Speed Profile : O055238-B040-VPWR01
Wind across swath
Wind along swath
Wind Speed (m/sec)
Distance From Initial Point (km)

Mount Etna





Chikurachhki



Maximum / Median height estimates: 4.287 / 2.830 km; Retrieval Quality: Good
Distance axis origin: lat 50.318 / lon 155.457