Vertical radar profiles over Iqaluit during STAR

William Henson, Ron Stewart and David Hudak

McGill University/University of Manitoba
Environment Canada

Motivation

Aim of the study is to investigate vertical radar profiles (and other ancillary data) in order to……

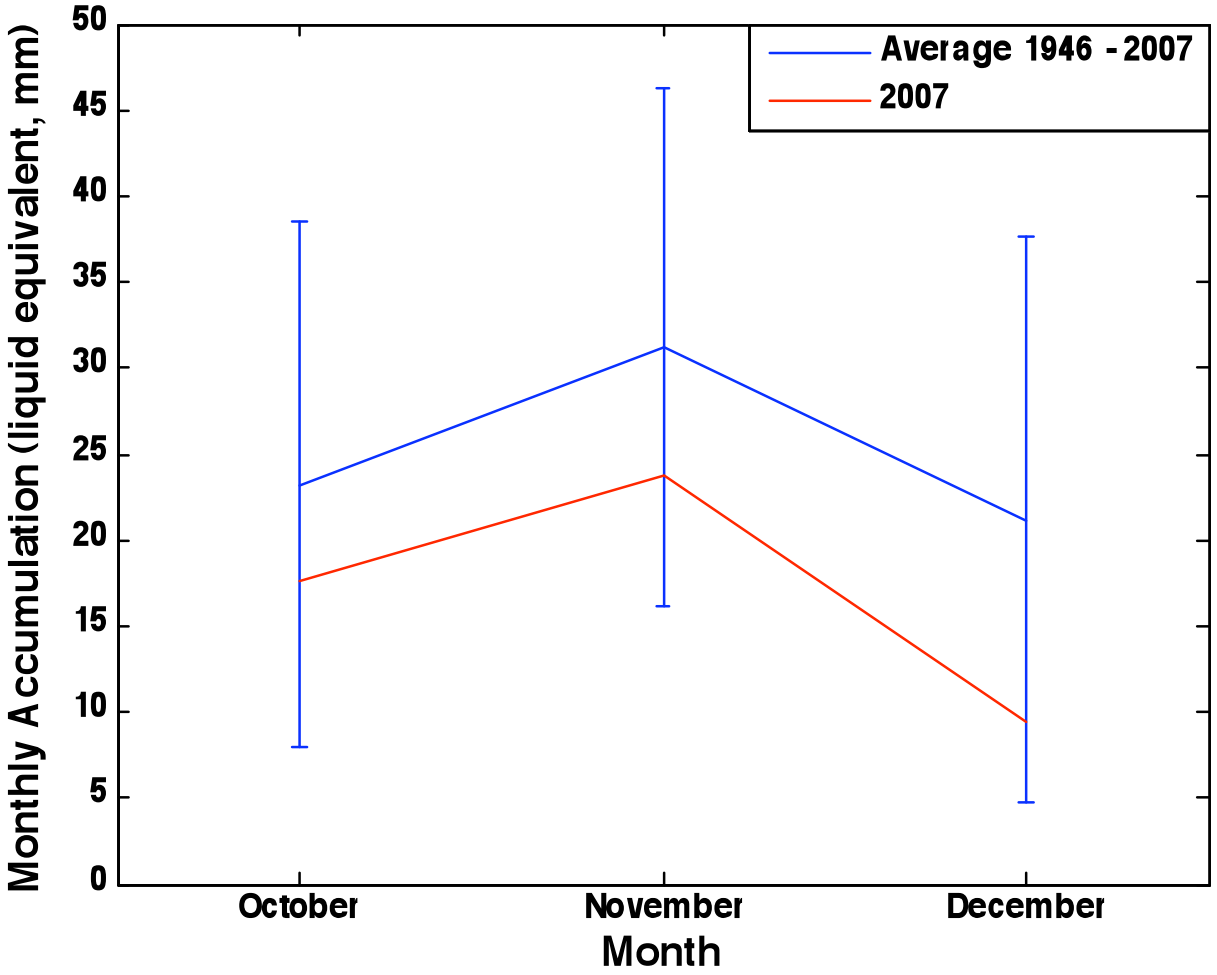
- to put the STAR field campaign into a historical context
- characterize precipitation events in Iqaluit and
- to investigate the role that microphysical processes may have during precipitation events in Iqaluit

Data sets

- EC portable X-band radar. Operated in a variety of modes (vertical pointing data used)
- Geonor gauge (in DFIR)
- Sounding, both the regular 12 h and supplemental soundings
- High resolution photographs

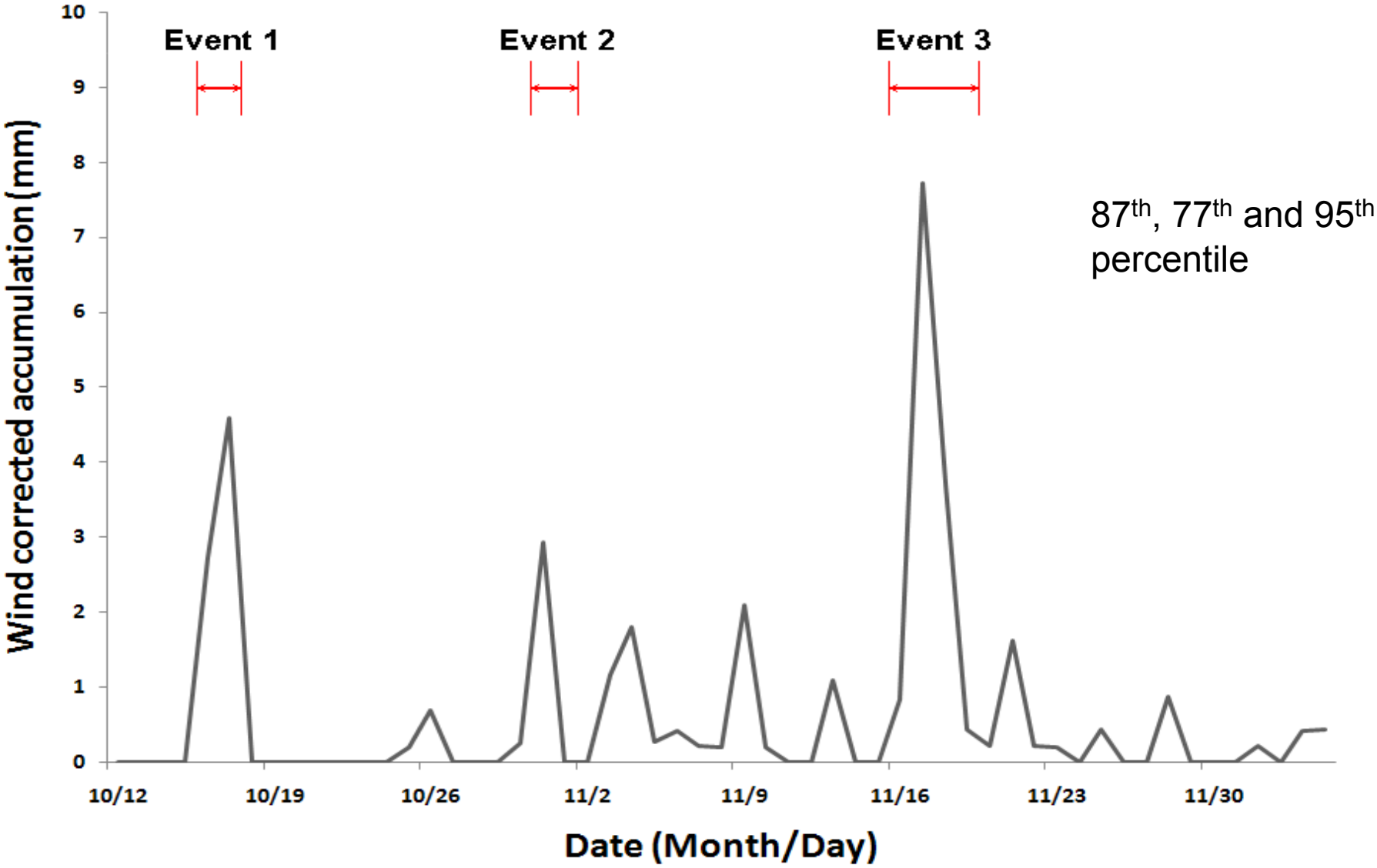
The X-band Radar

Historical Perspective



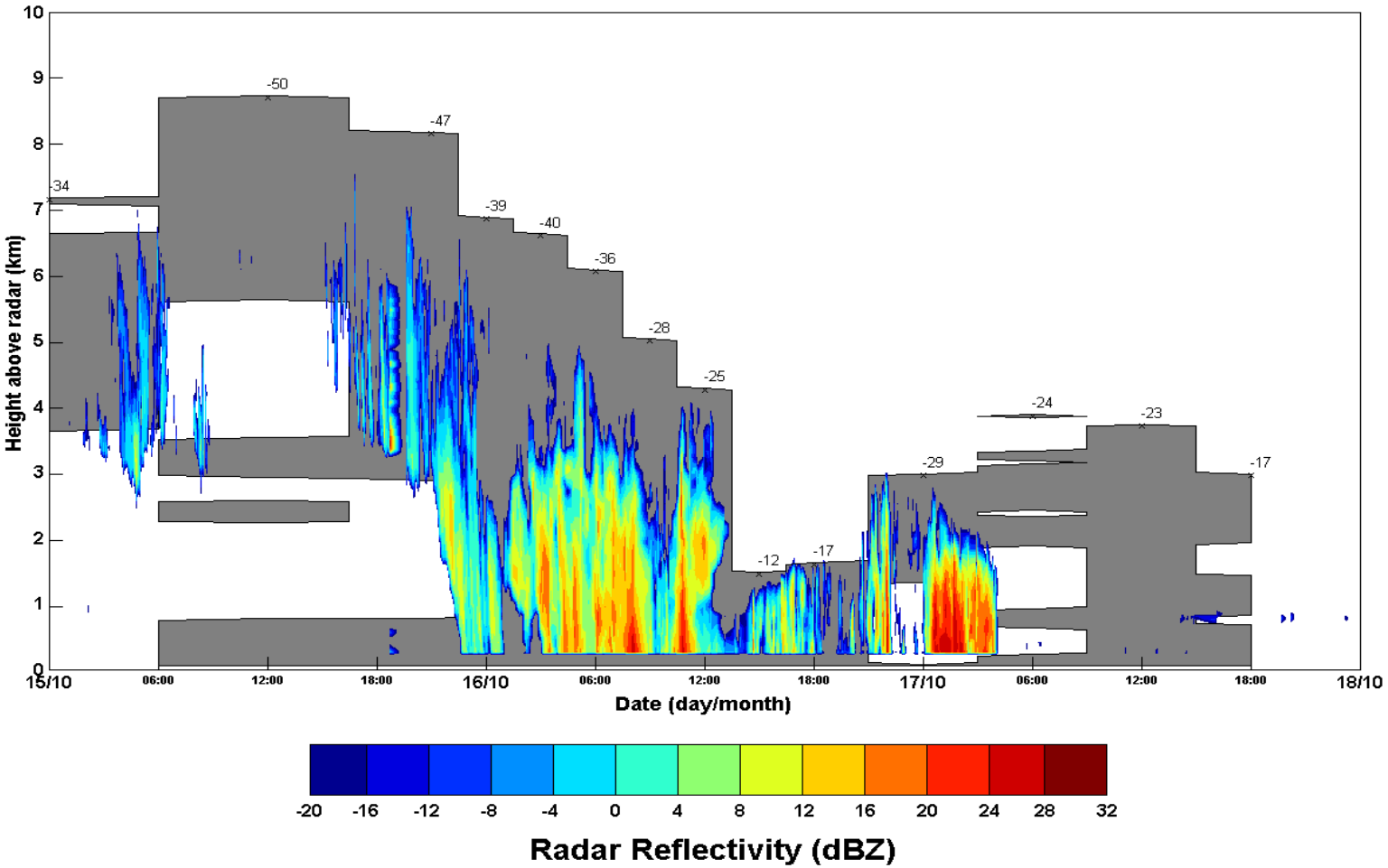
October average is from 12-31st

Events During STAR

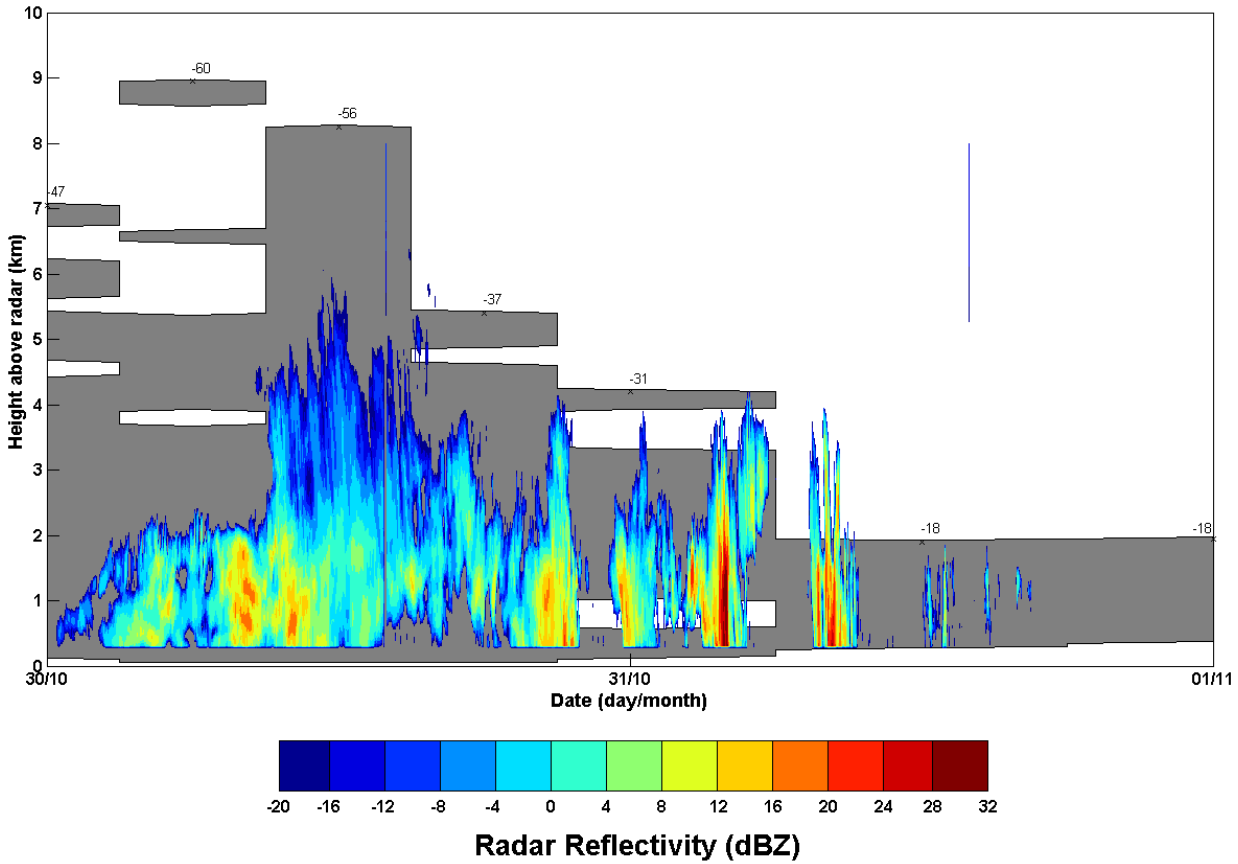


87th, 77th and 95th percentile

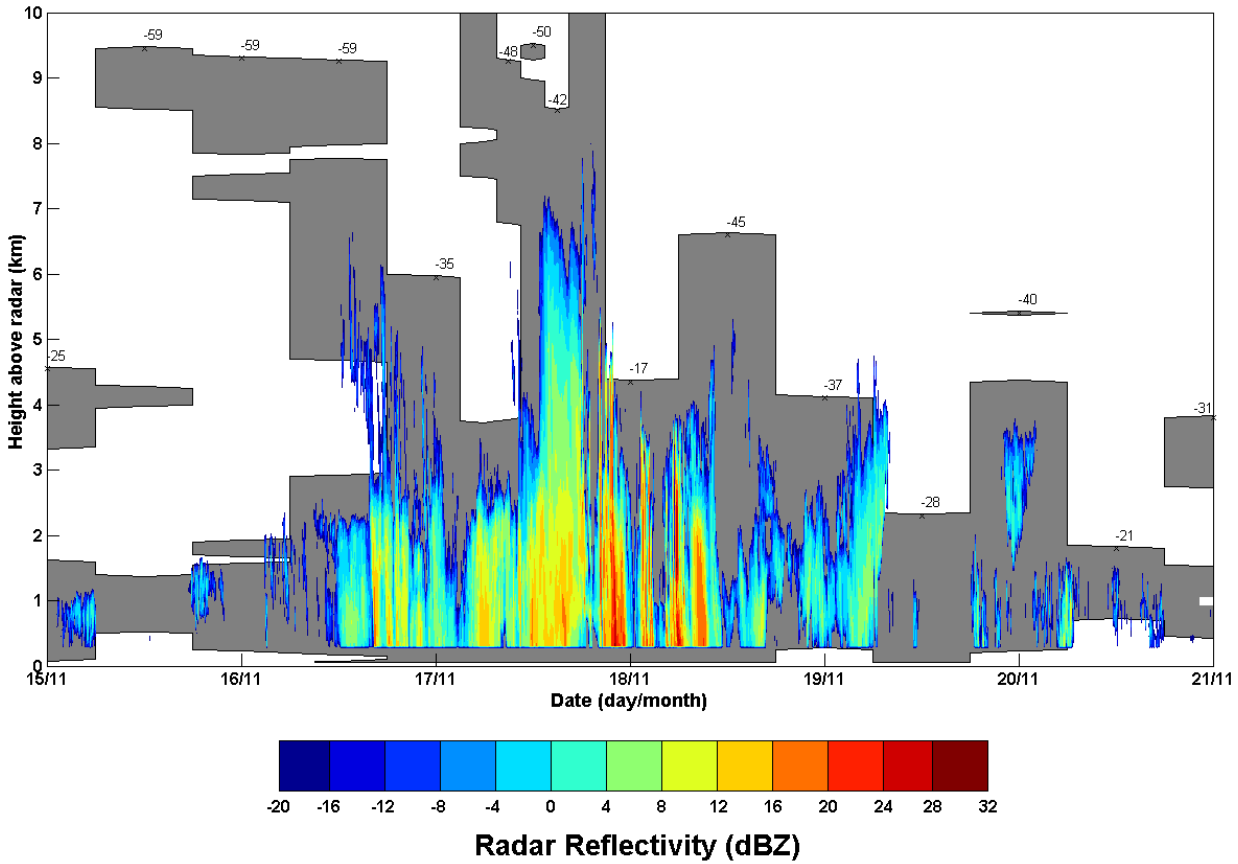
Event 1 : 15-17 October 2007



Event 2 : 30-31 October 2007

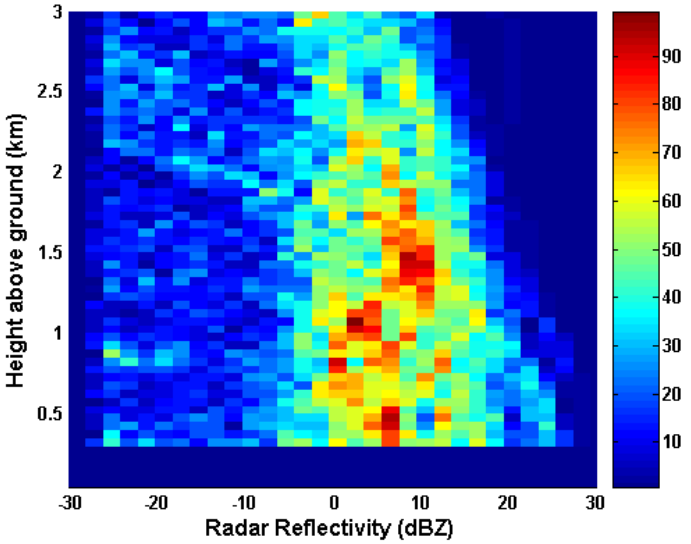


Event 3 : 16-20 November 2007

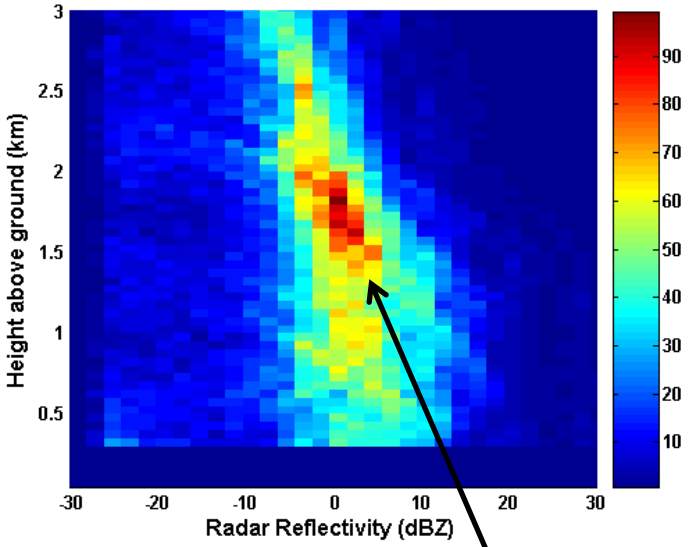


Reflectivity with Height (CFAD)

Event 1

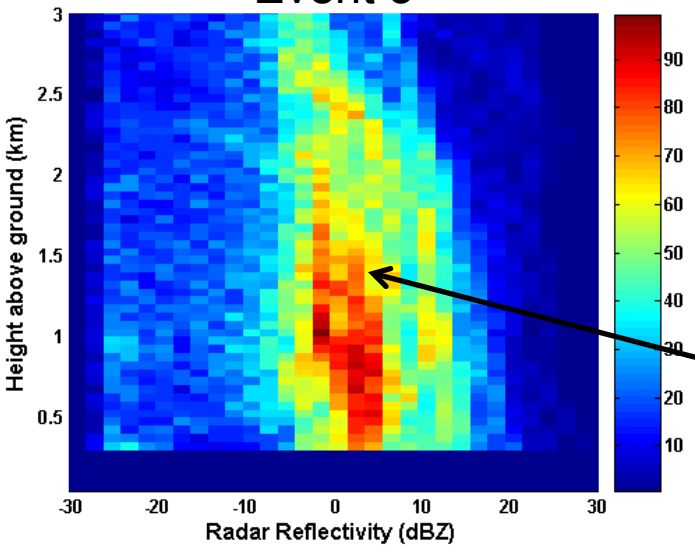


Event 2



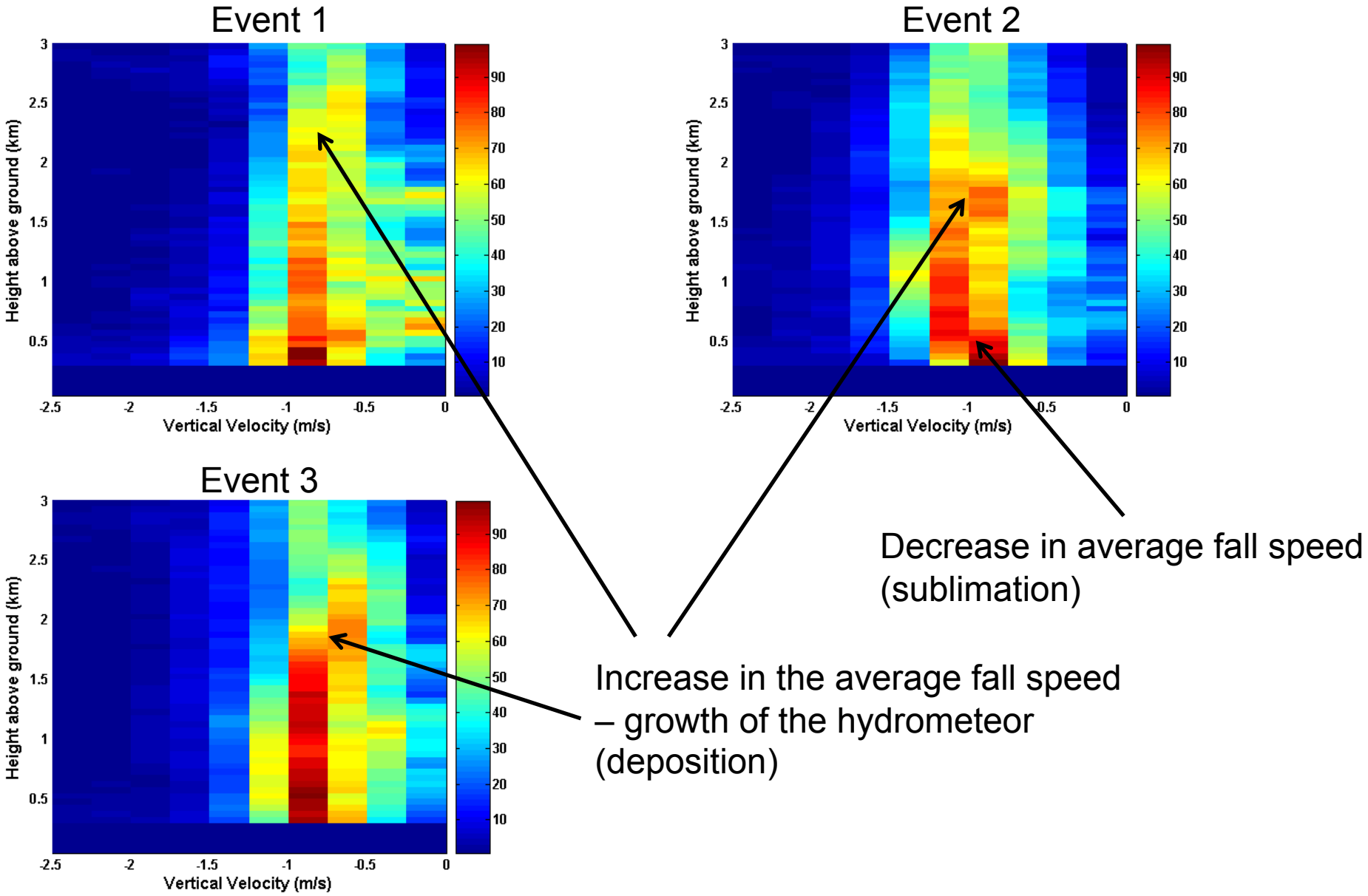
Bulls-eye

Event 3

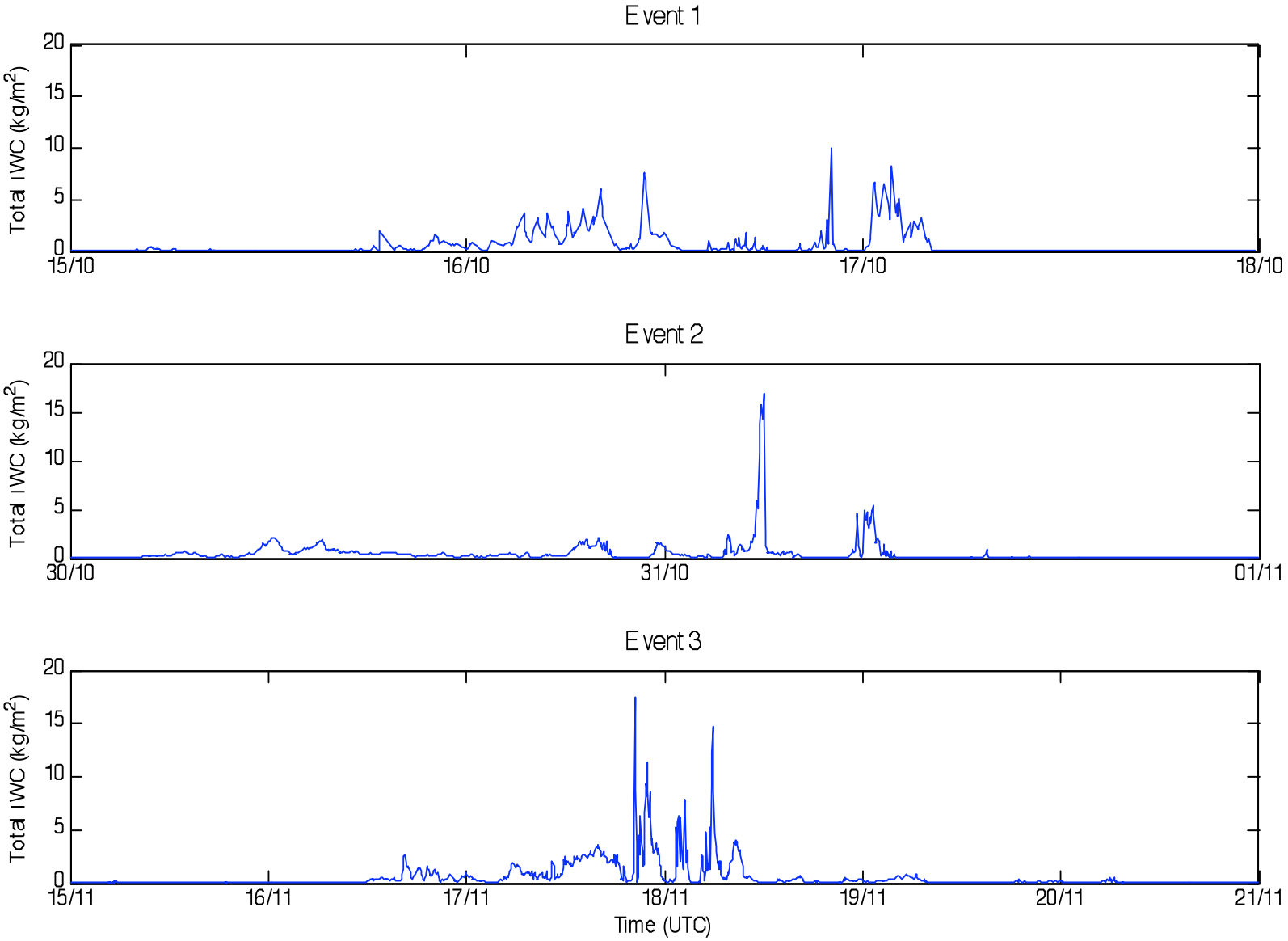


Growth in reflectivity – increasing number/ size of hydrometeors

Fall speed with height (CFAD)

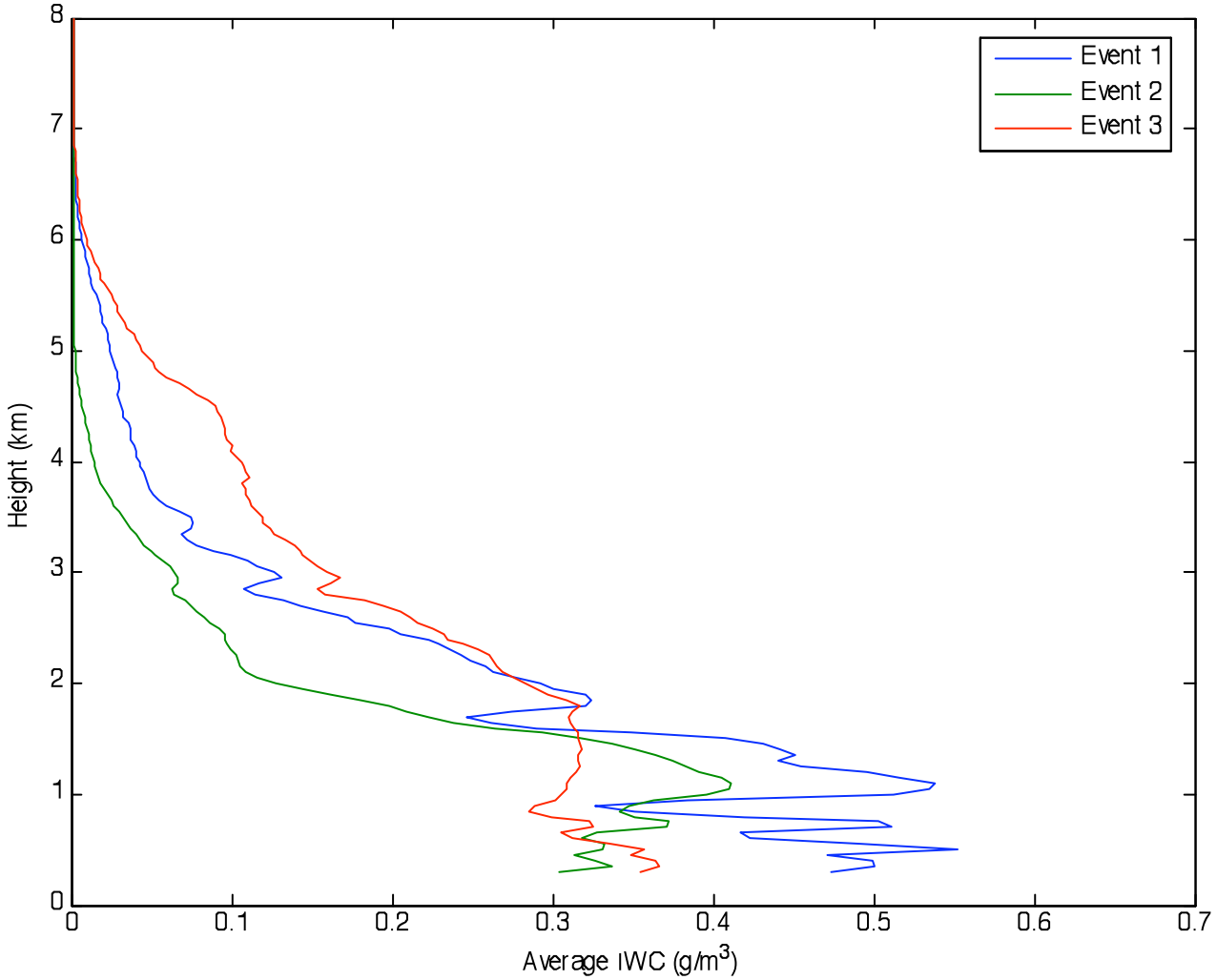


Vertically Integrated Ice Water Content



IWC – Z based on Liu and Illingworth (2000)

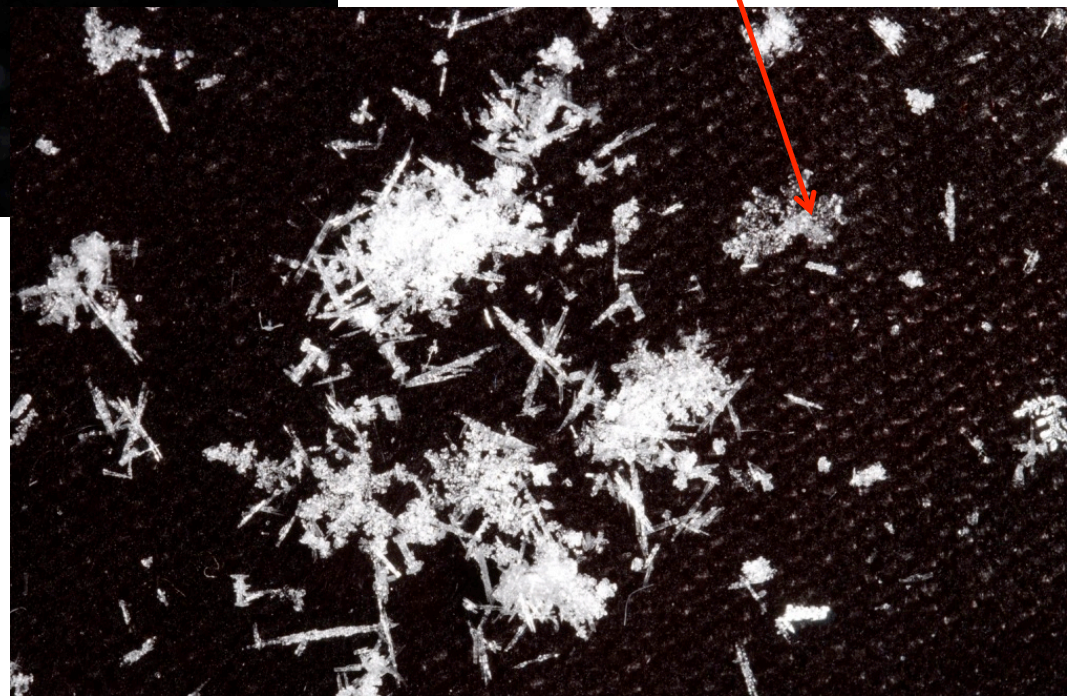
Average Ice Water Content with Height



IWC – Z based on Liu and Illingworth (2000)

Photographs

Event 1



Event 3

Summary

- 3 events provided the majority of precipitation (65%). Many other smaller events. STAR period was less than the historical record

- There were similarities and differences
  - Reflectivity aloft that didn't reach surface but at different stages in the event
  - Different maximum reflectivity heights
  - Similar reflectivity ranges
  - Reflectivity indicating passage of fronts

Summary (continued)

- CFADs indicate growth and decay of hydrometeors – evidence of sublimation in all 3 events, growth in 1 event

- Vertical IWC ranges were similar but significant IWC variance with height

- Super-cooled water was at times significant as evidenced by photography