Analysis of AMPR and HIWRAP Data in Two Cases From IMPACTS

Amanda Richter[1], Timothy Lang[2], Paul Meyer[2]

[1]*University of Alabama in Huntsville*
[2]*NASA Marshall Space Flight Center*

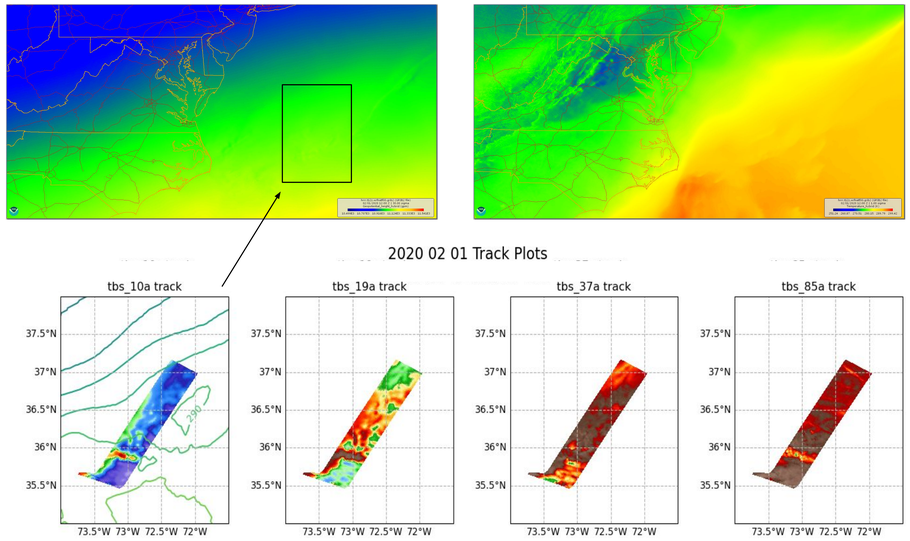
1.Introduction

- IMPACTS involved two NASA aircraft - the in situ P-3B and the remote sensing ER-2 - observing winter storms during Jan-Feb 2020
- The Advanced Microwave Precipitation Radiometer (AMPR) is a four-frequency passive microwave radiometer that is sensitive to clouds and precipitation
- The High Altitude Imaging Wind and Rain Airborne Profiler (HIWRAP) is a dual-wavelength Ka/Ku-band radar co-located with AMPR on the ER-2

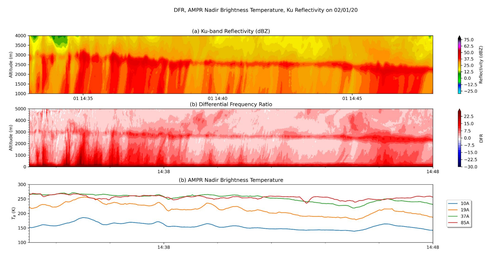
2. Data and Methods

- Data collected from the 2020 IMPACTS field campaign
- AMPR and HIWRAP observations analyzed together, focusing on nadir curtain
- In level flight legs with a bright band, slope was calculated monotonically from the endpoints of the bright band
- Linear regression performed between bright-band altitude and AMPR brightness temperature (Tb), and HIWRAP near-surface reflectivity and AMPR Tb
- HRRR data used to conduct fine-scale analysis to identify source of bright-band slope

3. Case #1: February 1



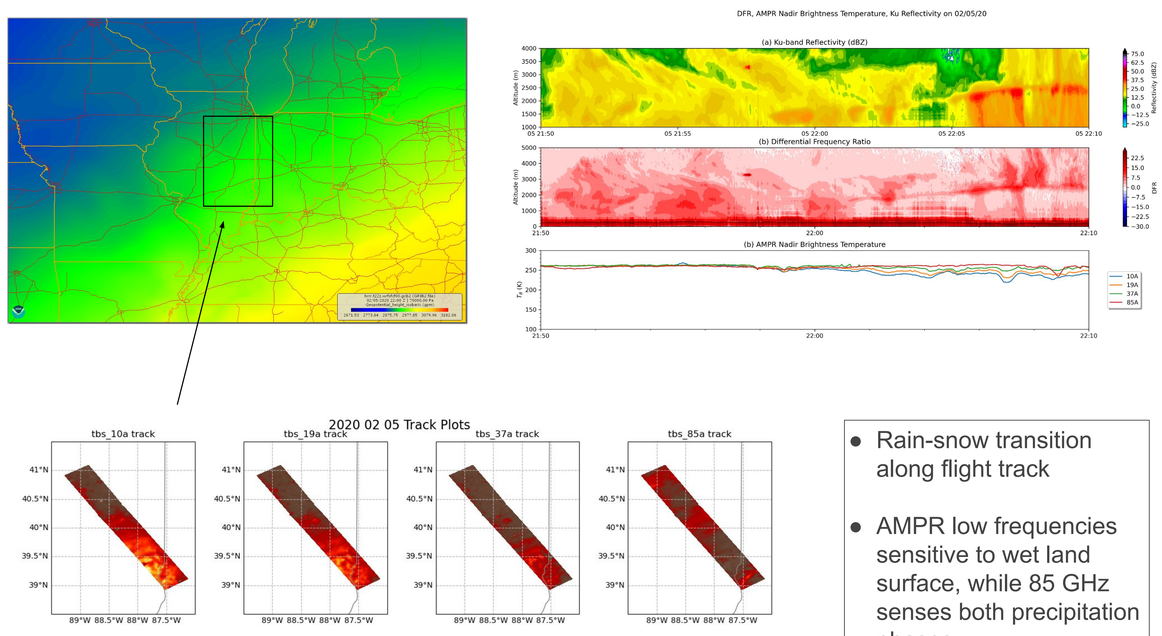
- Bright band slope seen in HIWRAP cross-section
- Similar negative slope in AMPR nadir Tb
- Bright-band slope due due to cold front



- Bright-band altitude correlated with AMPR nadir Tb
- Low-altitude reflectivity less correlated with AMPR nadir Tb

Frequency (GHz)	10	19	37	85	all
Date/Time	2020/2/1	14:33 - 14:48			
R^2 (Tb vs BB alt)	0.429	0.647	0.697	0.317	0.787
R^2 (Tb vs reflec)	0.359	0.229	0.079	0.018	0.451

4. Case #2: February 5



- Rain-snow transition along flight track
- AMPR low frequencies sensitive to wet land surface, while 85 GHz senses both precipitation phases

5. Conclusions and Future Work

- Slanted bright band detected in AMPR nadir brightness temperature on February 1
- Analysis of other flight legs suggests this correlation is meaningful, though more observations of bright band heterogeneity desired
- The 5 February over-land flight featured observations of a rain-snow transition and indicated AMPR's ability to provide information about both the land surface and the precipitating clouds
- Looking at additional flight legs/cases, as well as geophysical retrievals over water with noise-filtered AMPR observations