

Diagnosing and Predicting Precipitation Type Aloft – Promises and Challenges

Andrew A. Rosenow, Daniel D. Tripp, Heather D. Reeves

Cooperative Institute for Severe and High-Impact Weather Research and Operations (CIWRO) and
NOAA/OAR/NSSL

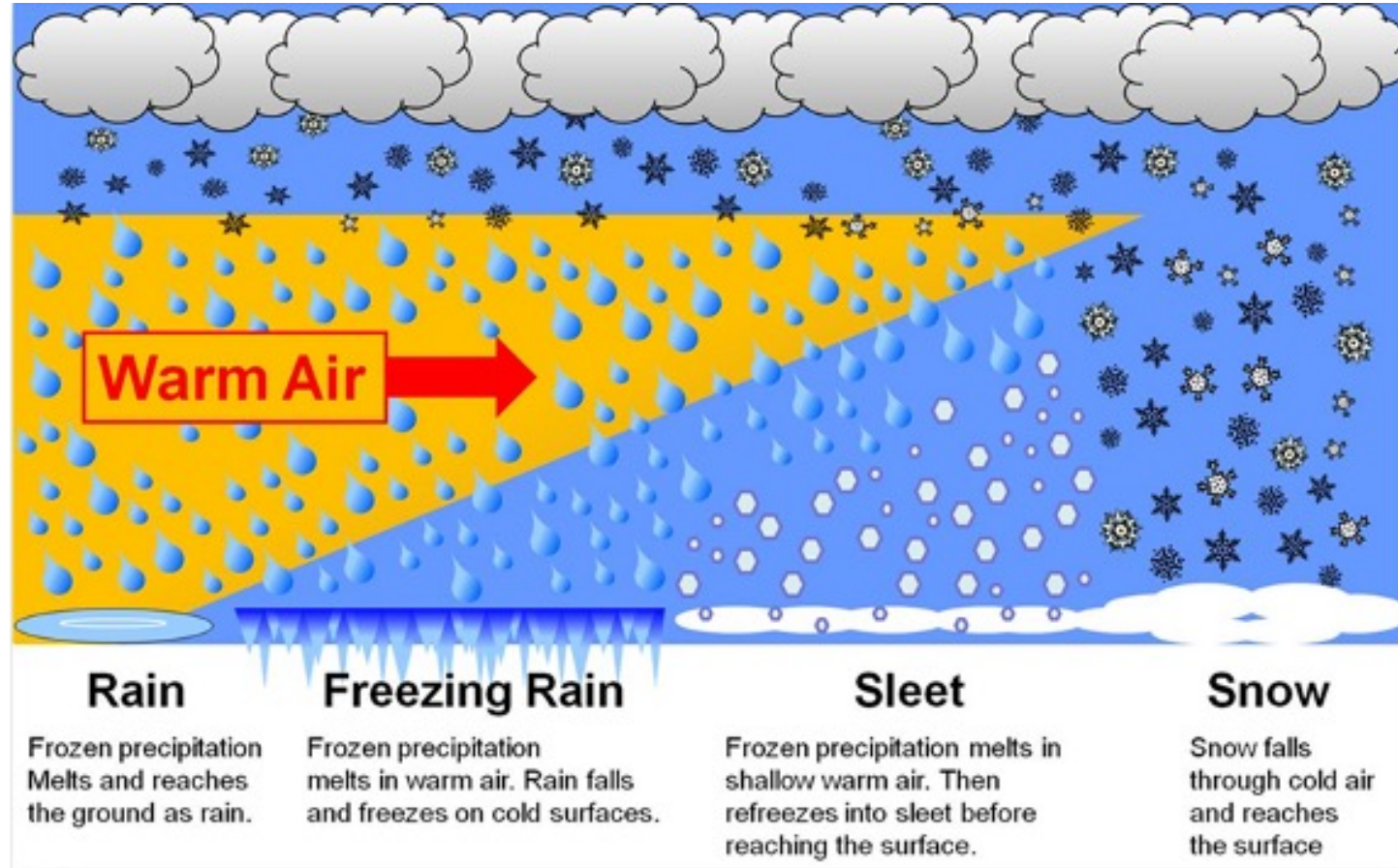
FPAW Fall Meeting

October 25, 2022 – Norman, OK

Andrew.Rosenow@noaa.gov



Precipitation Type

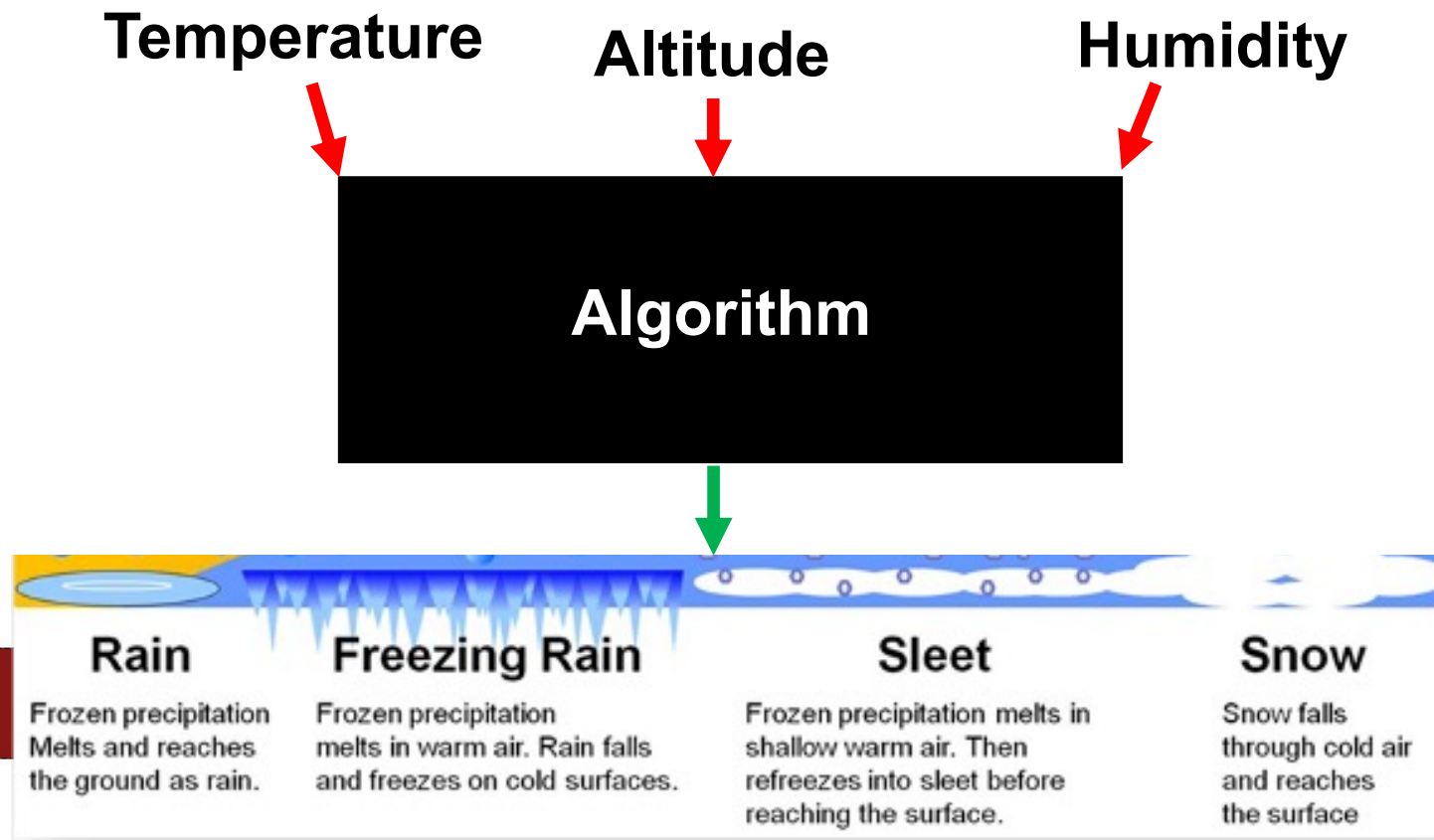


- Precipitation type is defined at the surface, but is a process that begins well above the ground

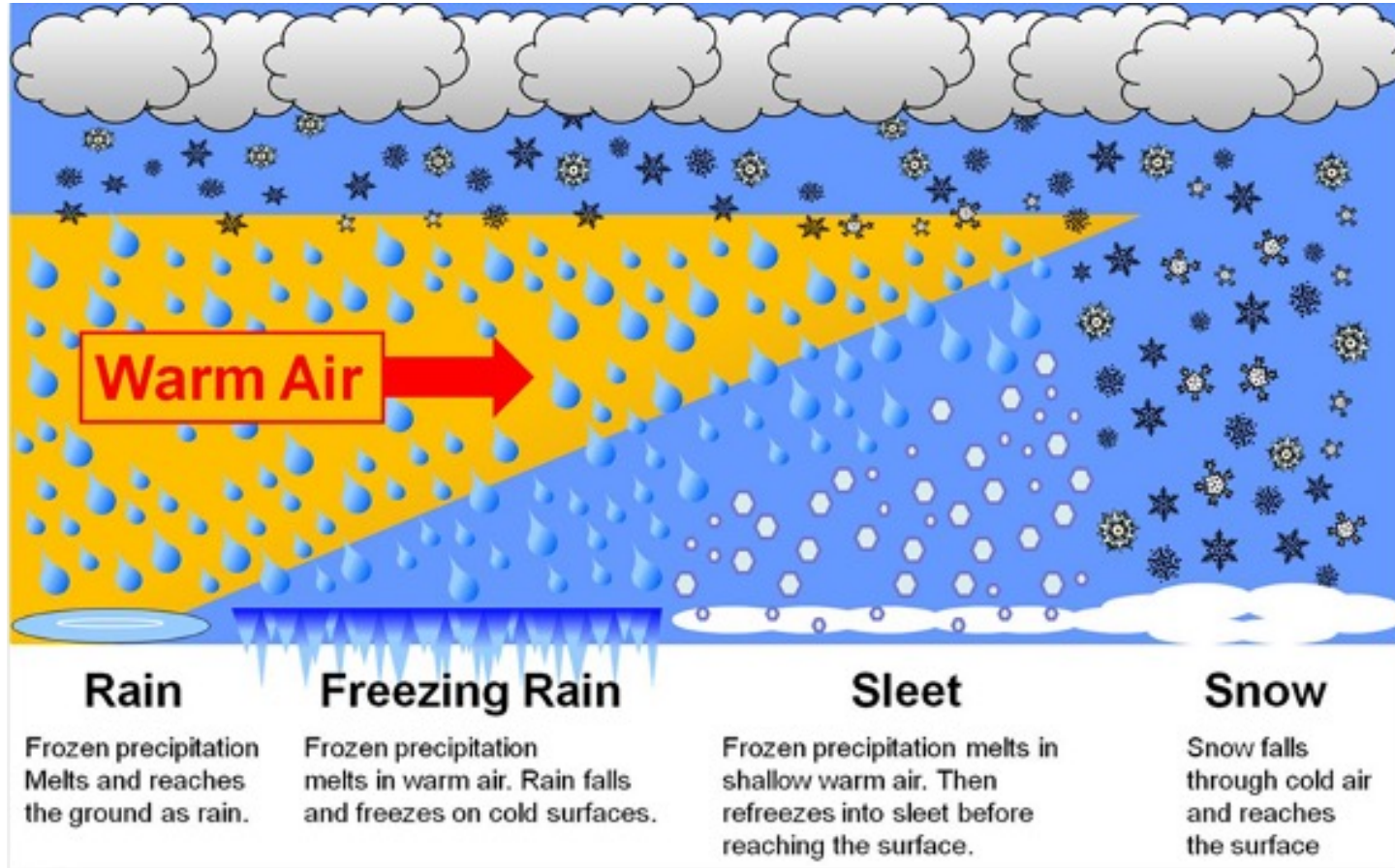


Forecasting p-type

- Most tools for forecasting historically only provided a surface diagnostic



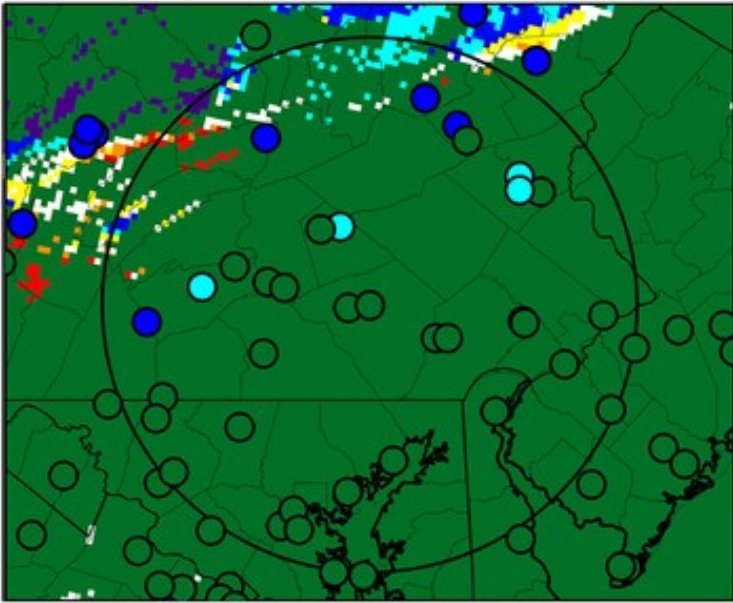
New Precipitation Type Capabilities



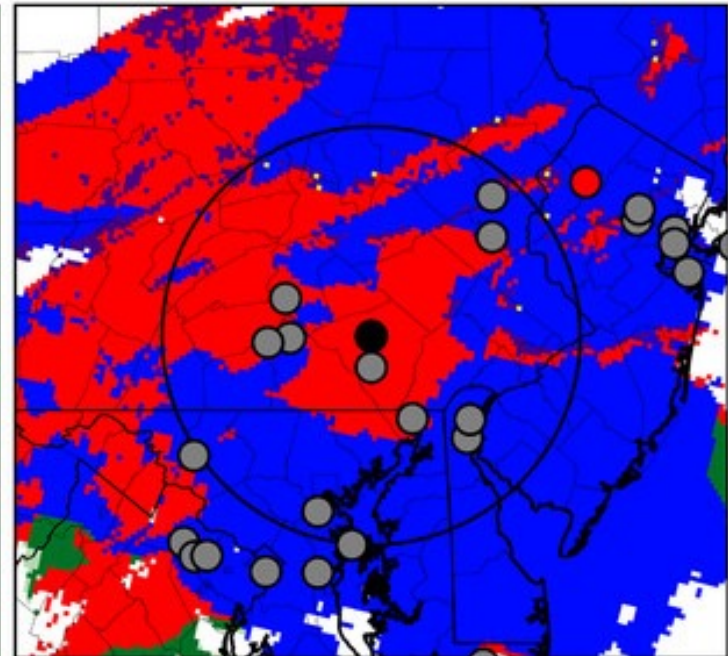
- New algorithms can track precipitation type changes as particles fall
- Will show example data here from the Spectral Bin Classifier from CIWRO (in R2O pipeline, release soon)
 - Concepts are tool-agnostic
- Big question: how do we present this new information?



d) SBC-original



f) SBC-LA



Plan view – Worst Case

- Top – Surface Precipitation Type
- Bottom – “Worst case” Precipitation Type in the lowest 12,000 ft.

We can change top altitude and p-type “danger” order. In what depth range is p-type most dangerous?

Types:

RAIN < SNOW < FREEZING RAIN



Profile View at Airport

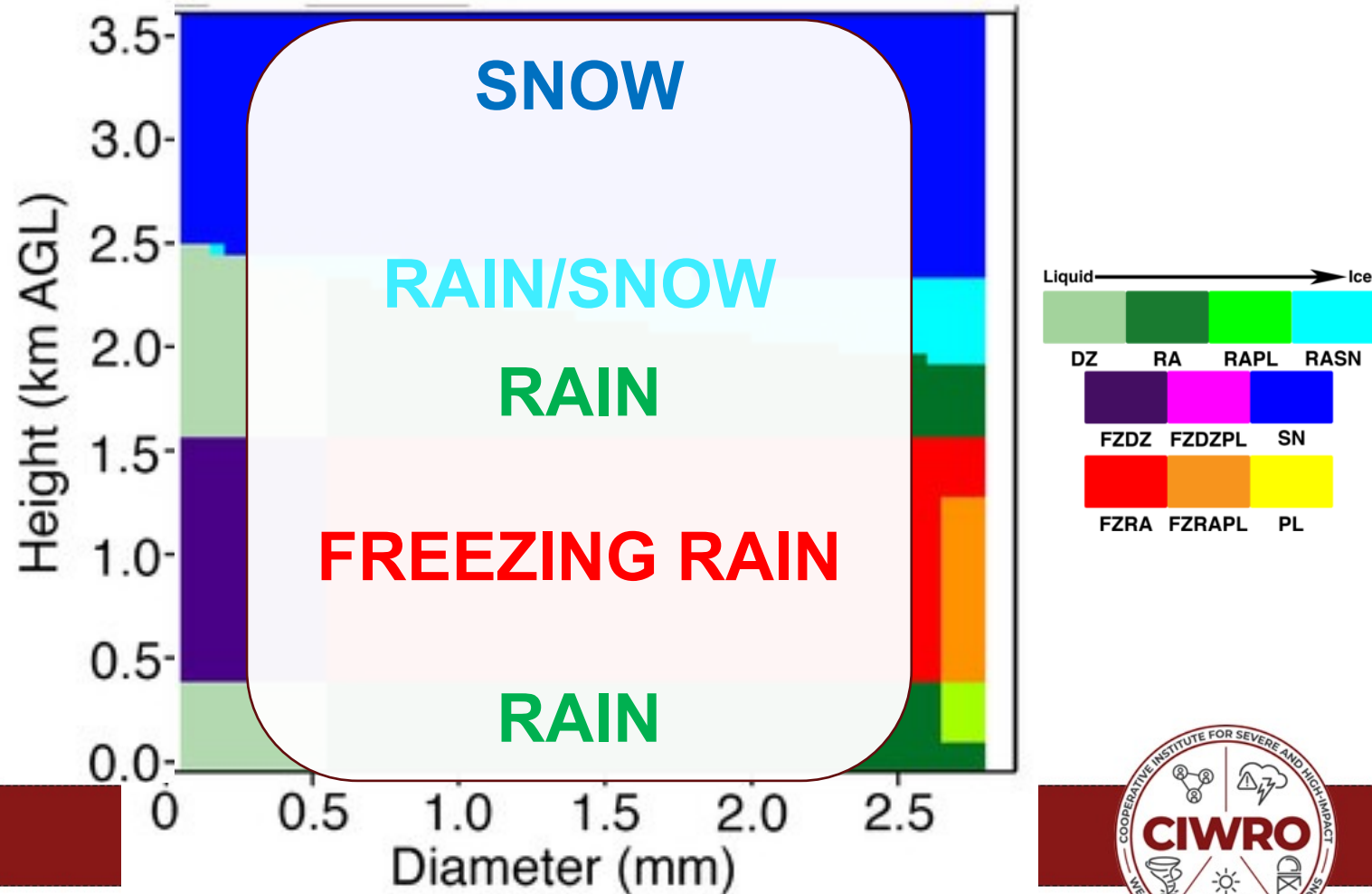
- By tracking phase as particles fall, we can identify where various precipitation types happen in the column

Large Particles:

RAIN FREEZING RAIN SNOW
RAIN/SNOW
FREEZING RAIN/ICE PELLETS
RAIN/ICE PELLETS

Small Particles:

DRIZZLE FREEZING DRIZZLE SNOW



Profile View at Airport

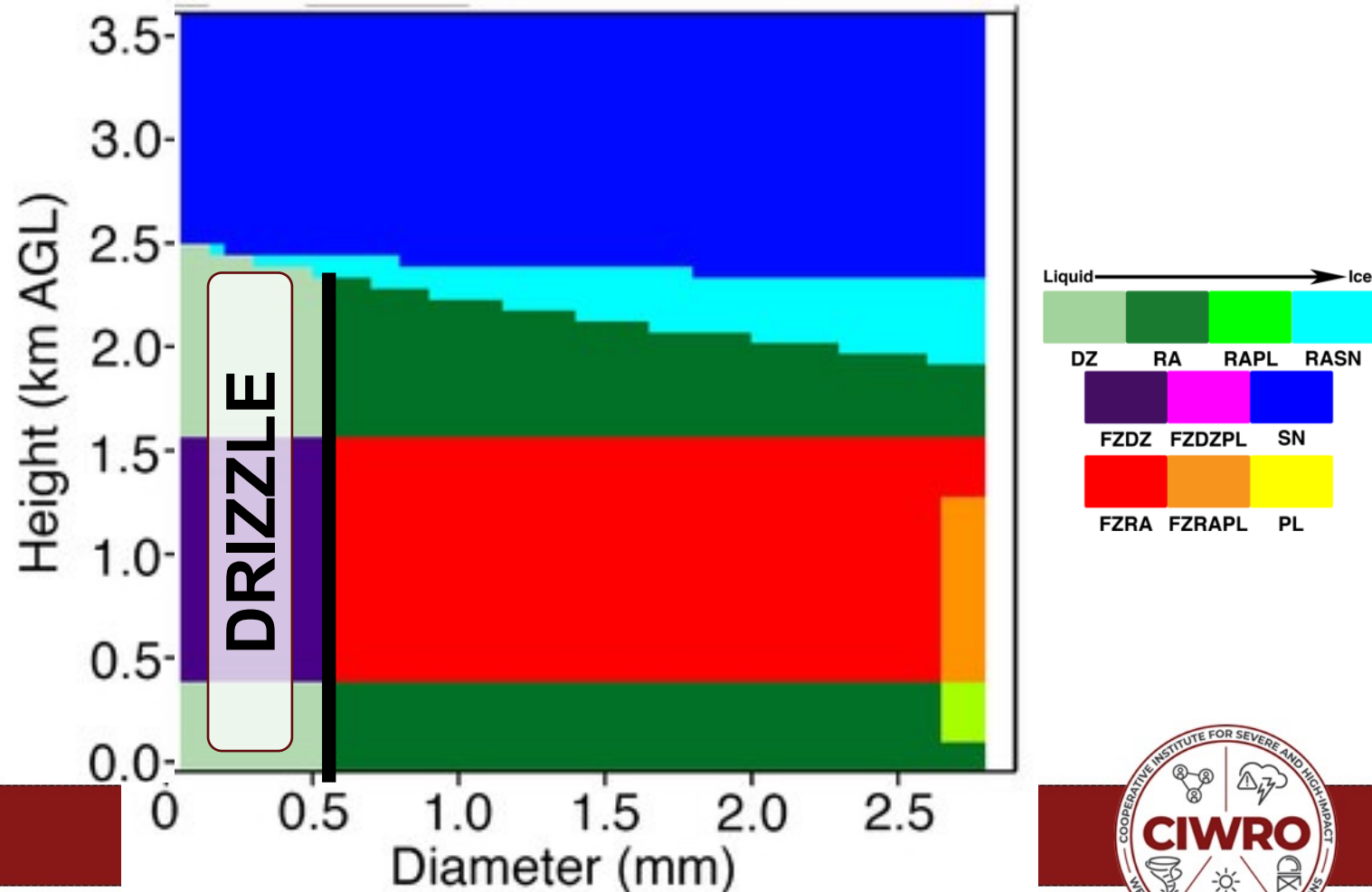
- By tracking phase as particles fall, we can identify where various precipitation types happen in the column

Large Particles:

RAIN FREEZING RAIN SNOW
RAIN/SNOW
FREEZING RAIN/ICE PELLETS
RAIN/ICE PELLETS

Small Particles:

DRIZZLE FREEZING DRIZZLE SNOW



Profile View at Airport

- By tracking phase as particles fall, we can identify where various precipitation types happen in the column

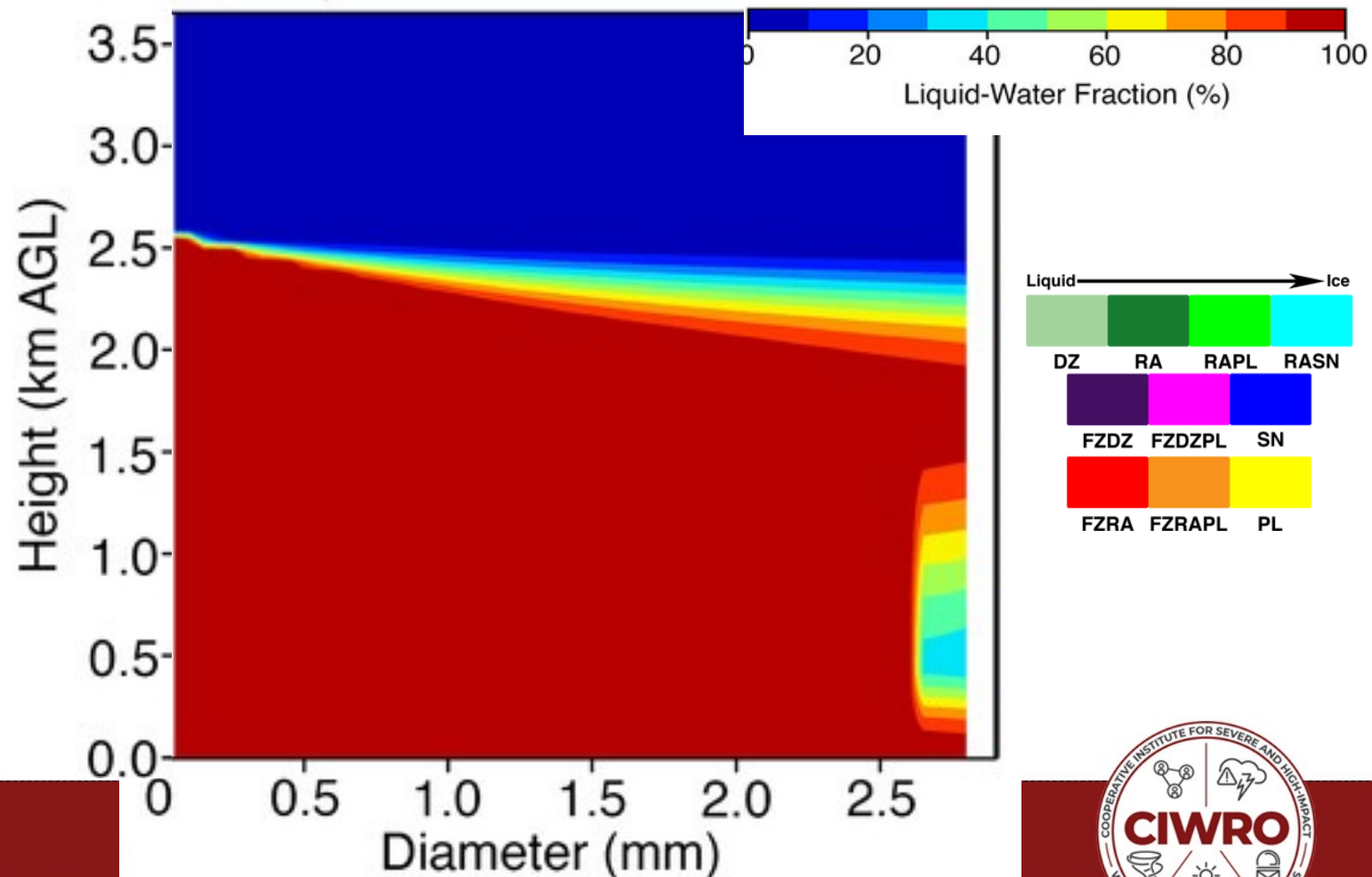
Large Particles:

RAIN FREEZING RAIN SNOW
RAIN/SNOW
FREEZING RAIN/ICE PELLETS
RAIN/ICE PELLETS

Small Particles:

DRIZZLE FREEZING DRIZZLE SNOW

What level of detail is helpful?
Drizzle classifications? Simple
liquid/ice classification?

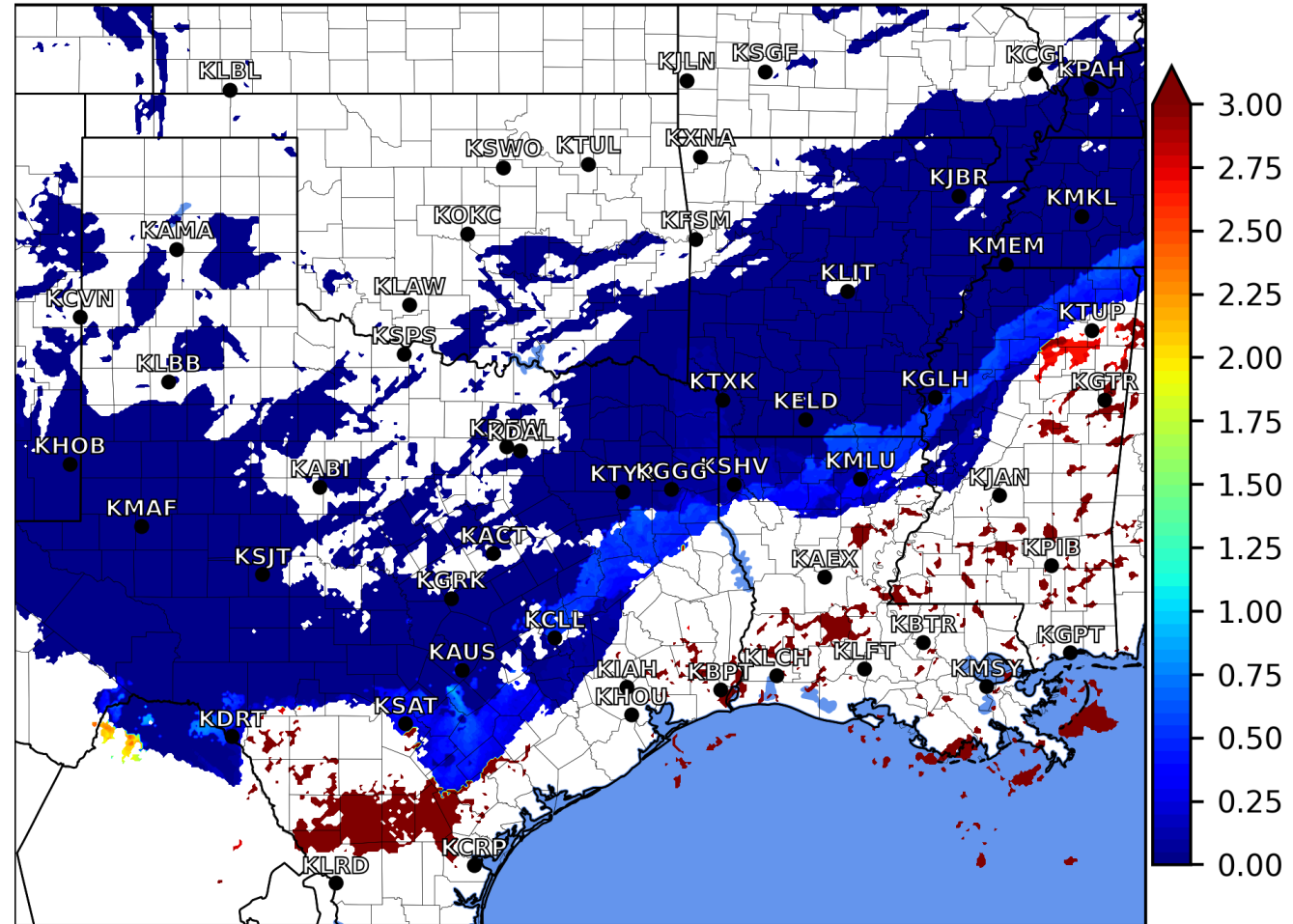


Level of lowest frozen precipitation

Ice Height Valid: (Thu) Feb 11, 2021 18 UTC

- Lowest altitude (km) to contain precipitation with ice or potential to freeze (snow, ice pellets, freezing rain)

**What about the top altitude?
Layer depth? What if there
are multiple layers?**



What can we do with these new tools?

- Determine precipitation type within specified altitude ranges
- Separate drizzle vs heavier precipitation
- Determine lowest altitude with frozen precipitation
- Combine p-type with other data sources to get accumulation rates
 - Further out - accretion rates?
- **All of these are sensitive to errors in input model data!**
 - This is where probabilistic forecasting will likely come in....

