

NOAA-08: An Optimal Atmospheric Dataset for Algorithm Training and Covariance Matrix Generation

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Outline

- Introduction
 - Purpose/motivation: Advantages to having an “optimal set” of temperature and humidity profiles
- NOAA-08
 - Components
 - Strengths/limitations
 - Sampling and coverage
 - Statistical Assessment
- Future Considerations
- Summary

Purpose

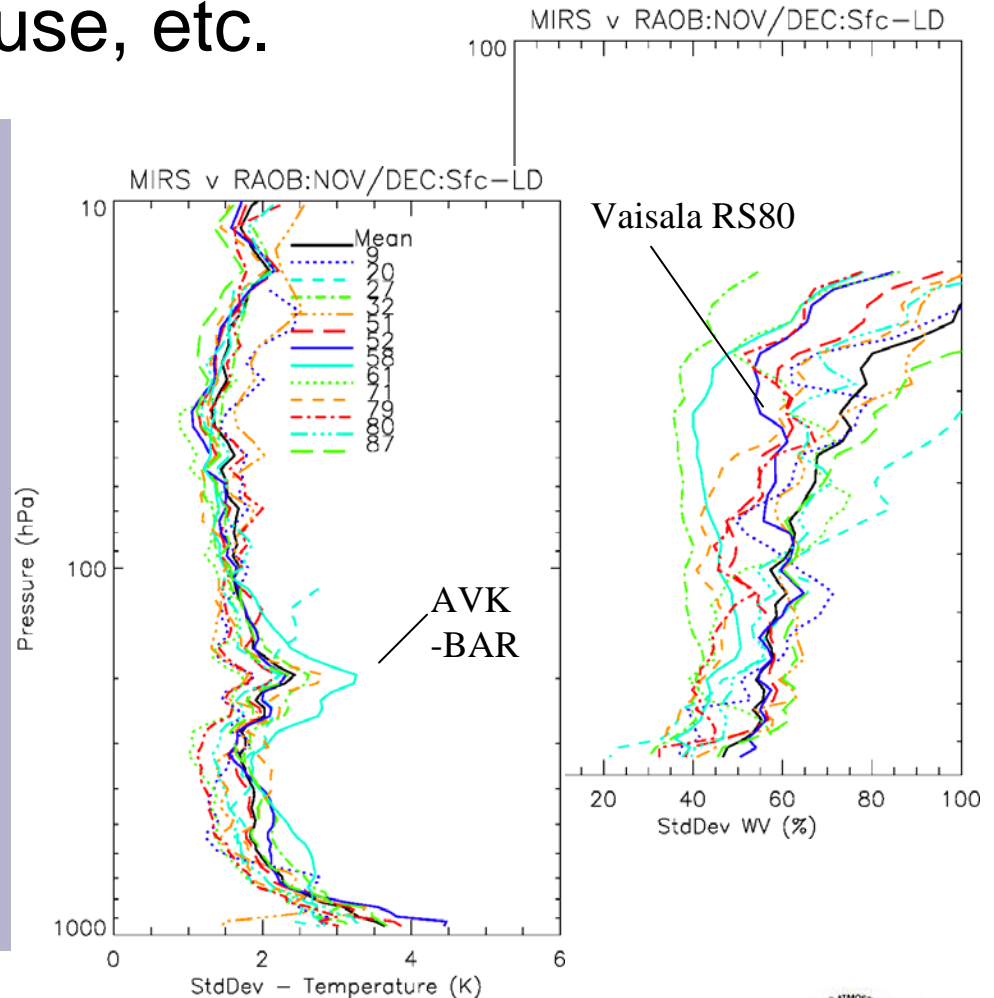
- Create a dataset comprised of consistent temperature and moisture profiles from various data sources to optimize the function of various remote sensing applications
 - Representation of available data sources to leverage strengths, lessen impact of inherent limitations in individual data sources
 - Representation of global variability
 - Inclusion of atmospheric and surface properties in all weather conditions, many surface types
 - High level of QC
- Provide repository with data extraction tool
 - Default profiles/distributions
 - Ability for user to sample data for desired distributions

Motivation

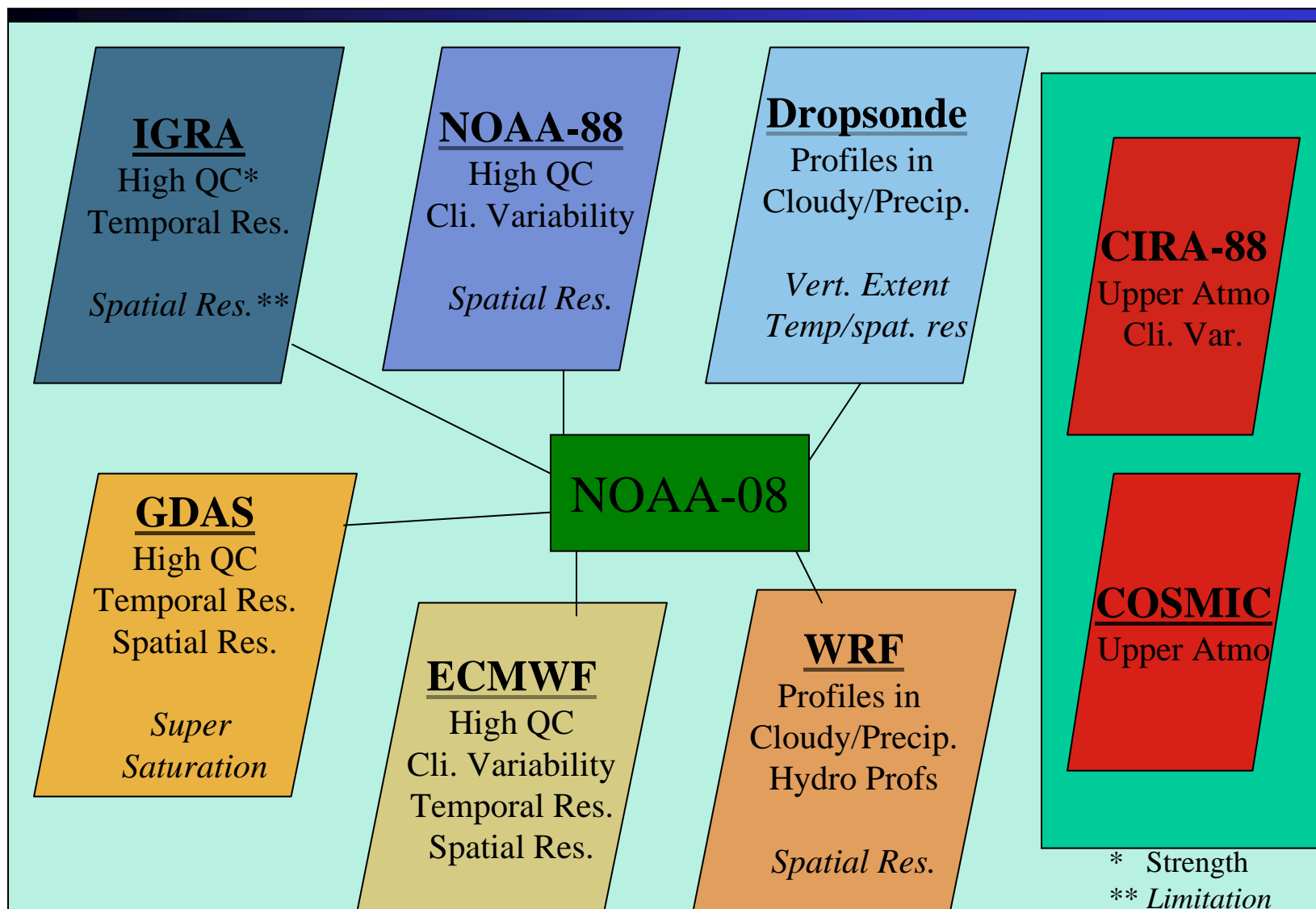
Caveats inherent to each data source impact application, analysis, use, etc.

Microcosm: Radiosonde

- Systematic differences between radiosonde instruments
- Algorithm training on just one RAOB instrument type would effect retrieval performances using full RAOB set for assessment
- Training on all RAOB instrument types would likely improve retrieval performances



NOAA-08 Components



NOAA-08 Components

- Integrated Global Radiosonde Archive (IGRA)
 - 2007 data
 - NOAA-88
 - Highly QC'd subset from 1988 RAOB
 - Global Data Assimilation System (GDAS)
 - 4 days sampled data (Jan., Apr., Jul., Oct.)
 - ECMWF 60L-SD (Chevallier, 2001)
 - Highly QC'd subset of ERA-40
 - Dropsonde
 - 2005 (Jun.-Sep.), cloudy, precip, and hurricane conditions
 - WRF Model
 - 3hr. forecast for Hurricane Bonnie (1998)
 - CIRA-88 (rocketsonde, lidar)
 - Upper atmosphere profiles
 - COSMIC
 - Upper atmosphere profiles
- Currently extending NOAA-08 with these sources

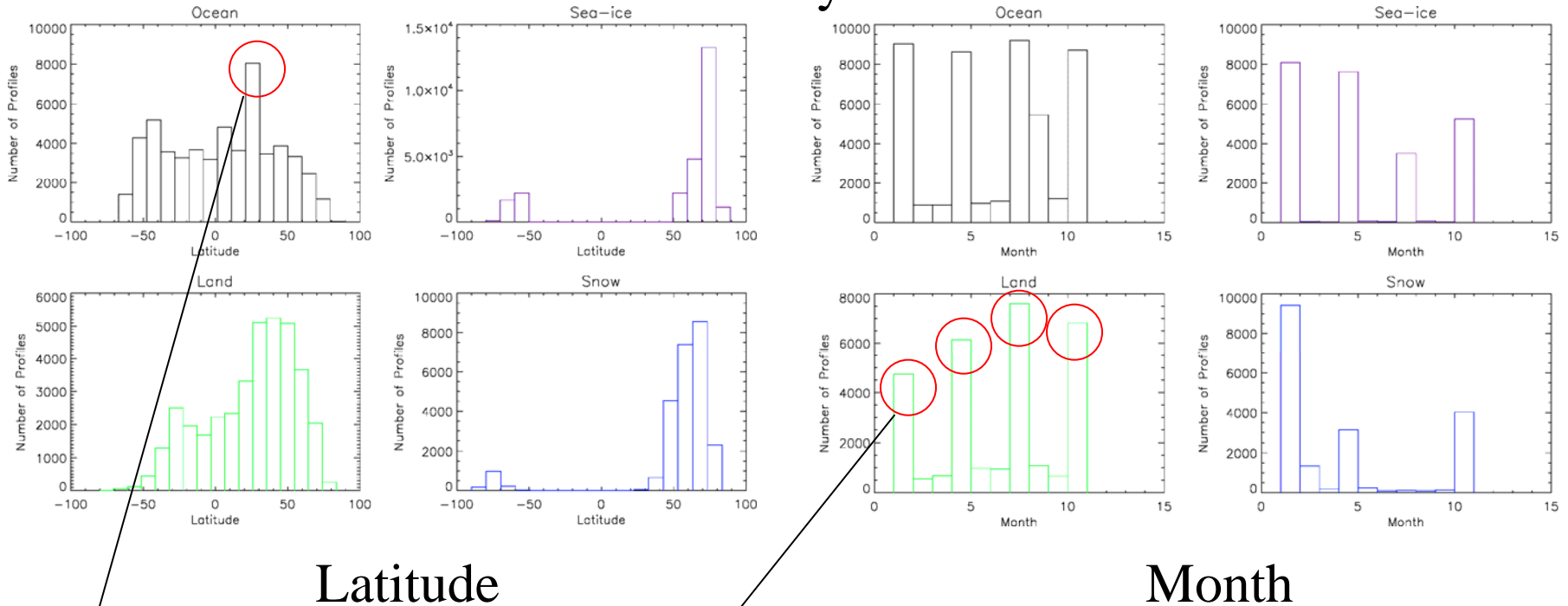
NOAA-08 Dataset

Approximate Number of Profiles

Source	Ocean	Sea-ice	Land	Snow	Total
IGRA	11000	0	9500	7200	27700
NOAA88	1300	300	4000	2000	7600
Dropsonde	1000	0	0	0	1000
GDAS	27000	24000	22000	17500	90500
ECMWF	6800	750	2900	1900	12350
WRF	4000	0	0	0	4000

NOAA-08 Dataset

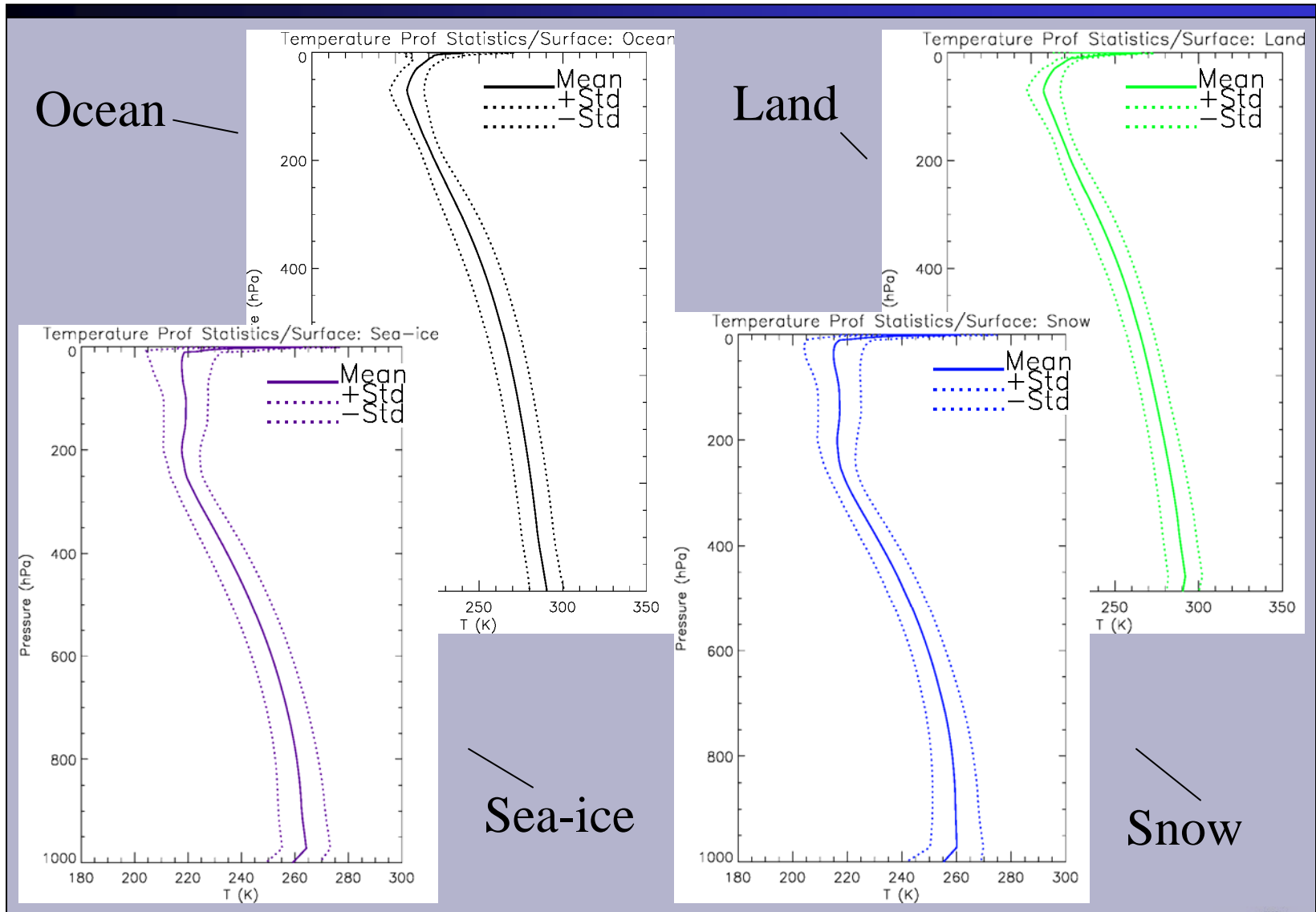
NOAA-08 Distribution by Latitude and Month



Hurricane
Bonnie (WRF)

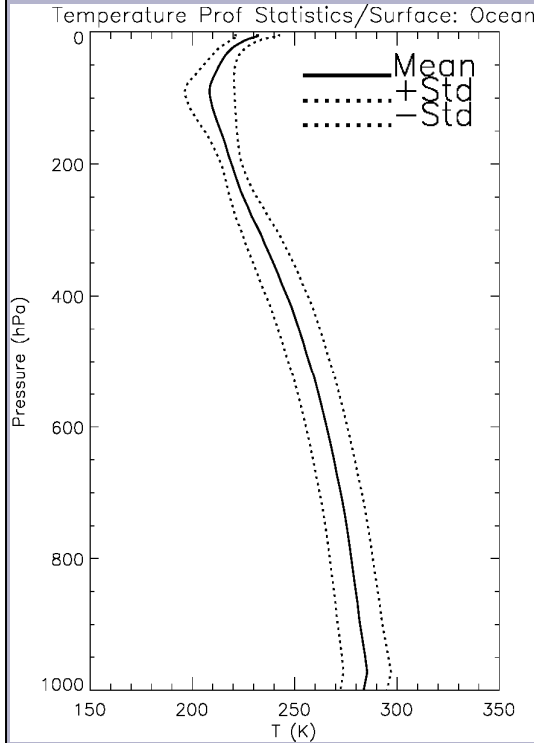
Number of GDAS profiles out-weights other data sources, however seasonal distribution still even

NOAA-08 Dataset

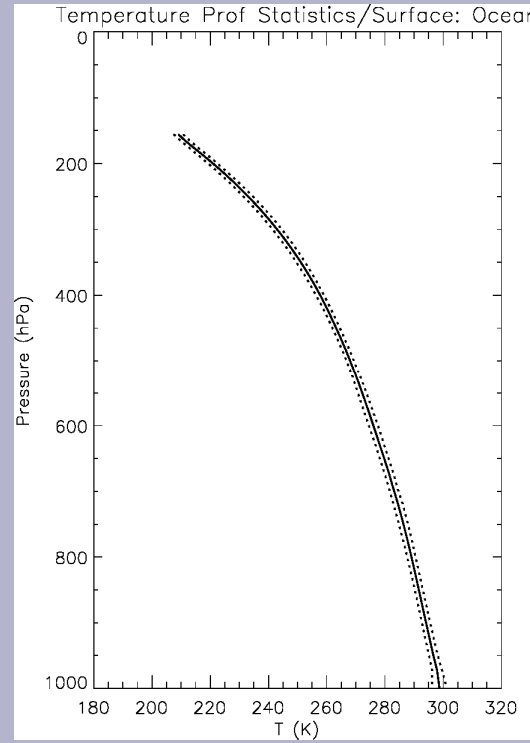


NOAA-08 Dataset

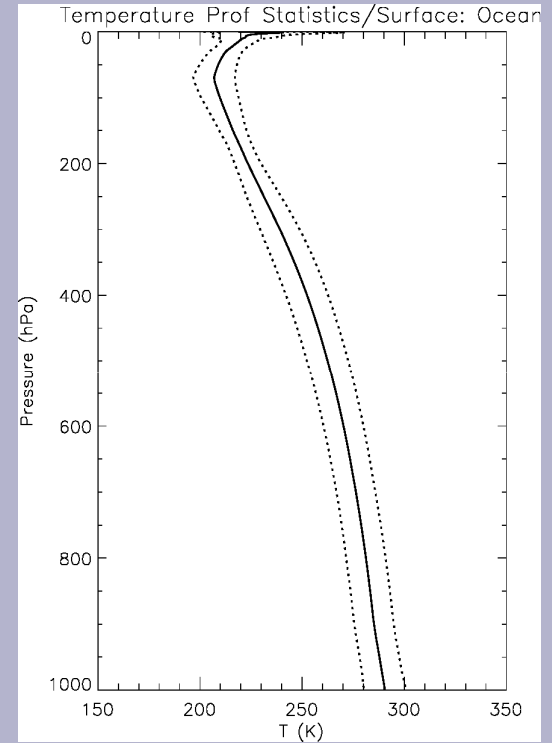
Temperature Mean and Mean \pm StdDev



IGRA

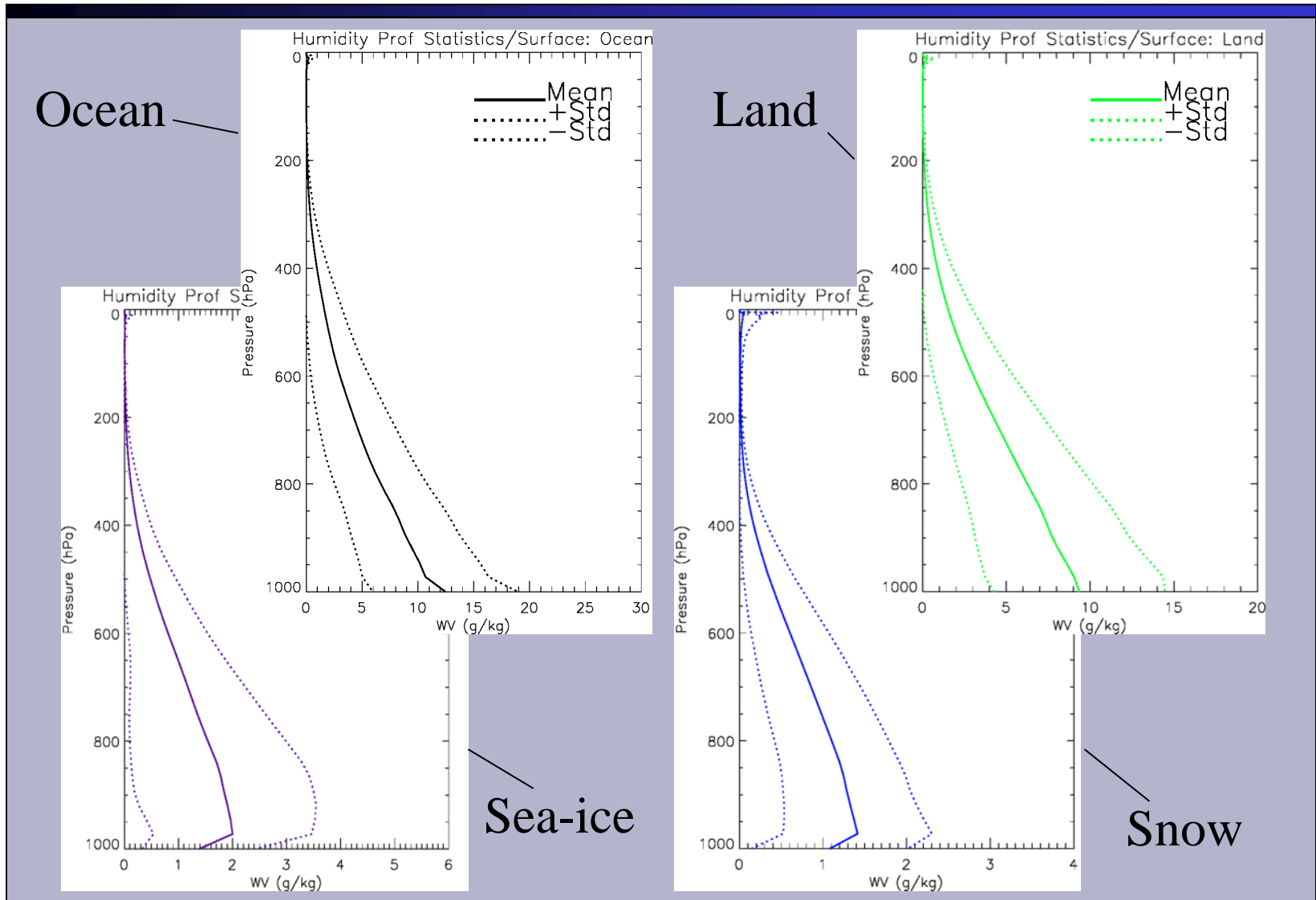


Dropsonde



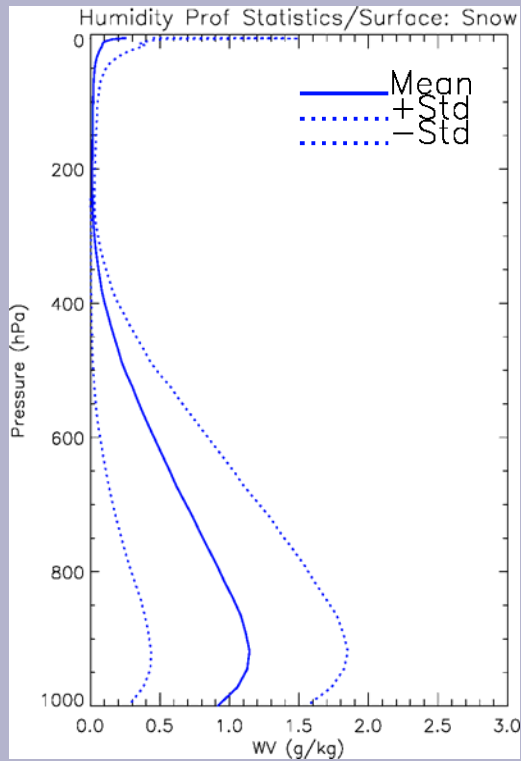
NOAA-08

NOAA-08 Dataset

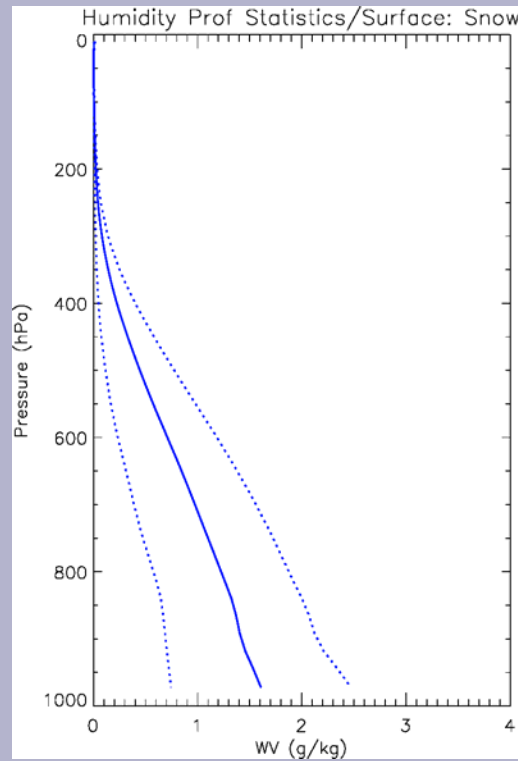


NOAA-08 Dataset

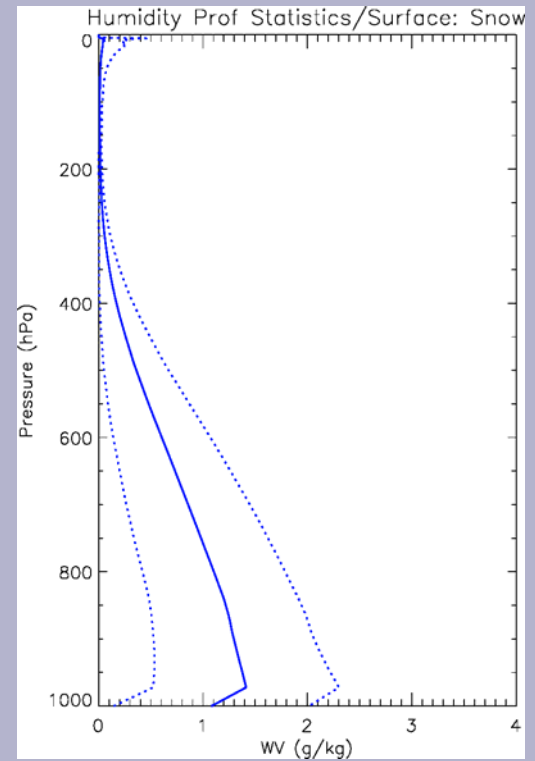
Mixing Ratio Mean and Mean \pm StdDev



IGRA

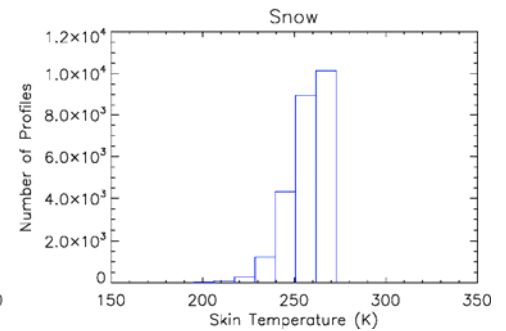
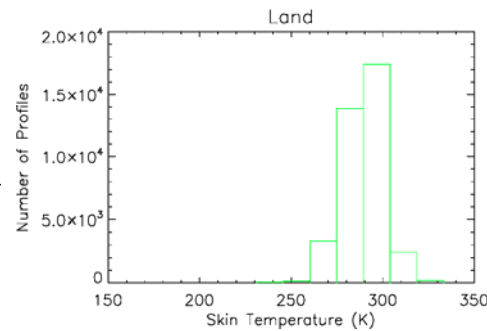
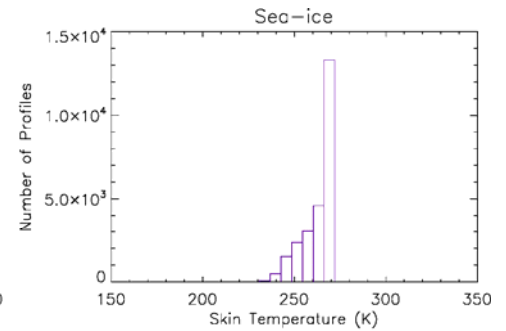
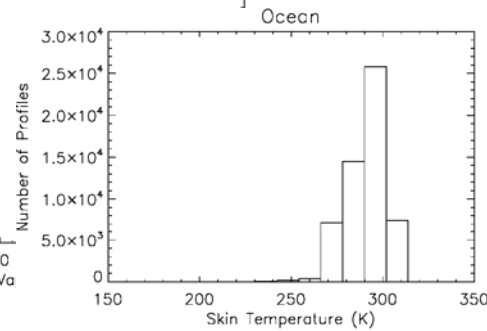
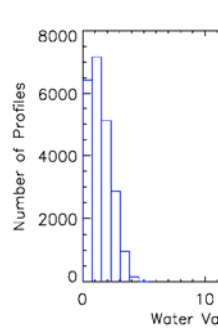
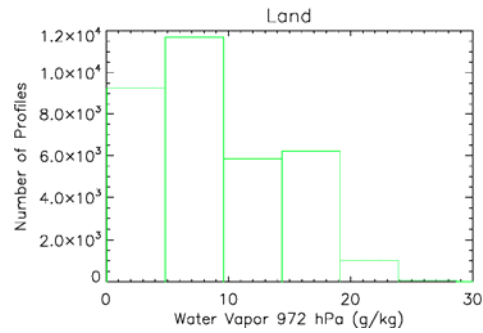
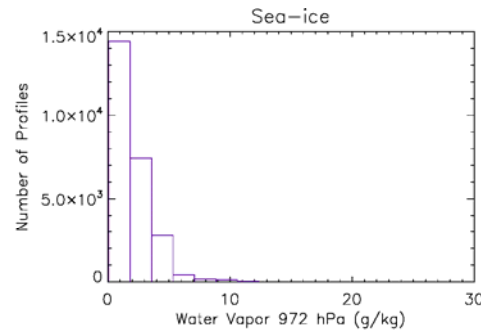
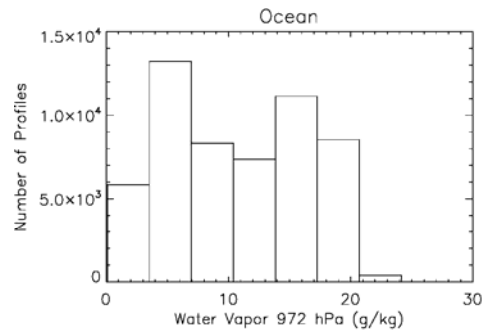


GDAS



NOAA-08

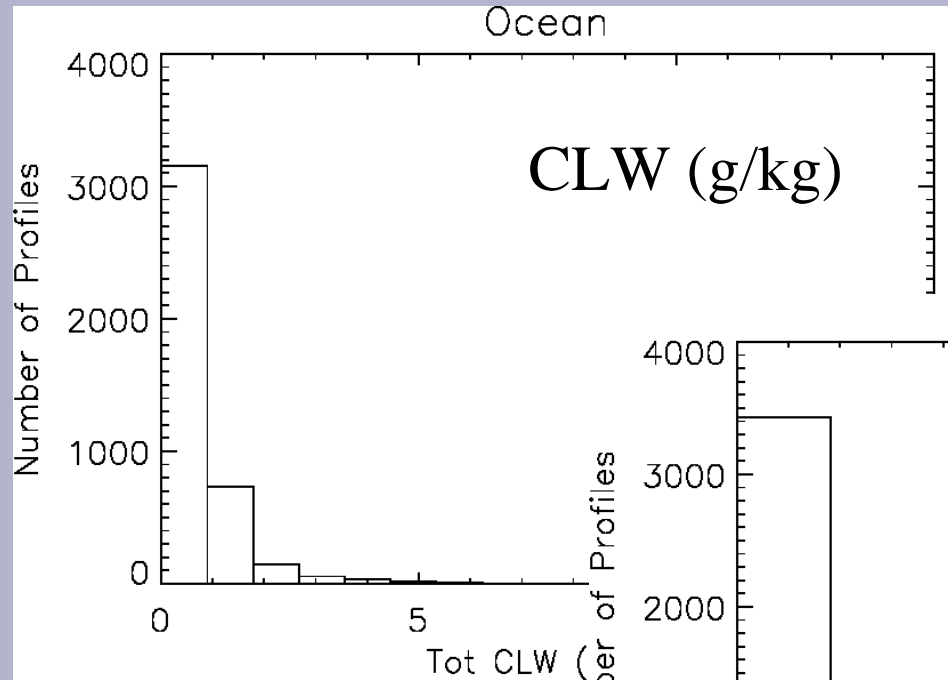
NOAA-08 Dataset



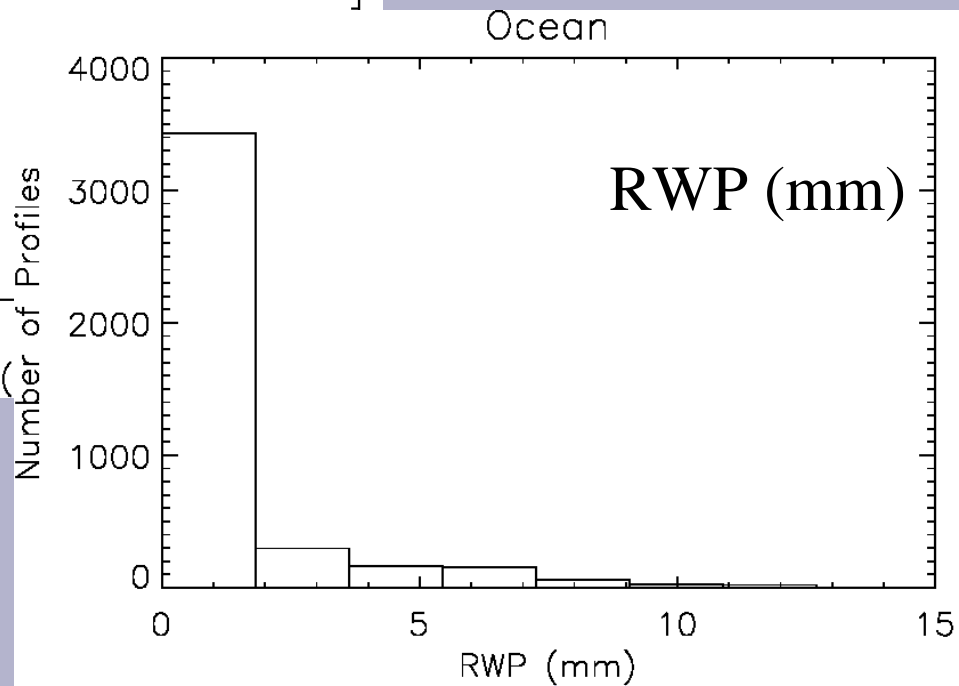
Water vapor mixing ratio at 972 hPa

Skin Temperature

NOAA-08 Dataset



CLW and RWP from WRF data in hurricane conditions.



Future Consideration

- Extend dataset to include CIRA-88 and COSMIC data
- Include realistic emissivity spectra for sea-ice, land and snow profiles
- Extrapolation of shallow profiles to upper atmos.
- Apply entire dataset and subset (e.g. NOAA-88) to regression algorithm training, compare results
- Create covariance matrix for 1D-variational retrieval constraint
- Include user controls in data reader for extraction

Summary

- A dataset of atmospheric profiles has been constructed from highly QC'd data sources
 - Multiple data sources in central repository
 - Climatologically representative of profiles over multiple surface types
 - Provide profiles in cloudy, precipitating, and extreme weather conditions
 - Diminish impact of systematic differences between sources
 - Provide a tool to extract sample profiles for desired distributions