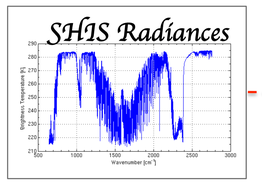
# NASA Global Hawk S-HIS Measurements During HS3

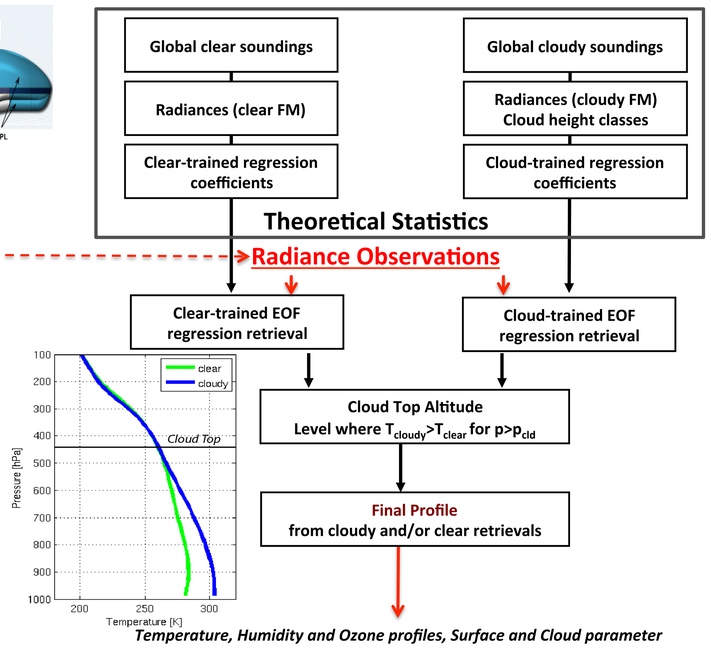
**W. L. Smith Sr., J. Taylor, E. Weisz, D. DeSlover, R. Garcia, D. Hoese, H. E. Revercomb, and C. Velden**

***Space Science and Engineering Center, University of Wisconsin-Madison***

The Hurricane and Severe Storm Sentinel (HS3) mission to observe Atlantic basin hurricane processes was achieved using a high altitude (20 km) NASA Global Hawk (GH) Uninhabited Aerial Vehicle (UAV) with a payload consisting of a high density dropsonde system (AVAPS), capable of ~80 drops per flight, a hyperspectral high resolution (1-2 km) infrared sounding system (S-HIS), and a cloud and aerosol profiling LIDAR (CPL). Deployments from NASA's Wallops Flight Facility provided 30-hour flight duration coverage of the entire Atlantic Ocean basin from mid-August to mid-September 2012-2014. High-density S-HIS vertical sounding observations are validated using the lower density, but higher vertical resolution, dropsonde observations. S-HIS capabilities to observe the thermodynamic characteristics of hurricanes and the Saharan Air Layer (SAL) are shown.

## Dual-Regression Retrieval Algorithm

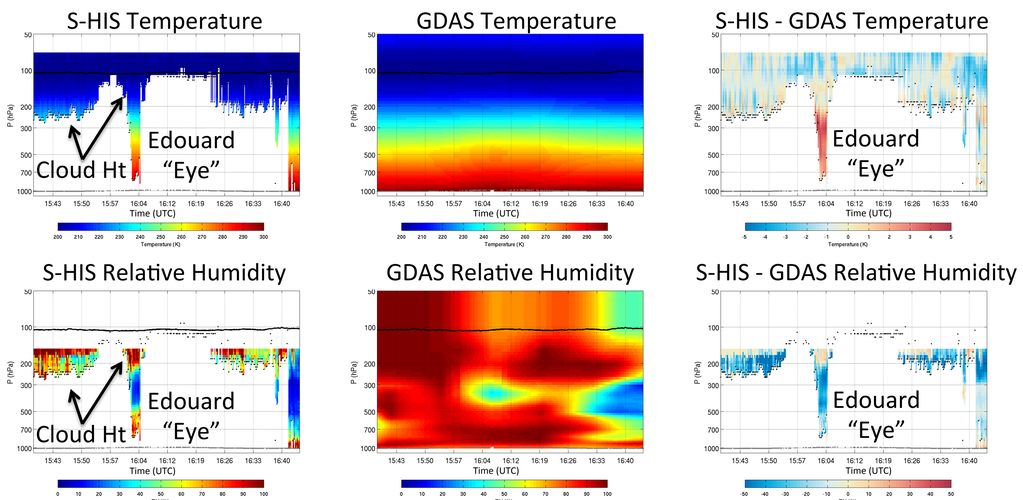

***Temperature, Humidity and Ozone profiles, Surface and Cloud parameter at single FOV (0-2-km) resolution***

## Vertical Resolution Alias Removal Using GDAS

DR method uses a statistical training data set. Imperfect skill, due to the relatively poor vertical resolution of radiances, leads to a bias towards the vertical structure of the mean profile. This vertical structure alias can be estimated by calculating S-HIS radiances from a forecast model profile (e.g., GDAS) and performing a DR retrieval from the model simulated S-HIS radiances. The difference between the model profile and the simulated radiance retrieval is an estimate of the the vertical structure alias of retrieval to be removed.

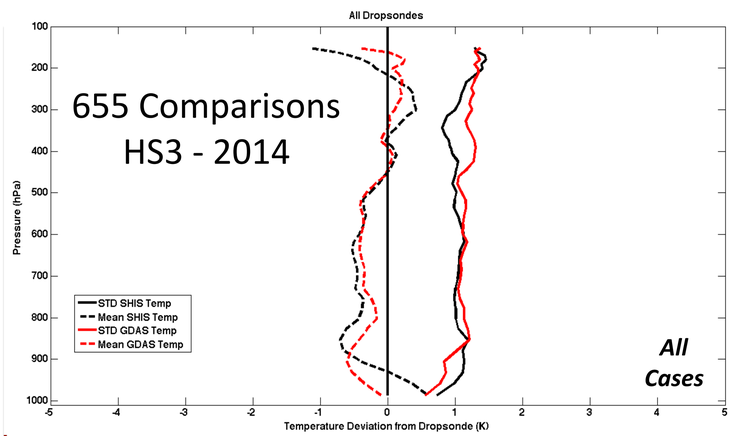
## De-Aliased Retrievals Reveal Model Uncertainties

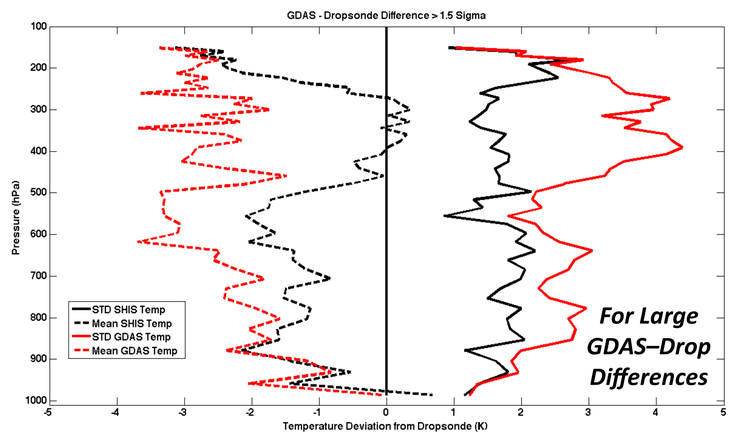
**Hurricane Edouard (September 16, 2014)**



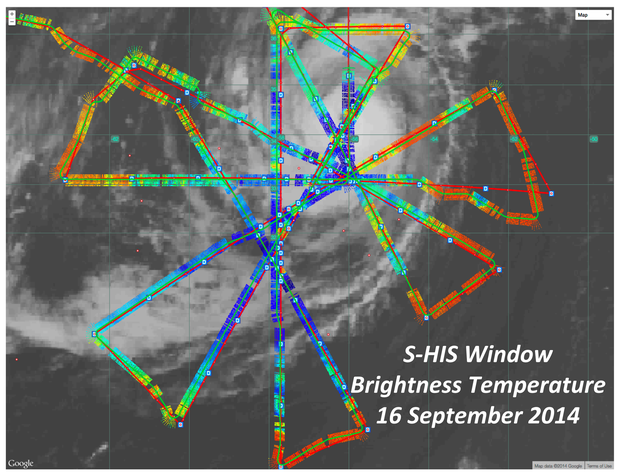

S-HIS indicates a warmer and drier Hurricane "Eye" (i.e., more intense storm) than does GDAS

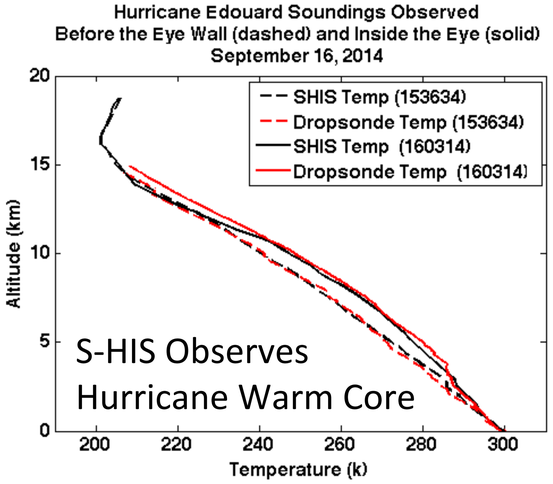
## S-HIS Validation Using Dropsondes



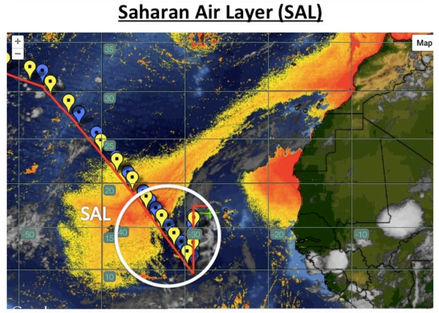

## S-HIS Observations of Hurricane Edouard

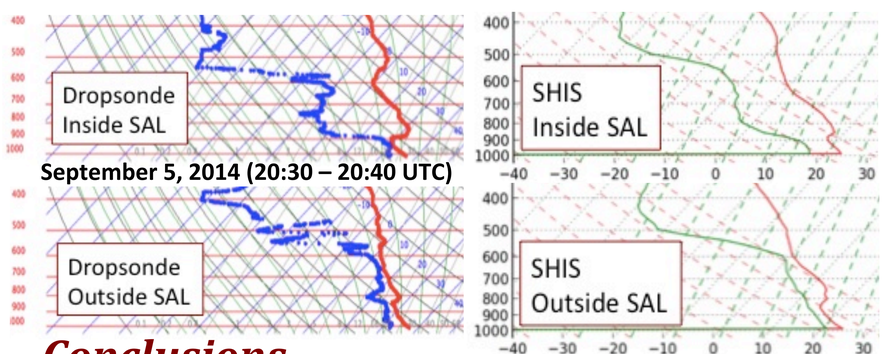



## Real-time Displays of Saharan Air Layer Thermodynamics

**SHIS Observations Across the Boundary of the Saharan Air Layer (SAL)**




## Conclusions

- **S-HIS provides reliable high density observations in support of HS3 mission objectives**
- **S-HIS resolves thermodynamic conditions associated with the SAL and tropical storms**