

Near-Surface Salinity Stratification Observed By SMOS and Aquarius Under Rainy Conditions

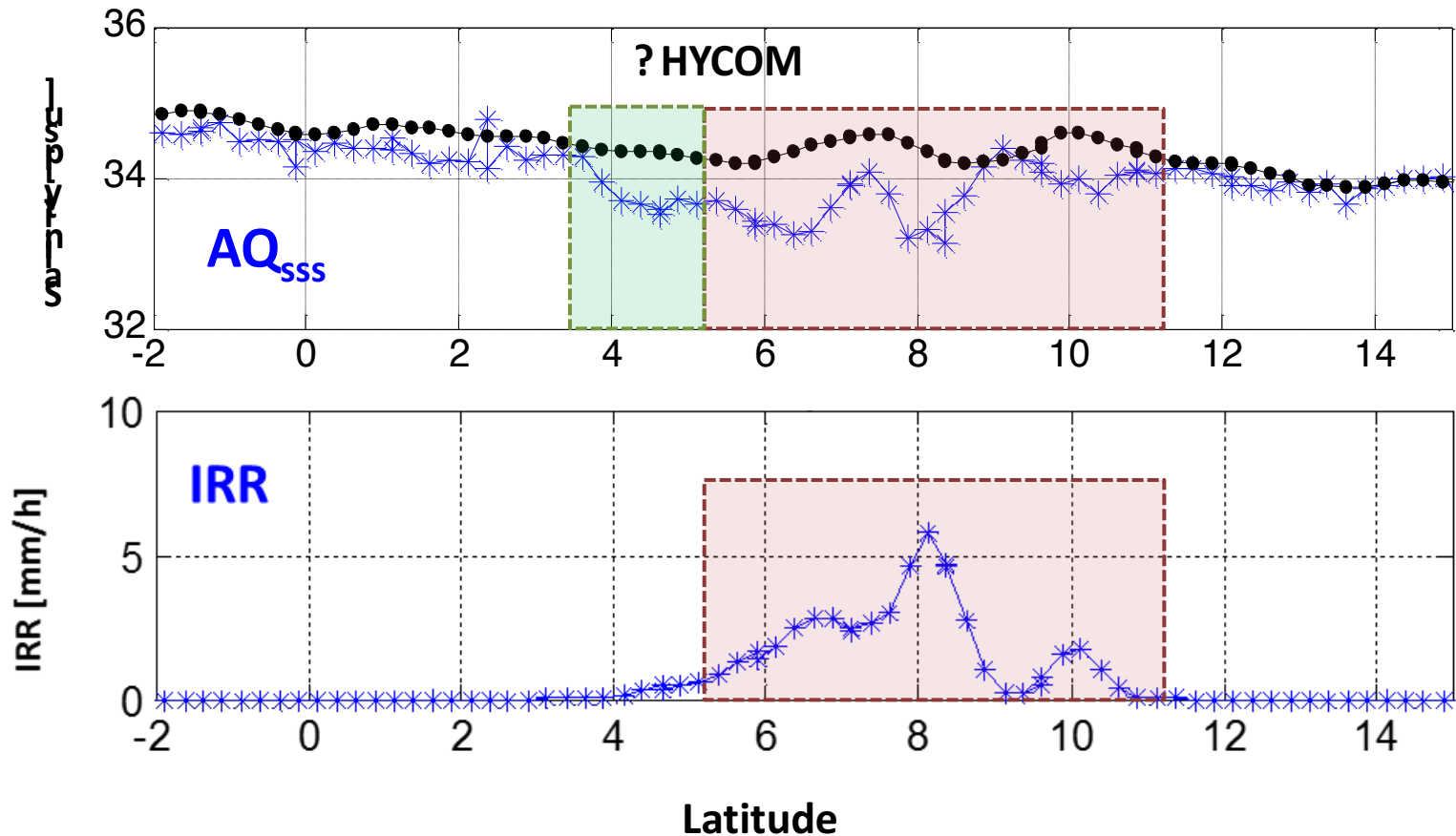
Andrea Santos-Garcia, Linwood Jones,
and Maria Jacob

Cal/Val Meeting Spring 2015

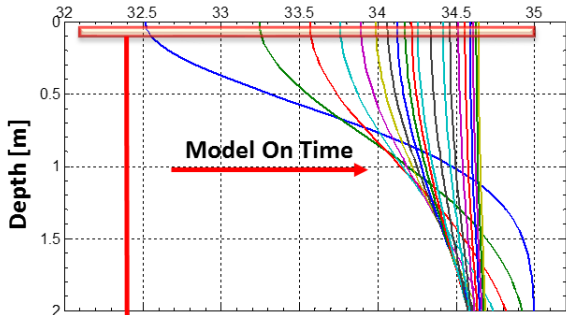
Central Florida Remote Sensing Laboratory
University of Central Florida

Rain Effects on SSS

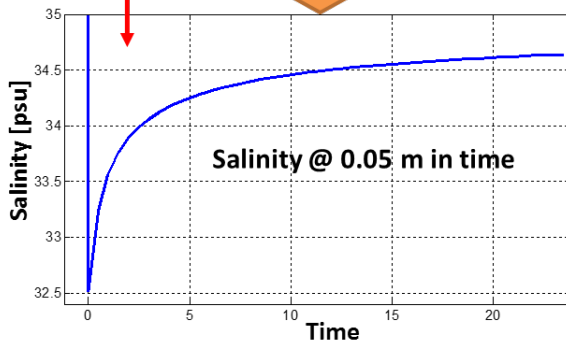
January 23rd 2012 – Orbit 2 – Beam 1



Stratification Performance for one single Rain Event (Based on In-Situ Measurements)

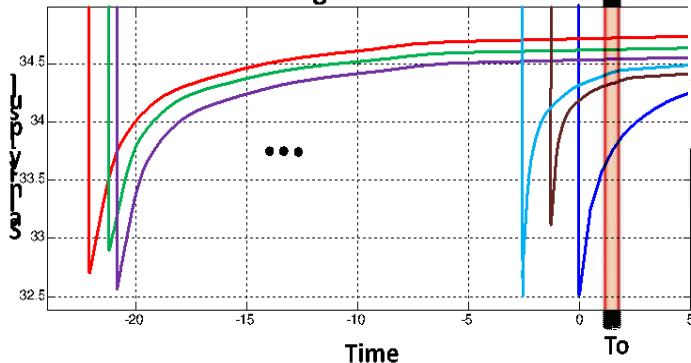


Sea Surface Salinity



Salinity @ 0.05 m in time

Superposition Model for Multiple Rain Events During last 24 Hours



Model Developed

Rain Impact Model – RIM V1.0

A. Santos-Garcia, M. M. Jacob, W. L. Jones, W. E. Asher, Y. Hejazin, H. Ebrahimi, *et al.*, "Investigation of rain effects on Aquarius Sea Surface Salinity measurements," *Journal of Geophysical Research: Oceans*, vol. 119, pp. 7605-7624, 2014

$$S(z, t) = S_0 d_0 * \left(d_0 + \frac{R}{\sqrt{K_z * t}} e^{-z^2/4K_z t} \right)^{-1}$$

Depth = 0.5 cm

$$RIM_{SSS} = S_0 \left[\left(\prod_{i=1}^n \left[1 + \frac{R_1 i}{\sqrt{K_z * t_i}} e^{-z^2/4K_z t_i} \right] \right) * \left[1 + \frac{R_2}{\sqrt{K_z * t}} e^{-z^2/4K_z t} \right] \right]^{-1}$$

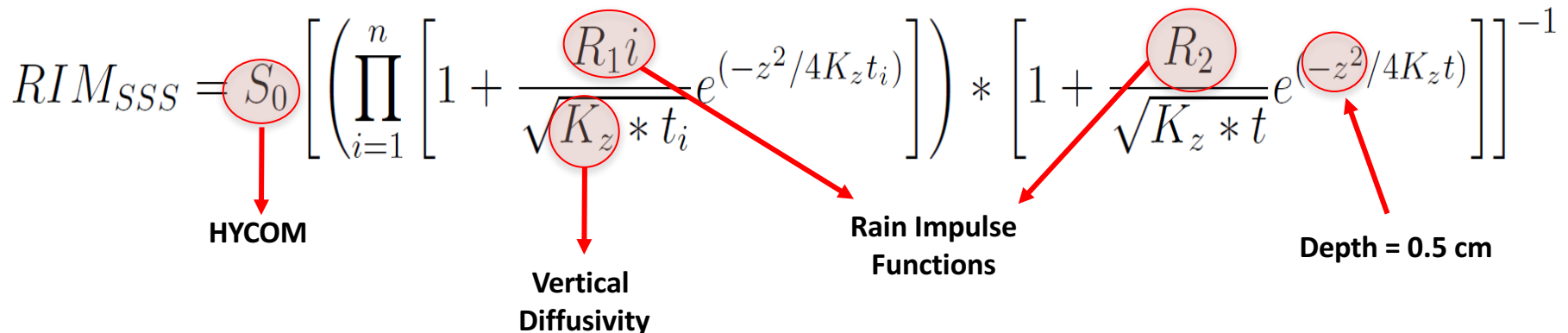
HYCOM

Vertical Diffusivity

Rain Impulse Functions

Rain Impact Model V1.0

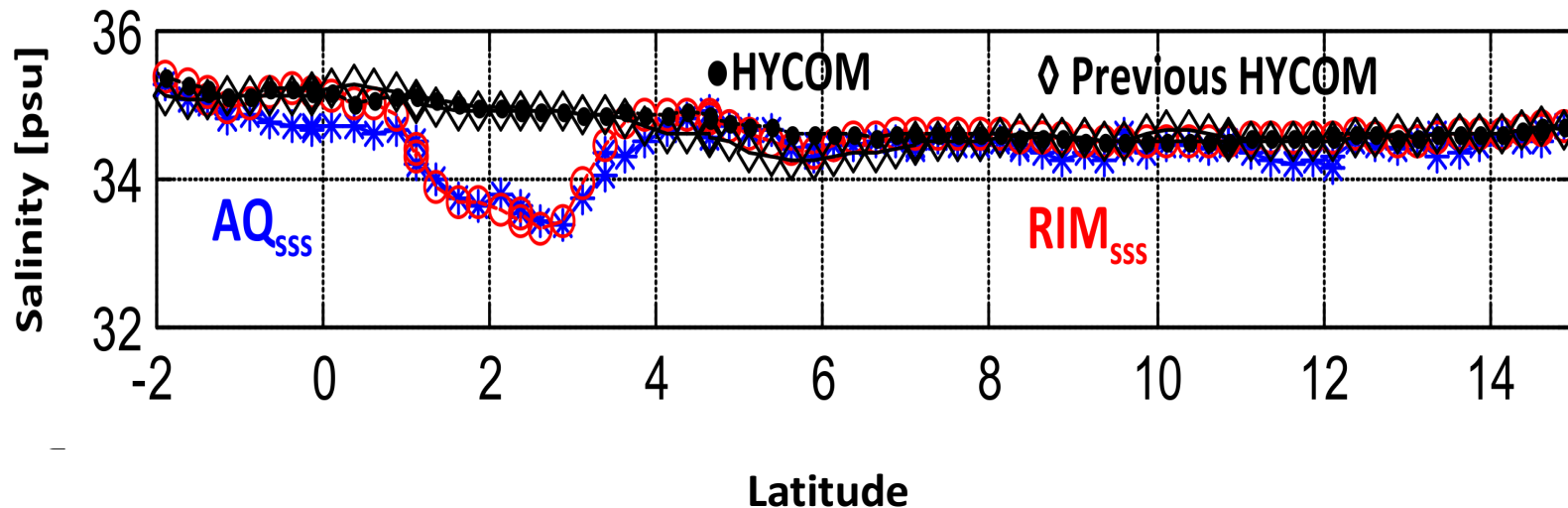
- **RIM_{SSS}** is an empirical model that estimates the SSS under rainy conditions at 0.005 meters depth.
 - Model is superposition of rain events using 1D stratification model
 - Uses HYCOM as initialization (From AQ L2)
 - Uses CMORPH to build the Rain History (CMORPH_V1.0)

$$RIM_{SSS} = S_0 \left[\left(\prod_{i=1}^n \left[1 + \frac{R_1 i}{\sqrt{K_z * t_i}} e^{(-z^2/4K_z t_i)} \right] \right) * \left[1 + \frac{R_2}{\sqrt{K_z * t}} e^{(-z^2/4K_z t)} \right] \right]^{-1}$$


Annotations in the diagram:
 - S_0 is linked to **HYCOM**.
 - K_z is linked to **Vertical Diffusivity**.
 - $R_1 i$ is linked to **Rain Impulse Functions**.
 - $-z^2/4K_z t$ is linked to **Depth = 0.5 cm**.

Rain Impact Model V1.0

- **RIM_{SSS}** is an empirical model that estimates the SSS under rainy conditions at 0.005 meters depth.
 - Model is superposition of rain events using 1D stratification model
 - Uses HYCOM as initialization (From AQ L2)
 - Uses CMORPH to build the Rain History (CMORPH_V1.0)

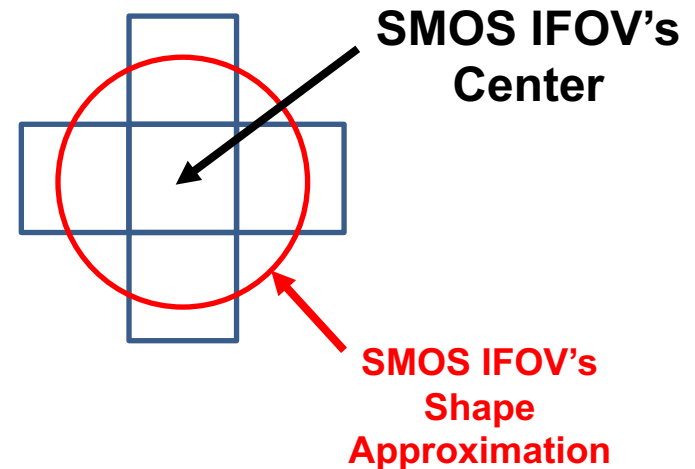


Rain Impact Model V1.0 Applied to SMOS data

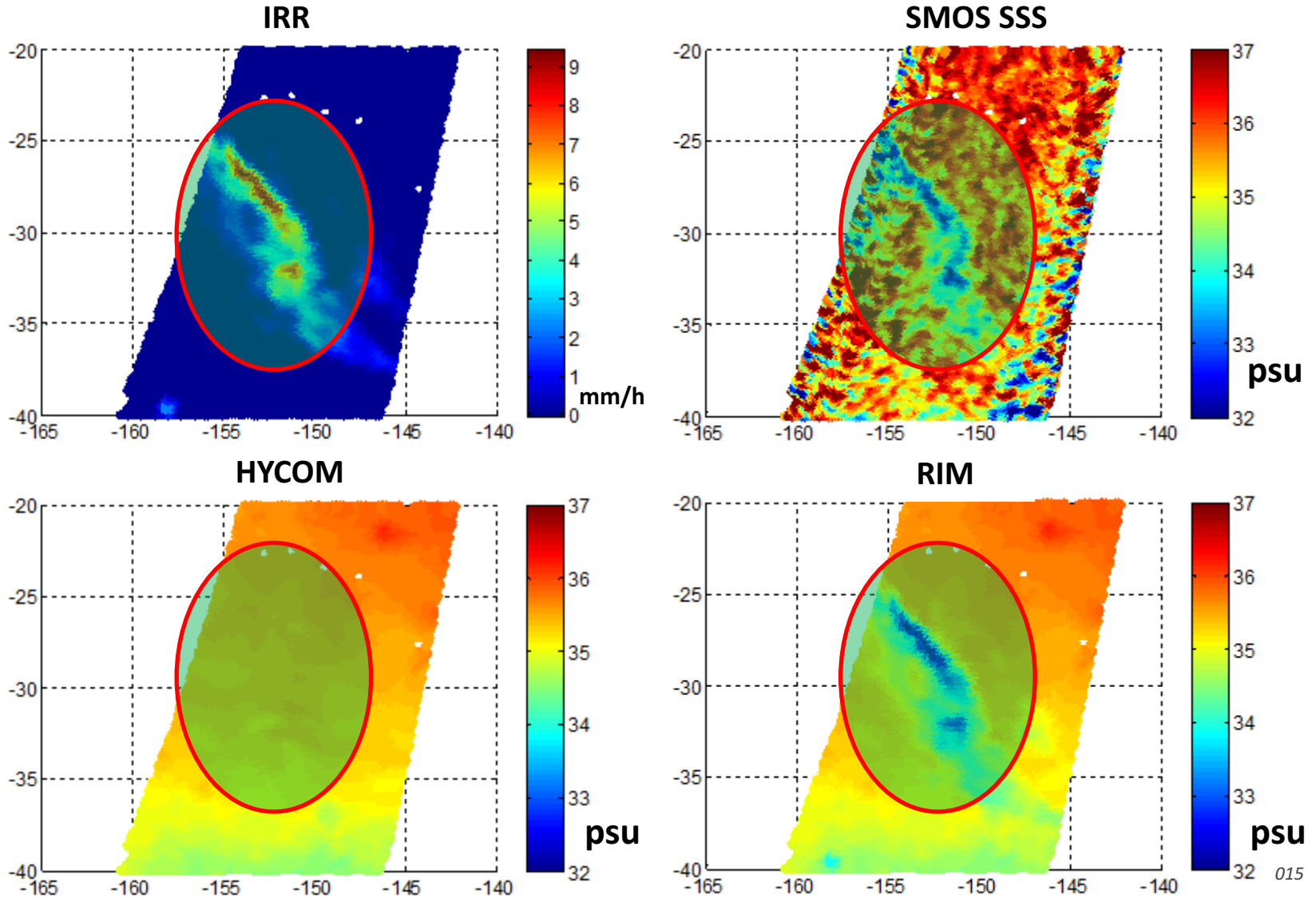
- Model is superposition of rain events using 1D stratification model
- Uses HYCOM as initialization (GLBu0.08/expt_90.9)
- Uses CMORPH to build the Rain History (CMORPH_V1.0)

**SMOS Level 2 Ocean Salinity
(SMOS.MIRAS.MIR_OSUDP2)**

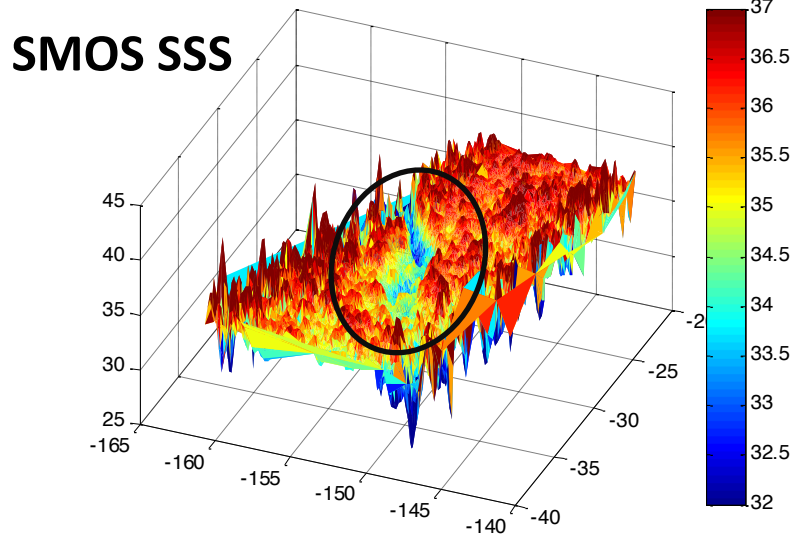
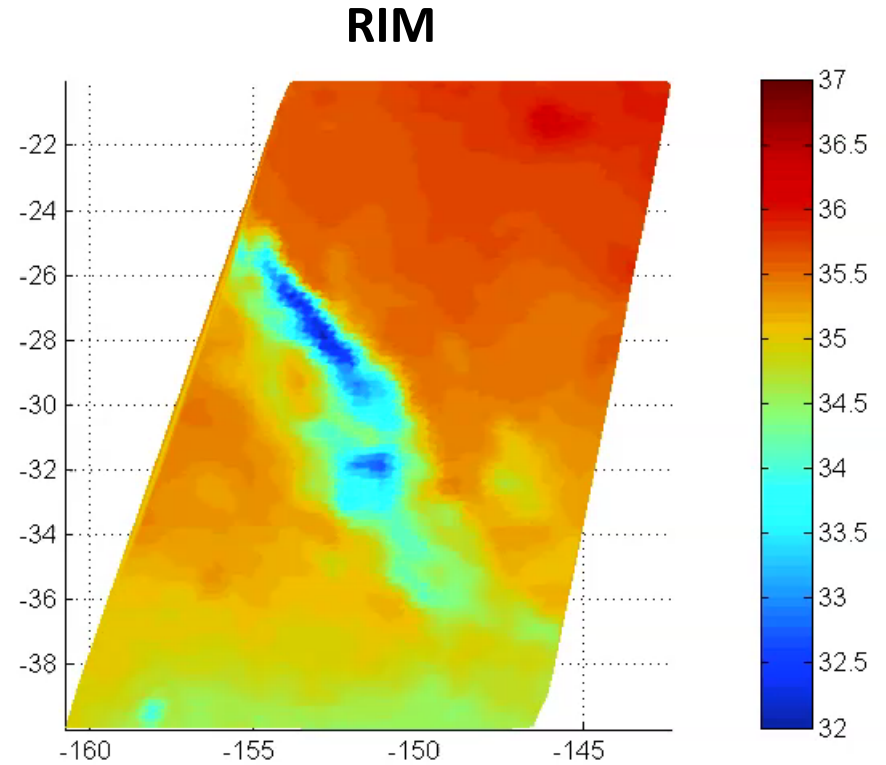
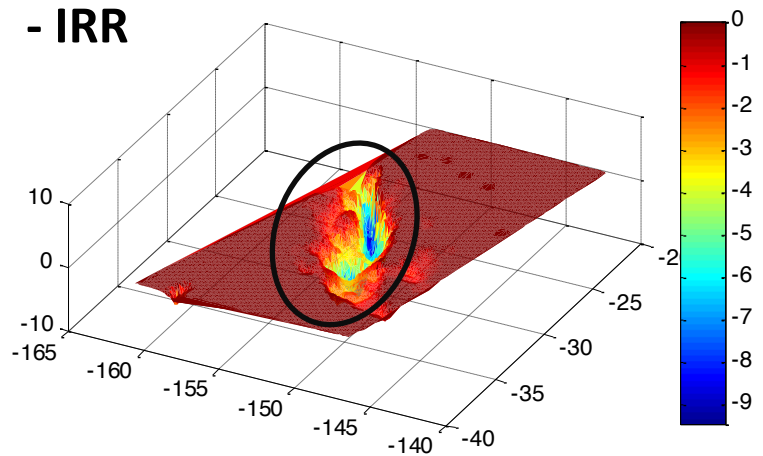
Spatial Resolution between 30 – 50 Km



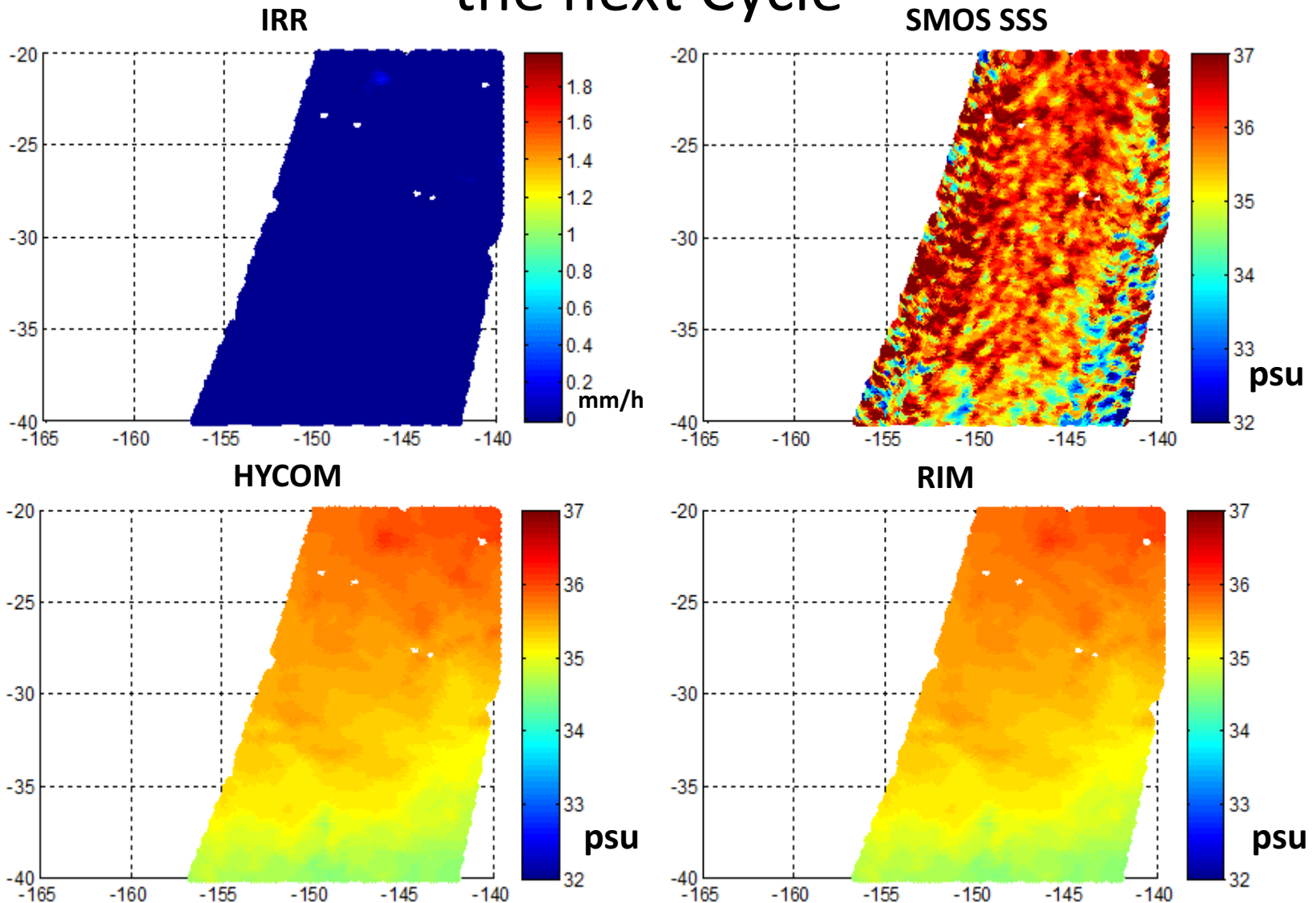
SMOS SSS compared to RAIN, HYCOM, and RIM



3D comparison of RIM and the areas with salinity stratification



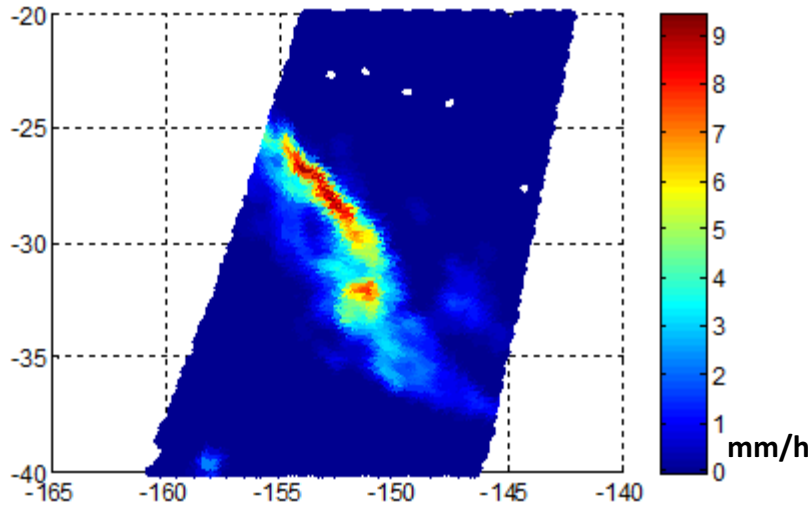
SMOS SSS compared to RAIN, HYCOM, and RIM for the next Cycle



SMOS SSS comparison between cycles

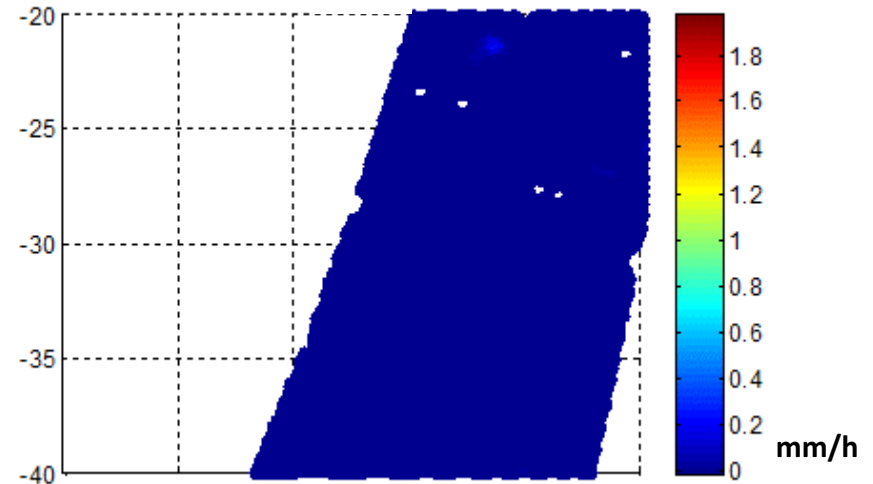
Case of Study

IRR

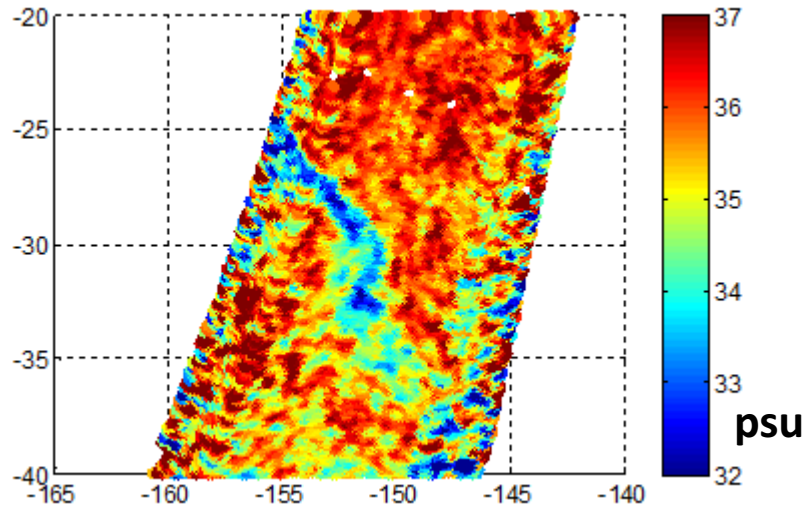


Next Cycle

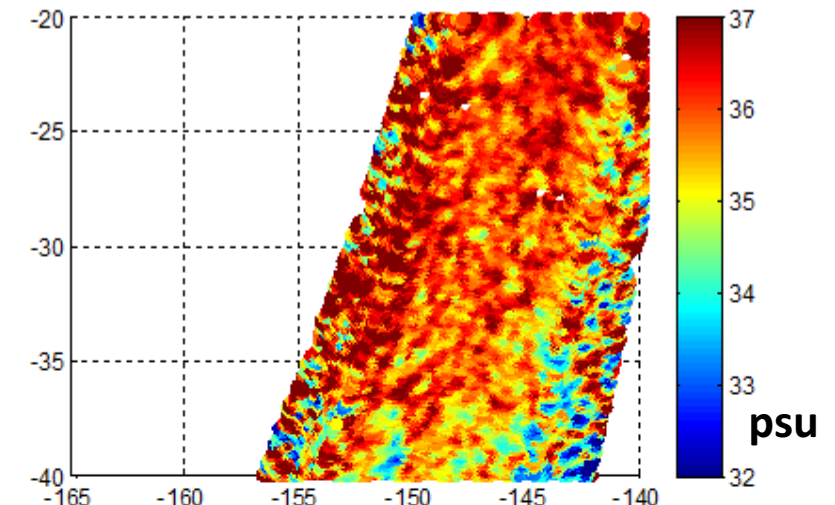
IRR



SMOS SSS

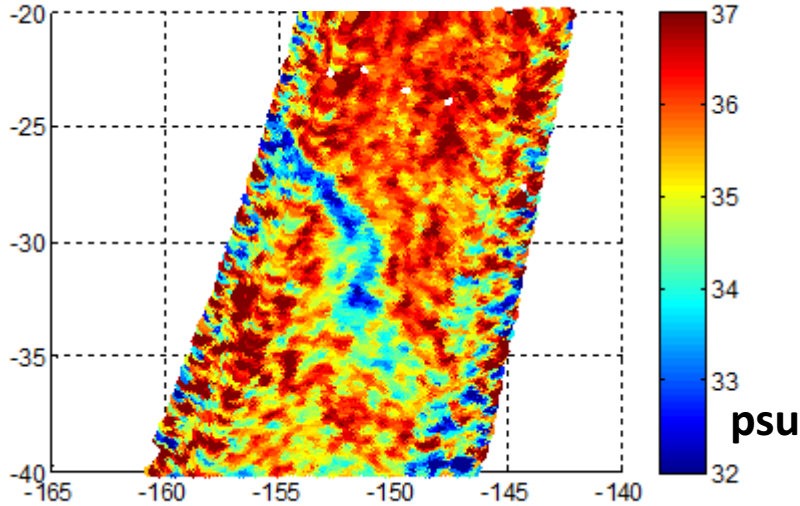


SMOS SSS

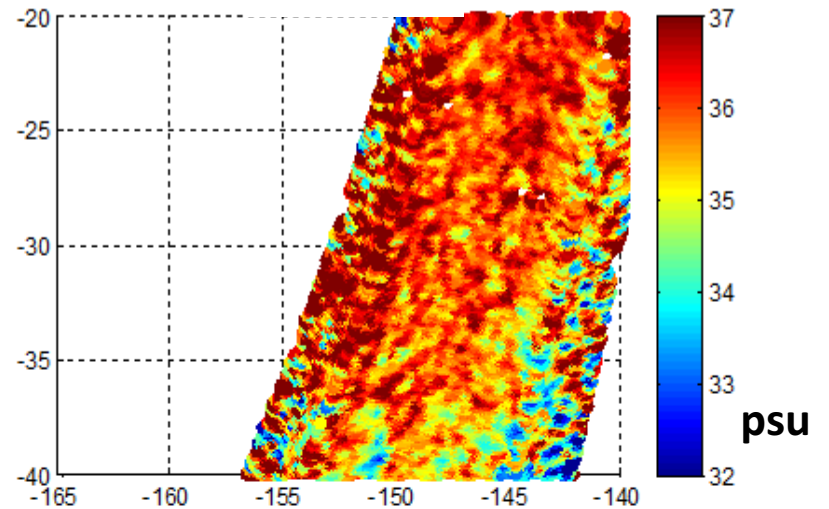


SMOS SSS comparison between cycles

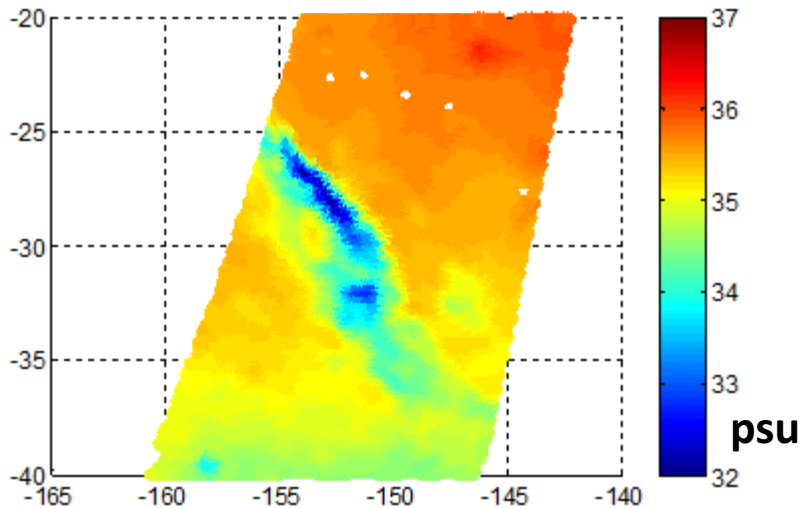
Case of Study
SMOS SSS



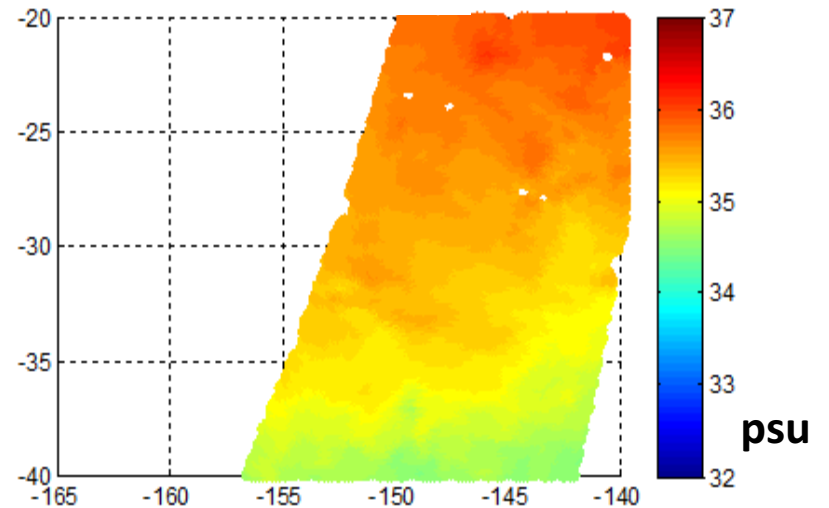
Next Cycle
SMOS SSS



RIM



RIM



BACKUP

3D comparison of RIM and the areas with salinity stratification

