RAIN IMPACT MODEL (RIM) FOR AQUARIUS

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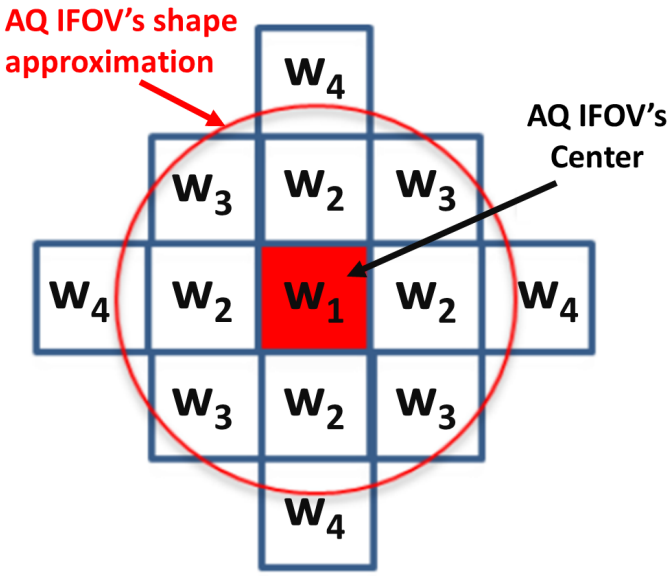
INTRODUCTION

– Impact of rain on the AQ Sea Surface Salinity have been investigated
  - For several months of 2012
  - Over the ITCZ

– AQ Rain Accumulation (RA) product based on CMORPH is used for all comparisons
  - Global coverage between ±60°lat
  - Every 0.5 h

– Spatial integration over AQ IFOV
  - Assumes circular foot print of 100 km
  - Uses 13 x 0.25° boxes
  - weighted average based on antenna beam efficiency

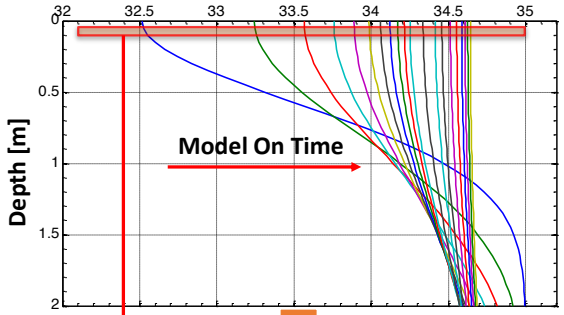


INTRODUCTION – cont.

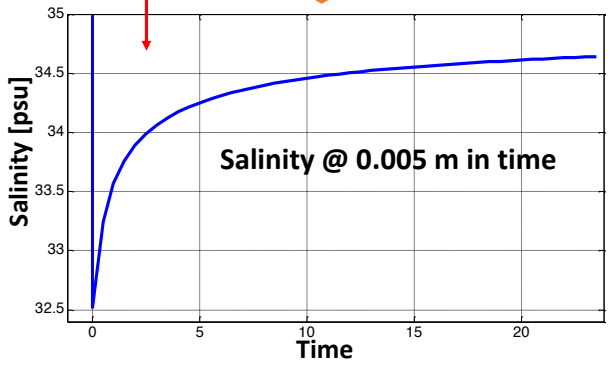
- The Rain Impact Model (RIM) is an overlay for the AQ-L2 product
- **RIM_{SSS}** (SSS based on RIM) is an empirical model that estimates the SSS under rainy conditions at 0.005 meters depth.
    - Model is superposition of rain events using 1D stratification model
    - Uses HYCOM as initialization
- **Ancillary paramenters provided are:**
    - **BF** (Rain Beam Fill Fraction): area weighted percentage of the beam that exceeds a threshold of 0.25 mm/hr
    - **PS** (Probability of Salinity Stratification): normalized ΔSSS per orbit between RIM at 10 m and RIM at 0.005 m

APPROACH

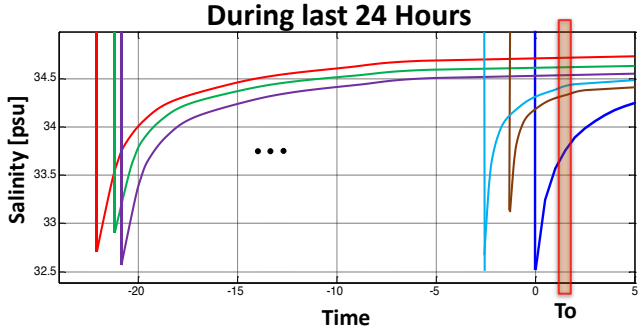
Stratification Performance for one single Rain Event



Model @
0.005 m = ½ cm



Superposition Model for Multiple Rain Events During last 24 Hours



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

Depth = 0.5 cm

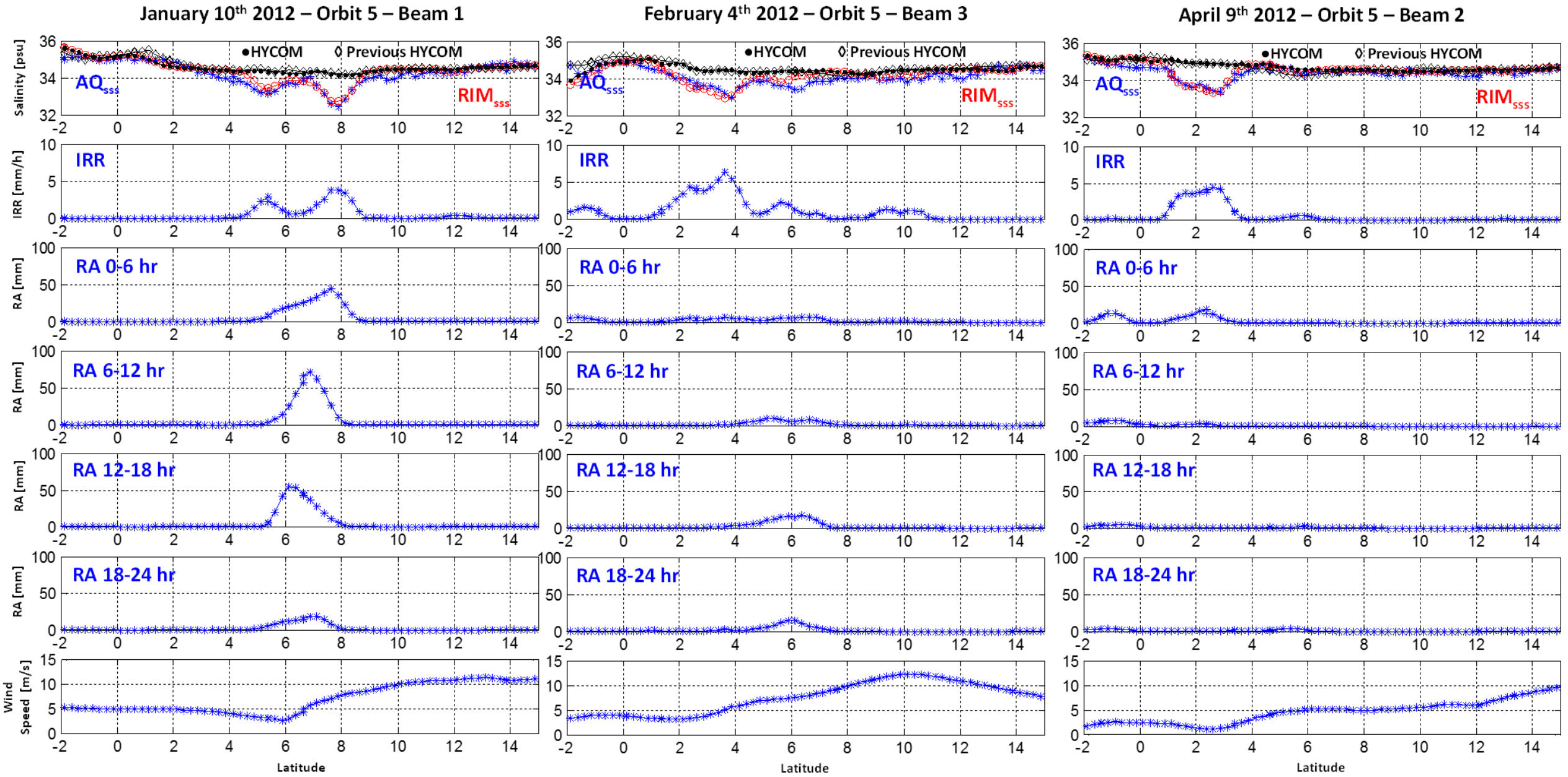
$$RIM_{SSS} = S_0 \left[\left(\prod_{i=1}^{n} \left[1 + \frac{R_1 i}{\sqrt{K_z * t_i}} e^{(-z^2/4K_z t_i)} \right] \right) * \left[1 + \frac{R_2}{\sqrt{K_z * t}} e^{(-z^2/4K_z t)} \right] \right]^{-1}$$

HYCOM

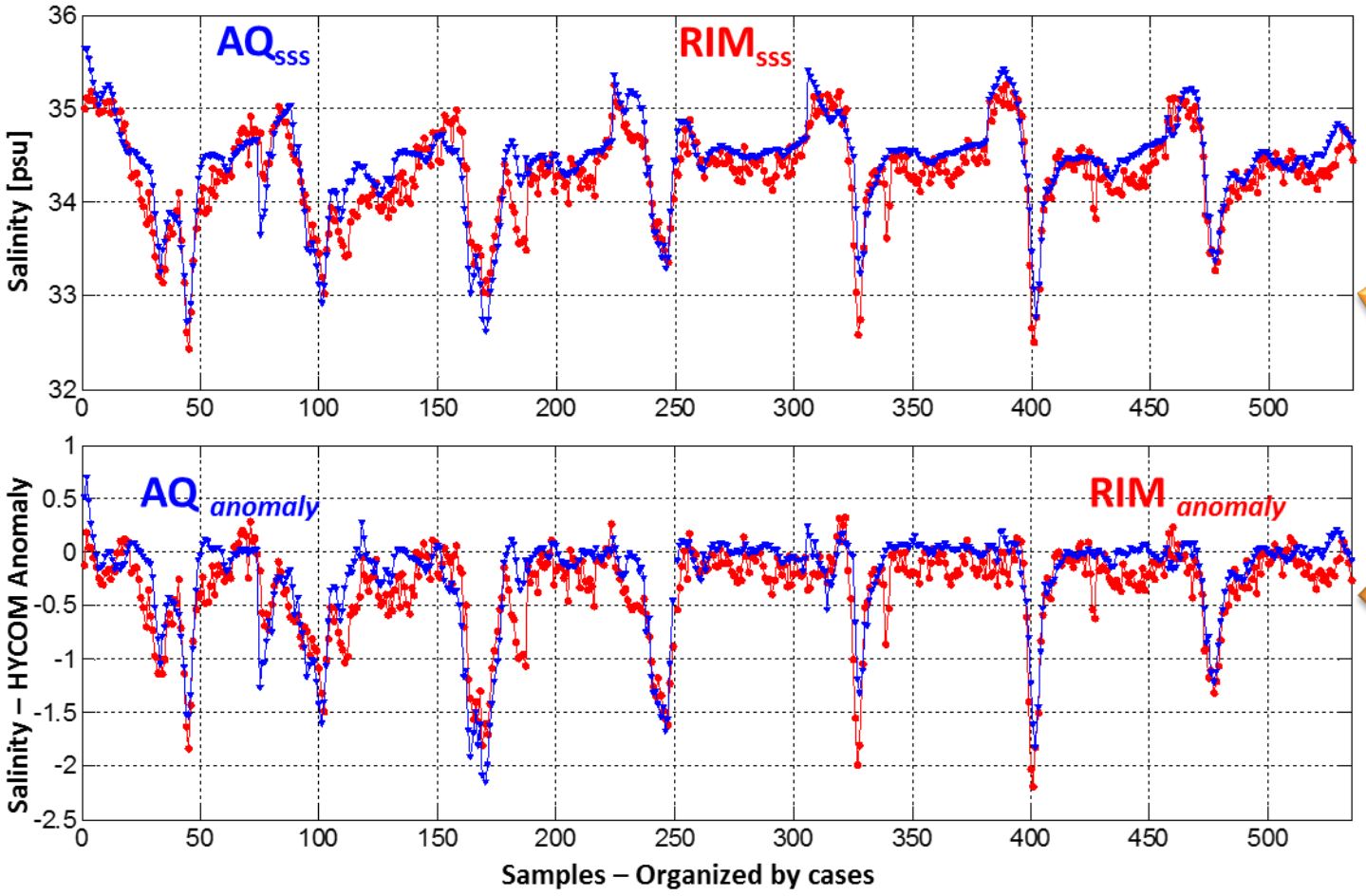
Vertical Difussivity

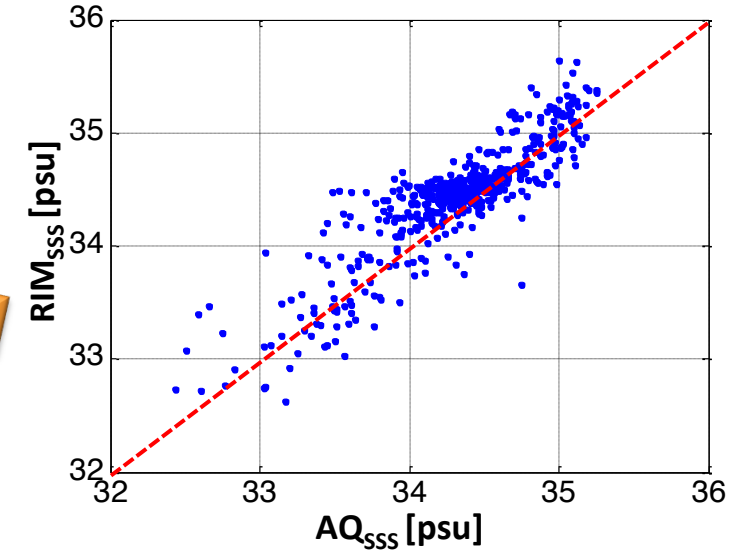
Rain Impulse Functions

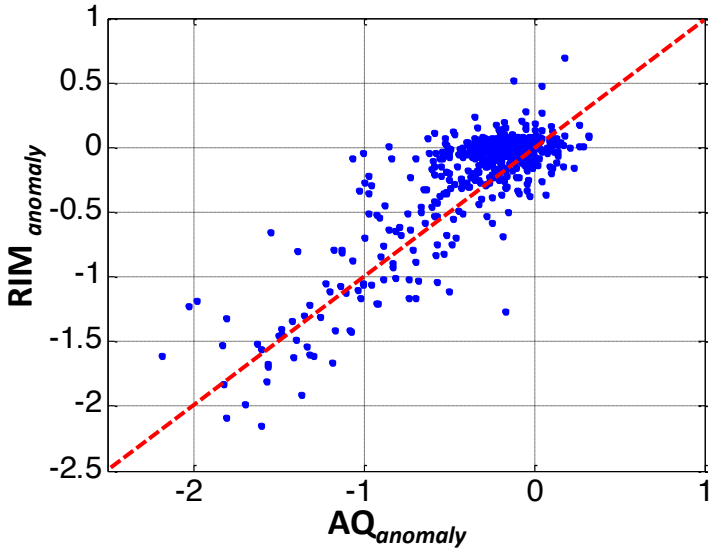
RESULTS


January 10th 2012 – Orbit 5 – Beam 1
February 4th 2012 – Orbit 5 – Beam 3
April 9th 2012 – Orbit 5 – Beam 2
Salinity [psu]
HYCOM
Previous HYCOM
AQsss
RIMsss
IRR [mm/h]
IRR
RA [mm]
RA 0-6 hr
RA 6-12 hr
RA 12-18 hr
RA 18-24 hr
Wind Speed [m/s]
Latitude

CONCATENATED RESULTS



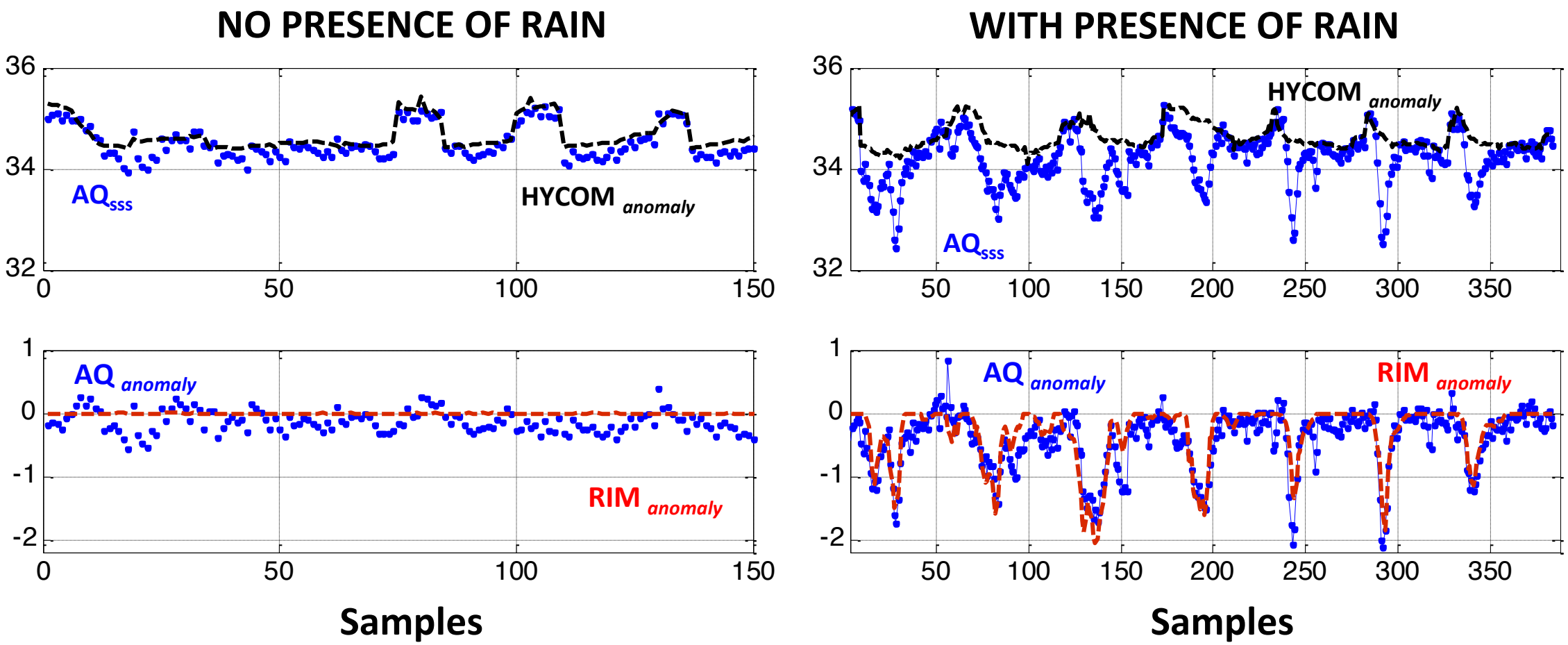




$AQ_{anomaly} = AQ_{SSS} - HYCOM_{mean}$

$RIM_{anomaly} = RIM_{SSS} - HYCOM_{mean}$

RAIN & NON-RAIN RESULTS



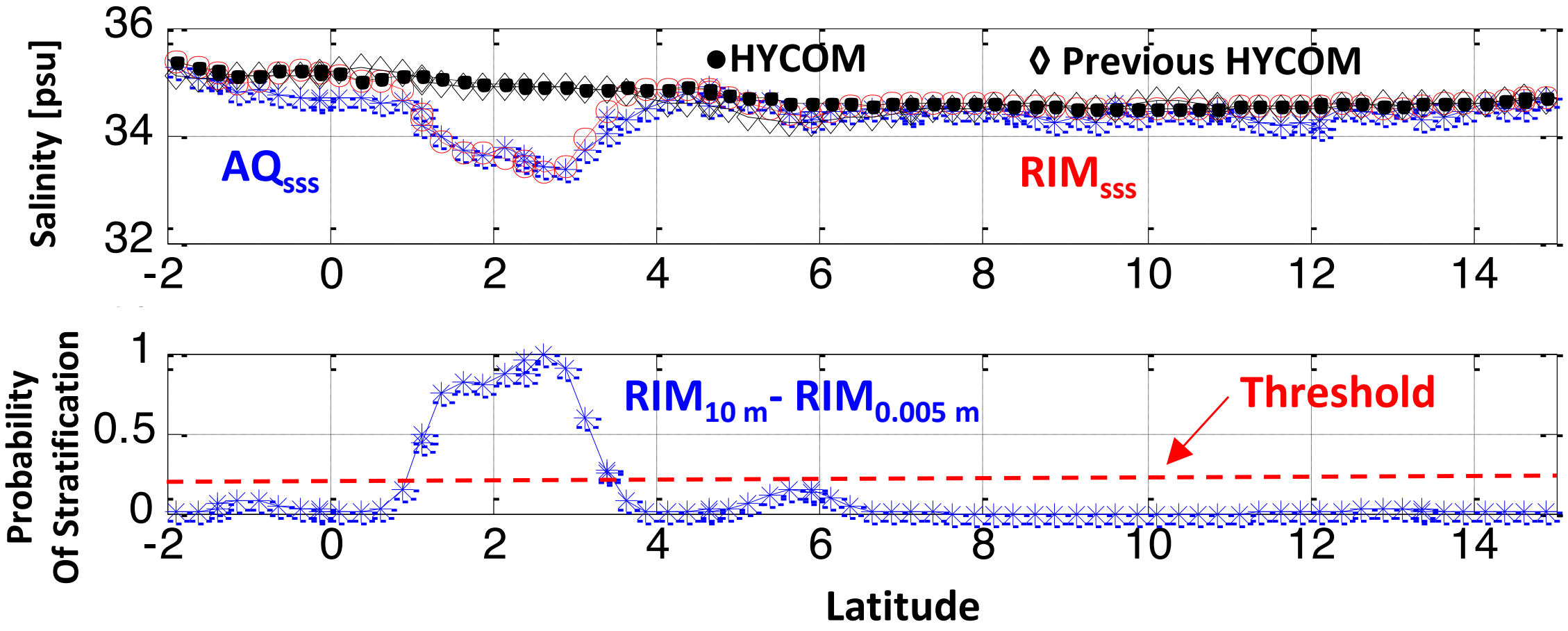
Non-rain case: Rain < 0.05 mm/hr

CROSS CORRELATIONS

Table 1. Cross-Correlation Summary Between AQ_{SSS} and RIM_{SSS}, and $AQ_{anomaly}$ and $RIM_{anomaly}$

	Beam Number	AQ and RIM, SSS (%)	AQ and RIM SSS, anomalies (%)
Date			
01/10/2012	1	93.7	92.7
02/04/2012	2	78.2	72.2
03/20/2012	3	77.9	71.5
04/09/2012	3	91.5	92.8
03/10/2012	1	85.1	86.2
03/10/2012	2	93.1	93.9
03/10/2012	3	92.6	82.6
Average		87.4	86.0
Concatenated data		87.8	84.0

PROBABILITY OF STRATIFICATION



SUMMARY

- The salinity gradient (surface to 1 – 2 m depth) is time dependent and depends upon the rainfall accumulation
  - In our analysis we find no evidence of SSS radiometric retrievals errors due to rain effects
- The analysis of AQ SSS measurements in the presence of rain, requires careful interpretation to account for near-surface salinity stratification
- A beta version of our AQ Rain Impact Model product will be upload to PODAAC next week
  - We solicit constructive criticism for our AQ RIM and seek collaboration with ocean modelers