The rain effect on Aquarius sea surface salinity retrieval

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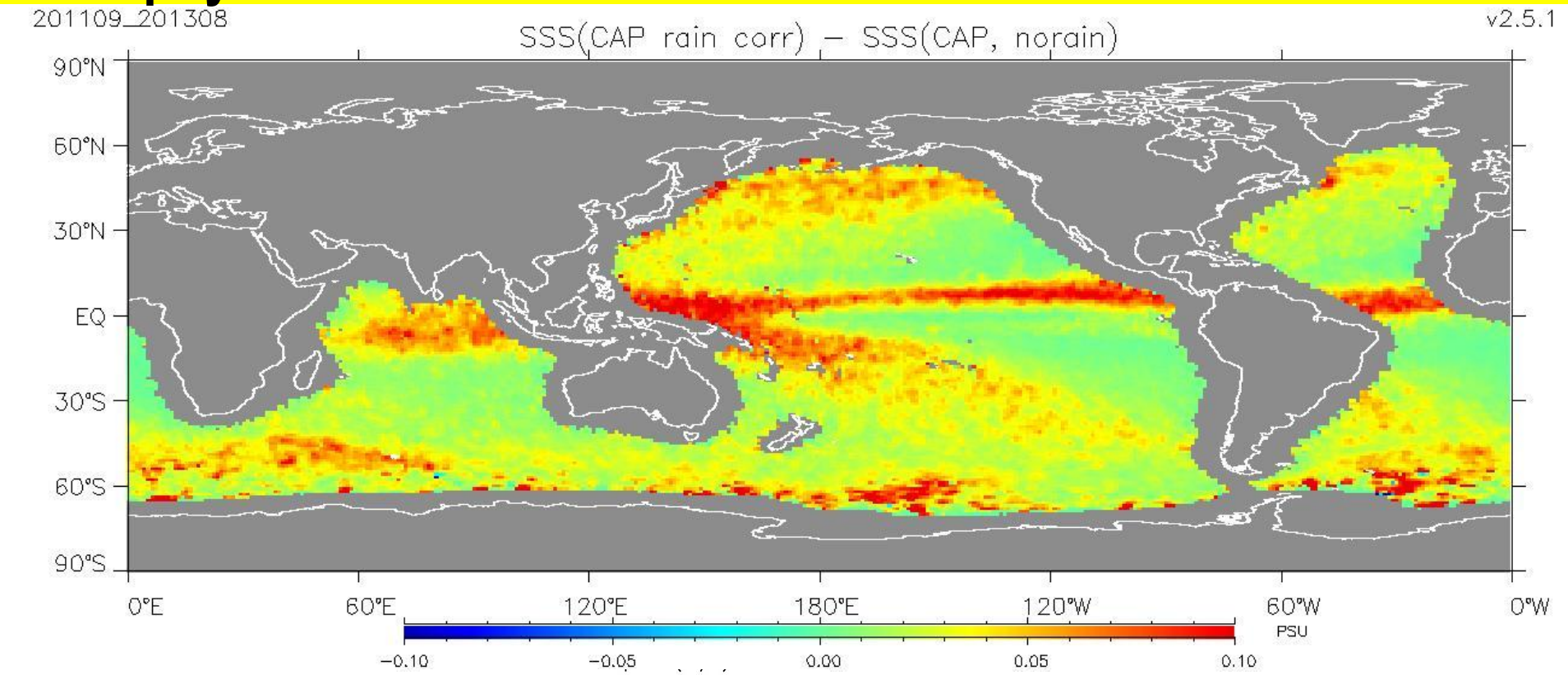
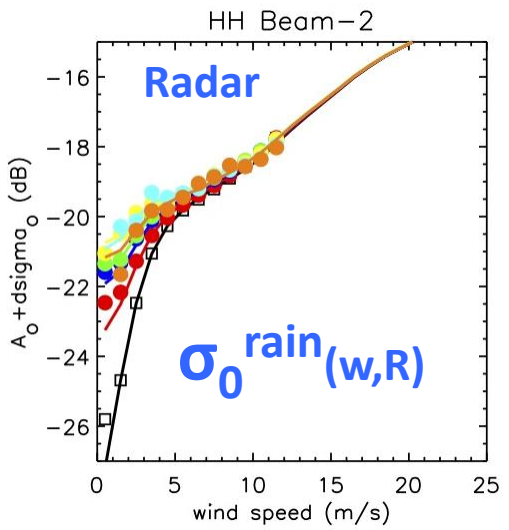
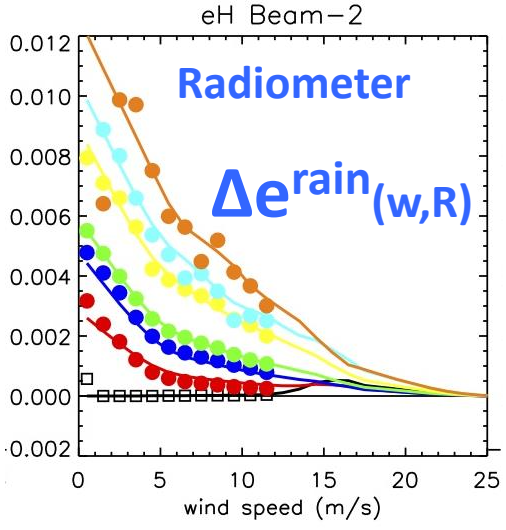
Geophysical Model Functions with rain corr. and CAP retrieval



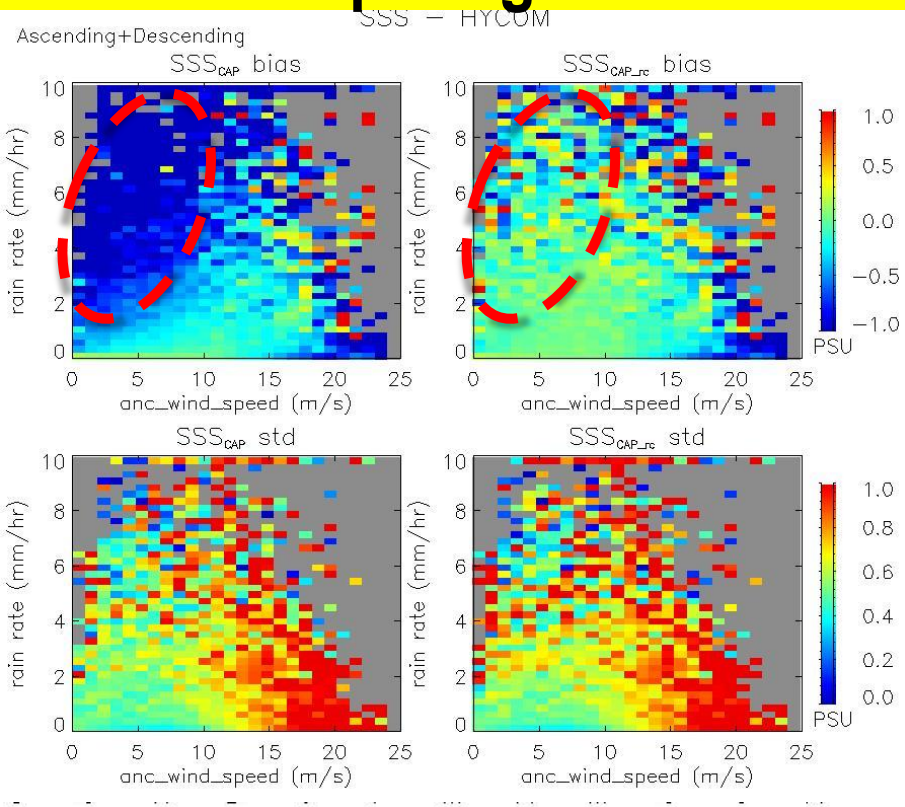


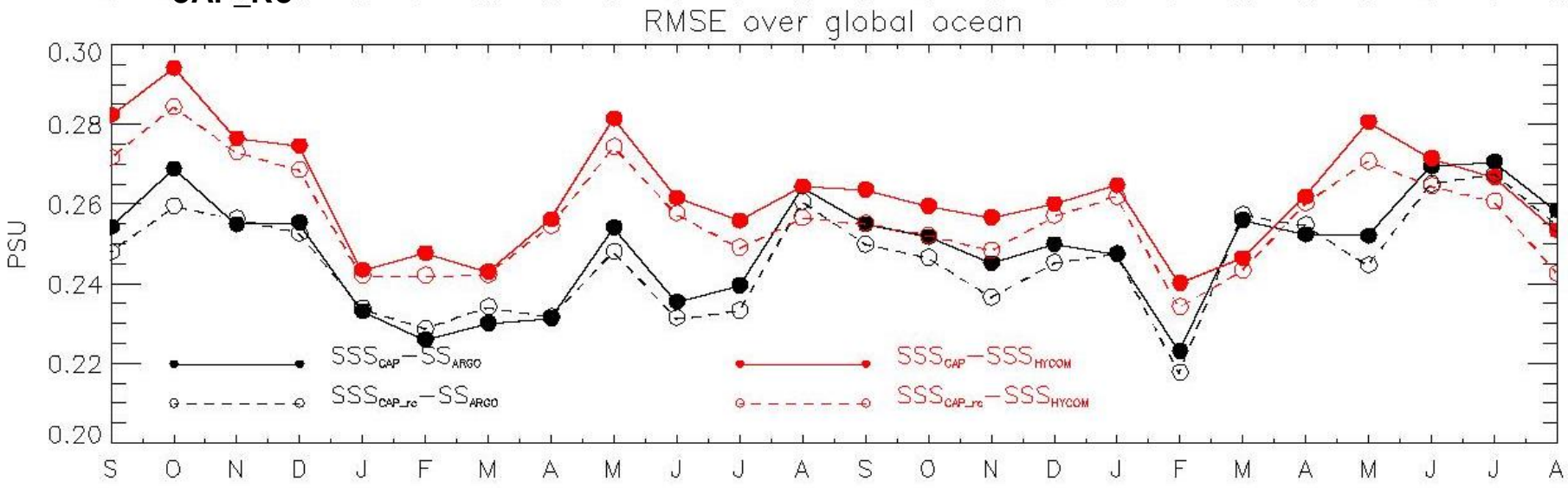


- Impact of rain derived from residuals, i.e. the difference between Aquarius L-band measurements and model predictions
- CAP processing retrieved SSS in parallel with / without rain corr.
- Rain correction reduces surface freshening under rain

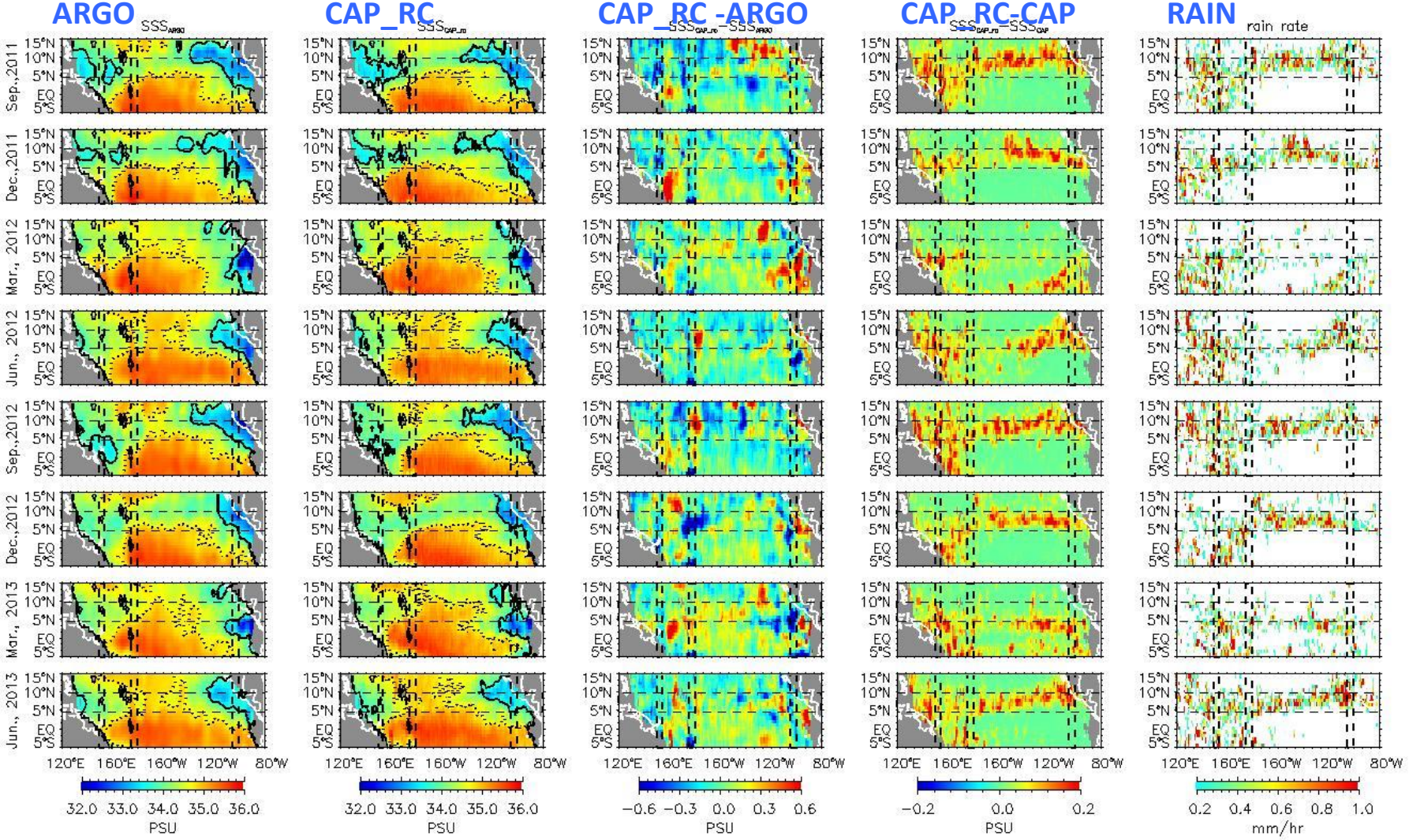
Rain correction improves error statistics comparing with ARGO

- The rain correction reduces RMSE of the global monthly gridded data w.r.t. SSS_{HYCOM} and SSS_{ARGO} consistent for most of the time
- The area in the 2-D space of wind & rain where SSS_{CAP} show significant large negative biases (over freshening) is corrected in SSS_{CAP_RC}:





Seasonal evolution of the equatorial Pacific fresh water pools



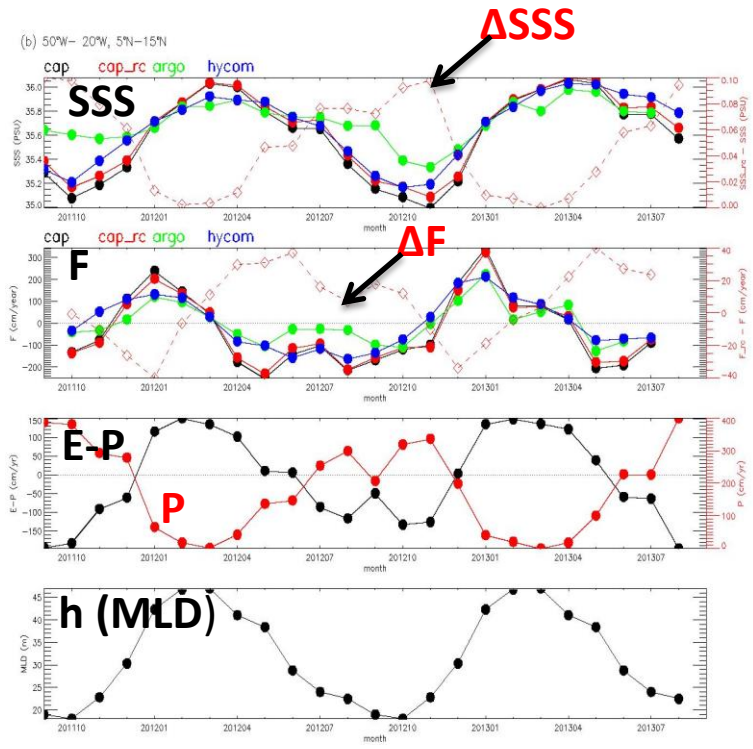
- Seasonal evolution of freshwater pools detected by Aquarius consistent with ARGO; but with more detail structure which may demonstrates satellite spatial/temporal sampling advantage or reflect the effect of near surface salinity stratification.
- ΔSSS(i.e. SSS_{CAP_RC}-SSS_{CAP}) highly correlates with the seasonal migration of rain belt but shows no correlation with residual bias with respect to ARGO

Impact of rain correction on the mixed layer salt storage tendency

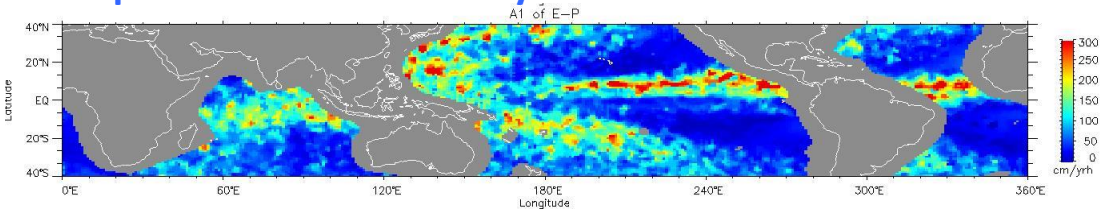
The effect of ΔSSS is estimated in terms of the normalized mixed-layer salt storage tendency, F, defined as

$$F = h(\partial S/\partial t)/S$$

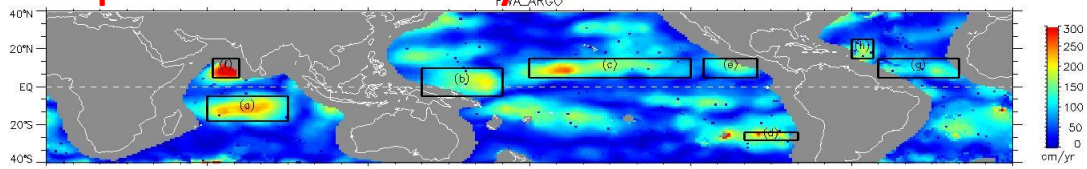
where the mixed layer depth h is obtained from ARGO climatological profiles.



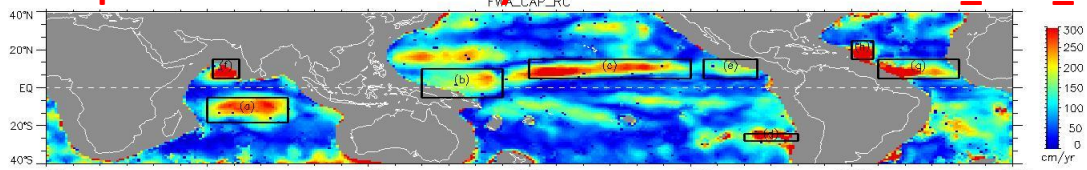
Amplitude of the annual cycle of E-P



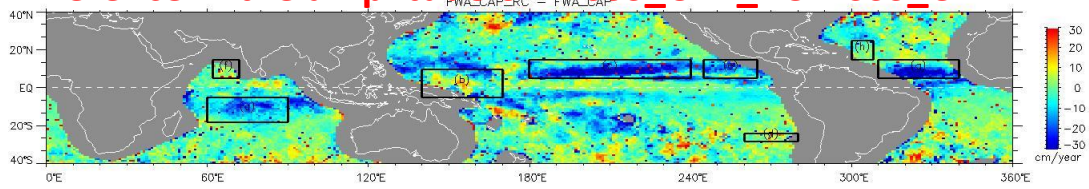
Amplitude of the annual cycle of F derived from ARGO SSS



Amplitude of the annual cycle of F derived from SSS_CAP_RC



Difference in the amplitude of F: SSS_CAP_RC – SSS_CAP



- F is the result of combined effect of the local fresh water forcing (E-P) and other terms such as advection and entrainment, etc.
- In area where E-P is identified as the dominant process of freshwater forcing (Yu, 2011), e.g. ITCZ, rain correction causes about 10-20% difference in the amplitude of the annual cycle of F