

Overview of Salinity Validation Data System

SVDS

Salinity Validation Data System

Login

Hsun-Ying Kao, David Carey, Julian Schanze and Gary S.E. Lagerloef

Earth & Space Research



SVDS Objectives

1. Flexible matchup for cal/val team

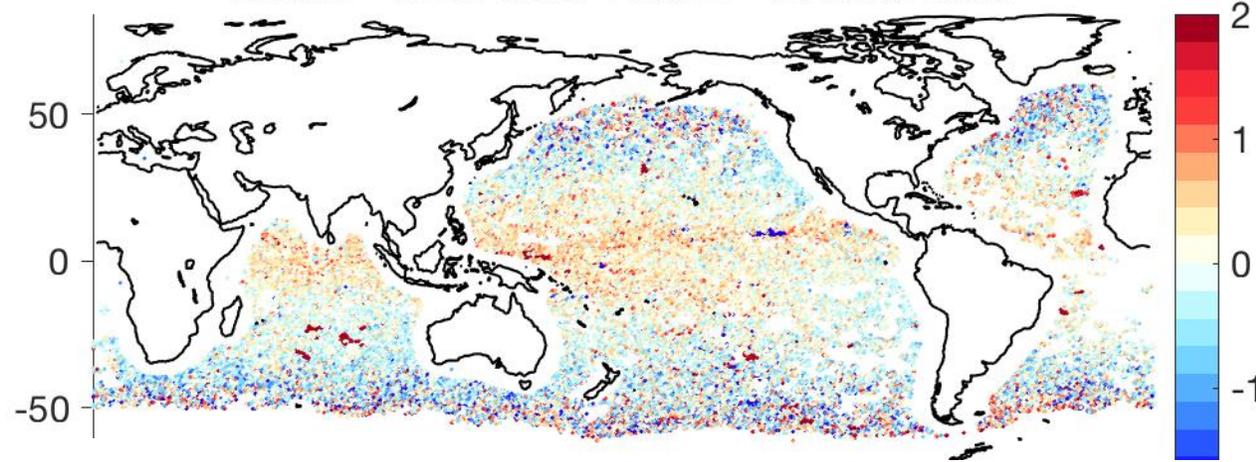
- Validation for each version of SMAP/Aquarius data, including test versions, SMOS will be included for comparisons (triple point analysis)
- Time window center on 1 orbit/day of the satellite data to understand the bias for the particular orbit/day of data.

2. The best matchup for general public and Pi-MEP

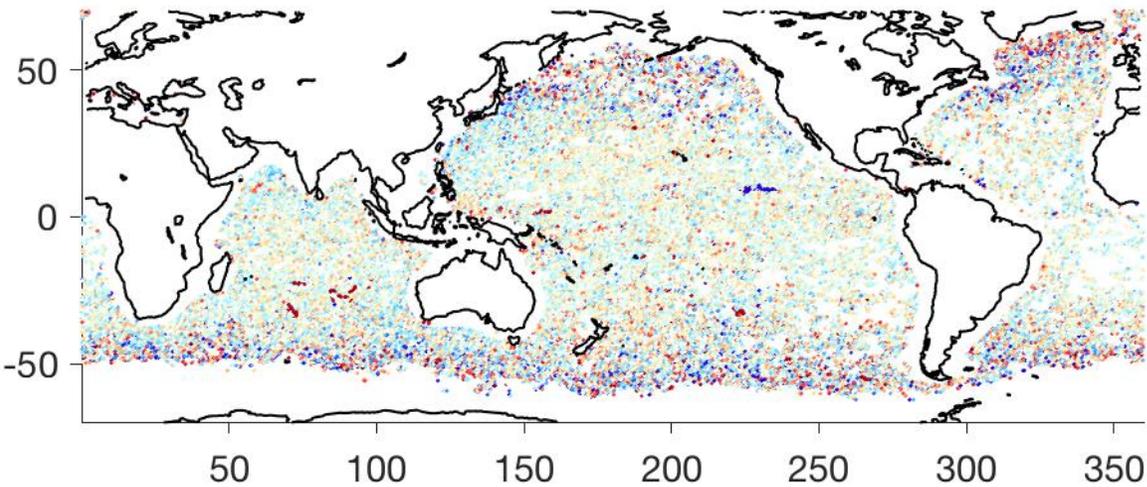
- Use the fixed criteria for matchup that has the lowest RMSD from the sensitivity test
- Time window center on the in situ data to have SMAP data averaged with more data points

Global validation for each version of SMAP with different spatial resolution of resampling

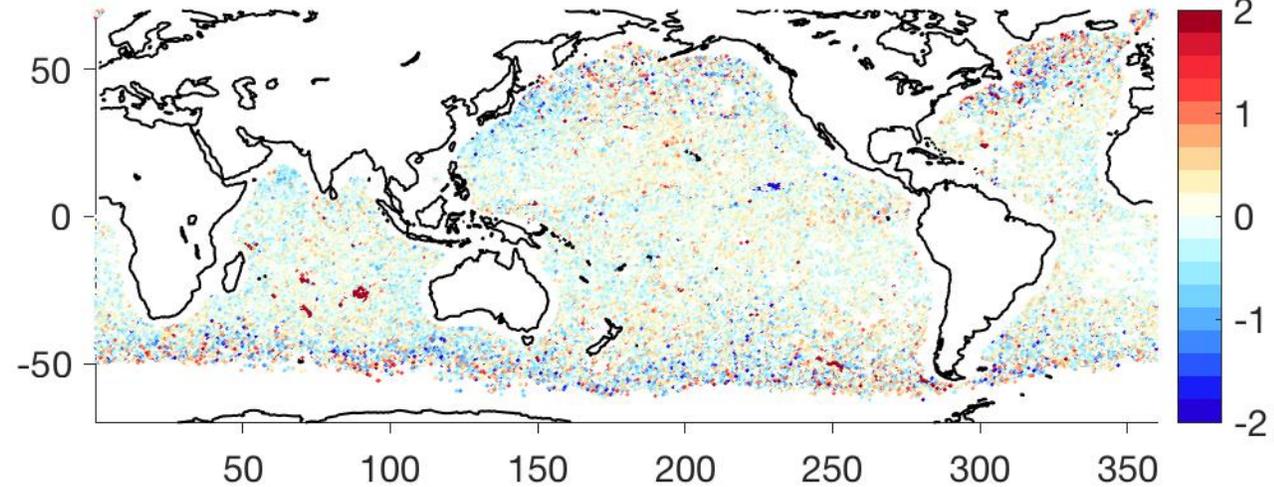
SMAP V2.0 SSS 70km - in situ SSS



SMAP V3.3 SSS 40km - in situ SSS



SMAP V3.3 SSS 70km - in situ SSS



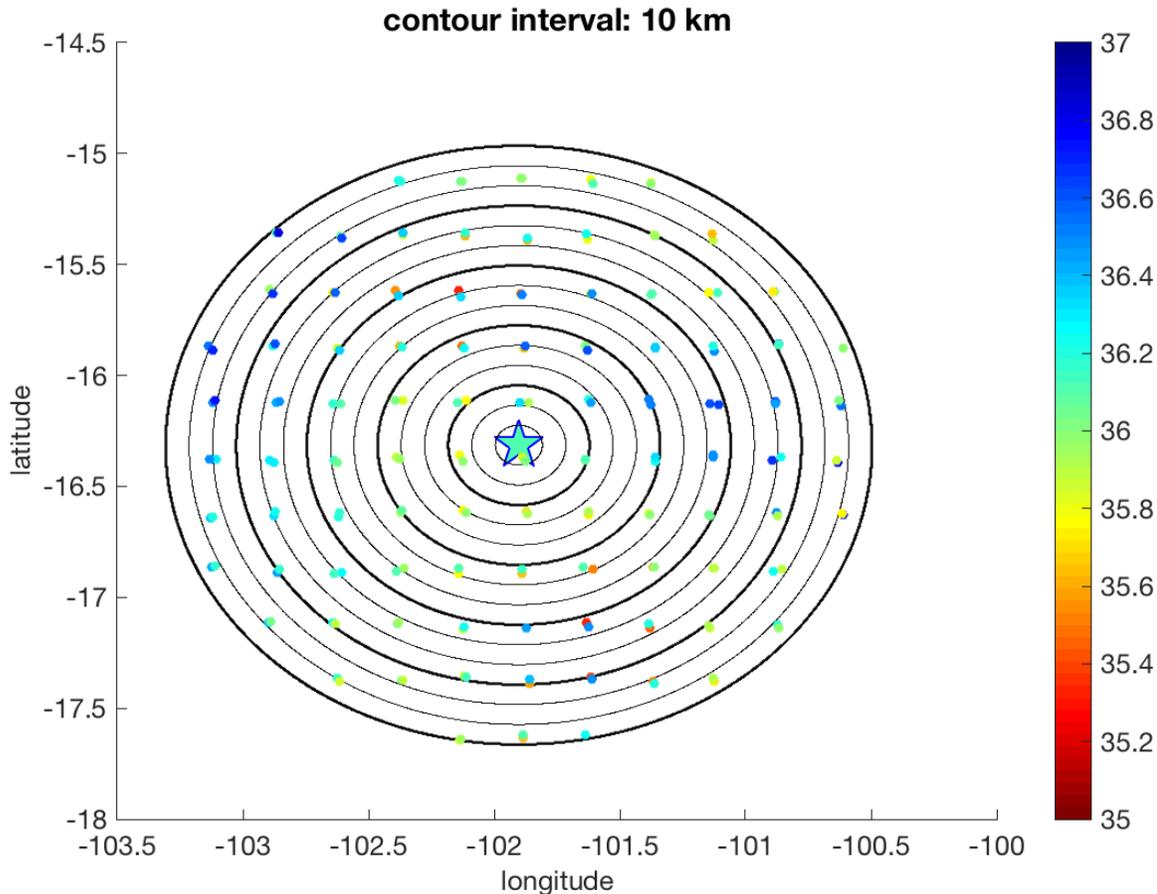
Criteria for Aquarius and SMAP match-up

summary of the matchup process are available on the FTP

	Search radius	time window	Smooth method
Aquarius	75 km (mission requirement is 0.2 psu on 150 km scale)	7 days (repeat cycle)	Average 11 footprints along the track
SMAP	30 km (according to sensitivity test)	8 days (repeat cycle)	Average within search radius

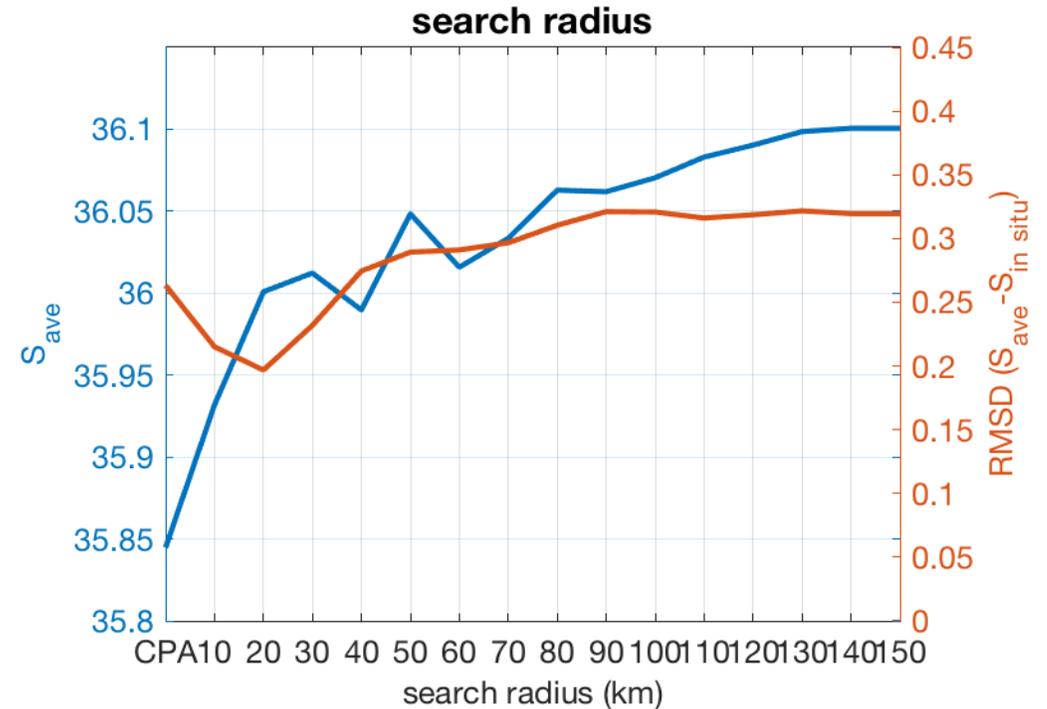
Sample of a match-up

8-day time window centered on 1 orbit of SMAP V3.3 70km



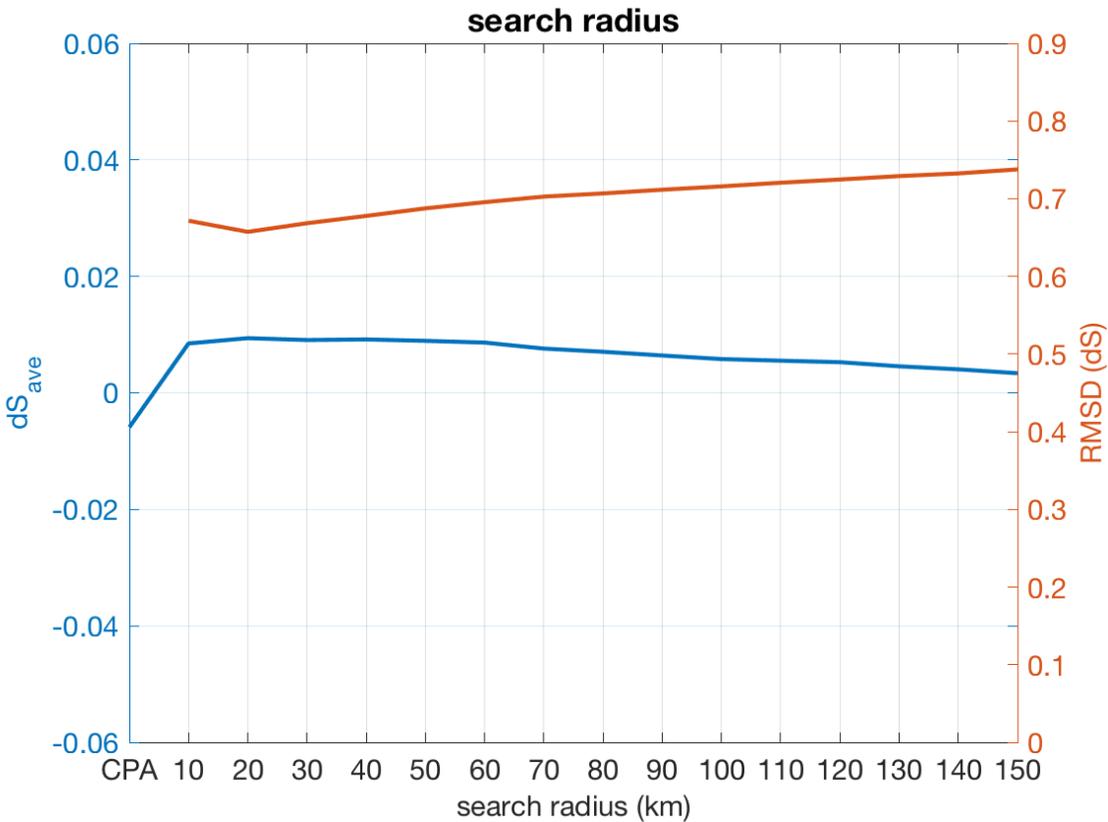
☆: in situ observation

Color dots: SMAP observations

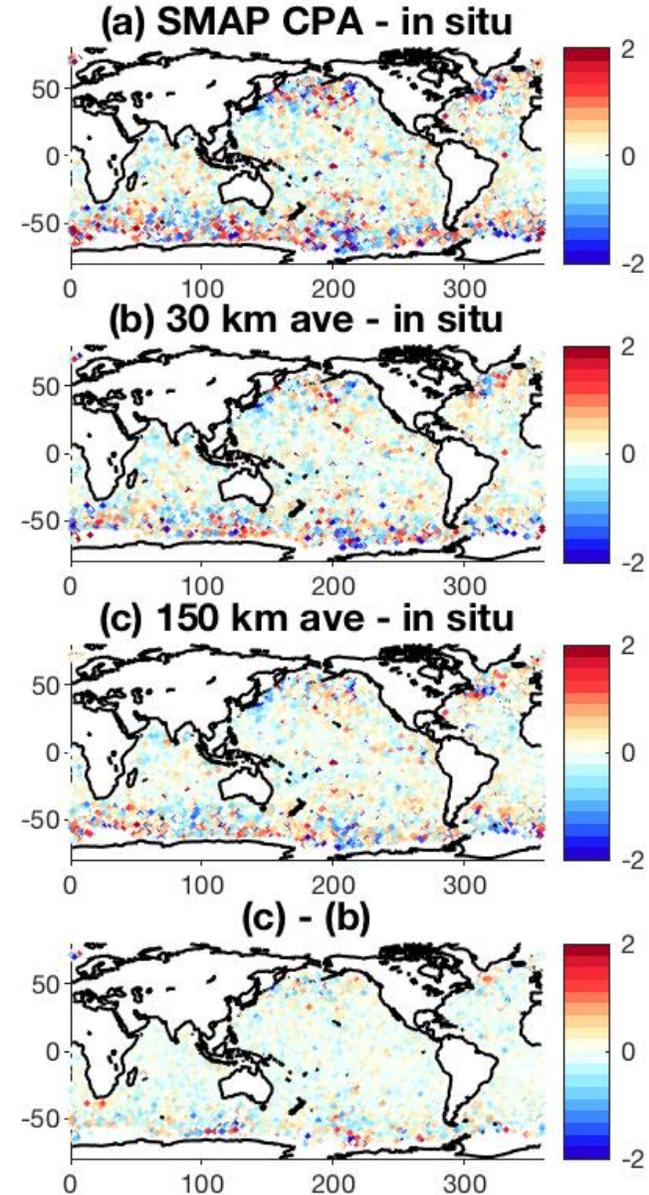


In situ $S = 36.1080$ psu

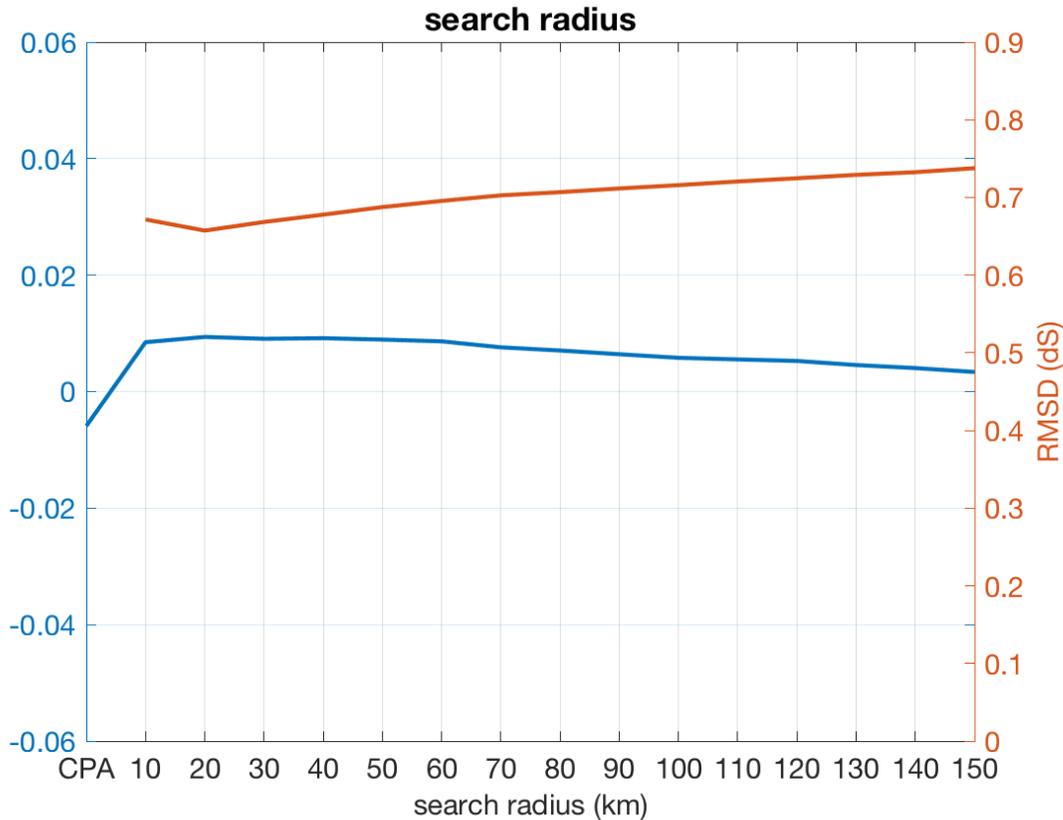
Salinity difference (SMAP minus in situ) with different search radius 4/1/2015-3/31/2016



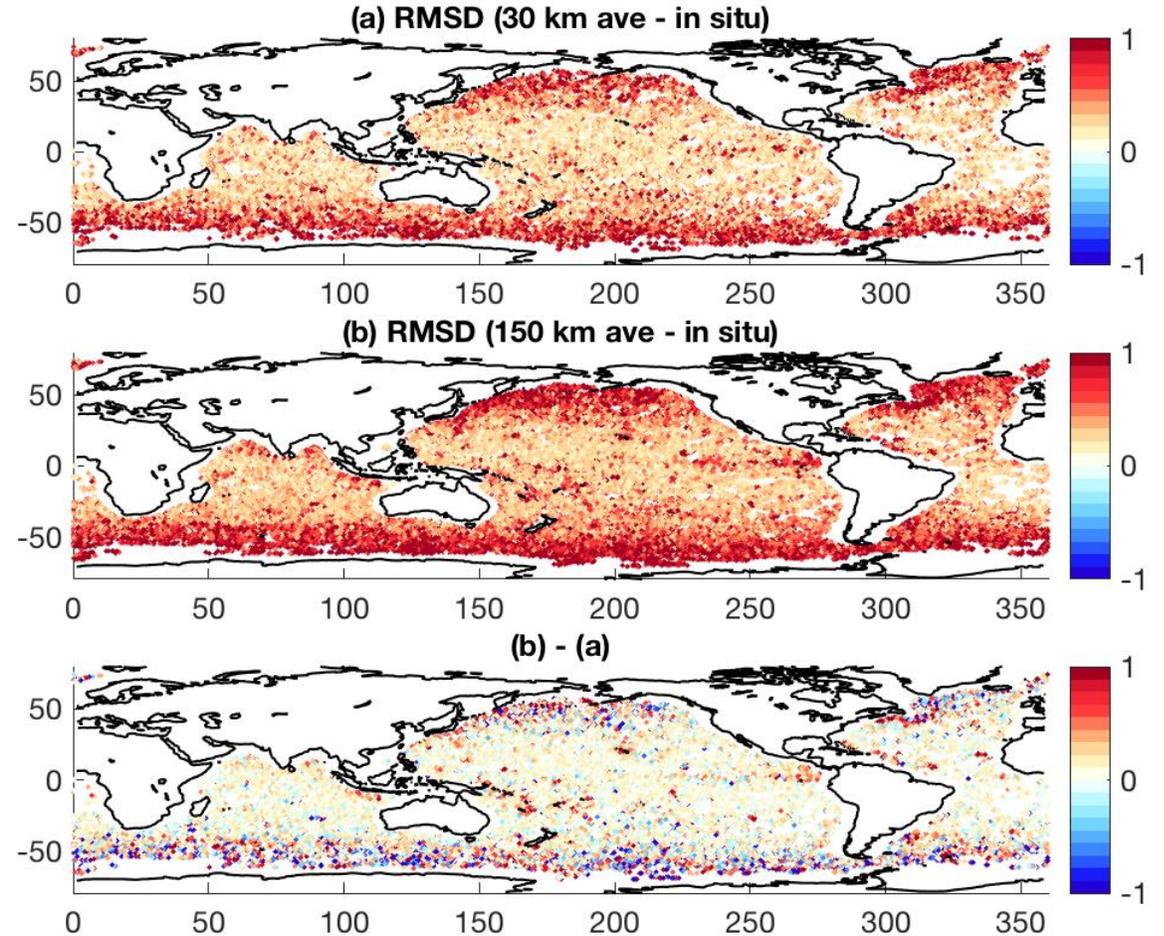
CPA: closest point approach



RMSD (SMAP minus in situ) with different search radius 4/1/2015-3/31/2016

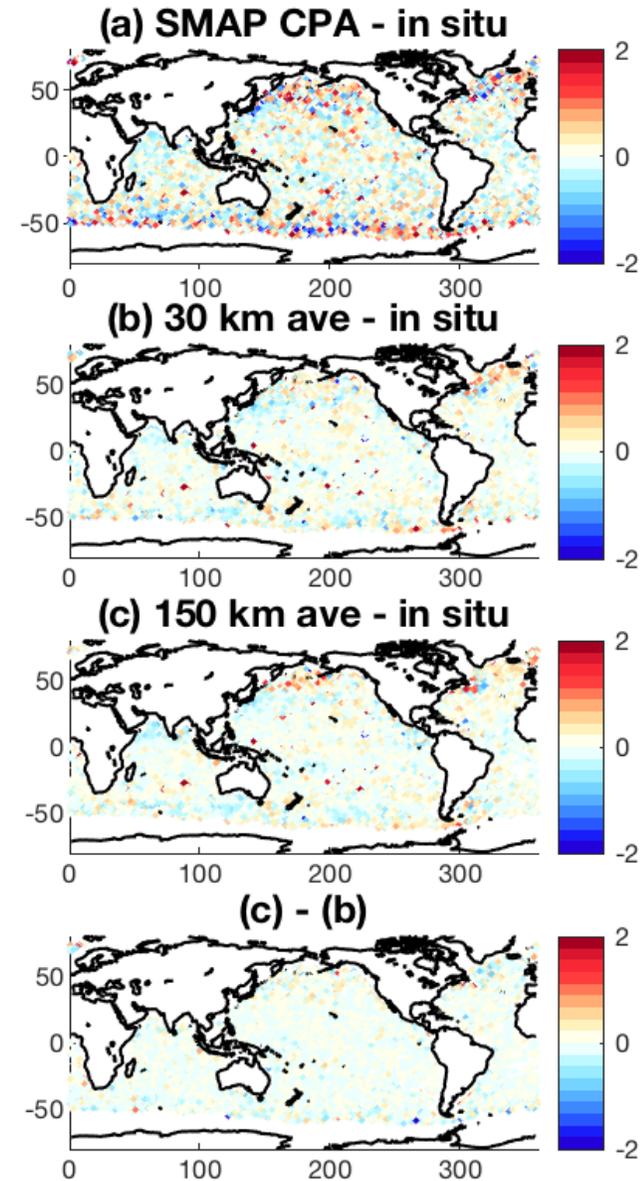
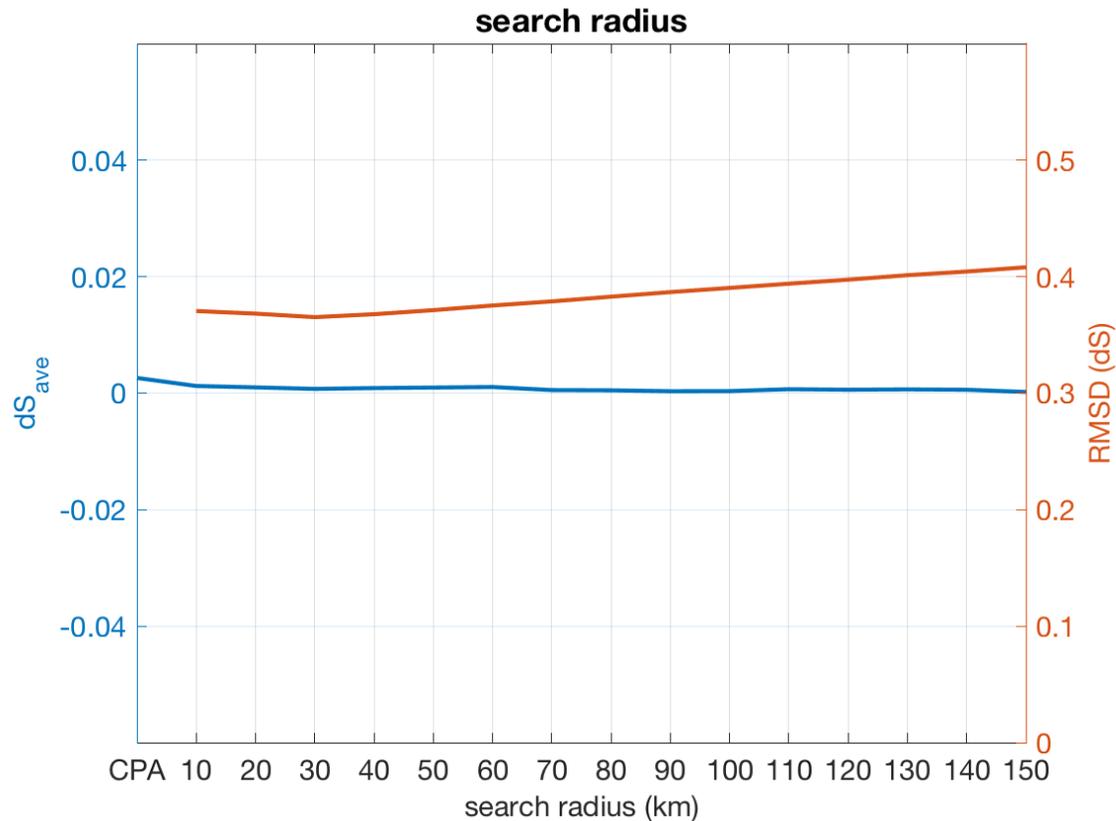


RMSD within the search radius shows more differences in high latitude, frontal regions and near coast areas

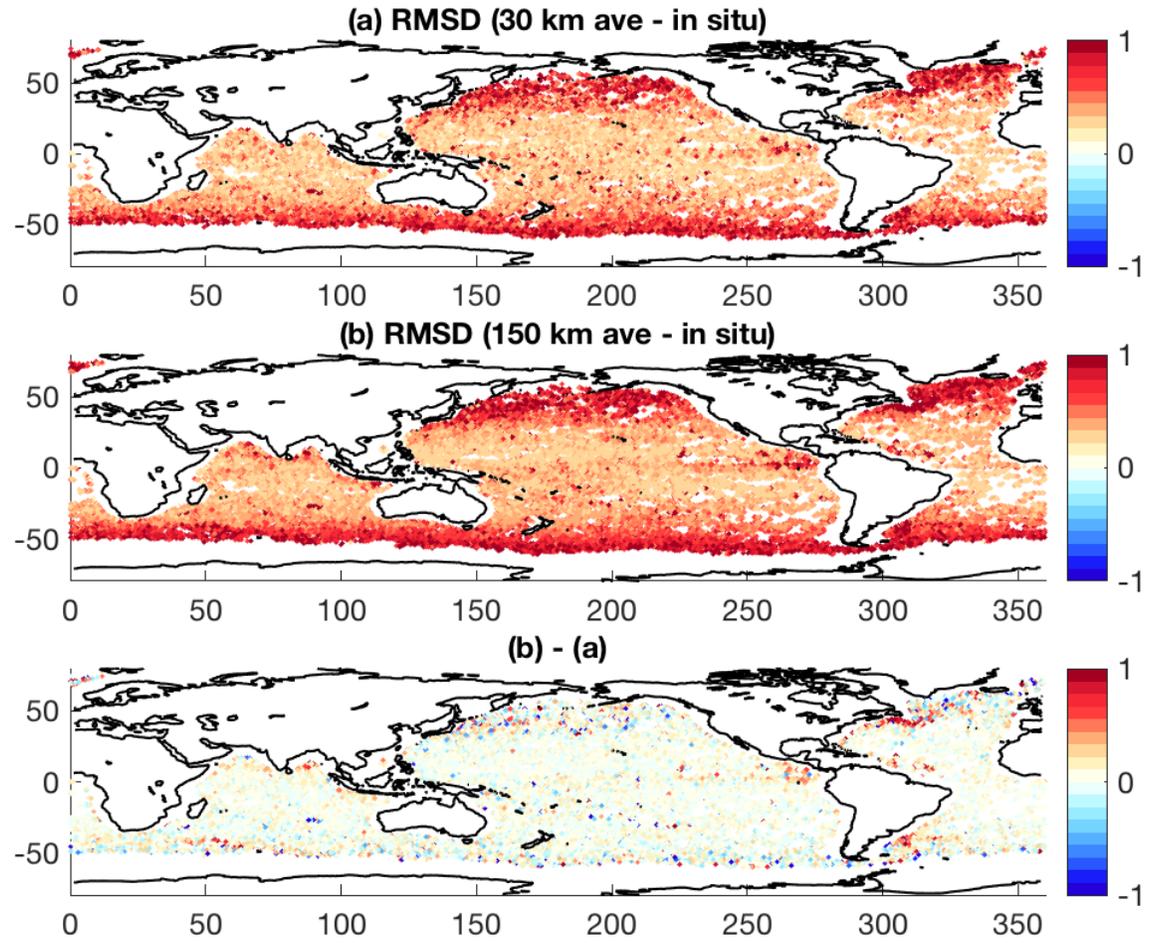
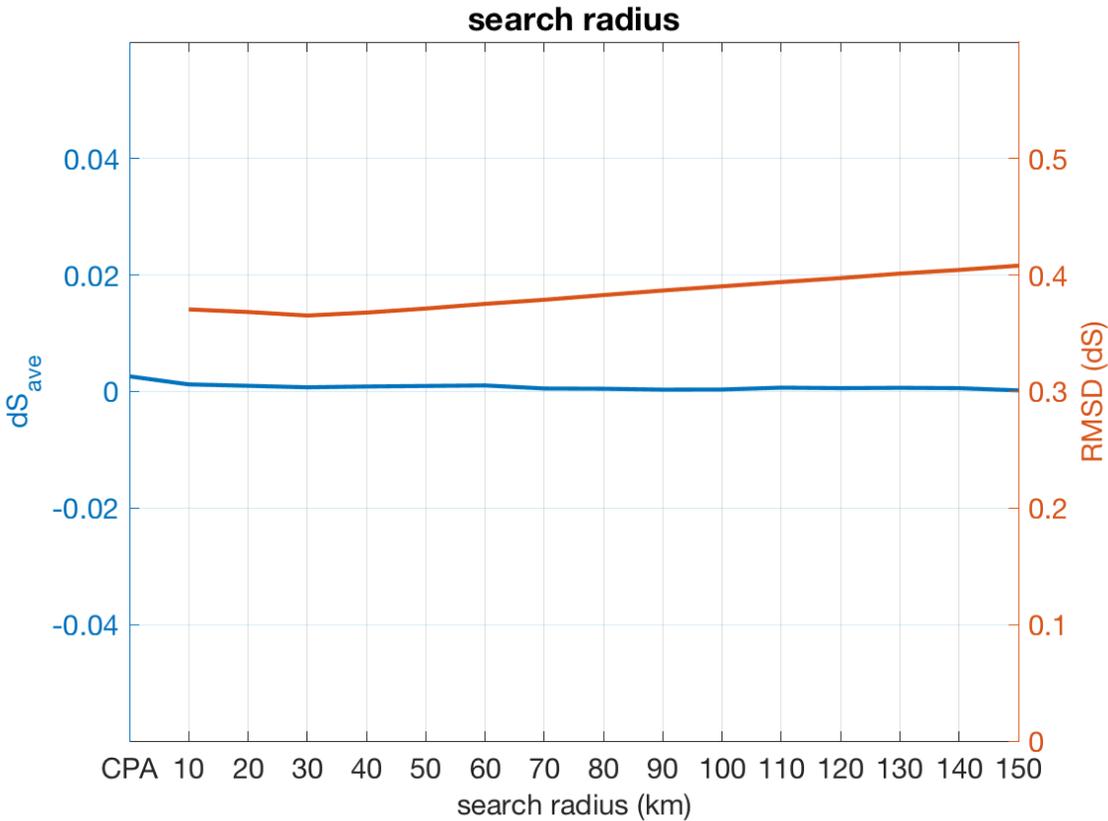


Salinity difference (SMAP minus in situ) with different search radius 4/1/2015-3/31/2016

**Time window center on in situ:
more average on SMAP data**



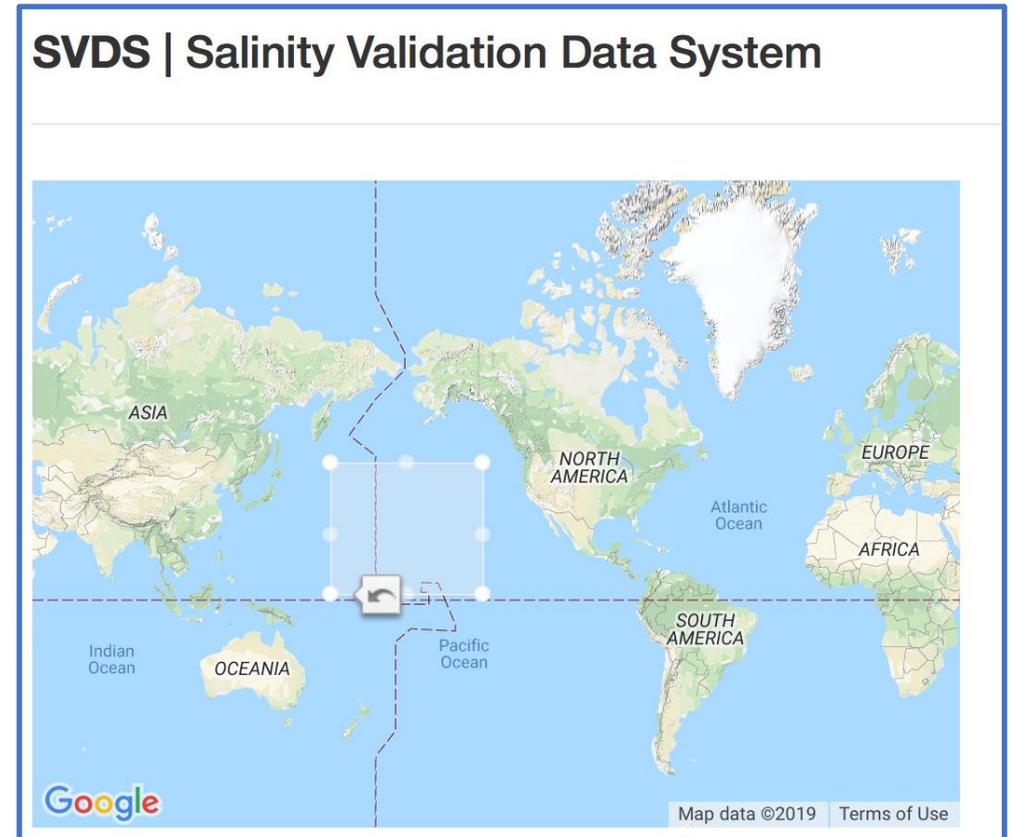
RMSD (SMAP minus in situ) with different search radius 4/1/2015-3/31/2016



RMSD within the search radius shows more differences in high latitude, ITCZ and near coast areas

What Will be Included Next

- Regional Validation (case studies)
- Validation with SPURS observations/ Saildrone
- Generate plots for Sensitivity test



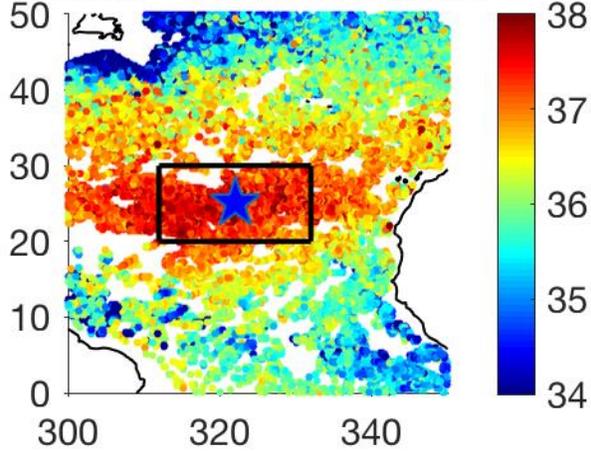
Regional validation

SPURS-1: Salinity maximum region

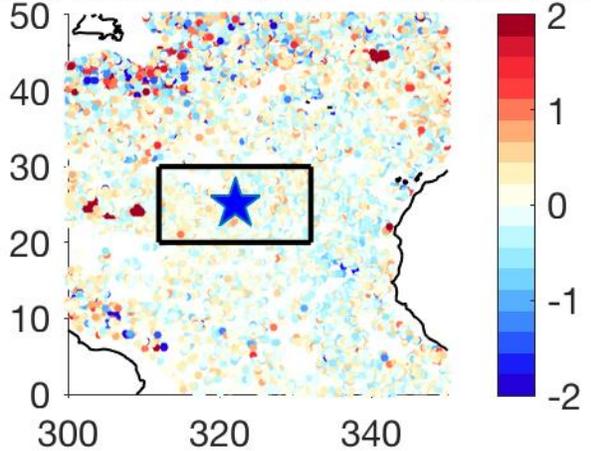
Salinity Processes in the Upper Ocean Regional Study



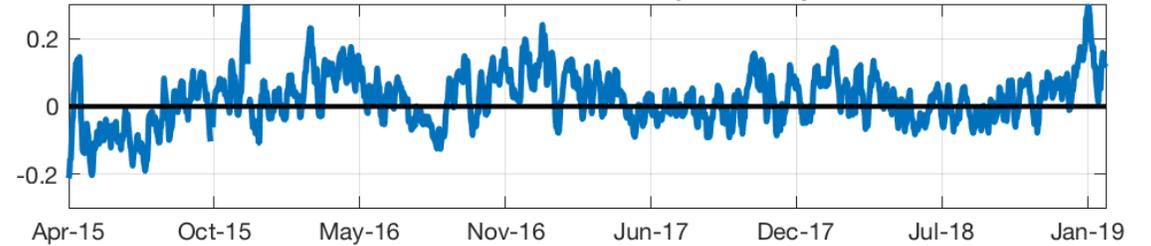
SMAP V3 SSS 70km



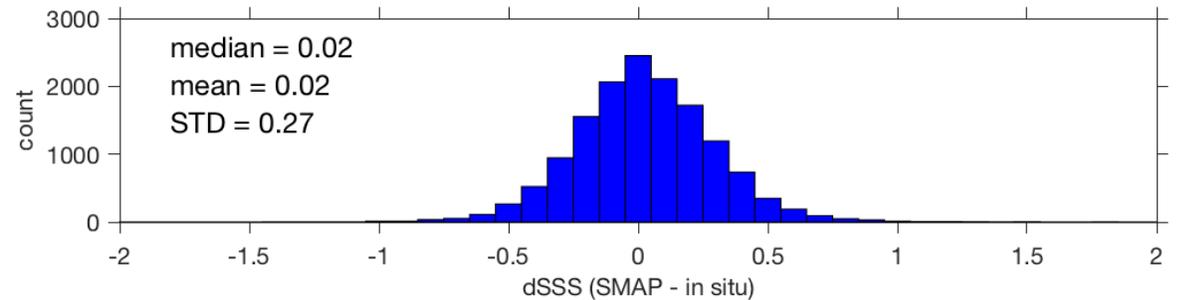
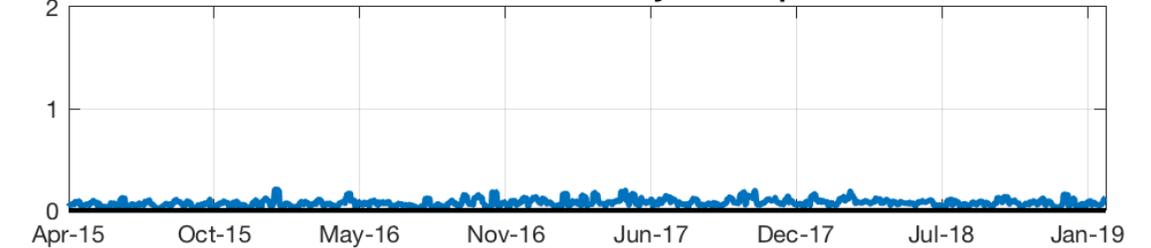
SMAP V3 SSS 70km - in situ SSS



median of dSSS for daily matchup



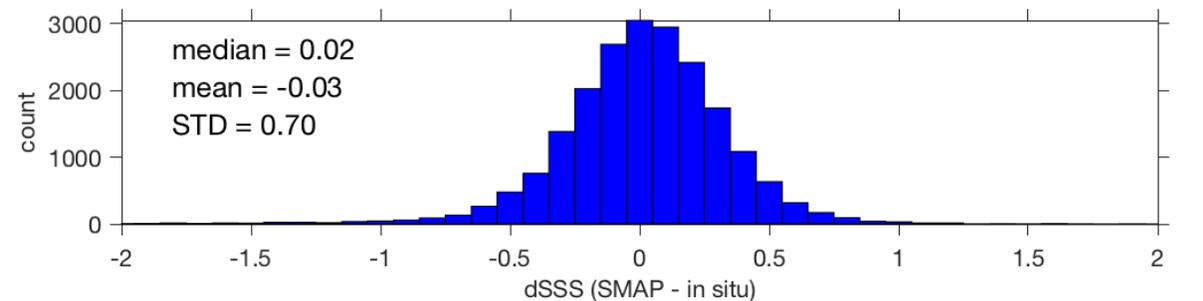
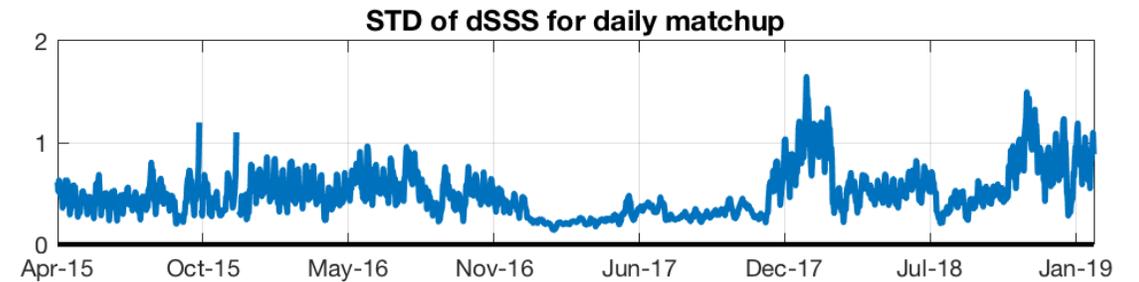
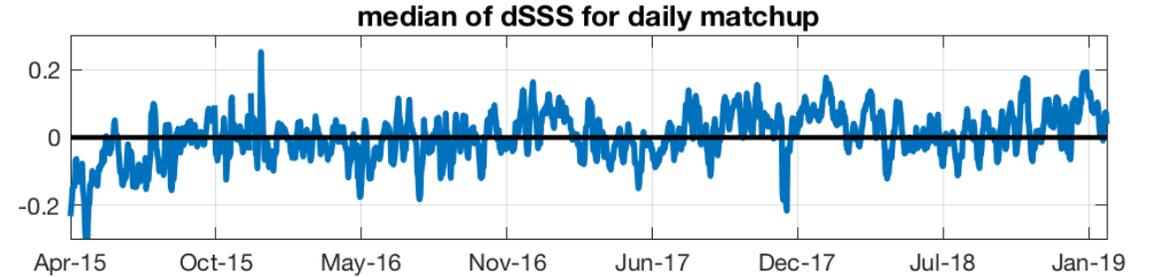
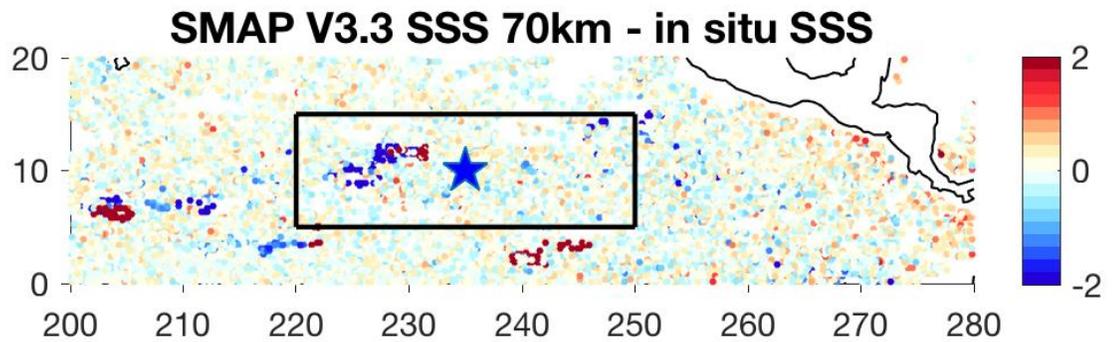
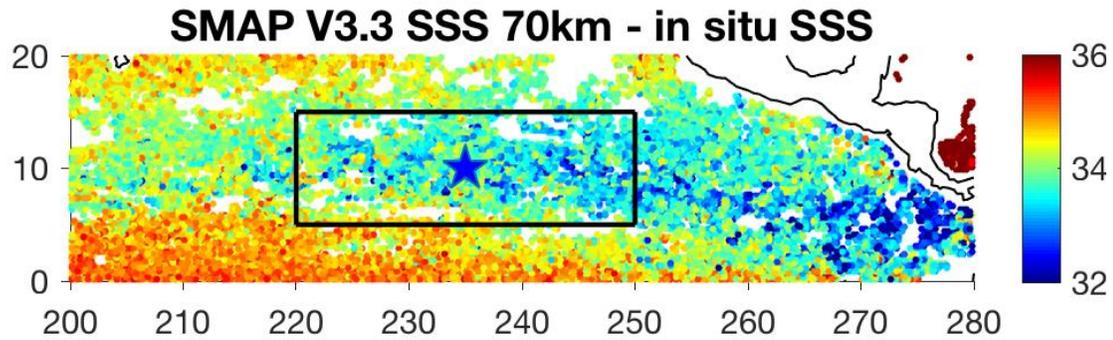
STD of dSSS for daily matchup



Regional validation with rain flagged

SPURS-2: Under Pacific ITCZ

Salinity Processes in the Upper Ocean Regional Study

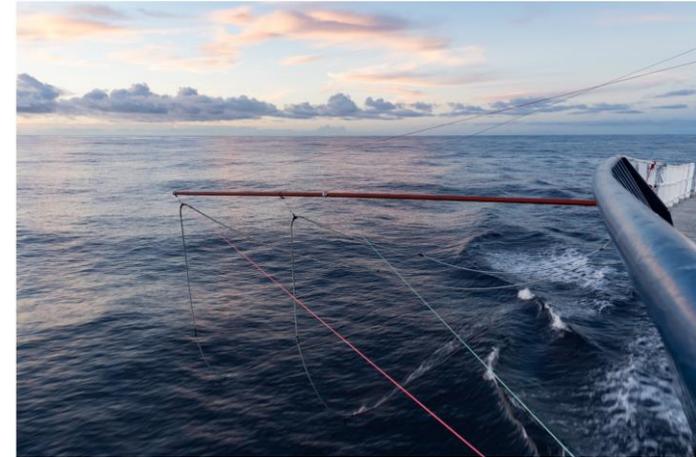
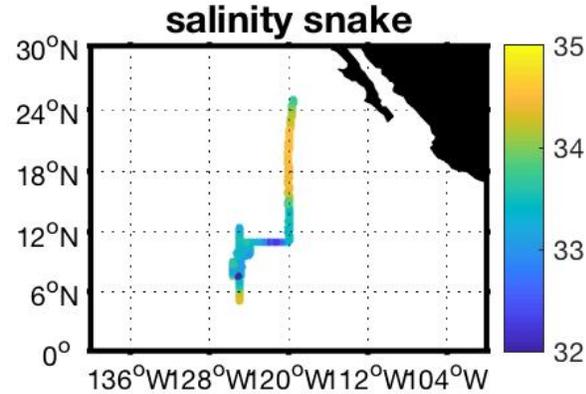


Validation with SPURS-2 Salinity Snake

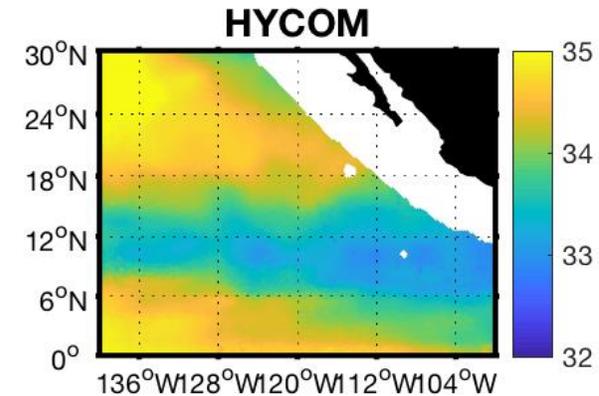
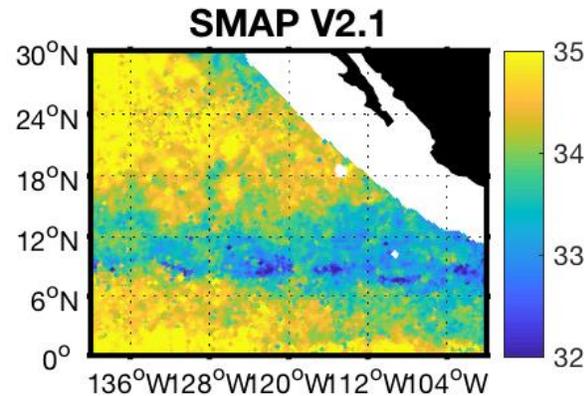
10/24/2017-11/15/2017

Salinity snake observes the salinity in the upper few cms.

7 day time window
30 km search radius

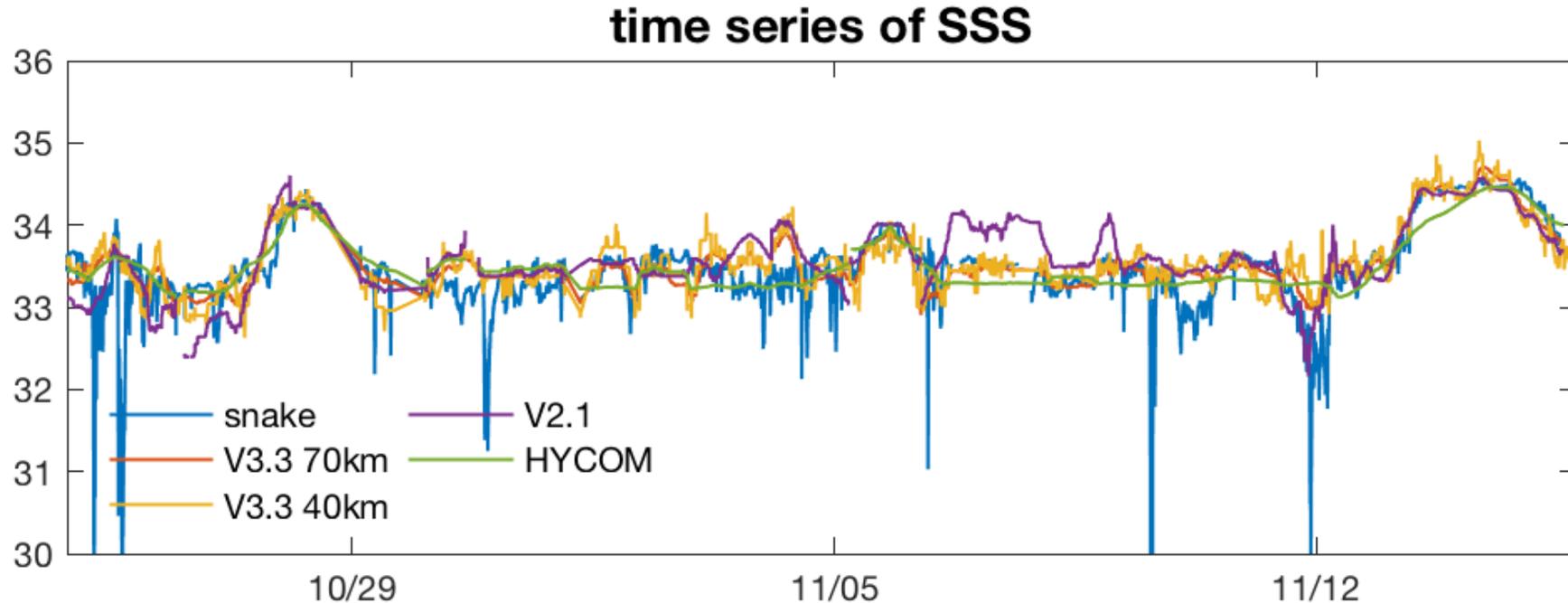


Picture of salinity snake (Schanze) from SPURS-2 cruise report



Validation with Salinity snake time series of SMAP SSS

- SMAP V3.3 shows better match with salinity snake than SMAP V2.1
- Around 11/12/2017 the drop in SMAP V2.1 is closer to the observations from salinity snake



$r(\text{snake}, \text{SMAPV2.1}, 70 \text{ km}) = 0.61$

$r(\text{snake}, \text{SMAPV3.3}, 70 \text{ km wo/rain flag}) = 0.69$

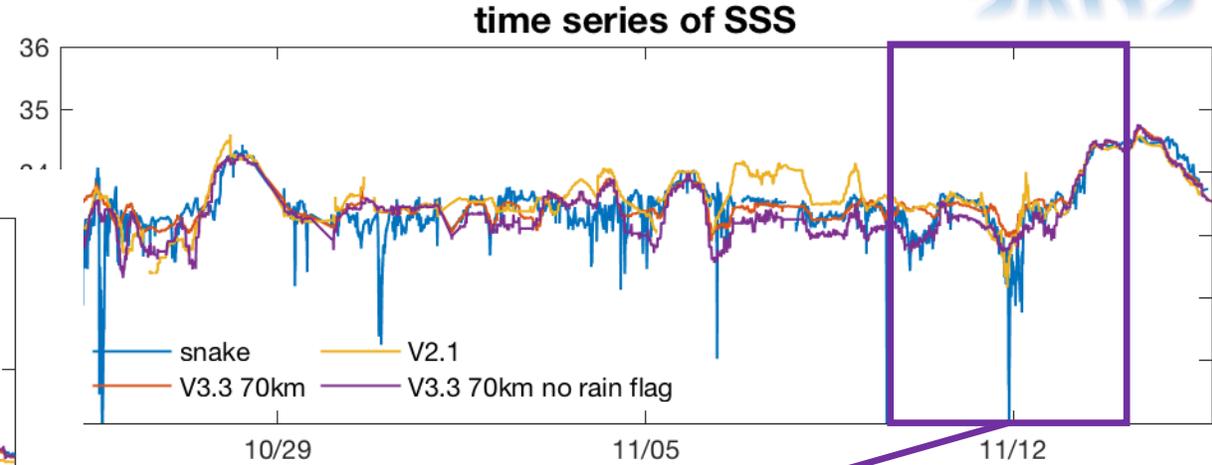
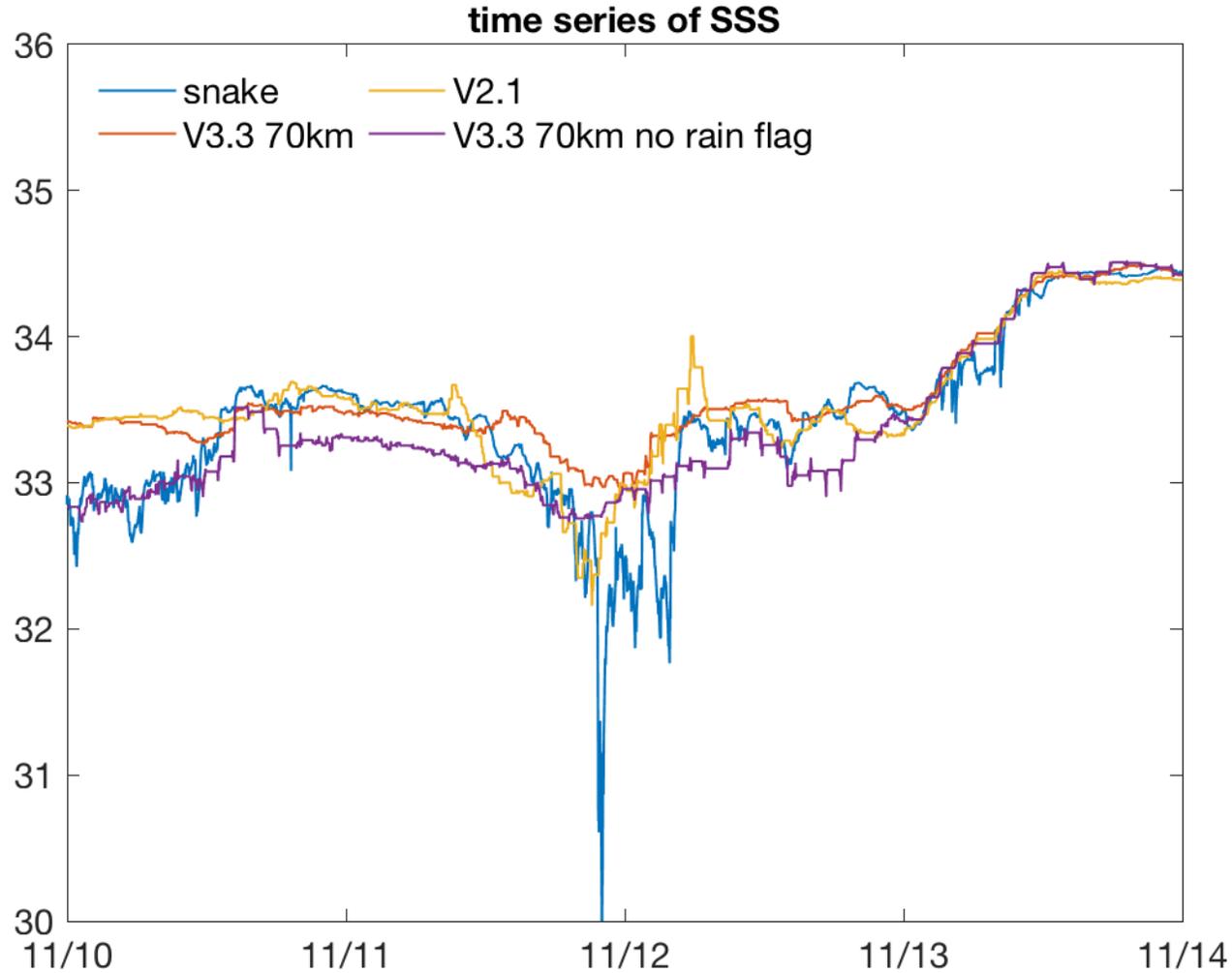
$r(\text{snake}, \text{HYCOM}) = 0.67$

$r(\text{snake}, \text{SMAPV3.3}, 40\text{km w/rain flag}) = 0.63$

$r(\text{snake}, \text{SMAPV3.3}, 70\text{km w/rain flag}) = 0.66$



Salinity snake validation near 11/12/2017



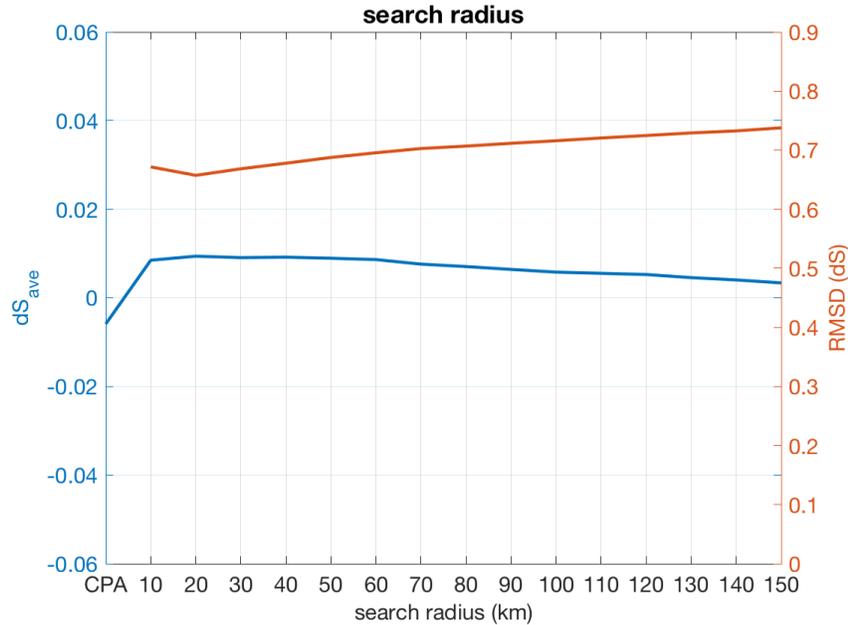
During the 11/12 salinity drop, V3.3 without rain flag shows larger drop than the one with rain flag

Validation with Salinity Snake is very useful to check the rain flag used for SMAP, or validation for gradient.

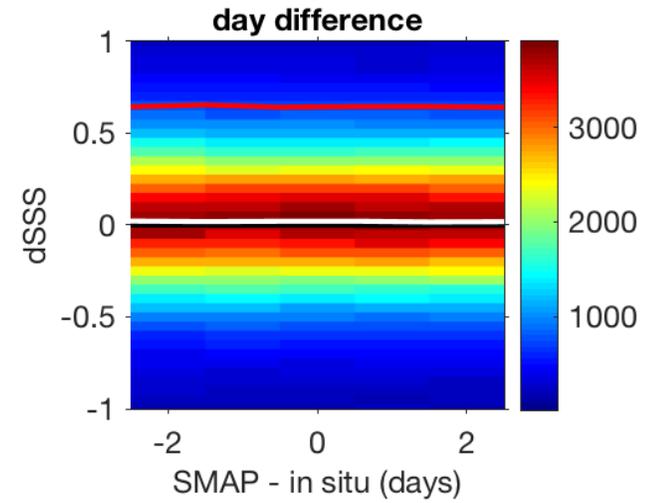


Sensitivity test

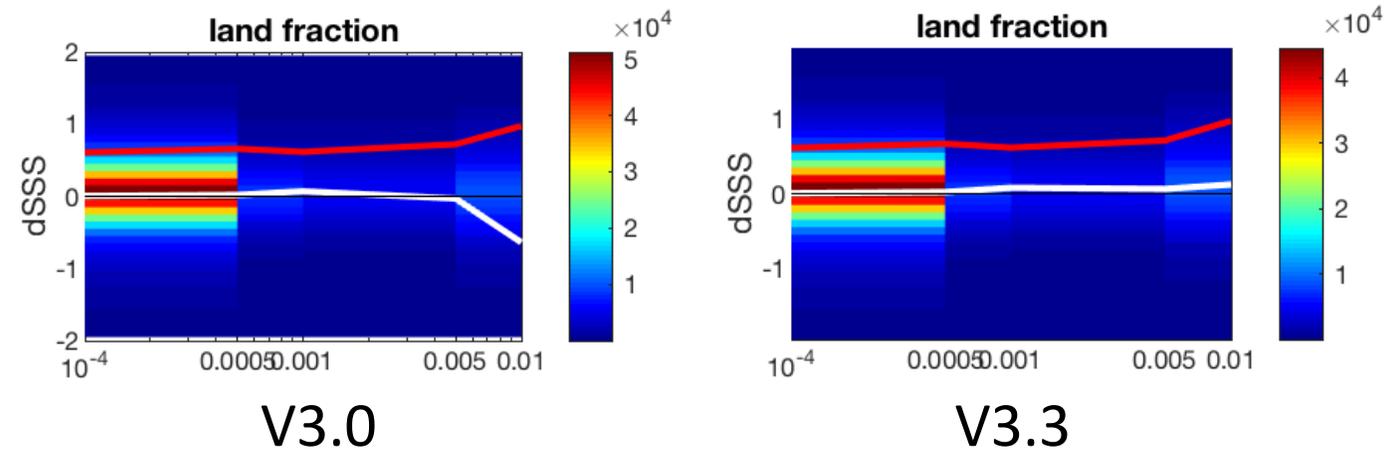
dSSS vs search radius

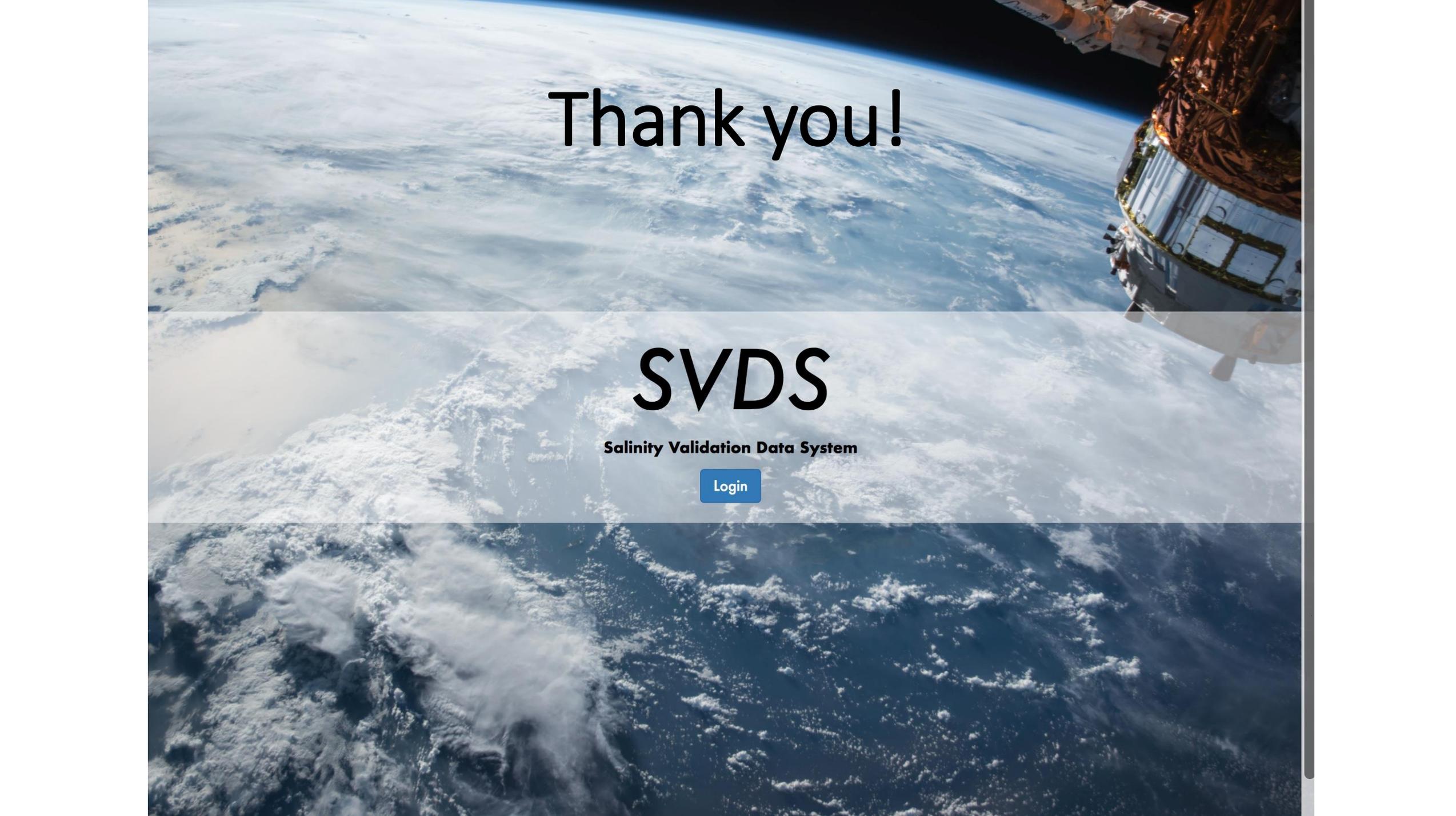


dSSS vs day difference



dSSS vs land fraction



A photograph of a space station in orbit over Earth, with the planet's blue oceans and white clouds visible. The station's complex structure, including gold-colored thermal blankets and various modules, is partially visible in the upper right corner.

Thank you!

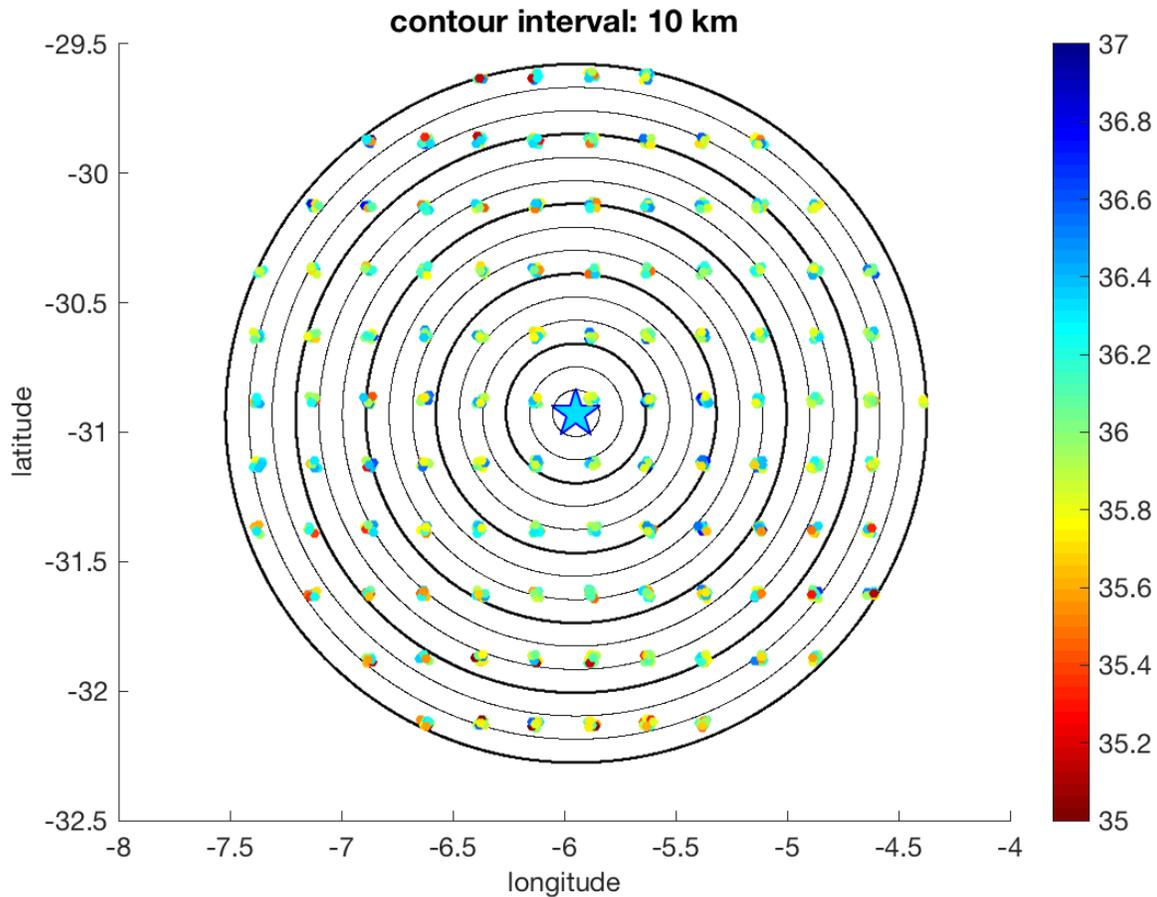
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Salinity Validation Data System

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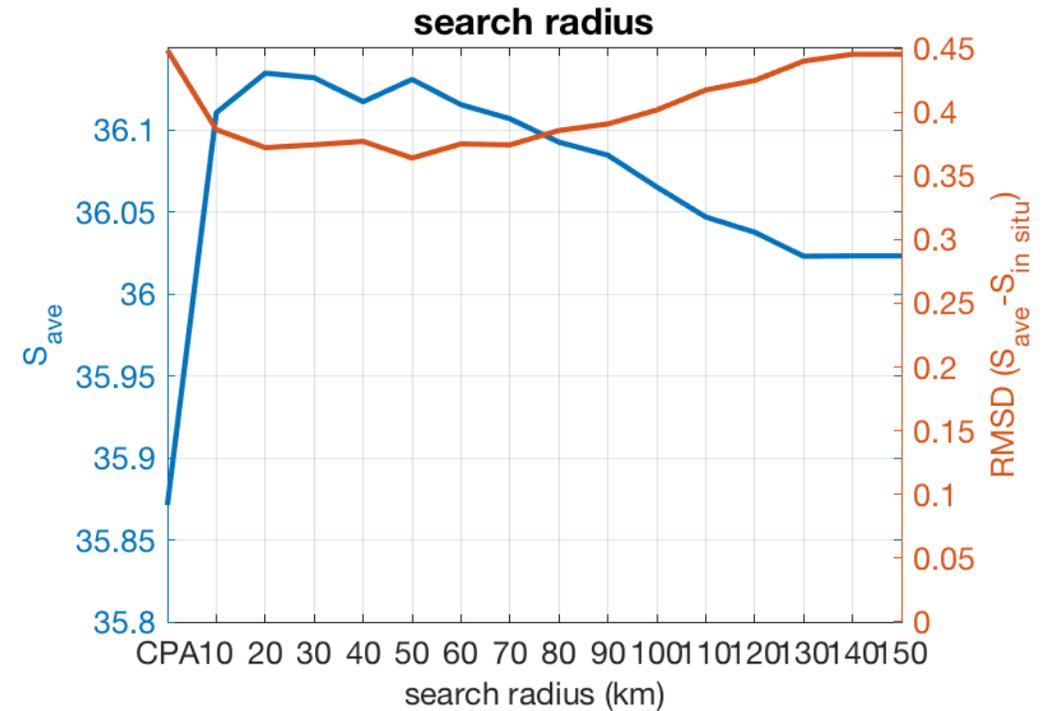
Backup slides

Sample of a match-up time window centered on Argo

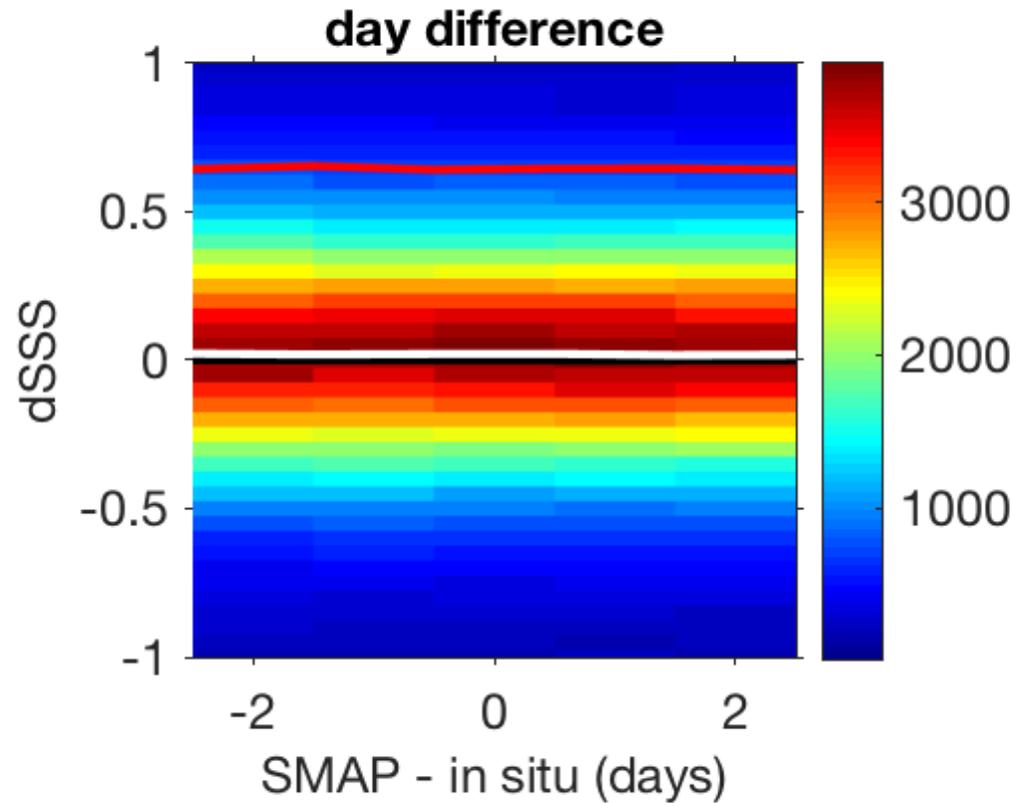


☆: in situ observation

Color dots: SMAP observations



Sensitivity to the time difference



Red line: standard deviation
White line: salinity differences

Salinity differences are not related to the time differences within 3 days.

Flags used for SMAP V3 validation

Flag #0: no valid radiometer observation in cell

Flag #1: Problem with OI

Flag #2: Strong land contamination

Flag #3: Strong sea ice contamination

Flag #4: MLE in SSS retrieval algorithm has not converged

Flag #5: sunglint

Flag #6: moonglint

Flag #7: high reflected galaxy

Flag #10: high residual of MLE in SSS retrieval algorithm

Flag #11: low SST (5C)

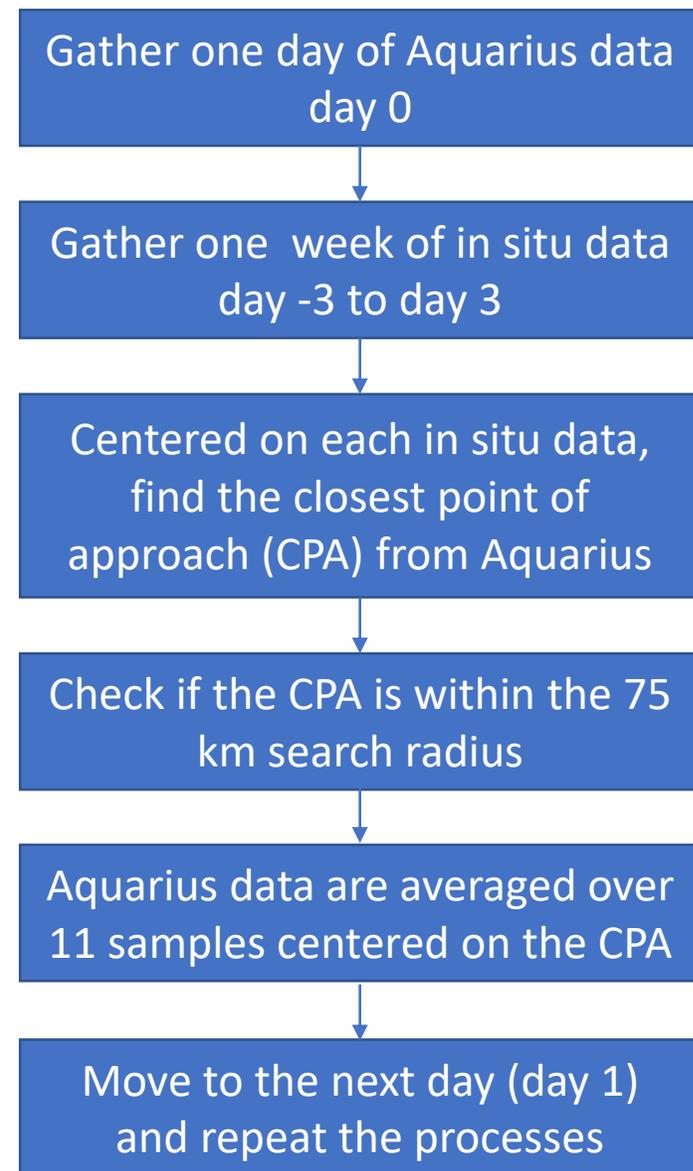
Flag #12: high wind speed (>15m/s)

Flag #13: light land contamination (0.001)

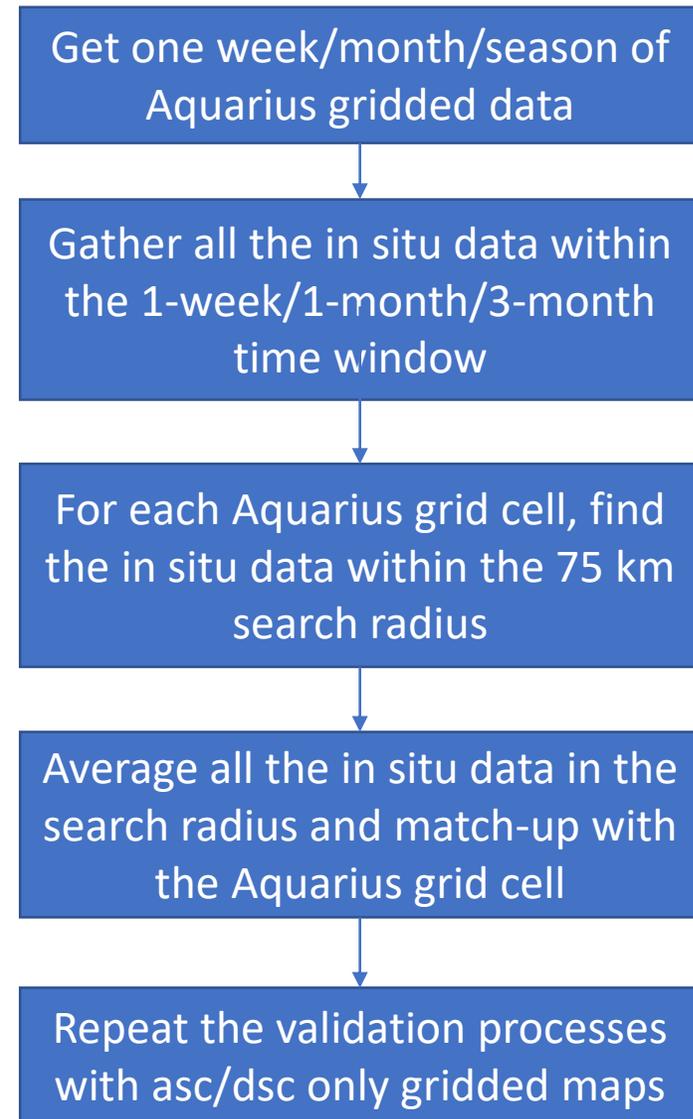
Flag #14: light sea-ice contamination (0.0005)

Flag #15: rain flag IMERG rain-rate exceeds 0.1 mm/h

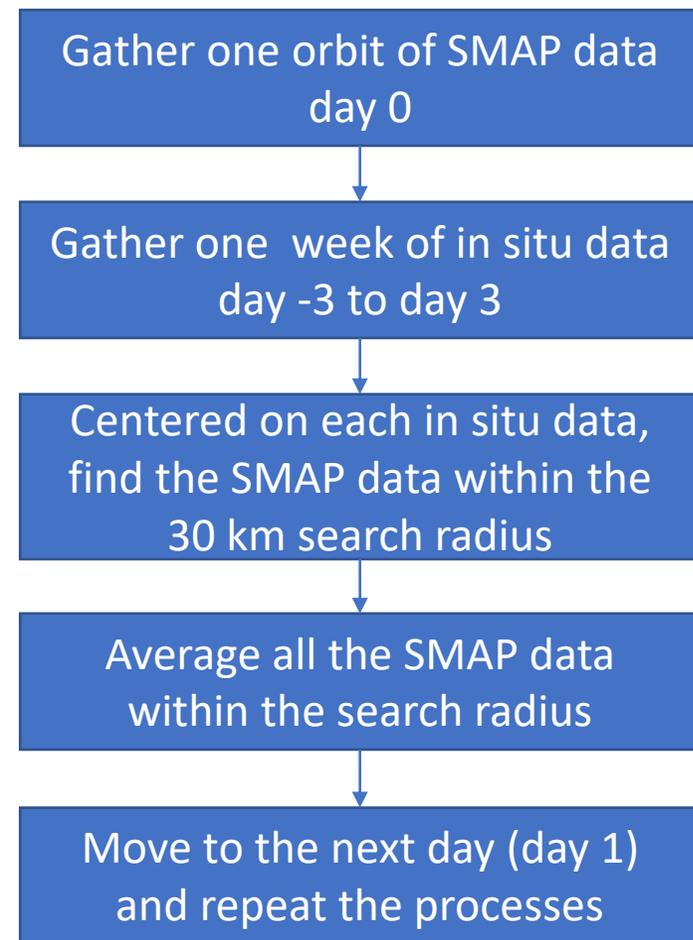
Flow diagram of AVDS L2



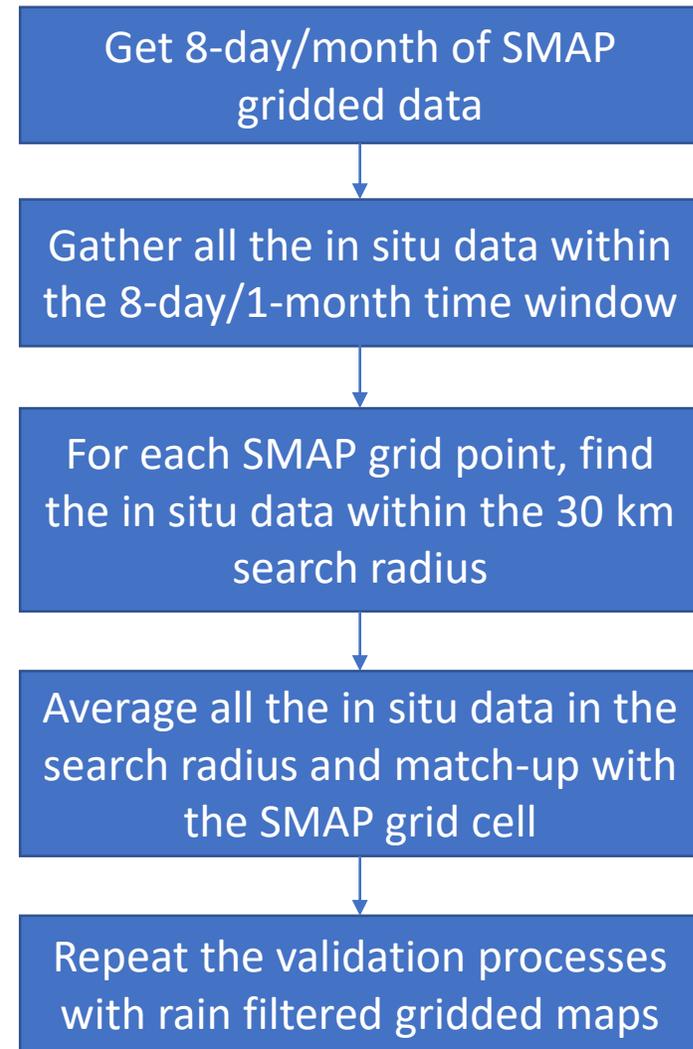
Flow diagram of AVDS L3



Flow diagram of SVDS L2



Flow diagram of SVDS L3



Regional validation

Amazon Outflow

