Status of Radiometer RFI Detection and Mitigation

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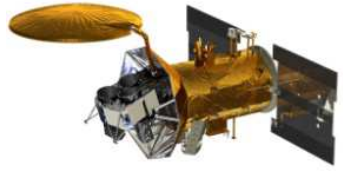

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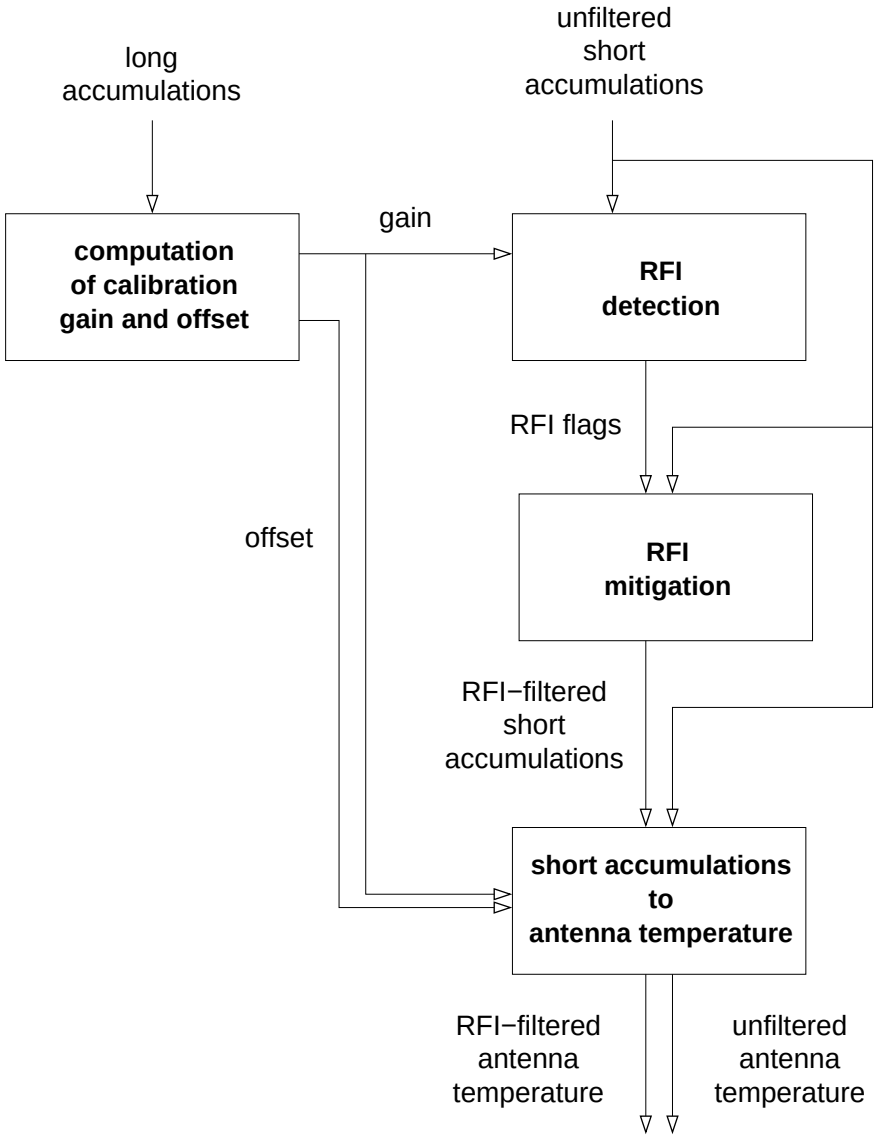
Outline

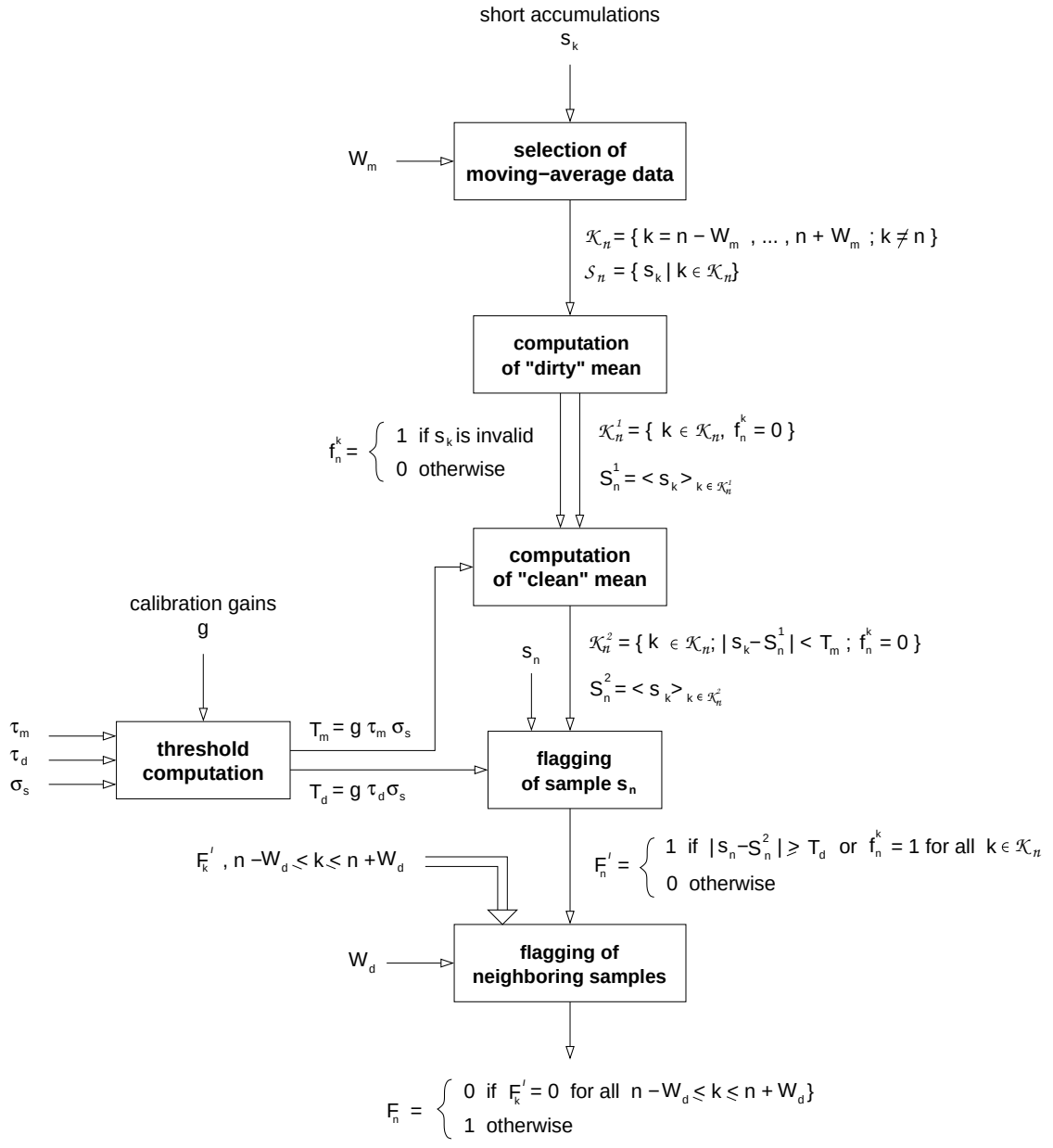
- Brief algorithm review
- Issues
- Accomplishments and future work

RFI Detection and Mitigation



RFI Detection Algorithm

W_m	10
W_d	2
σ_s	~ 0.5
g	0.8-1.6
τ_m	1.5
τ_d	4.0

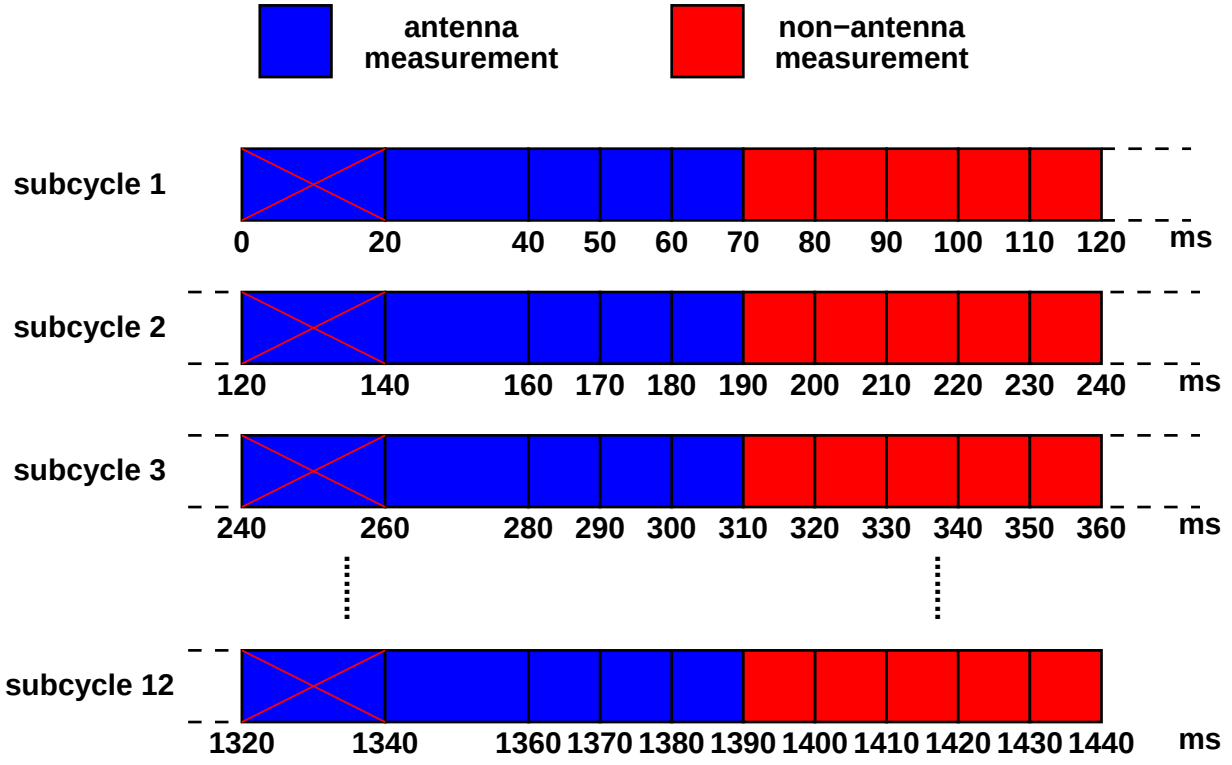


Issues

- Problem with Short Accumulation 1
- Equalization of false alarm rate
- Tuning of geographycally dependent parameters
- Missed detection of low-level RFI

Problem with Short Accumulation 1

- Values of Short Accumulation 1 (SA1) inconsistent with values of Short Accumulations 2 to 5
- Solution: removal of Short Accumulation 1 from radiometer processing



RFI Detection Algorithm Thresholds

- Two thresholds:
  - $T_m = g(\text{beam}, \text{pol})\, \sigma_s\, \tau_m(\text{lat}, \text{lon})$ for removing outliers
  - $T_d = g(\text{beam}, \text{pol})\, \sigma_s\, \tau_d(\text{lat}, \text{lon})$ for RFI flag decision
- g is the gain used in the conversion from short accumulations to antenna temperatures
- τ_m and τ_d tunable by geographical location (ocean, land, etc.)
- σ_s corresponds to the standard deviation of the measured antenna temperature (Noise Equivalent Delta T, NEDT)

Equalization of False Alarm Rate (FAR)

- values of σ_s are chosen to yield a FAR of 4% over RFI-free ocean across all brams and polarization channels
- before FAR equalization, σ_s values are pre-launch estimates independent of beam:

V	V+H	V-H	H
0.5157,	0.4735	0.4735	0.4313

- after FAR equalization, σ_s values are given by

	V	V+H	V-H	H
Beam 1	0.558	0.551	0.540	0.532
Beam 2	0.543	0.562	0.548	0.538
Beam 3	0.552	0.548	0.554	0.546

Percent of RFI over Ocean

- Percentage of RFI-flagged samples for water fraction > 99.99% (week of December 8-14, 2011)

	without SA1 removal without FAR equalization				with SA1 removal without FAR equalization			
	V	V+H	V-H	H	V	V+H	V-H	H
Beam 1	25.8%	32.3%	27.0%	31.3%	5.8%	12.3%	7.0%	11.3%
Beam 2	24.6%	39.1%	31.2%	31.4%	4.6%	19.1%	11.2%	11.4%
Beam 3	25.6%	40.3%	32.4%	35.5%	5.6%	20.3%	12.4%	15.5%

	with SA1 removal with FAR equalization			
	V	V+H	V-H	H
Beam 1	4.0%	4.0%	3.3%	3.5%
Beam 2	3.6%	3.5%	3.6%	3.2%
Beam 3	3.7%	5.2%	4.0%	3.7%

Ongoing and Future Work

- Geographycal tuning of RFI detection algorithm parameters (Cris Ruf and David Chen)
- Improve detection of low-level RFI.