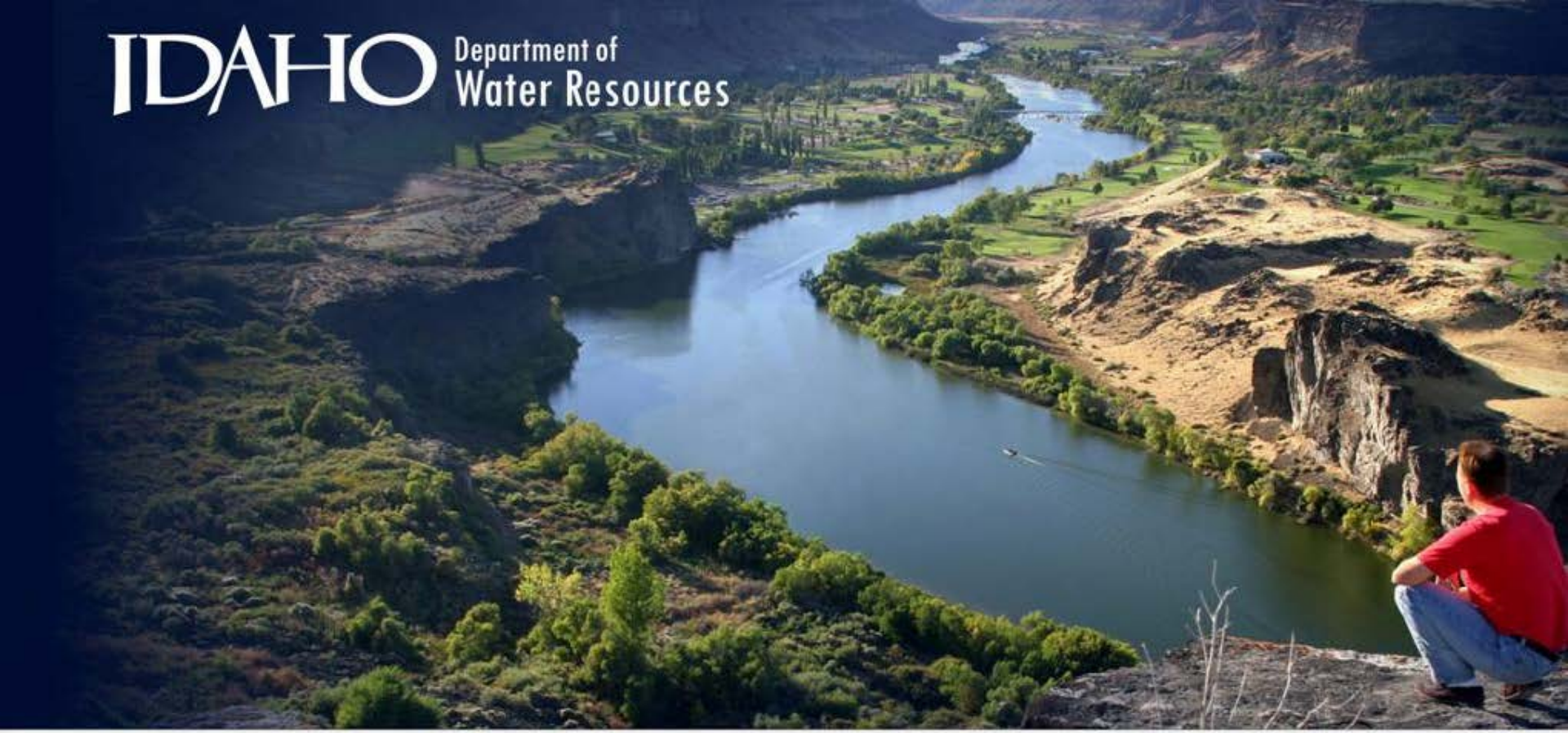


Surface Area Weighted Stage Estimation in AADF

Presented to the Swan Falls Technical Working Group

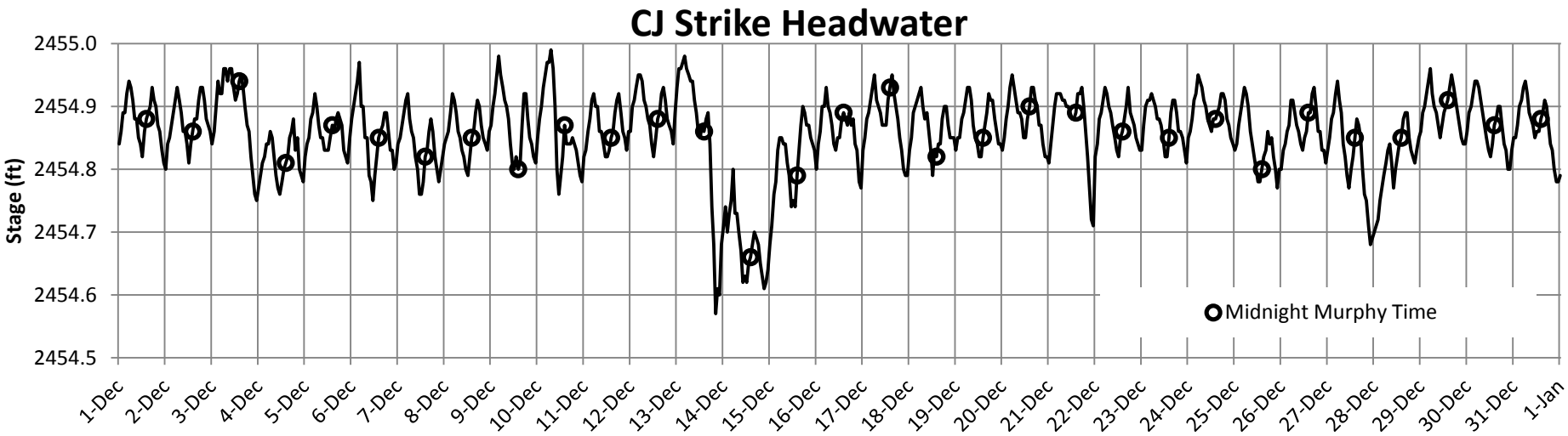
March 3, 2016

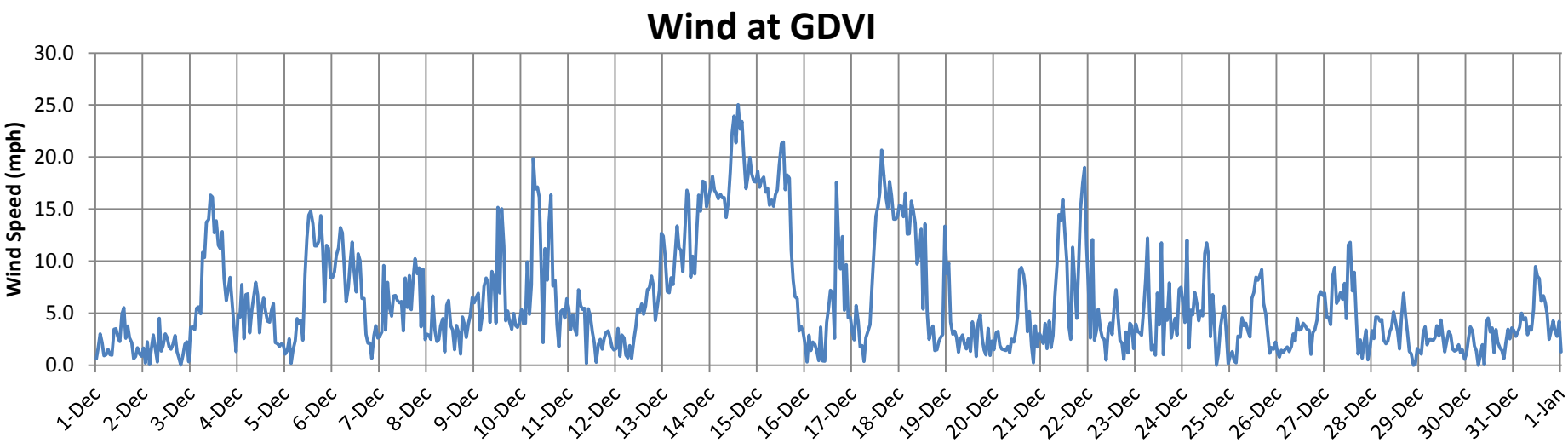
Dan Stanaway, Staff Hydrologist

Overview

- Introduction
  - Problem Statement
  - Proposed Solution – weighted stage developed by IPCo
- Evaluation of weighted stage proposal
  - Stage, Δ Stage Analysis
  - Weighted Average Analysis
  - AADF Analysis
- Conclusions and Recommendations

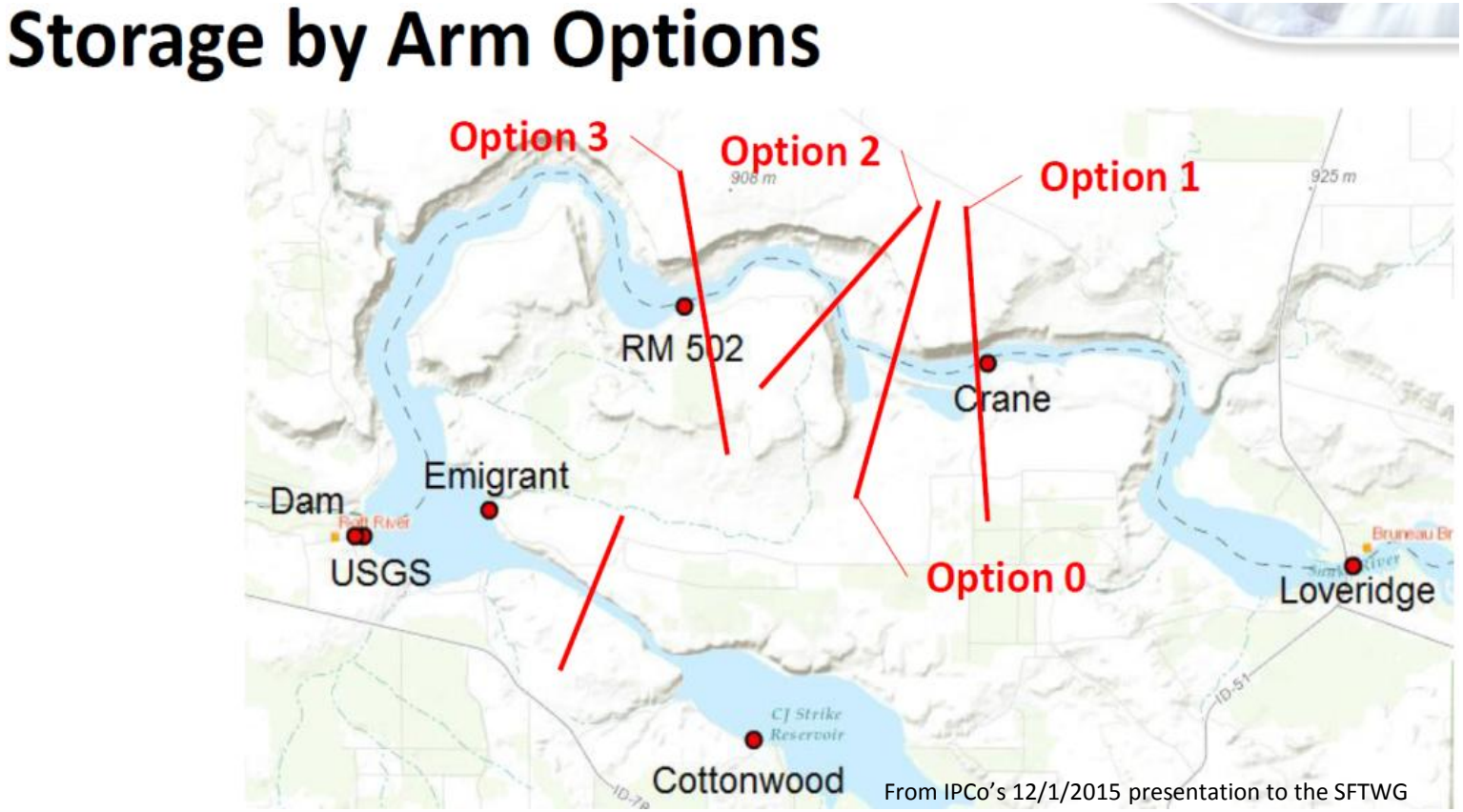
Problem Statement





A Proposed Solution

- Multiple gage averaging
- Weight by surface area



From IPCo's 12/1/2015 presentation to the SFTWG

IPCo Proposed Averaging Procedures

Surface Area Percent by Option				
Arm	Option 0	Option 1	Option 2	Option 3
Loveridge	31%	29%	32%	35%
Dam	42%	44%	41%	38%
Bruneau	27%	27%	27%	27%

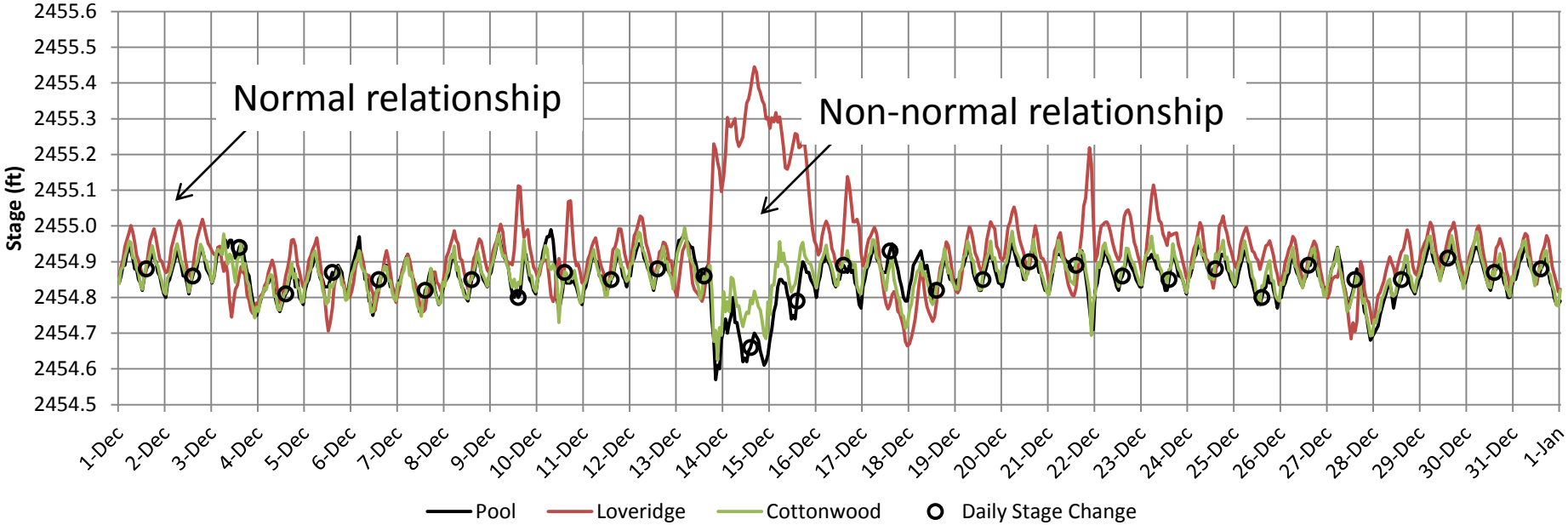
Analysis Overview

I. Weighted average comparison to current method (stage, Δstage)
II. 4 weighted averaging procedures analyzed
III. “Composite” stage applied to AADF

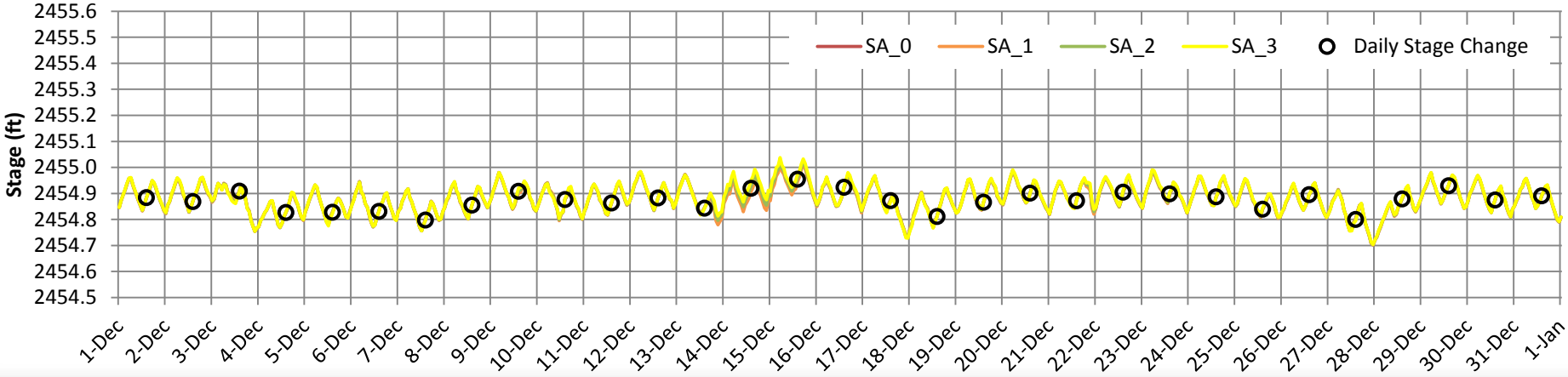
Analysis limited to December 2015 data

Analysis I: Stage

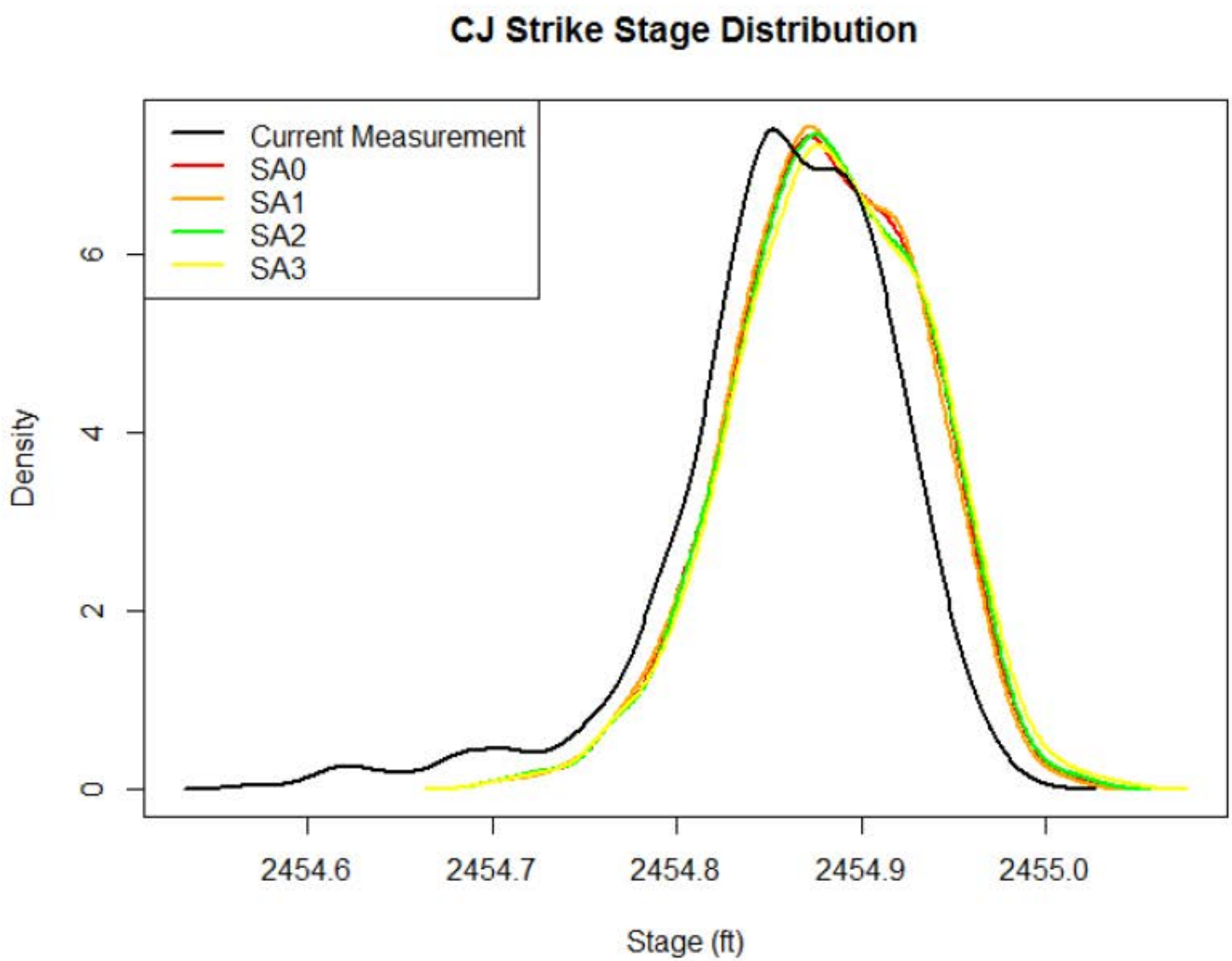
CJ Strike Reservoir December 2015



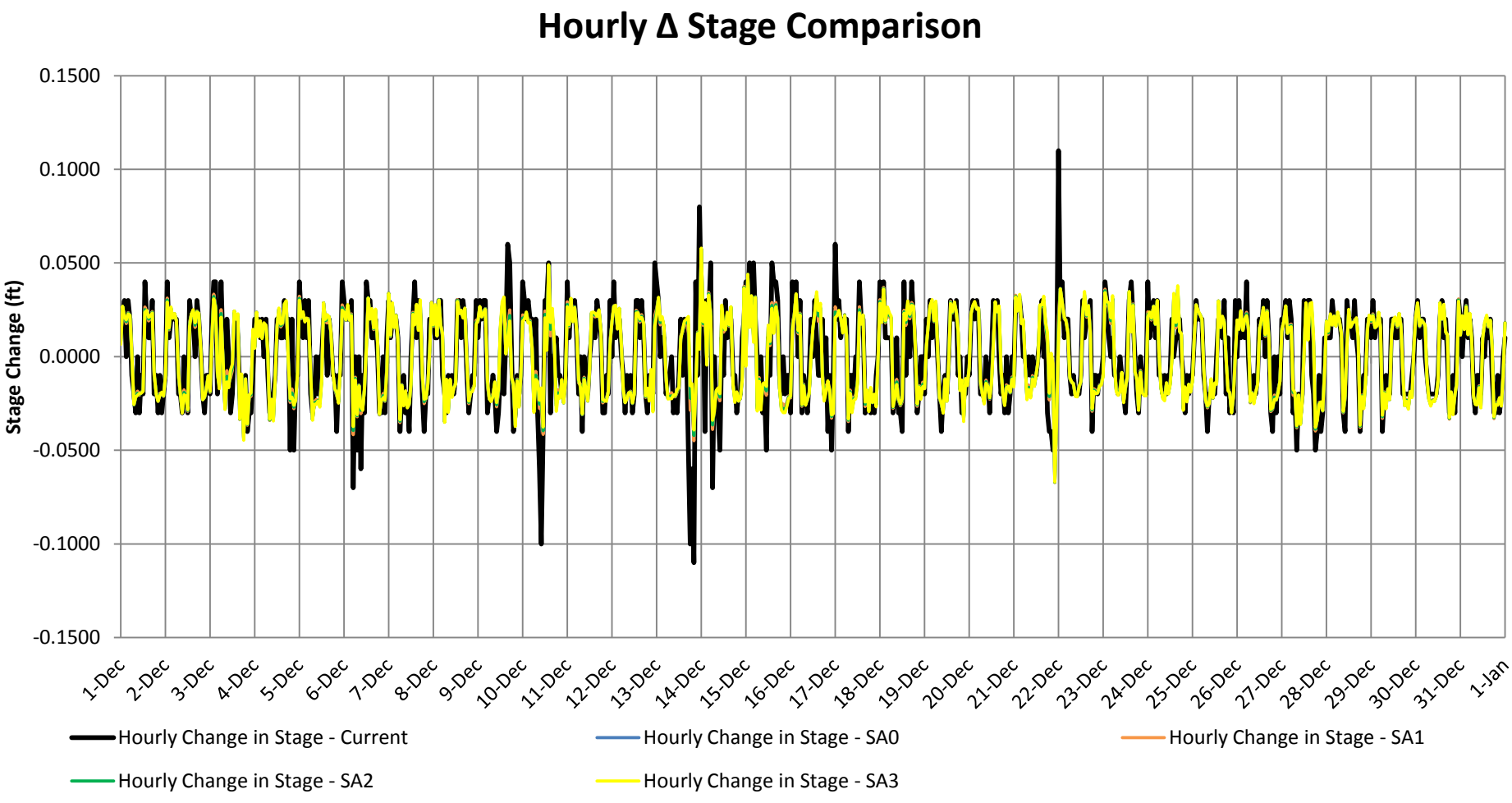
CJ Strike Headwater Estimation



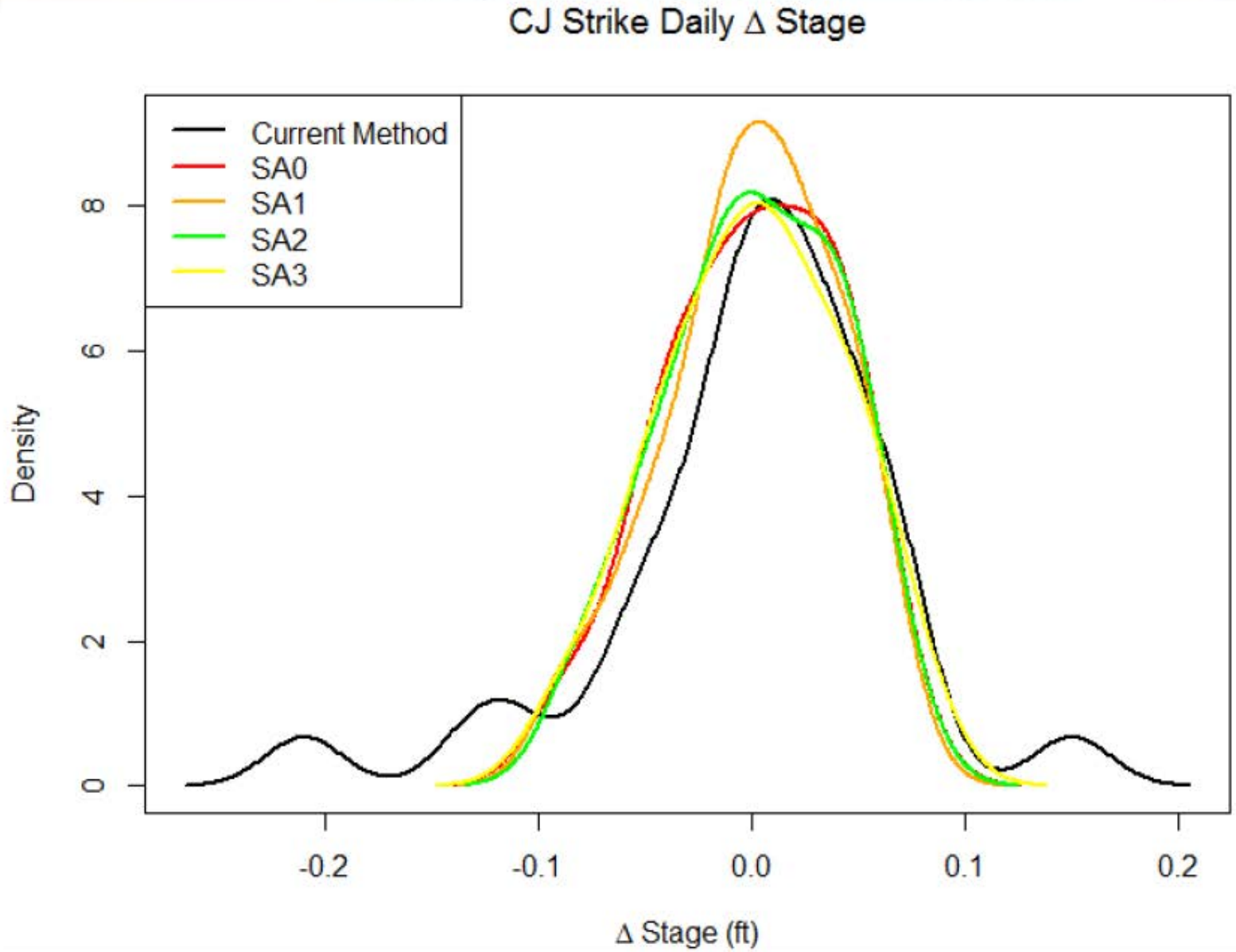
Analysis I: Stage



Analysis I: Δ Stage



Analysis I: Δ Stage



Analysis I wrap up

Stage

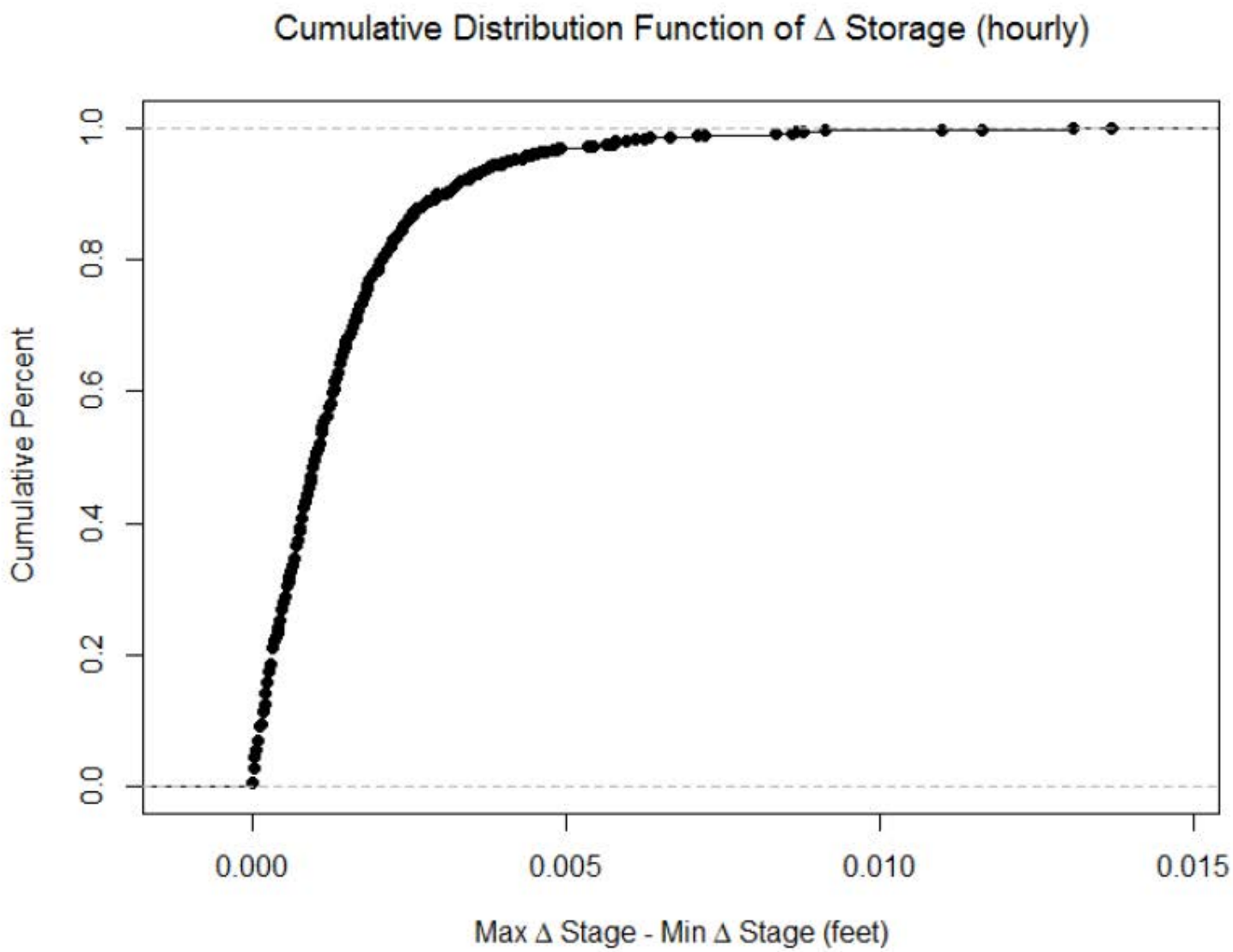
- Weighted average and current method distributions are distinct
- Weighted average distribution show reduced variance

△Stage

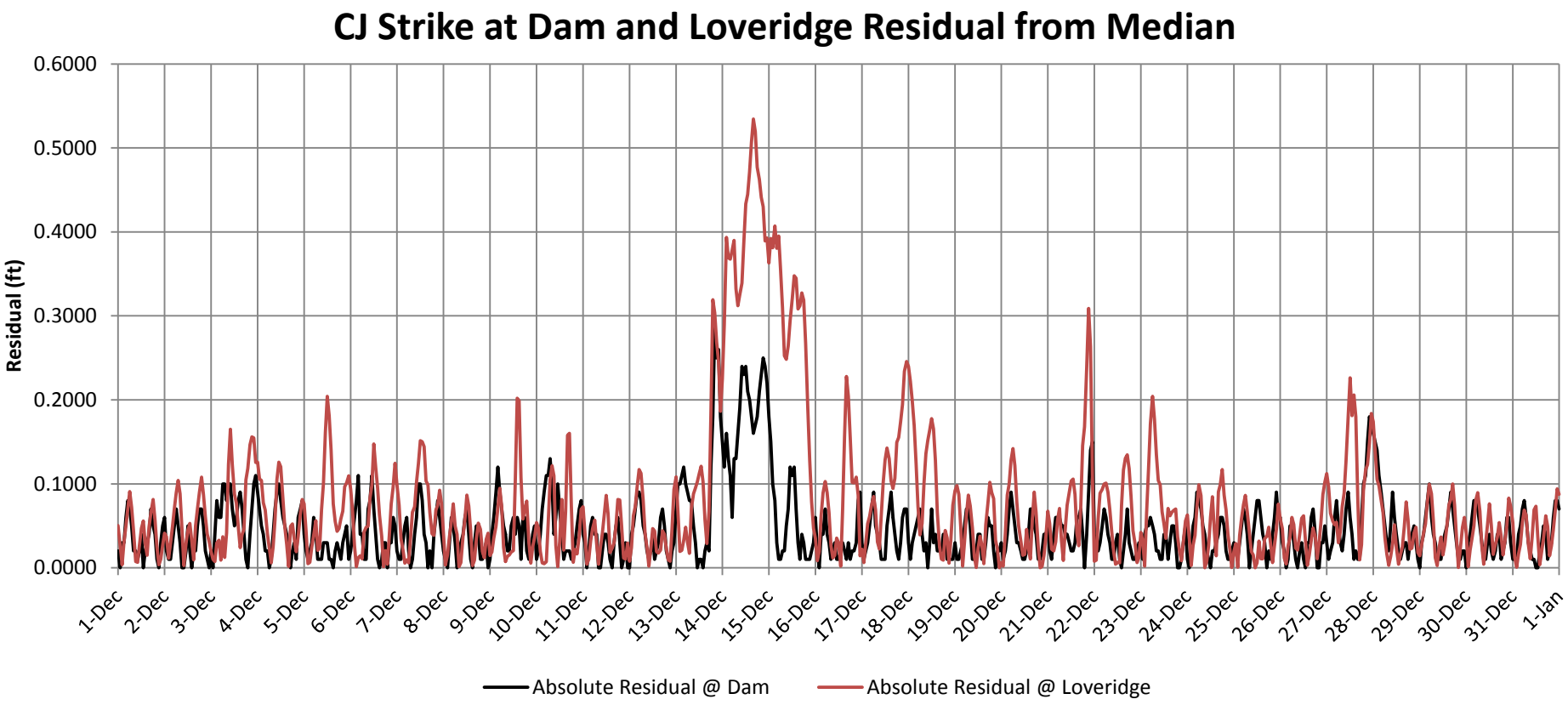
- Current method distribution shows potential outliers
- Current method shows higher variance
- Methods show agreement with Δstage within ± 0.05
- Methods diverge with Δstage outside ± 0.05
- Weighted average distributions show slight differences

Which weighted average procedure is most appropriate?

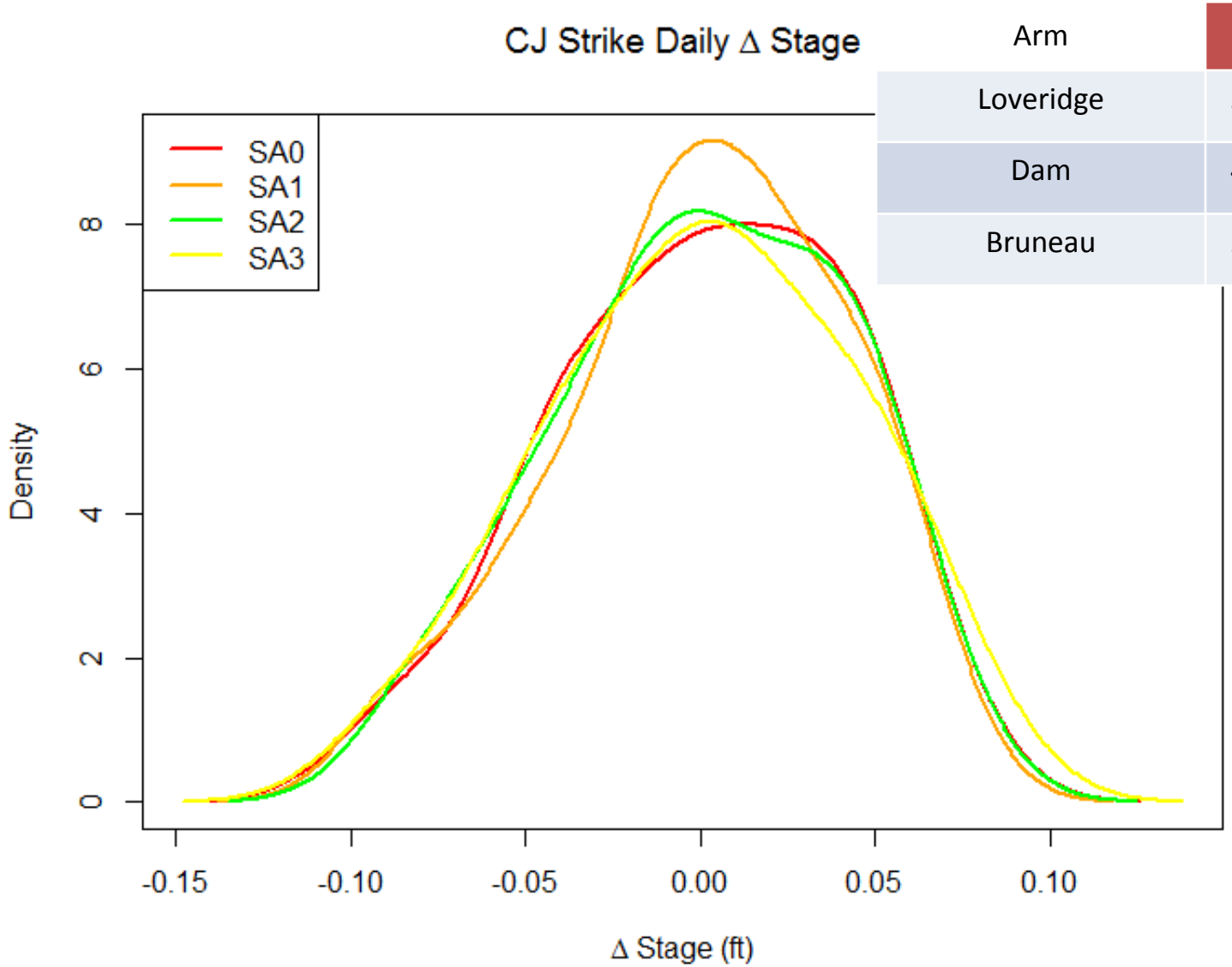
Analysis II: Weighted Averages



Analysis II: Weighted Averages



Analysis II: Weighted Averages



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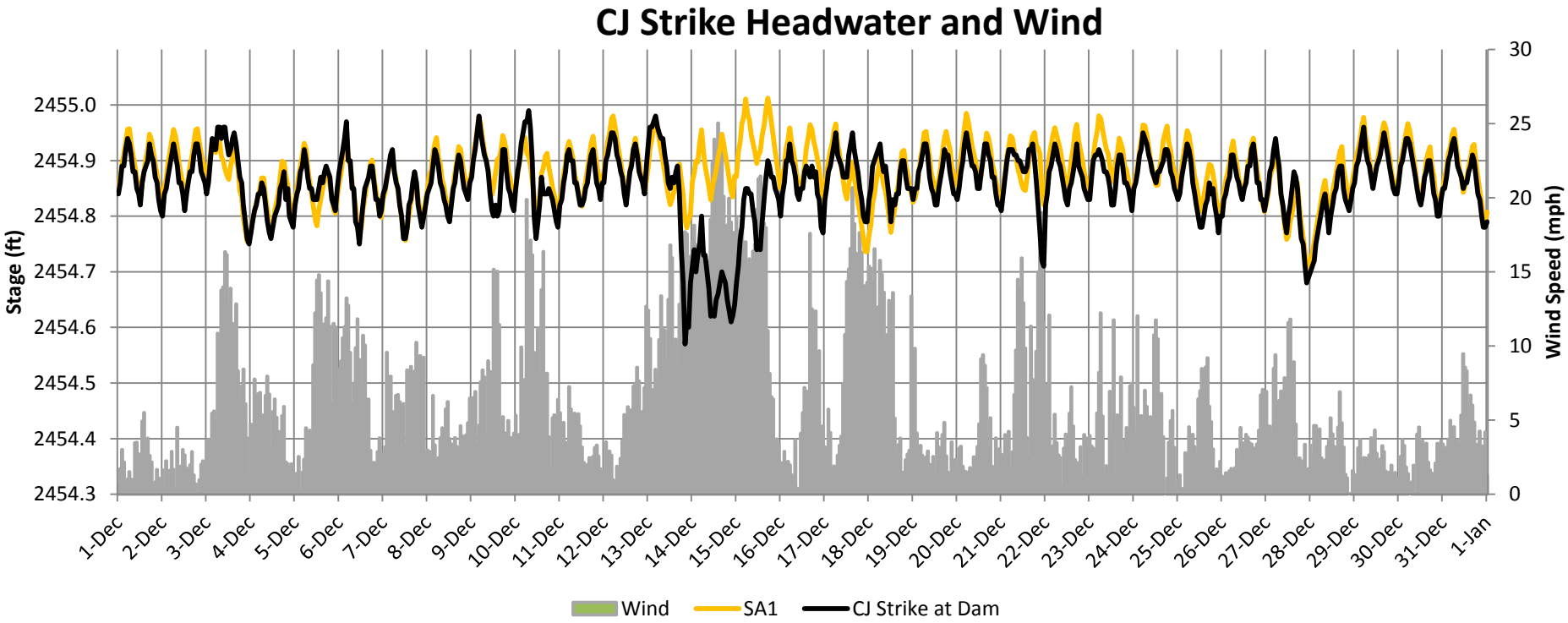
Analysis II: Weighted Averages

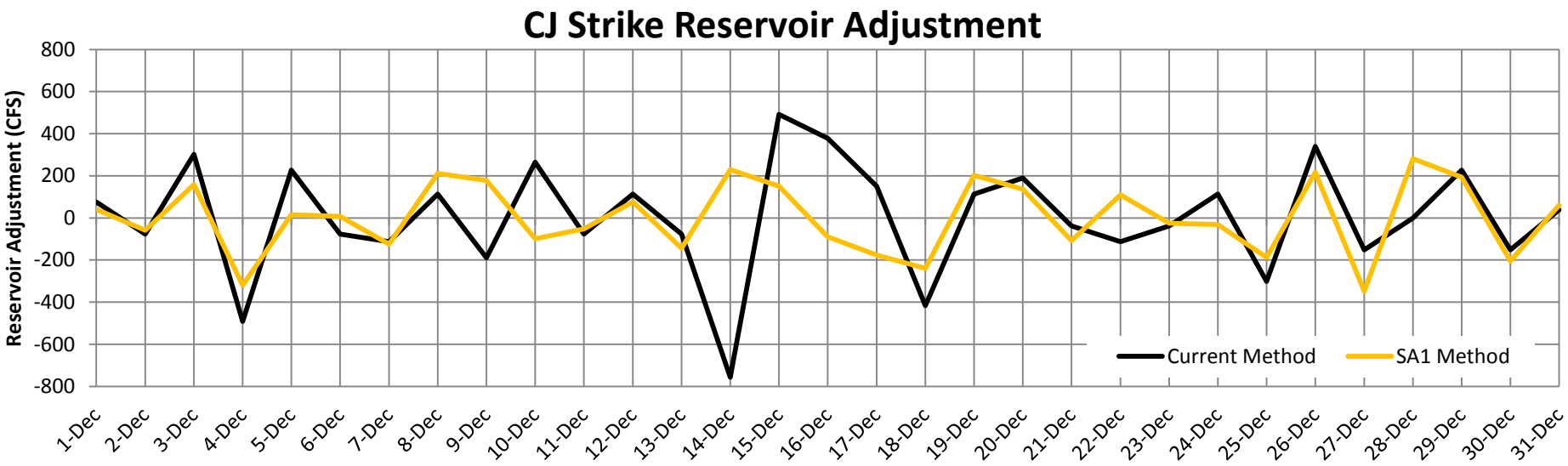


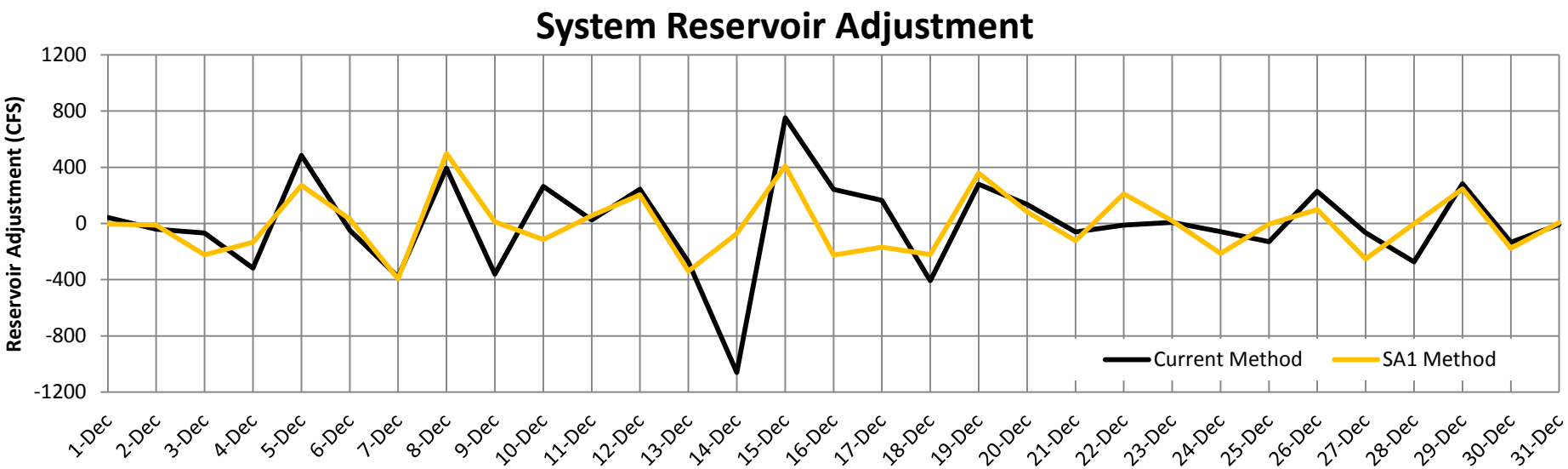
Analysis II: Wrap Up

Weighted Average Analysis

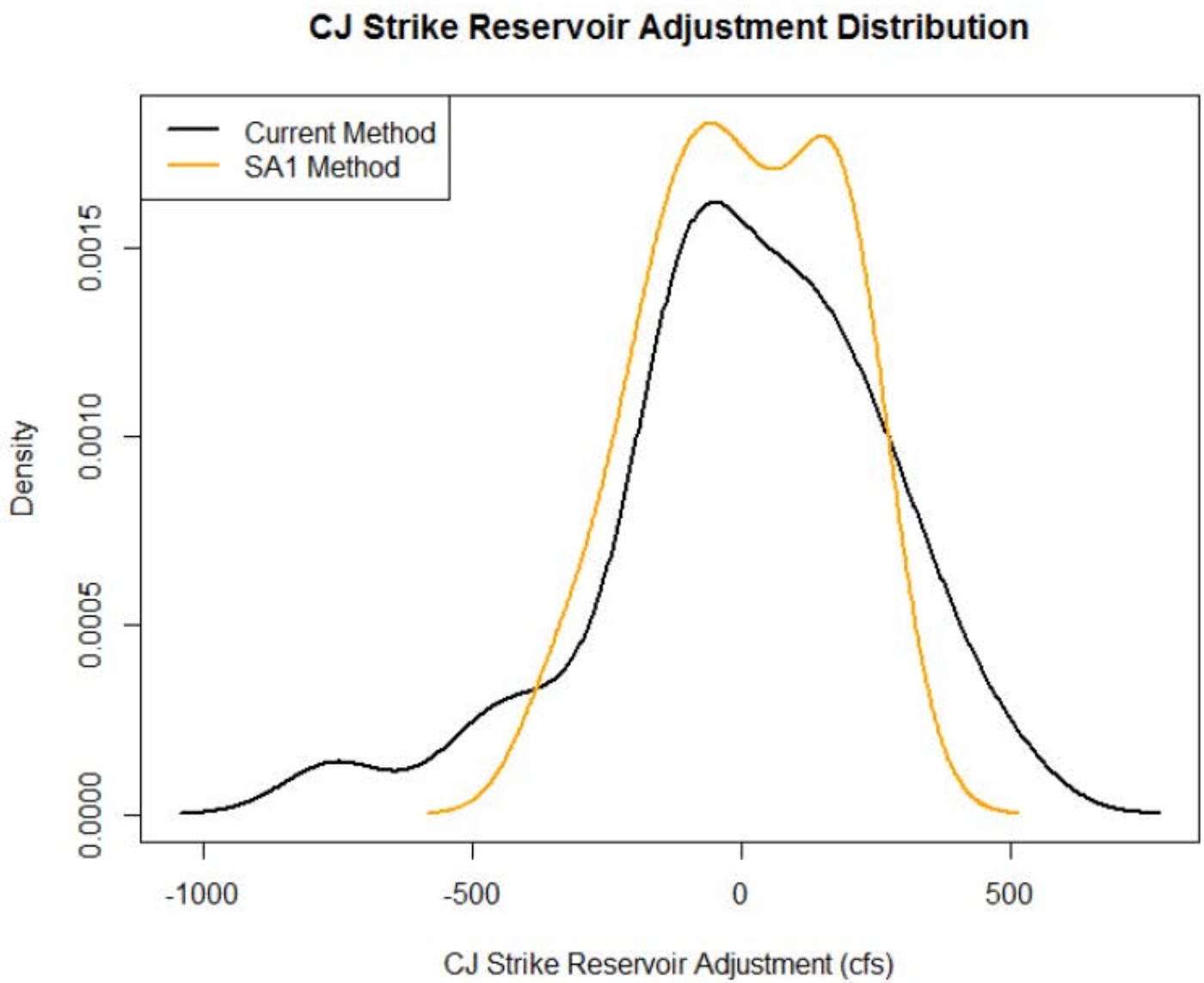
- All averaging procedures perform comparably
- SA1 minimizes Loveridge weight
- SA1 has a tighter distribution

Analysis III: AADF

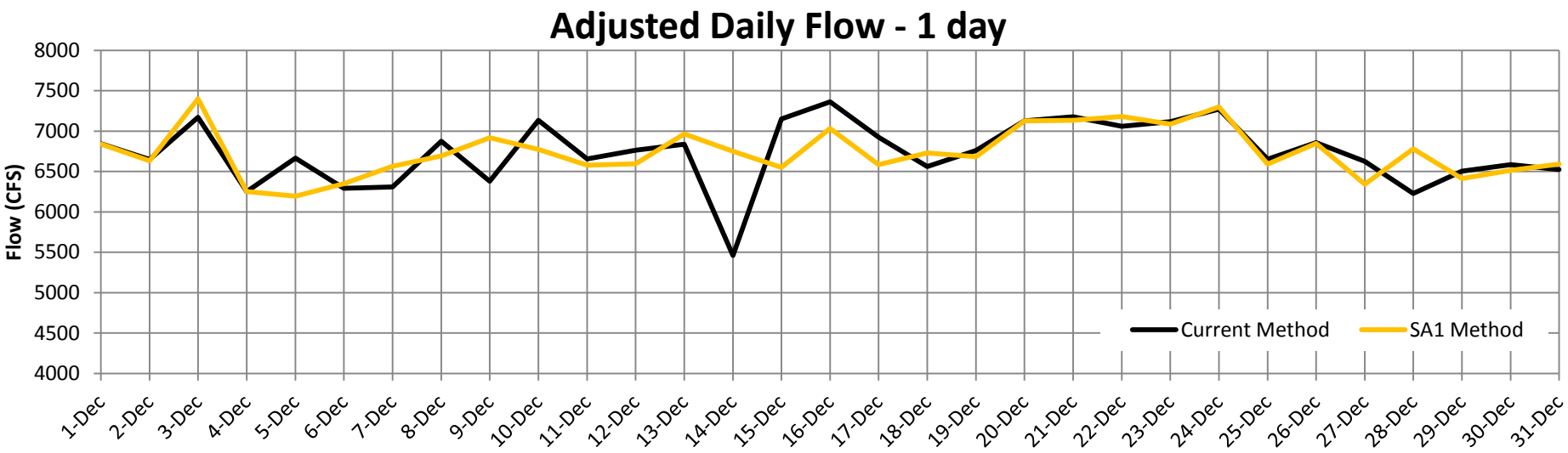


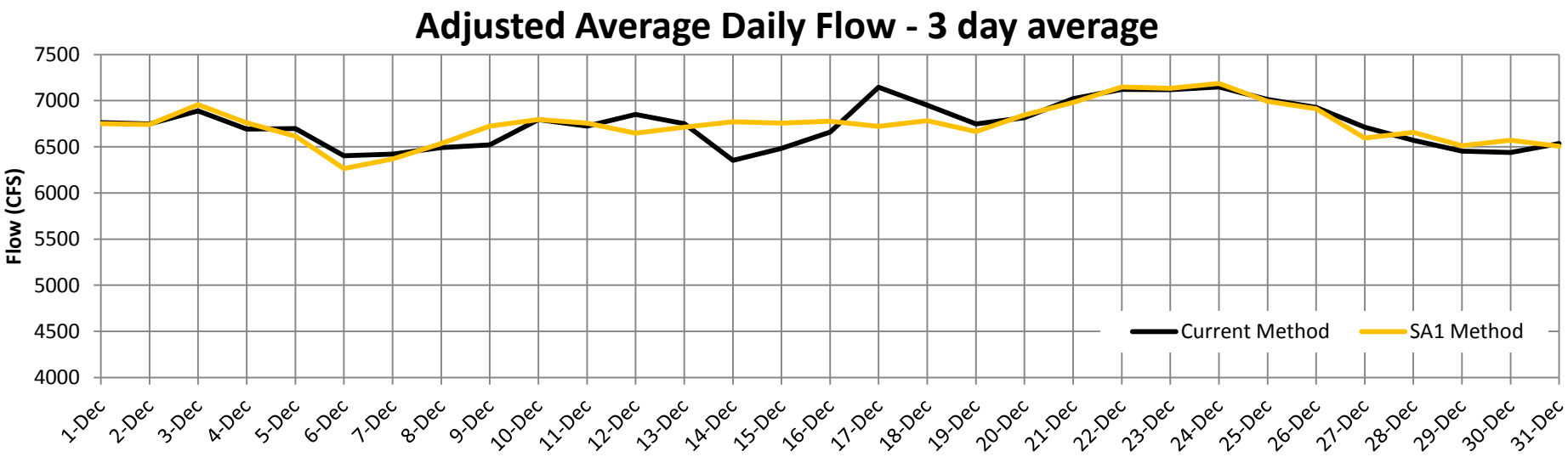


Analysis III: AADF



Analysis III: AADF



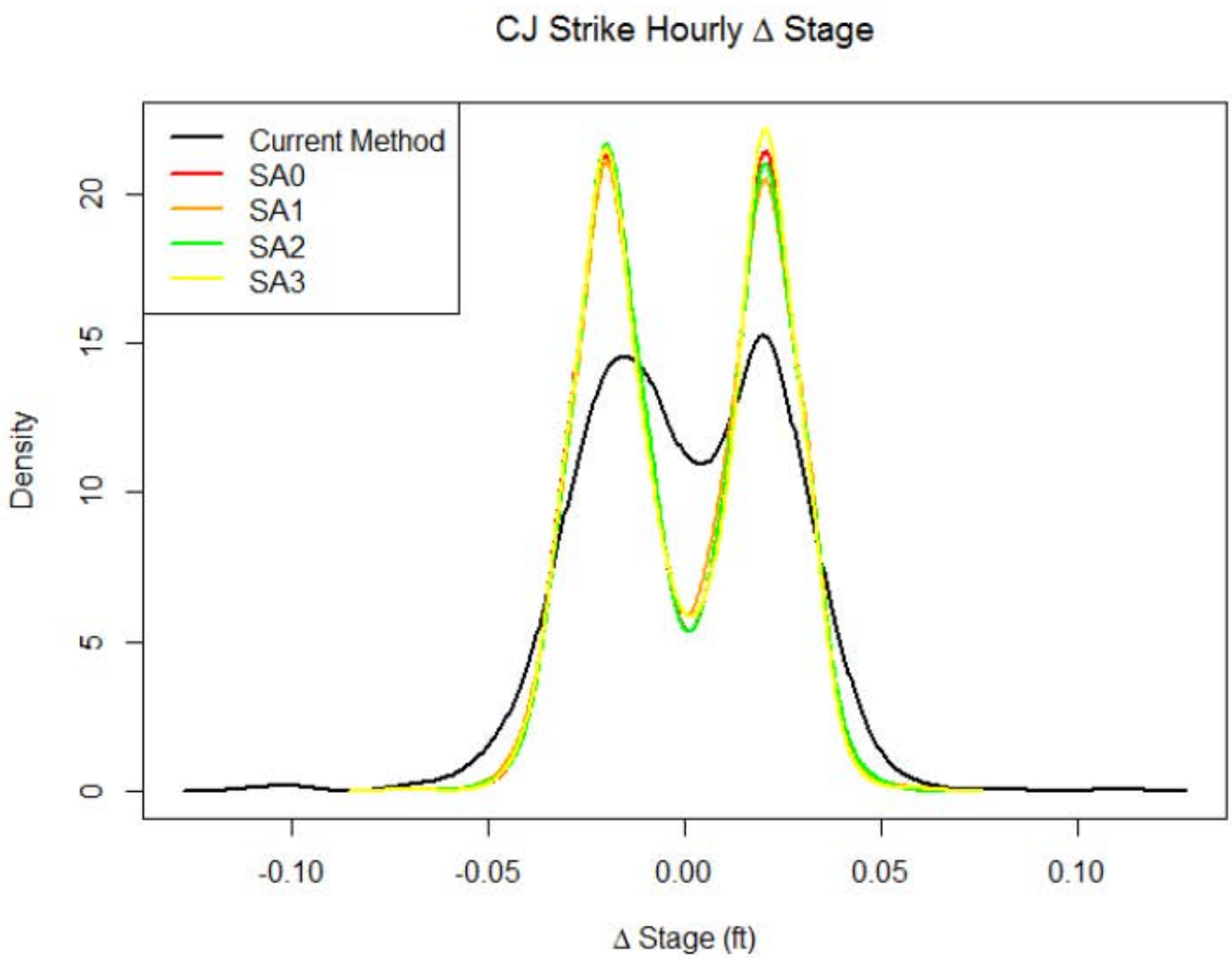


Conclusions

- Weighted average stage estimation apparently reduces wind induced error
- SA1 attributes least weight to Loveridge and is most defined Δ stage distribution
- Weighted stage estimation exaggerates Δ stage when all gages show similar trends
- Smoothes AADF

Recommendations

- SFTWG should consider implementation of weighted average stage estimation
- Extend analysis beyond December 2015 data
- Further analysis of inflow and outflow to determine validity of weighted average stage
- Further analysis of potential Loveridge time lag


CJ Strike Hourly Δ Stage
Current Method
SA0
SA1
SA2
SA3
Density
0
5
10
15
20
-0.10
-0.05
0.00
0.05
0.10
Δ Stage (ft)