Effect of Air Mass Predictor Choice on the AIRS Bias Correction

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Based on the Harris and Kelly bias correction scheme used at ECMWF and the Bureau of Meteorology, a bias correction code was set up to apply to a given set of channel from the AIRS instrument on the AQUA satellite. Using a choice of bias predictors, scan only and air-mass predictors based on background fields, various combinations of predictors were applied to a large subset of AIRS channels in order to determine the optimal set of predictors for the subset.

Dataset used for April 2003

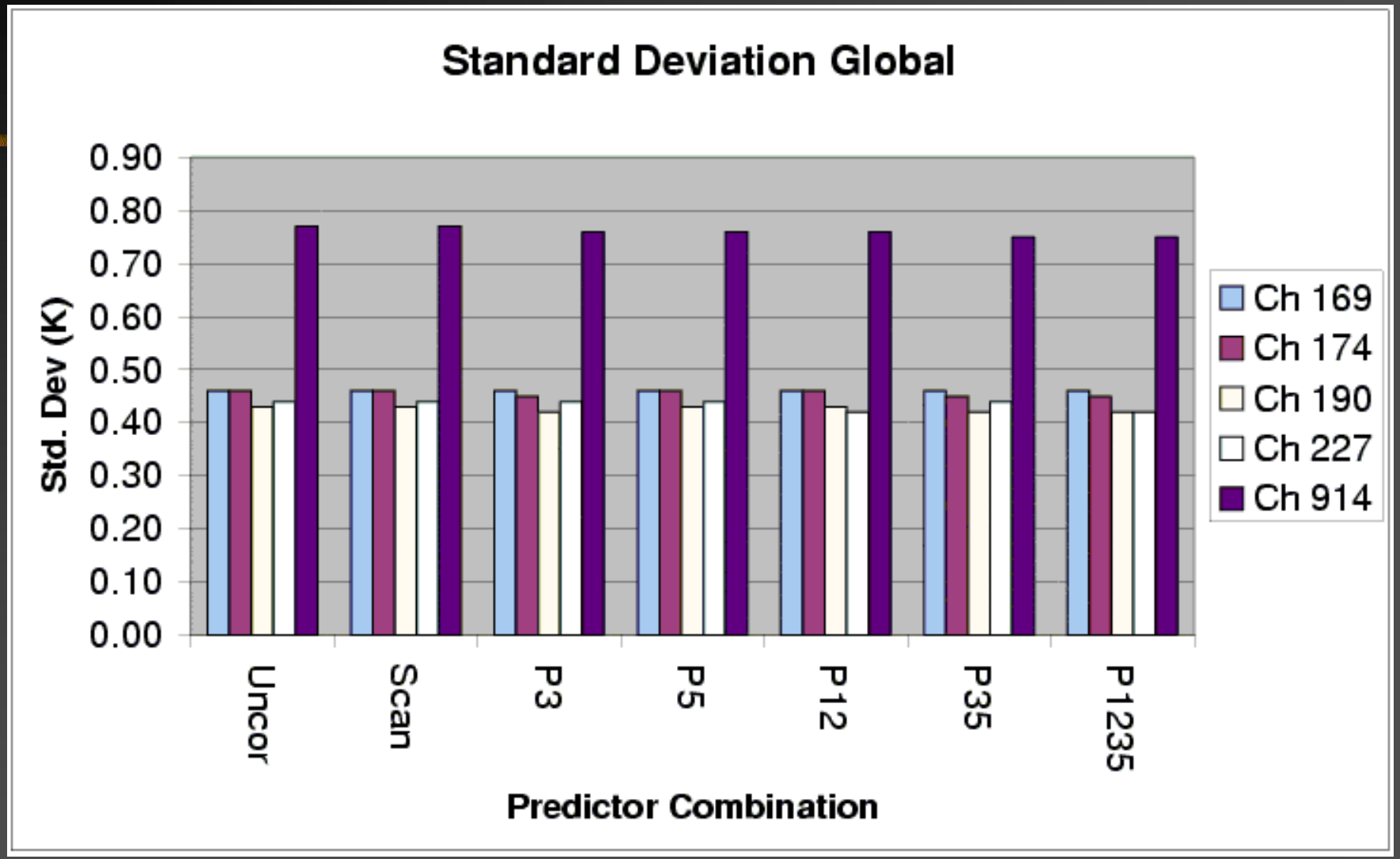
	90S-60S	60S-30S	30S-30N	30N-60N	60N-90N	Global
Total	3935	50468	158164	20222	2073	234862
Thinned	3935	5873	5811	9157	2073	26849

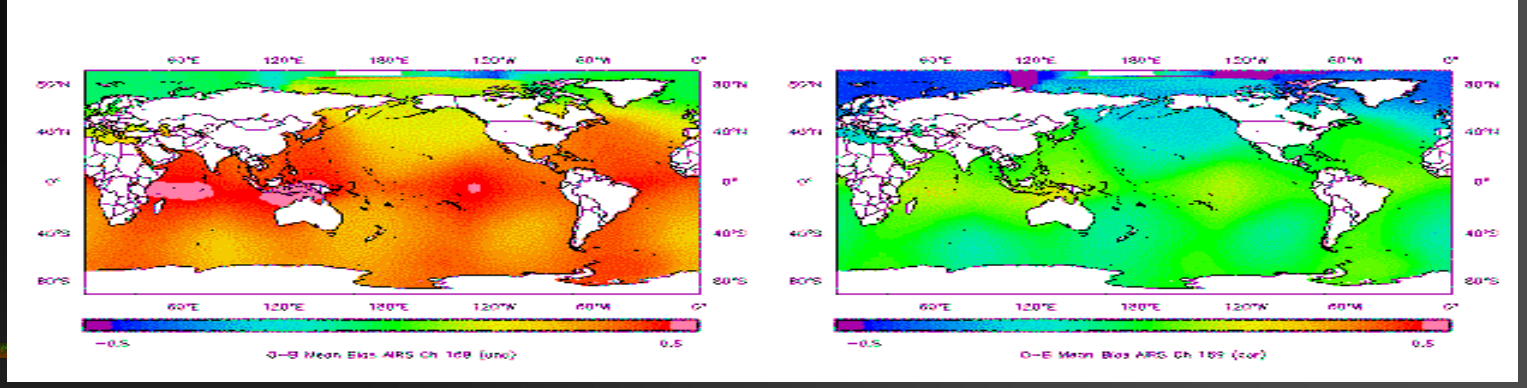
March using small channel subset

Index	73	77	85	100	140
Channel	169	174	190	227	914
Wavenumber	698.276	699.276	704.162	714.782	965.842

Air Mass Bias Predictors

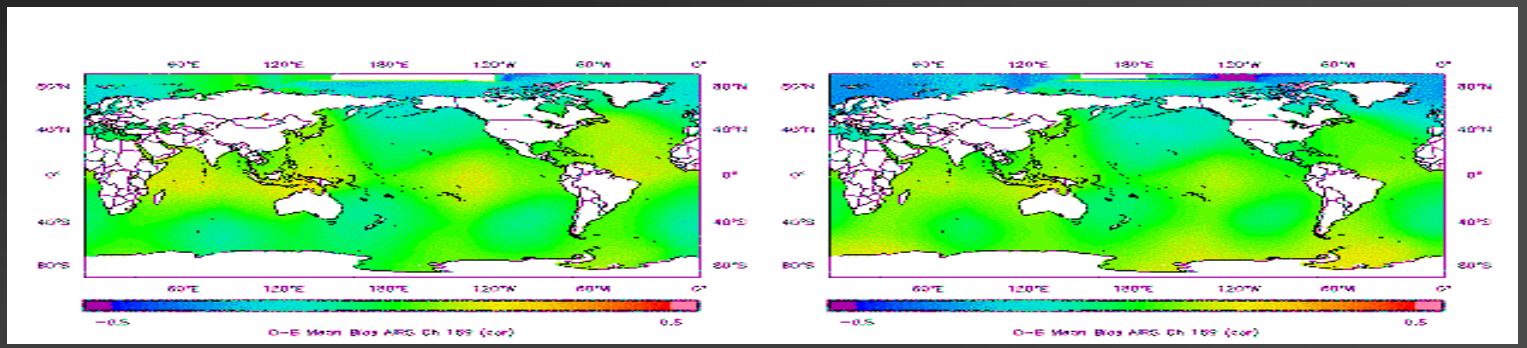
- 1 850 – 300 Hpa
- 2 200 – 50 Hpa
- 3 Skin Temperature
- 4 Total Column Water Vapour (not used)
- 5 Background Radiance


Standard Deviation Global
Std. Dev (K)
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Uncor
Scan
P3
P5
P12
P35
P1235
Predictor Combination
Ch 169
Ch 174
Ch 190
Ch 227
Ch 914



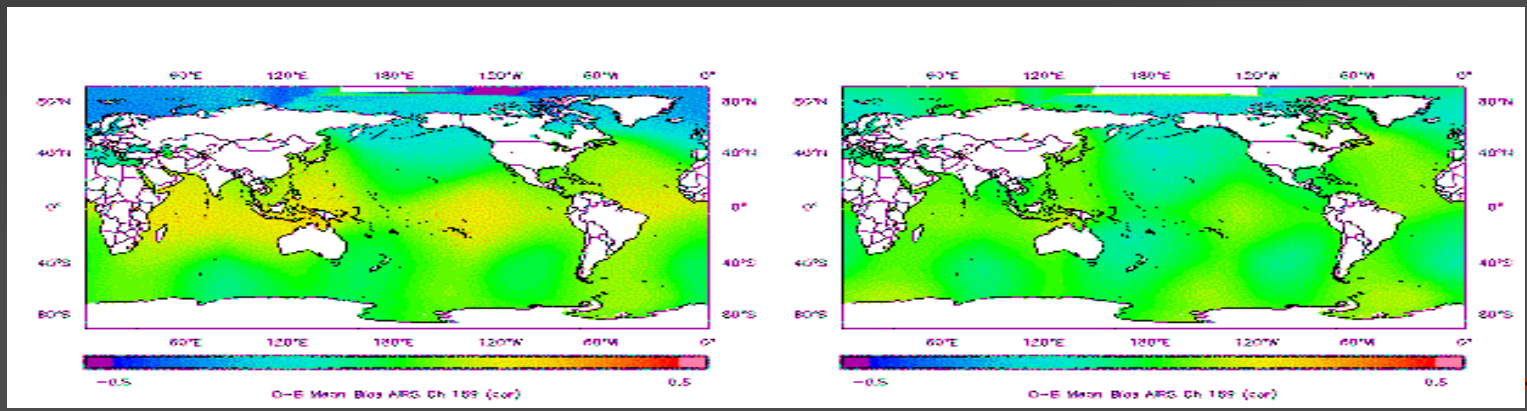
Uncor Ch 169

Scan Ch 169



P12 Ch169

P3 Ch 169

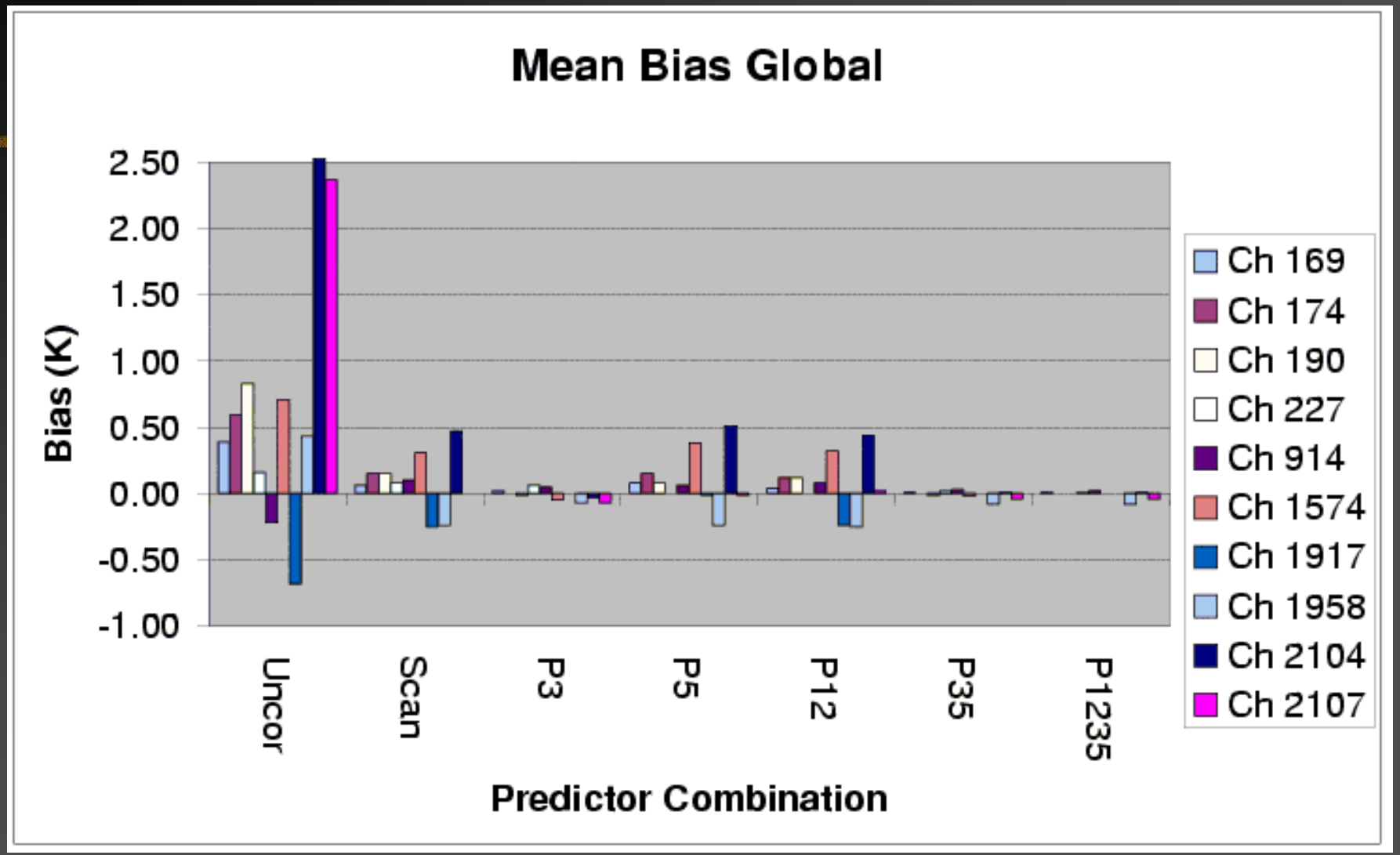


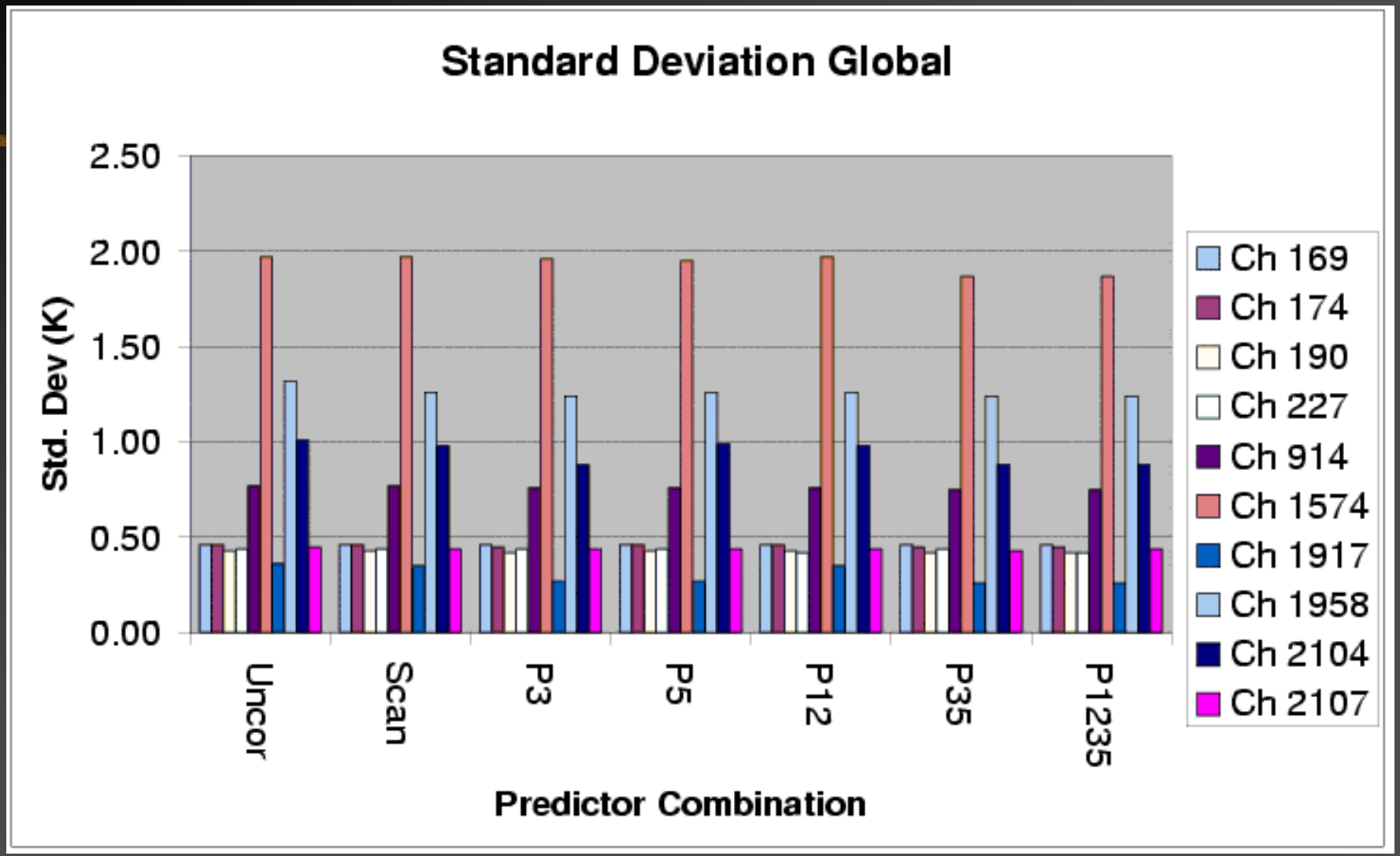
P5 Ch169

P35 Ch 160

Further Five Channels for March

Index	203	253	266	279	281
Channel	1874	1817	1958	2104	2107
Wavenumber	1397.708	2330.566	2270.009	2384.283	2387.208


Mean Bias Global
Bias (K)
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
Uncor
Scan
P3
P5
P12
P35
P1235
Predictor Combination
Ch 169
Ch 174
Ch 190
Ch 227
Ch 914
Ch 1574
Ch 1917
Ch 1958
Ch 2104
Ch 2107

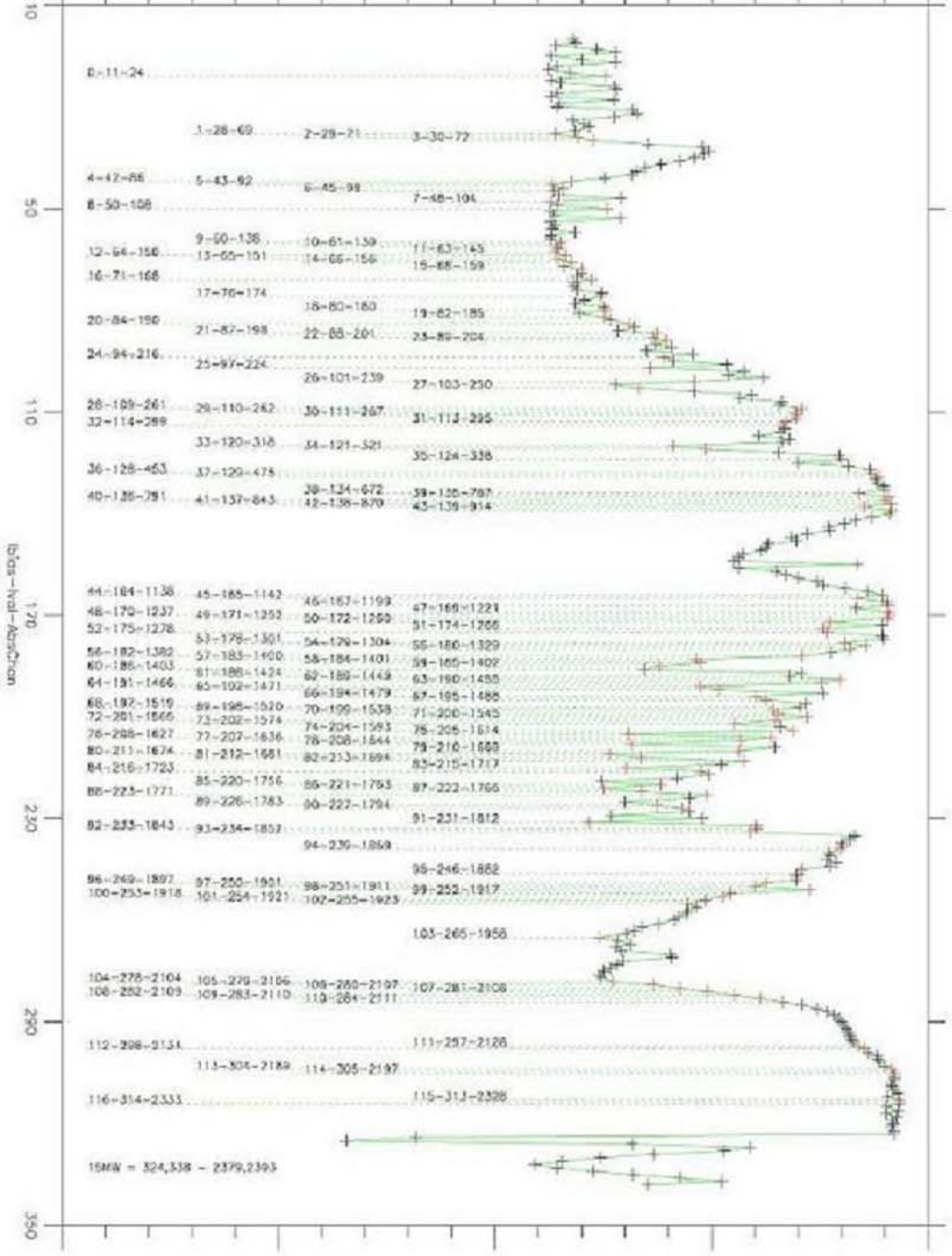

Standard Deviation Global
Std. Dev (K)
2.50
2.00
1.50
1.00
0.50
0.00
Uncor
Scan
P3
P5
P12
P35
P1235
Predictor Combination
Ch 169
Ch 174
Ch 190
Ch 227
Ch 914
Ch 1574
Ch 1917
Ch 1958
Ch 2104
Ch 2107

Preliminary Conclusions From March Dataset

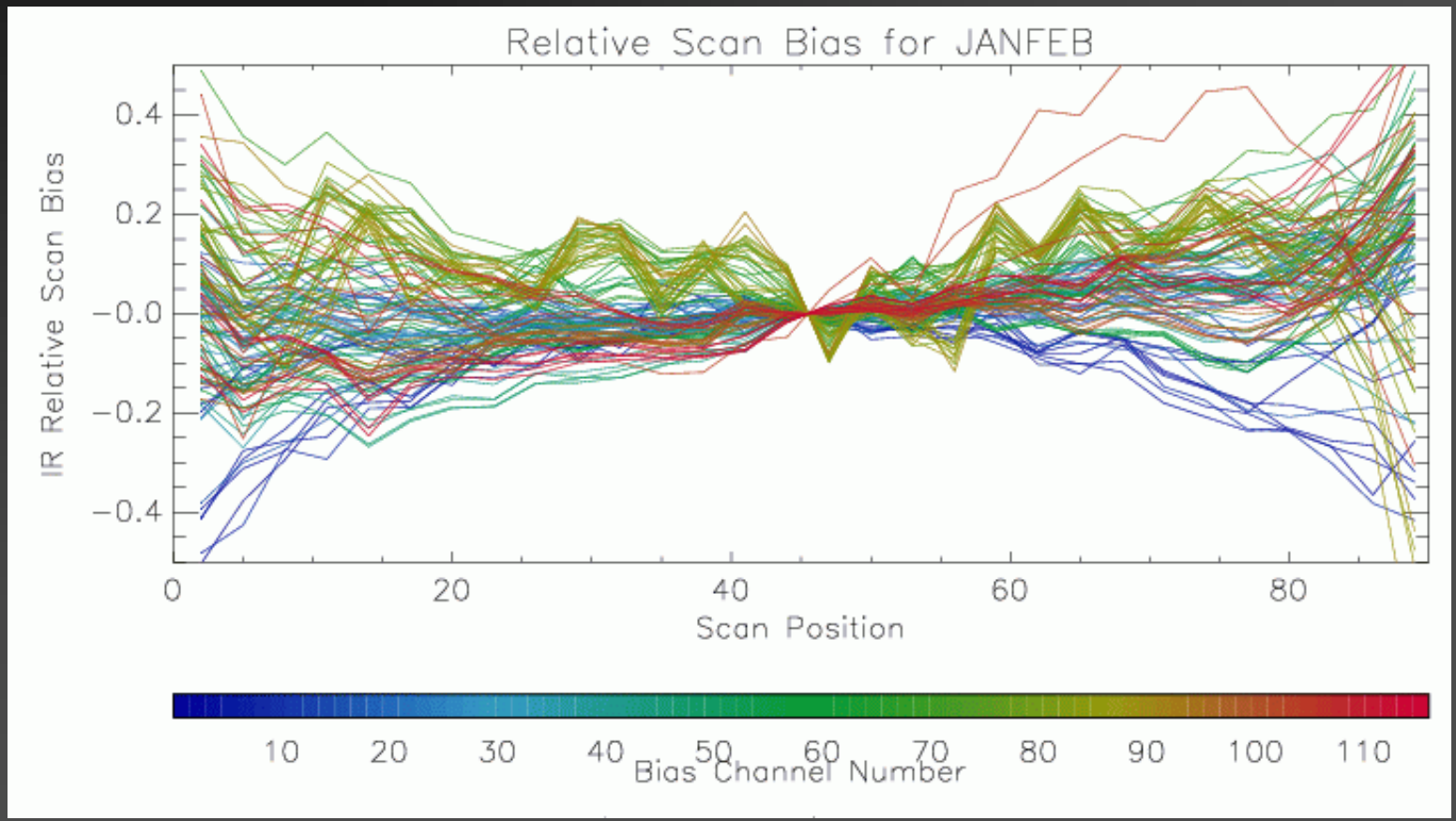
- Scan Correction alone unsatisfactory
- P5 and P12 inadequate
- P35 and P1235 gives best results

Dataset used for Jan/Feb 2003

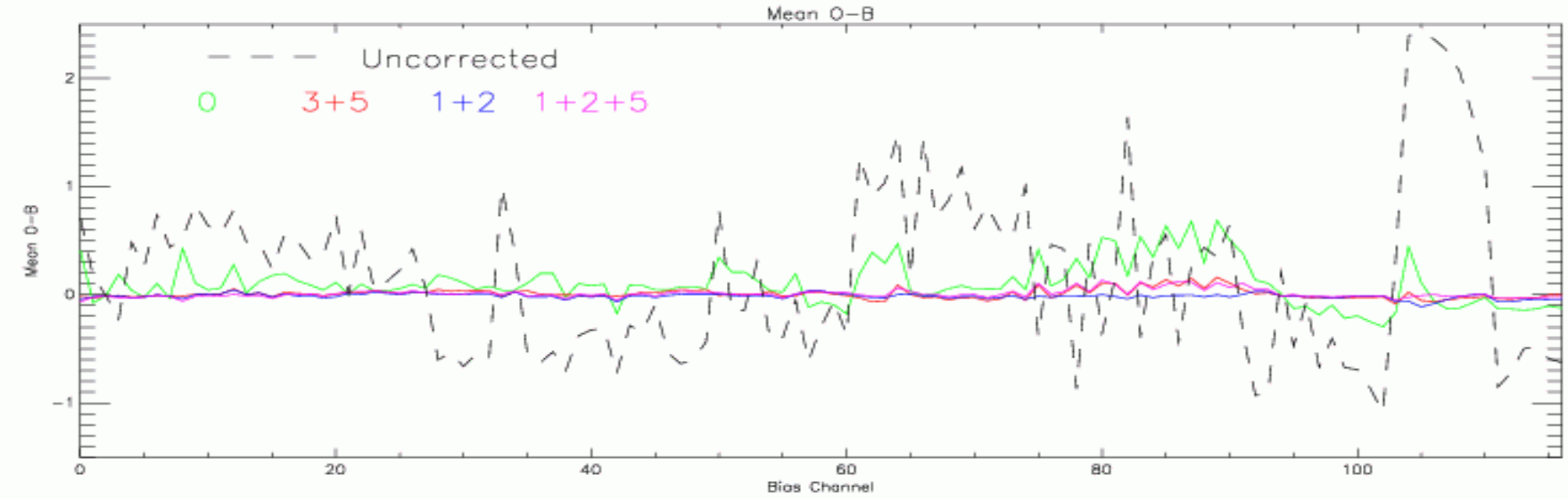
	90S-60S	60S-30S	30S-30N	30N-60N	60N-90N	Global
Total	4189	48994	133838	15940	624	203585
Thinned	4189	5951	5144	6867	624	22775

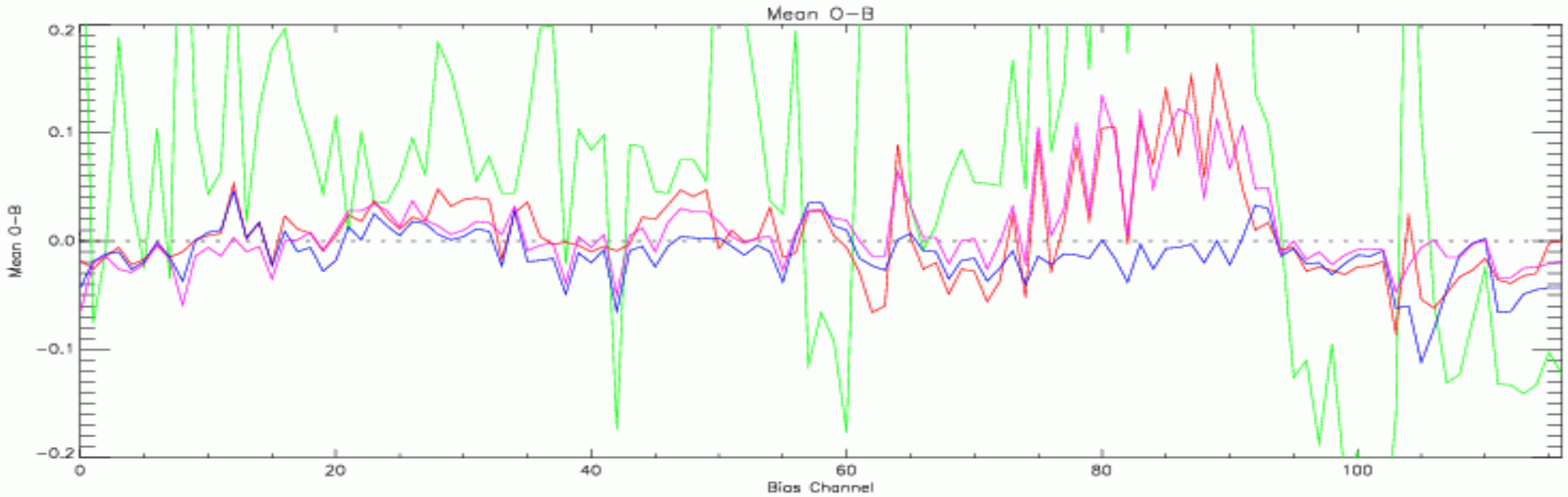

1-11-24
1-28-69
2-29-71
3-30-72
4-42-88
5-43-92
6-45-98
7-48-104
8-50-108
9-60-136
10-61-139
11-63-145
12-64-150
13-65-151
14-66-156
15-68-159
16-71-166
17-76-174
18-80-180
19-82-185
20-84-190
21-87-198
22-88-201
23-89-204
24-94-216
25-97-224
26-101-239
27-103-250
28-109-261
29-110-262
30-111-267
31-113-295
32-114-289
33-120-316
34-121-321
35-124-338
36-128-463
37-129-475
38-134-672
39-135-787
40-136-791
41-137-843
42-138-879
43-139-914
44-164-1138
45-165-1142
46-167-1199
47-169-1221
48-170-1237
49-171-1252
50-172-1259
51-174-1266
52-175-1278
53-178-1301
54-179-1304
55-180-1329
56-182-1382
57-183-1400
58-184-1401
59-185-1402
60-186-1403
61-188-1424
62-189-1449
63-190-1455
64-191-1466
65-192-1471
66-194-1479
67-195-1485
68-197-1519
69-198-1520
70-199-1538
71-200-1545
72-201-1566
73-202-1574
74-204-1593
75-205-1614
76-206-1627
77-207-1636
78-208-1644
79-210-1660
80-211-1674
81-212-1681
82-213-1694
83-215-1717
84-216-1723
85-220-1756
86-221-1793
87-222-1796
88-225-1771
89-226-1783
90-227-1794
91-231-1812
92-233-1843
93-234-1852
94-239-1869
95-246-1882
96-249-1897
97-250-1901
98-251-1911
99-252-1917
100-253-1918
101-254-1921
102-255-1923
103-265-1956
104-278-2104
105-279-2106
106-282-2109
109-280-2197
107-281-2108
110-284-2111
112-298-2134
111-297-2126
113-304-2189
114-305-2197
116-314-2333
115-313-2328
15MW = 324,338 - 2379,2393
Bass-Hyd-Asian
10
50
110
170
230
290
350

Scan Bias For Jan/Feb

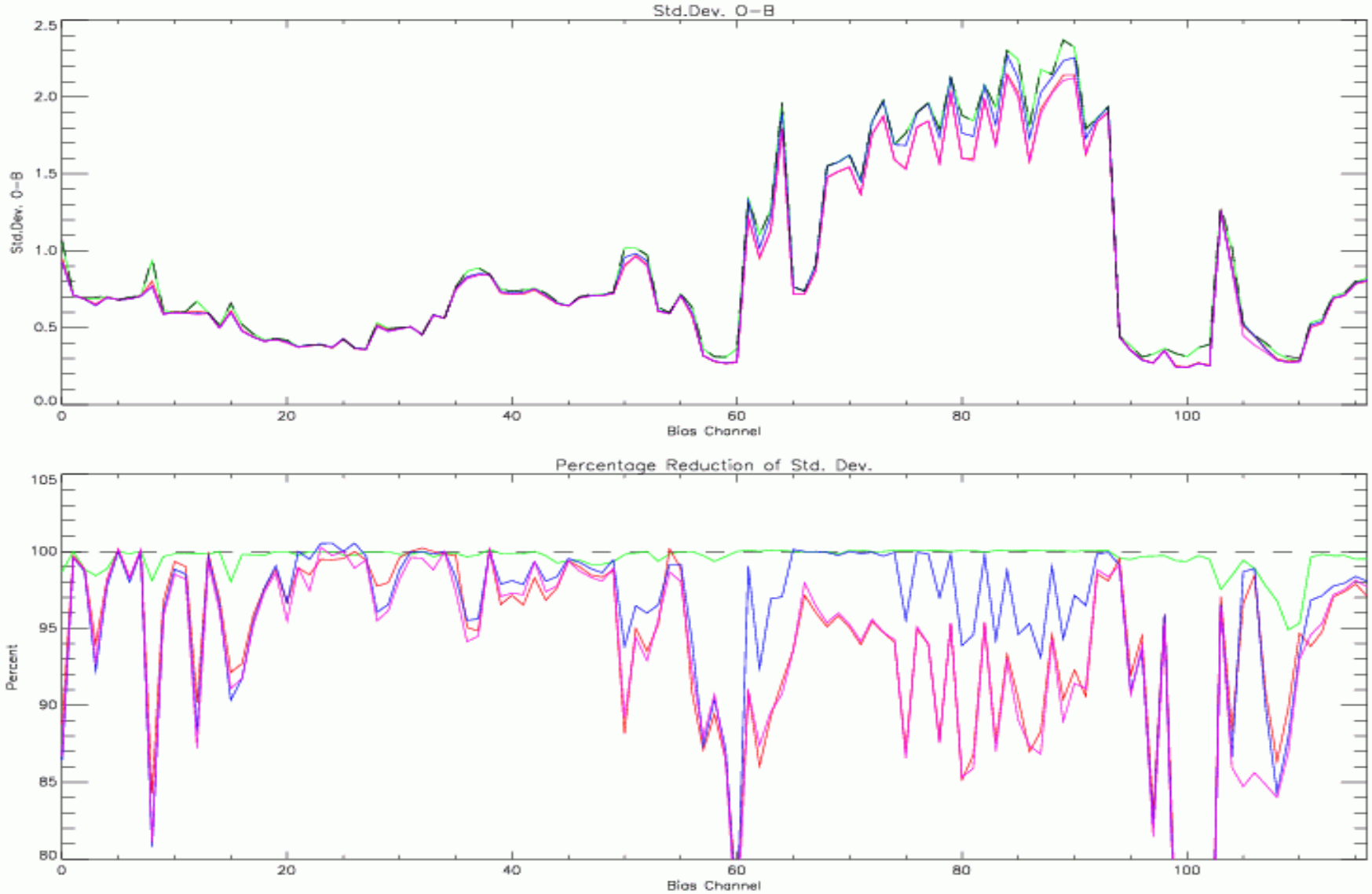


Corrected Bias for 117 Channels

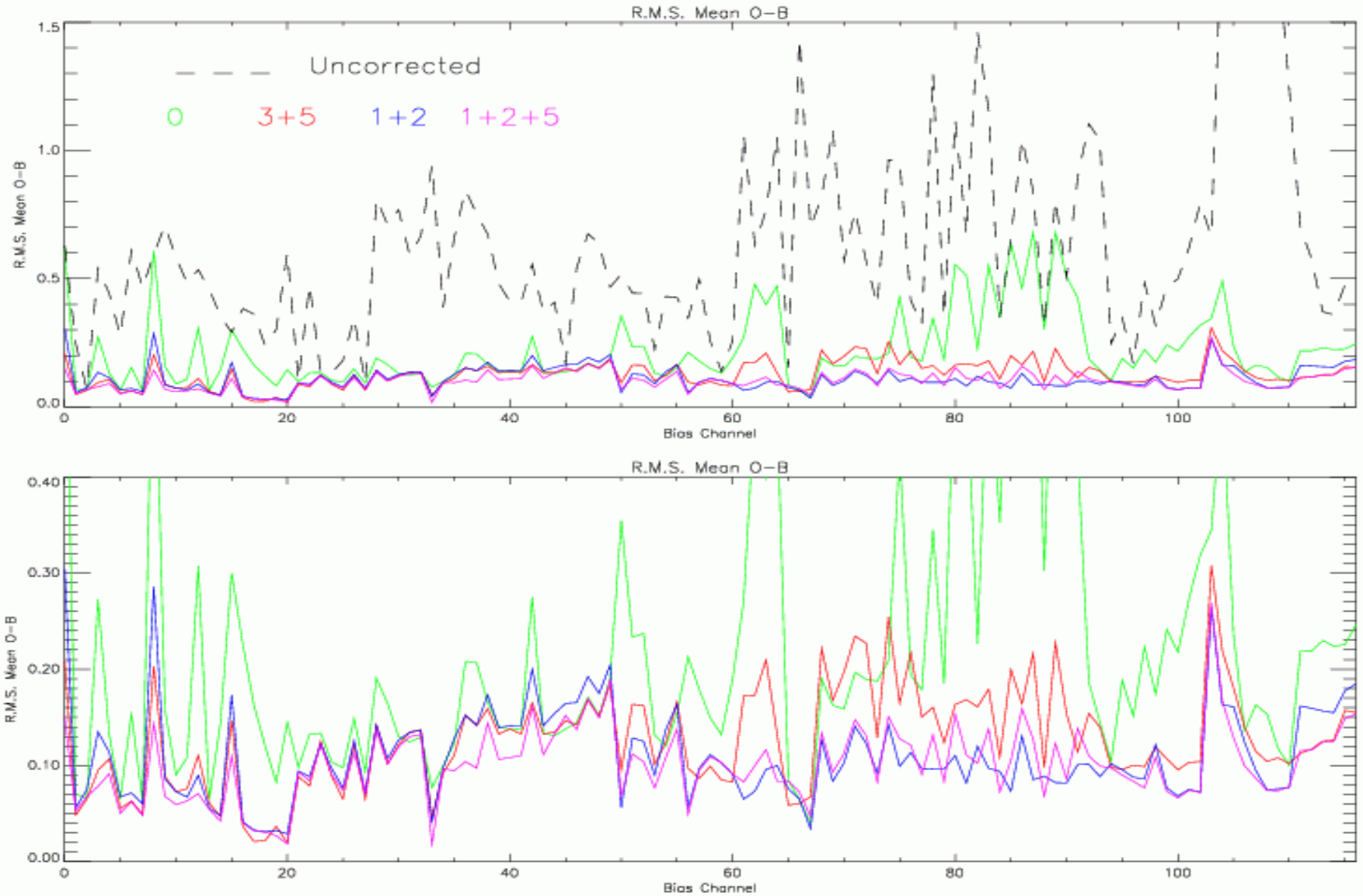




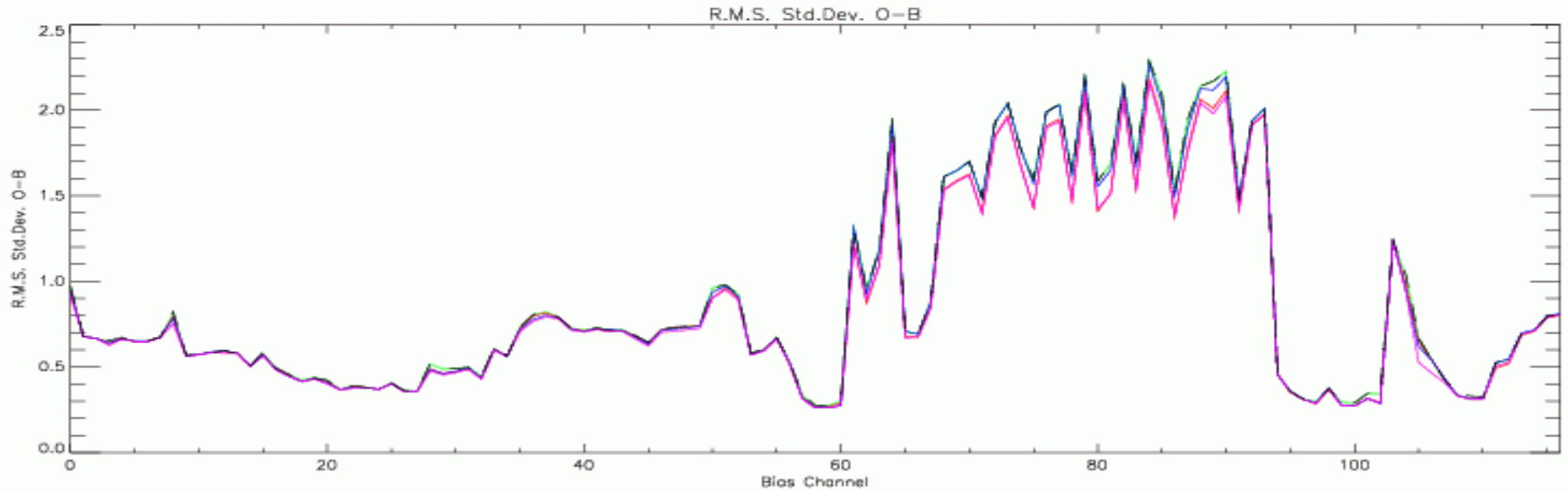
Standard Deviation

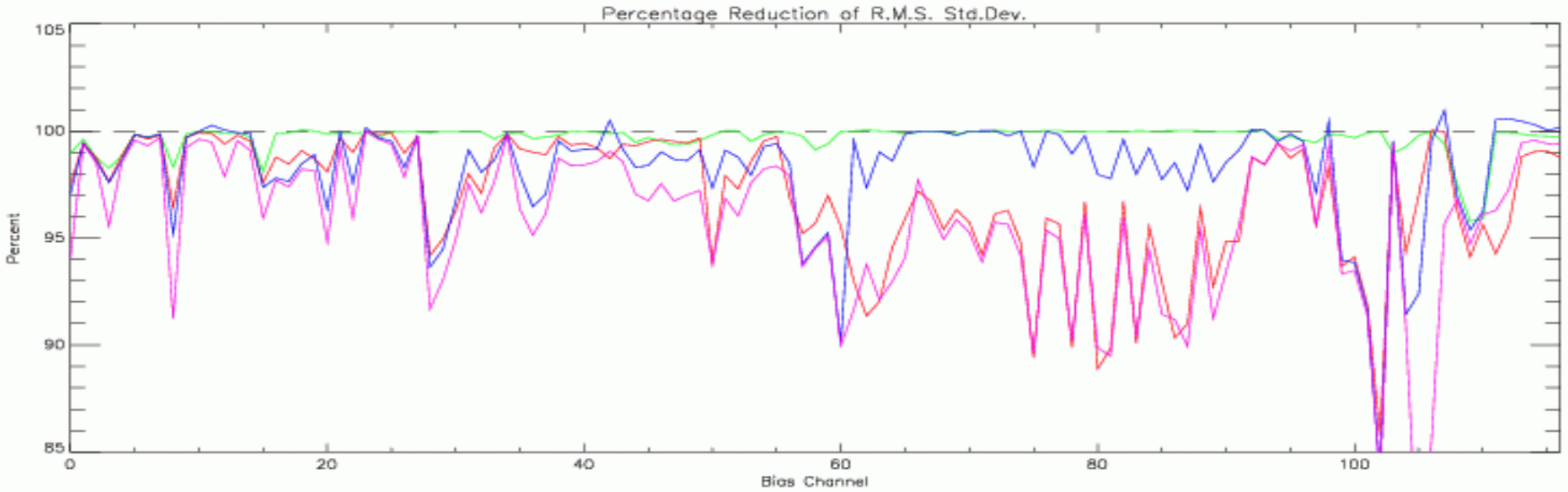


RMS Mean


R.M.S. Mean O−B
Uncorrected
0
3+5
1+2
1+2+5
R.M.S. Mean O−B
Bias Channel
R.M.S. Mean O−B
R.M.S. Mean O−B
Bias Channel

RMS Standard Deviation





Conclusions

- Scan Correction Inadequate
- P35 Reduced Std Dev but not Mean
- P12 Reduces Mean but not Std Dev
- P1235 Best Overall

References

- B.Harris and G. Kelly *A satellite radiance bias correction scheme for data assimilation* QJR Met. Soc **127**, 1453 (2001).
- J. Eyre *A bias correction scheme for simulated TOVS brightness temperatures.* Tech. Memo. 186, ECMWF (1992).
- Y Takeuchi. *Cloud Detection for the Advanced Infrared Radiometer Sounder* Private communication, JMA (2003).
- P. Rayer. *Lie on AIRS Channels,* Working Paper, Met Office (2002)
- J. Cameron. *AIRS Bias Correction. Met Office Internal Web Page* **URL: http::/www-nwp/~frbq/airs/bias/index.html**
- A. Collard. Private Communication.