METHODS COMPARISON

FOR THE PRODUCTION OF

INTERPOLATED CLIMATE LAYERS FOR USE IN SPECIES MODELING:

Interpolation of maximum temperature in Oregon.

11-28-2012

Additional analyses: Part II

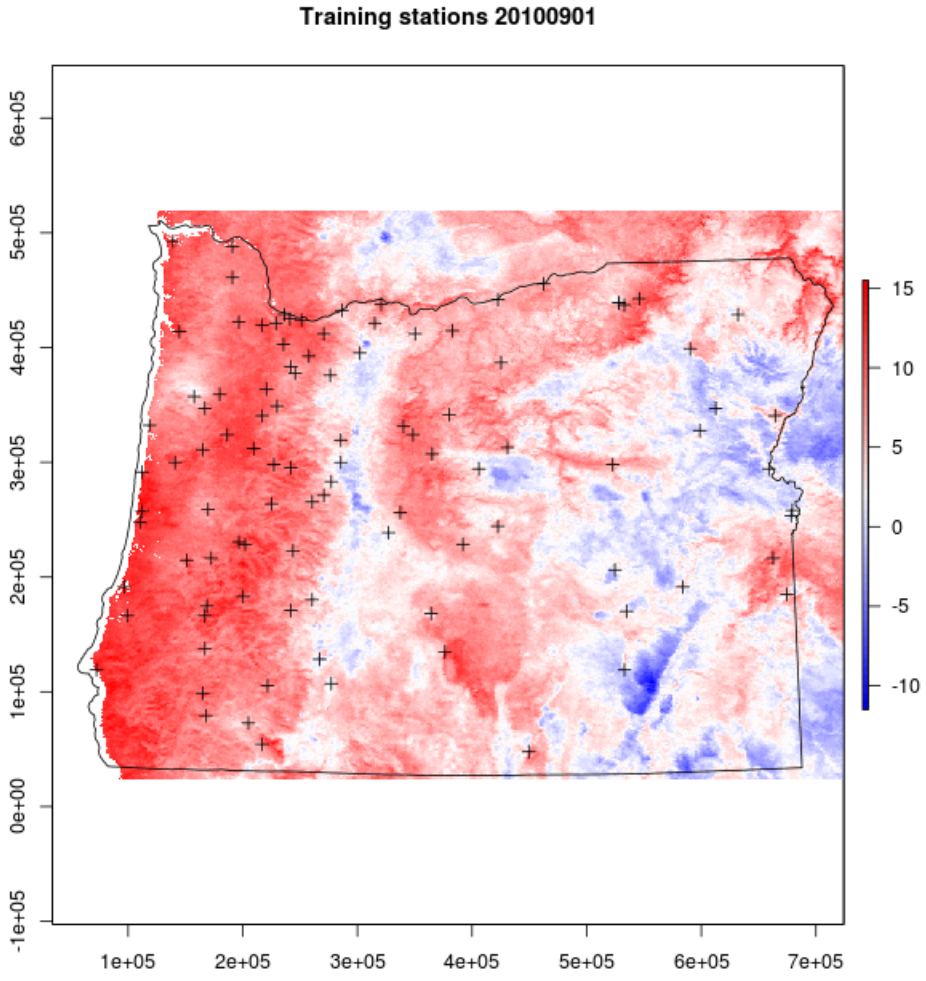
Benoit Parmentier

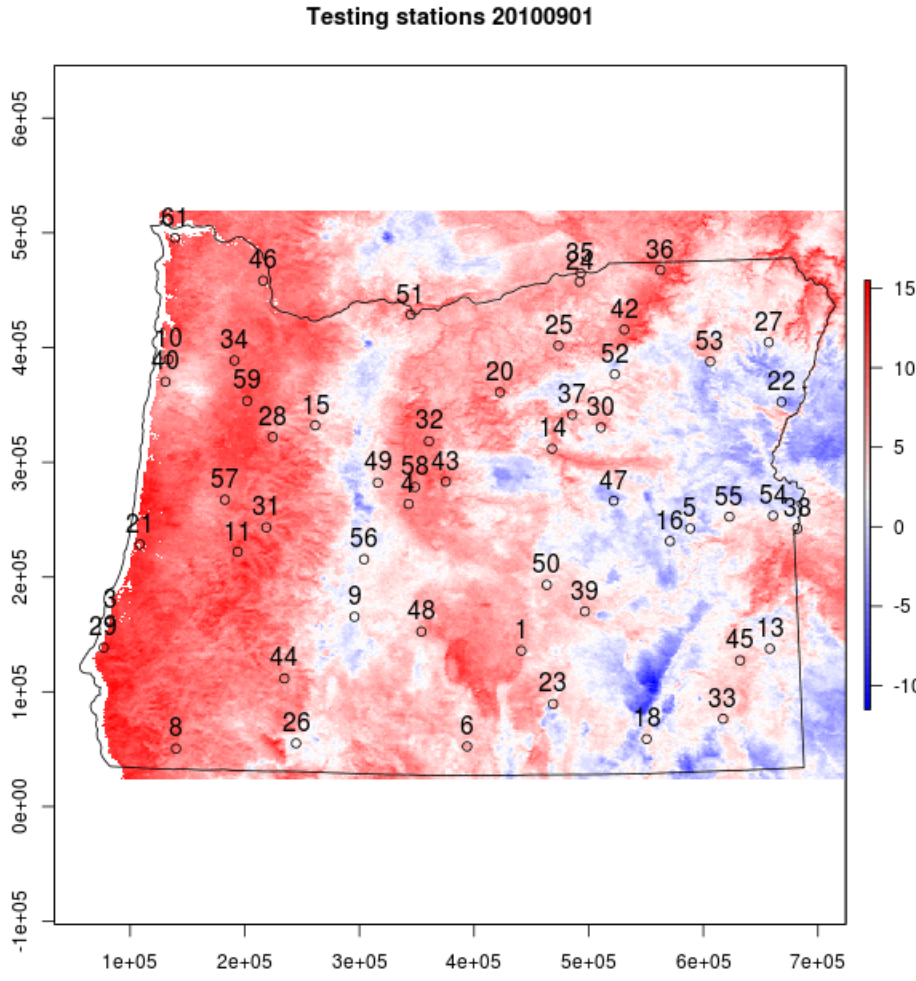
PRESENTATION - TABLE OF CONTENT

I. RESIDUALS COMPARISON STATIONS

1. Residuals analyses Date 1
2. Residuals analyses Date 2
3. Correlations and co-linearity

DAY 20100901


Training stations 20100901
6e+05
5e+05
4e+05
3e+05
2e+05
1e+05
0e+00
-1e+05
1e+05
2e+05
3e+05
4e+05
5e+05
6e+05
7e+05
15
10
5
0
-5
-10


Testing stations 20100901
6e+05
5e+05
4e+05
3e+05
2e+05
1e+05
0e+00
-1e+05
1e+05
2e+05
3e+05
4e+05
5e+05
6e+05
7e+05
61
46
51
35
24
36
42
25
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10
40
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59
52
53
20
22
37
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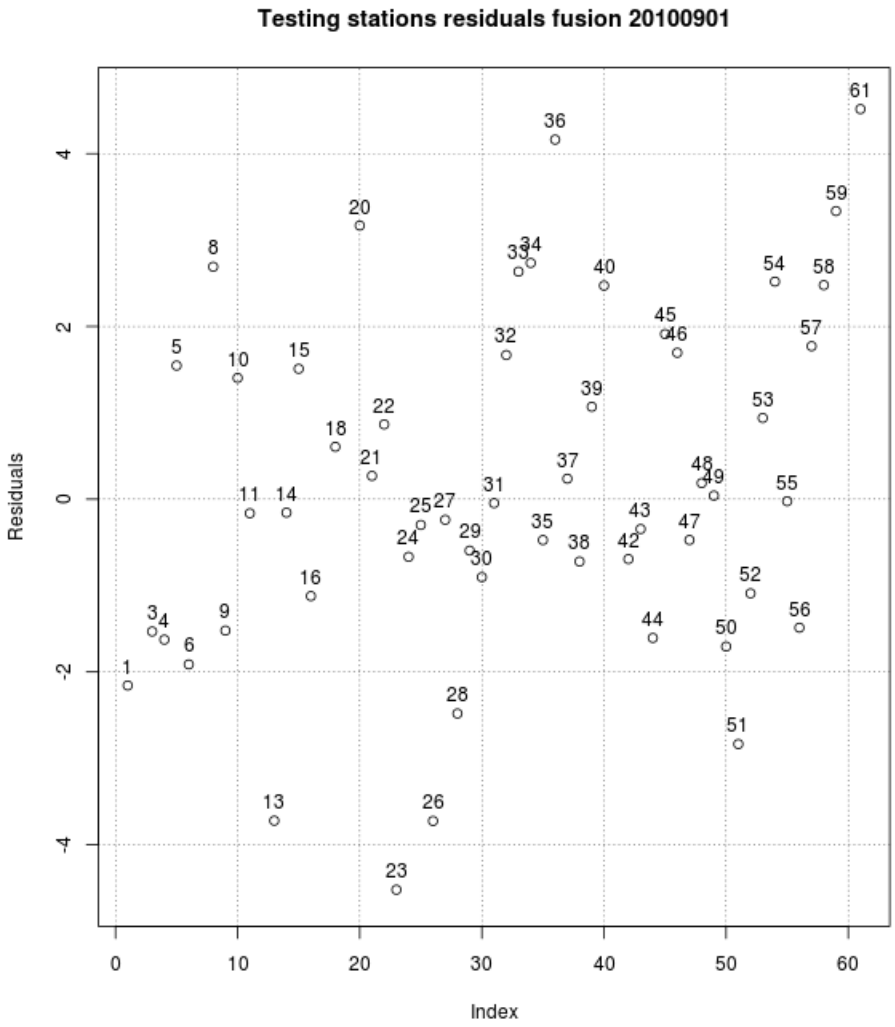
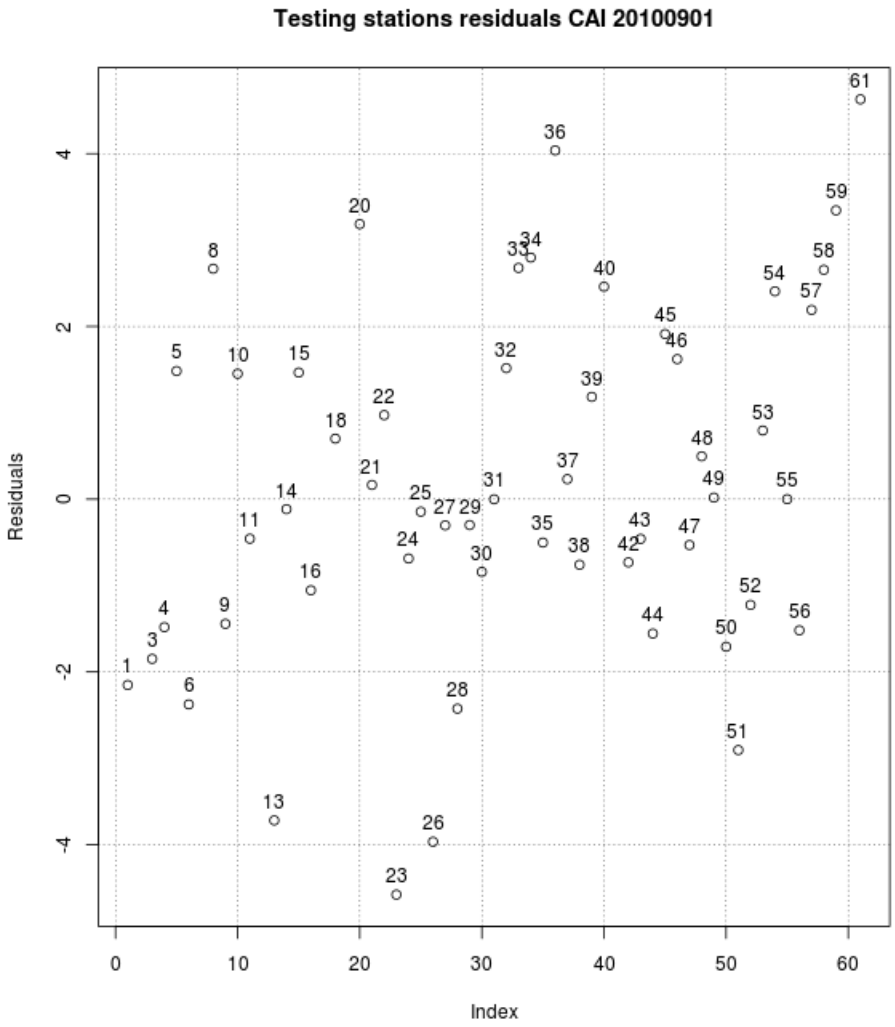
32
14
49
58
43
4
47
57
31
21
11
56
16
5
55
54
38
50
39
3
29
9
48
1
45
13
44
23
33
8
26
6
18
15
10
5
0
-5

Insert fig1

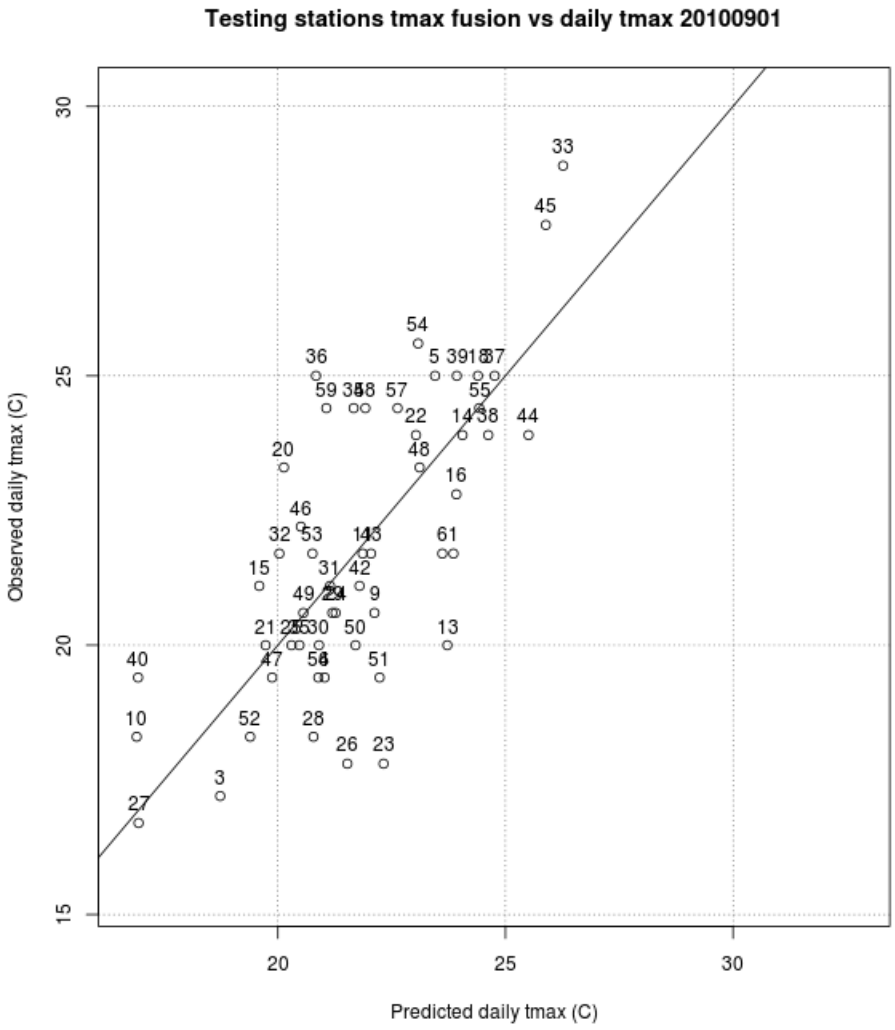
RESIDUALS FOR TESTING STATIONS: OREGON

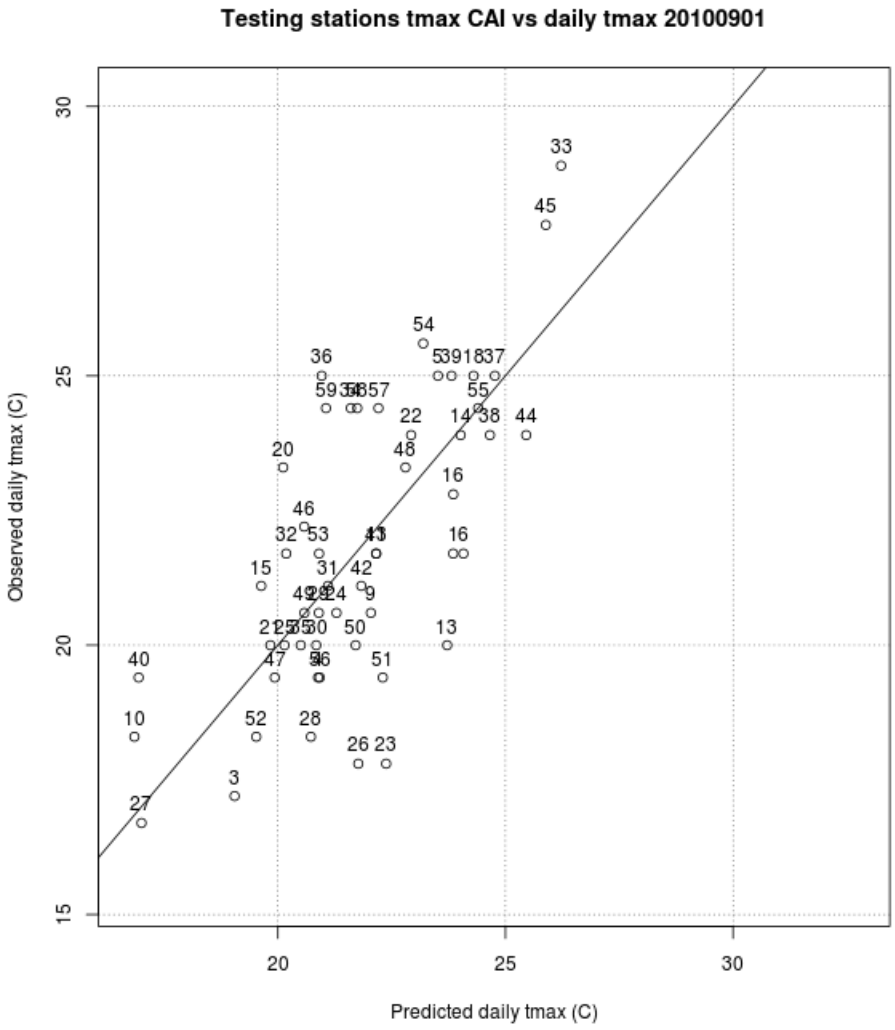




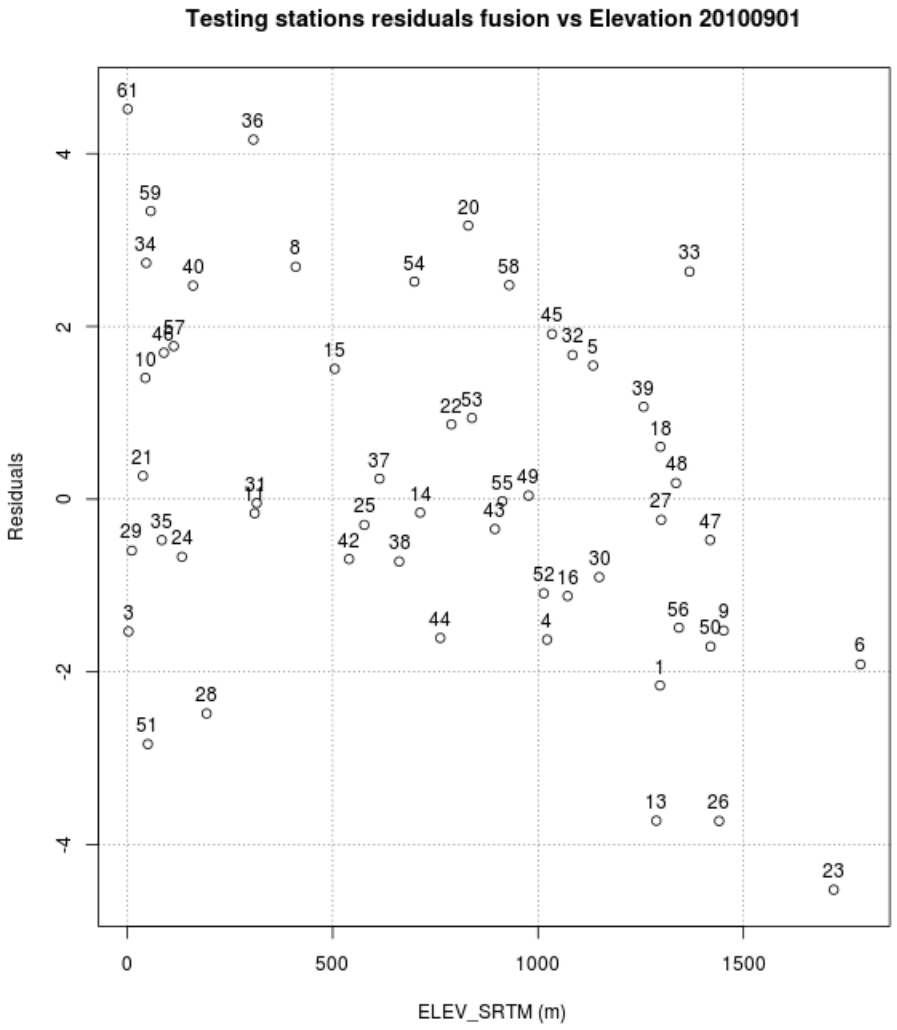
Insert fig2

OBSERVED AND PREDICTION FOR TESTING STATIONS: OREGON





RESIDUALS AND ELEVATION FOR TESTING STATIONS: OREGON



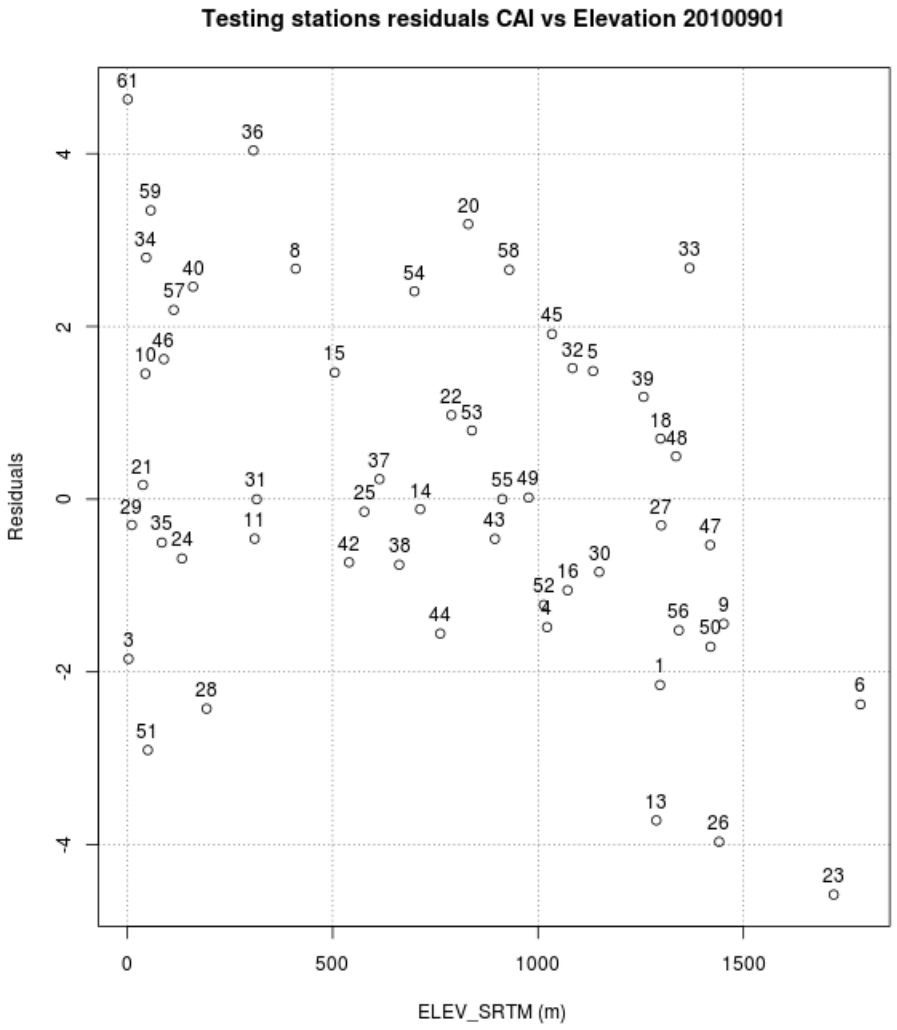
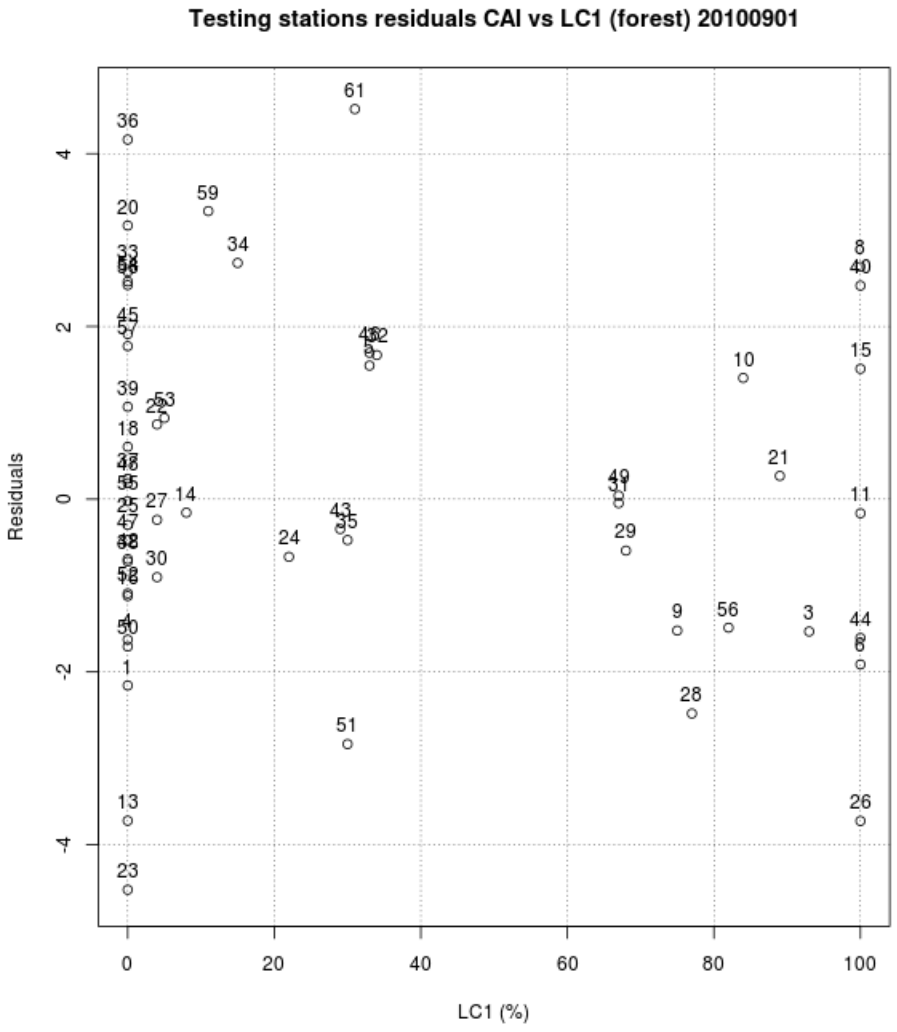


fig4


Testing stations residuals CAI vs LC1 (forest) 20100901
Residuals
LC1 (%)

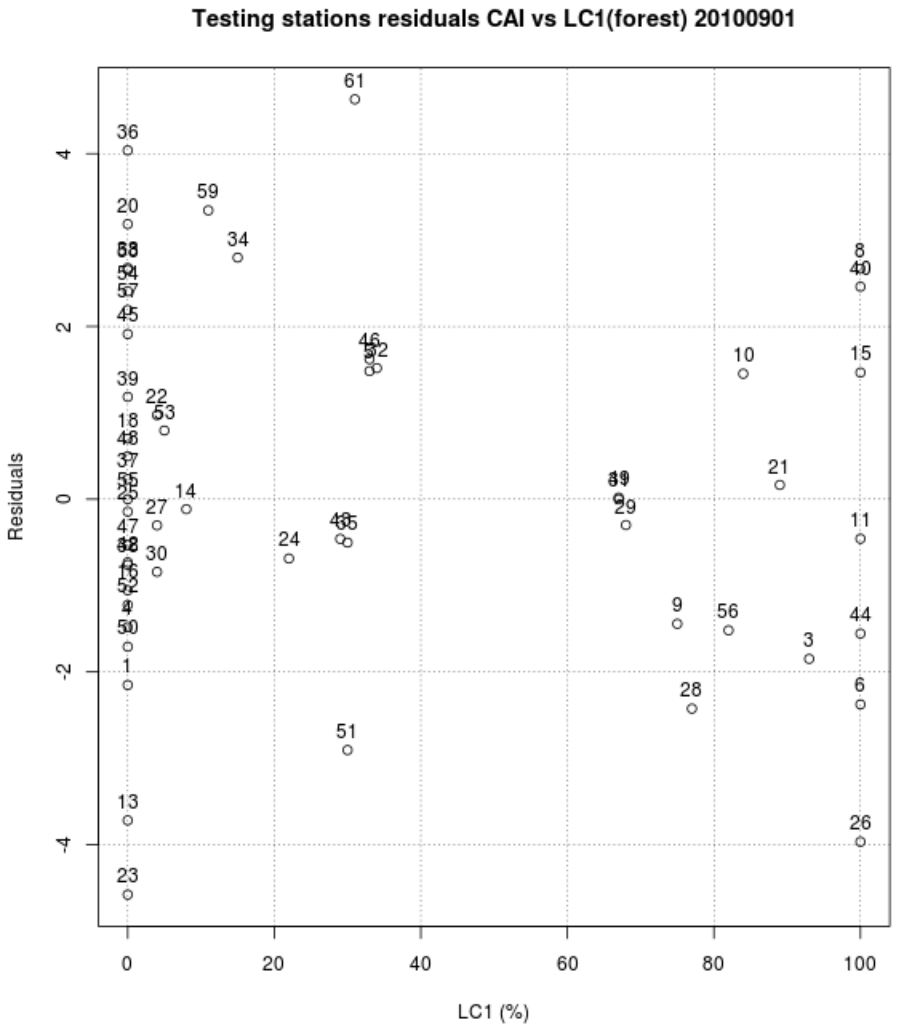
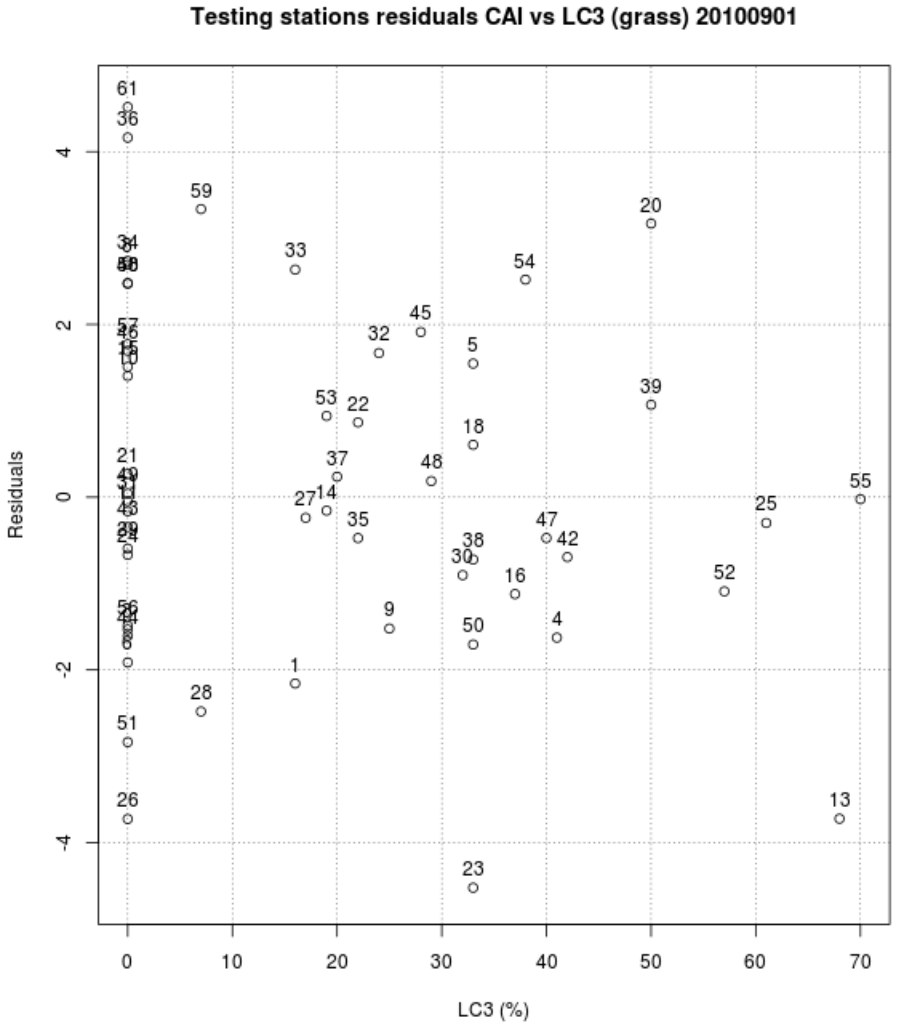

Testing stations residuals CAI vs LC1(forest) 20100901
Residuals
LC1 (%)

fig5


Testing stations residuals CAI vs LC3 (grass) 20100901
Residuals
LC3 (%)

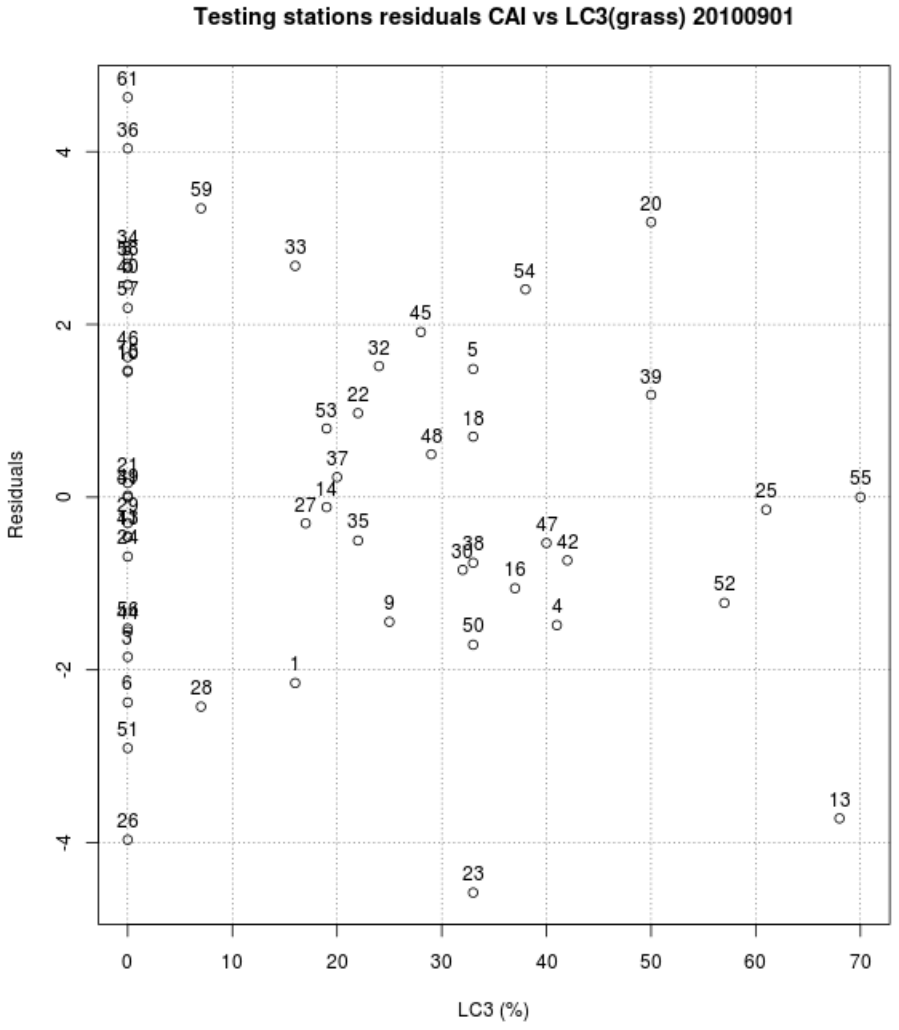
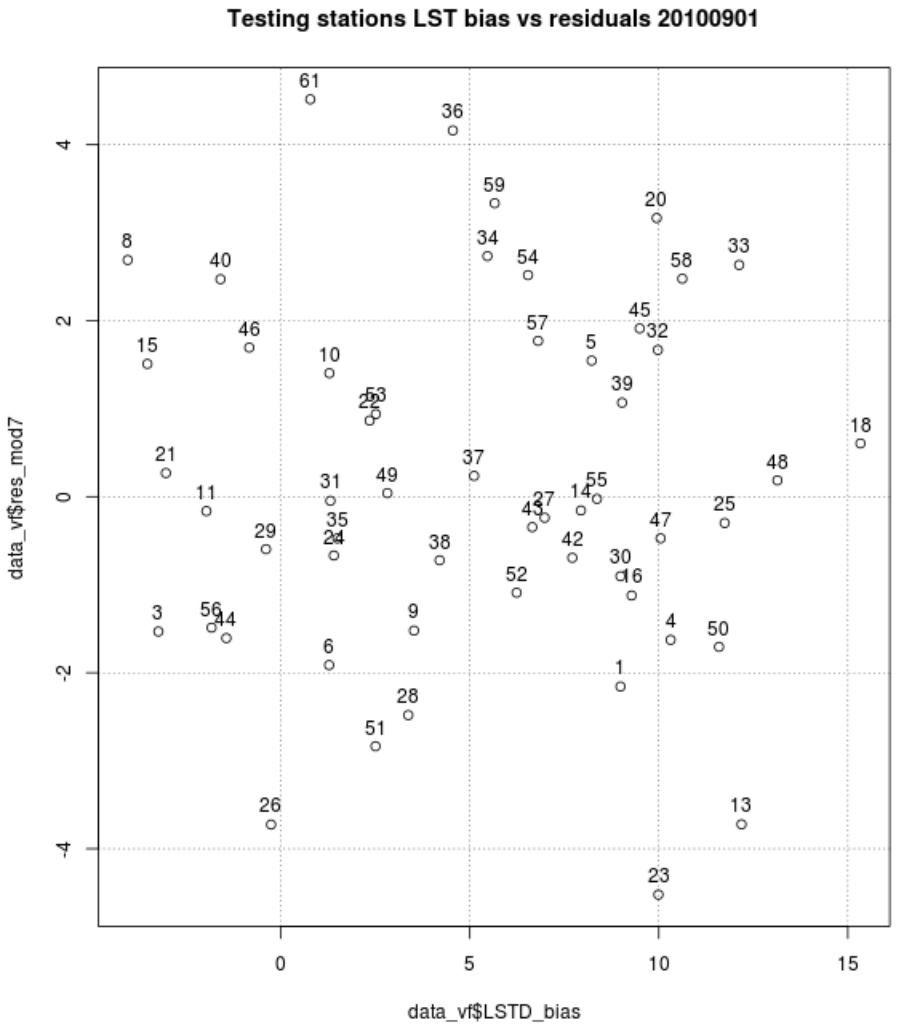

Testing stations residuals CAI vs LC3(grass) 20100901
Residuals
LC3 (%)

fig6


Testing stations LST bias vs residuals 20100901
data_vf$res_mod7
data_vf$LSTD_bias

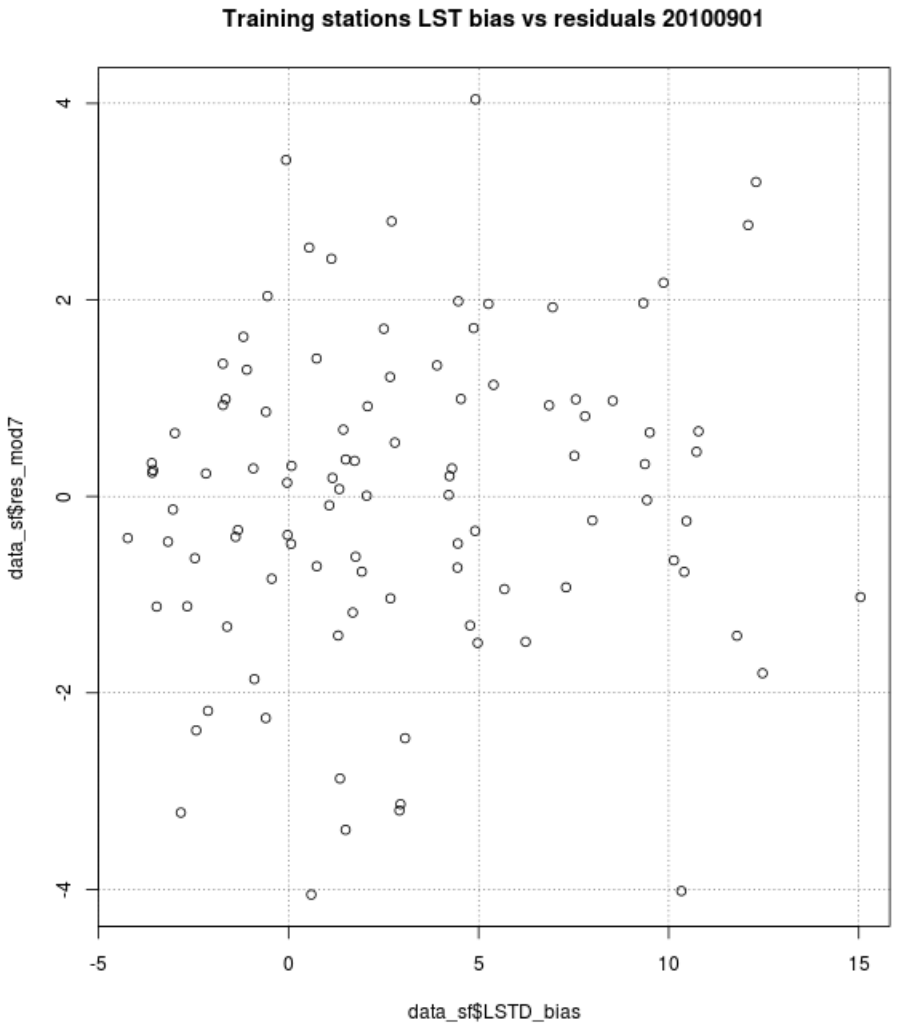
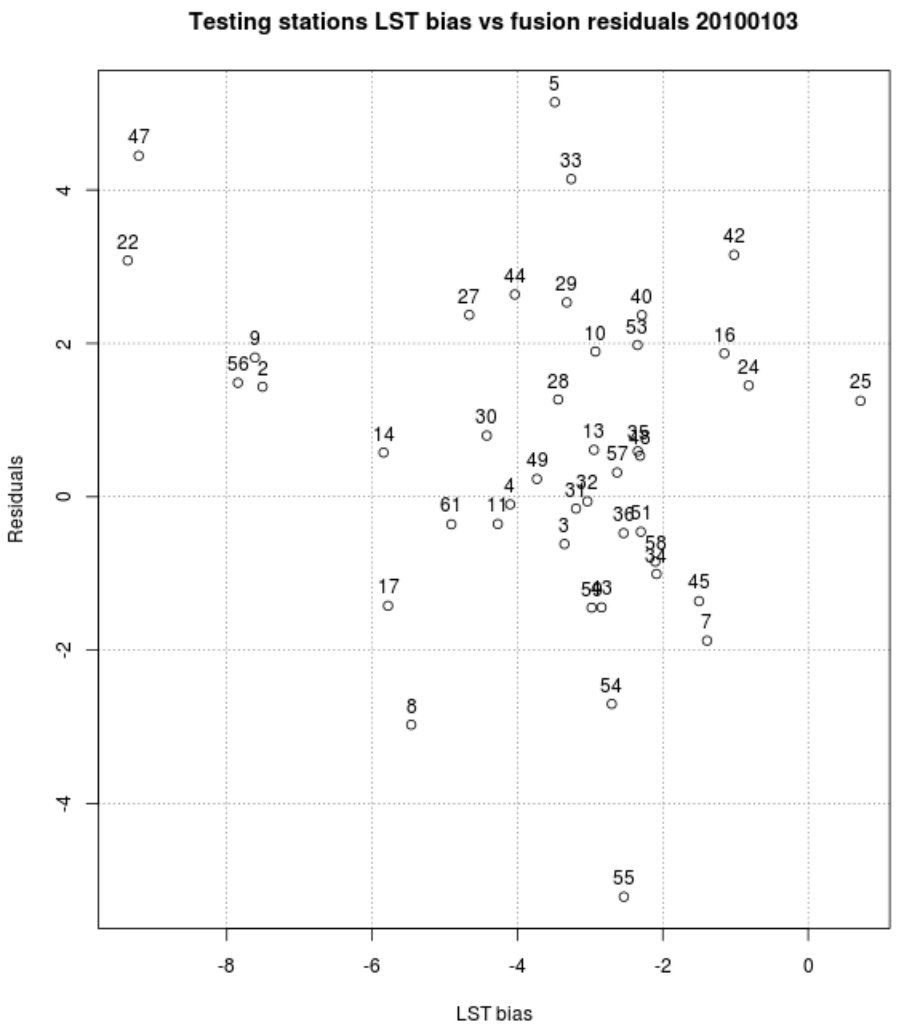

Training stations LST bias vs residuals 20100901
data_sf$res_mod7
data_sf$LSTD_bias

fig7



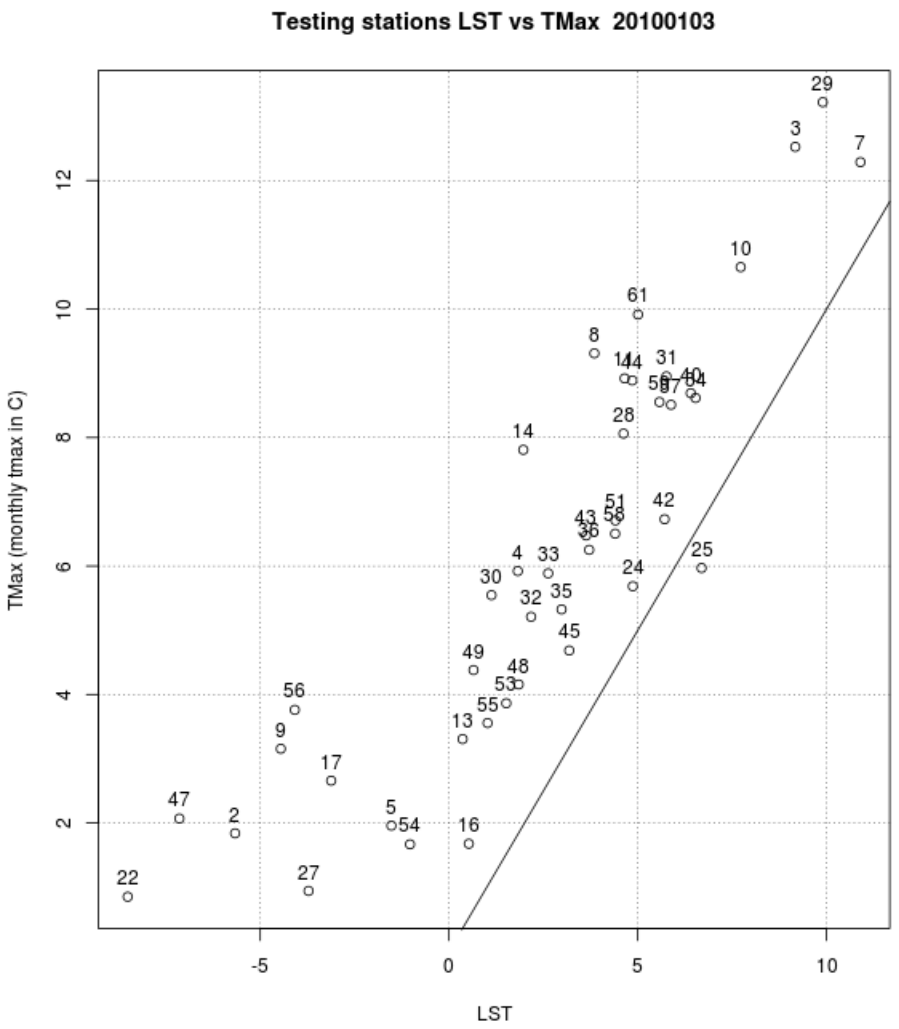
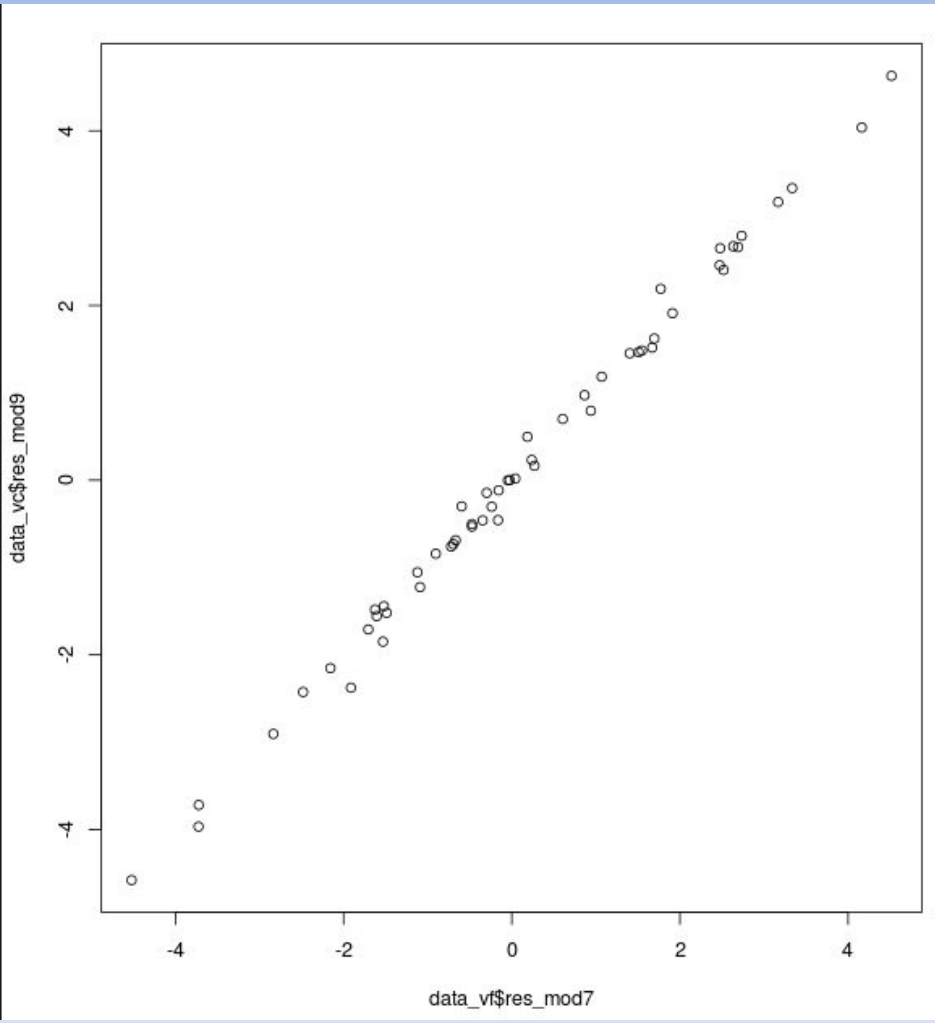


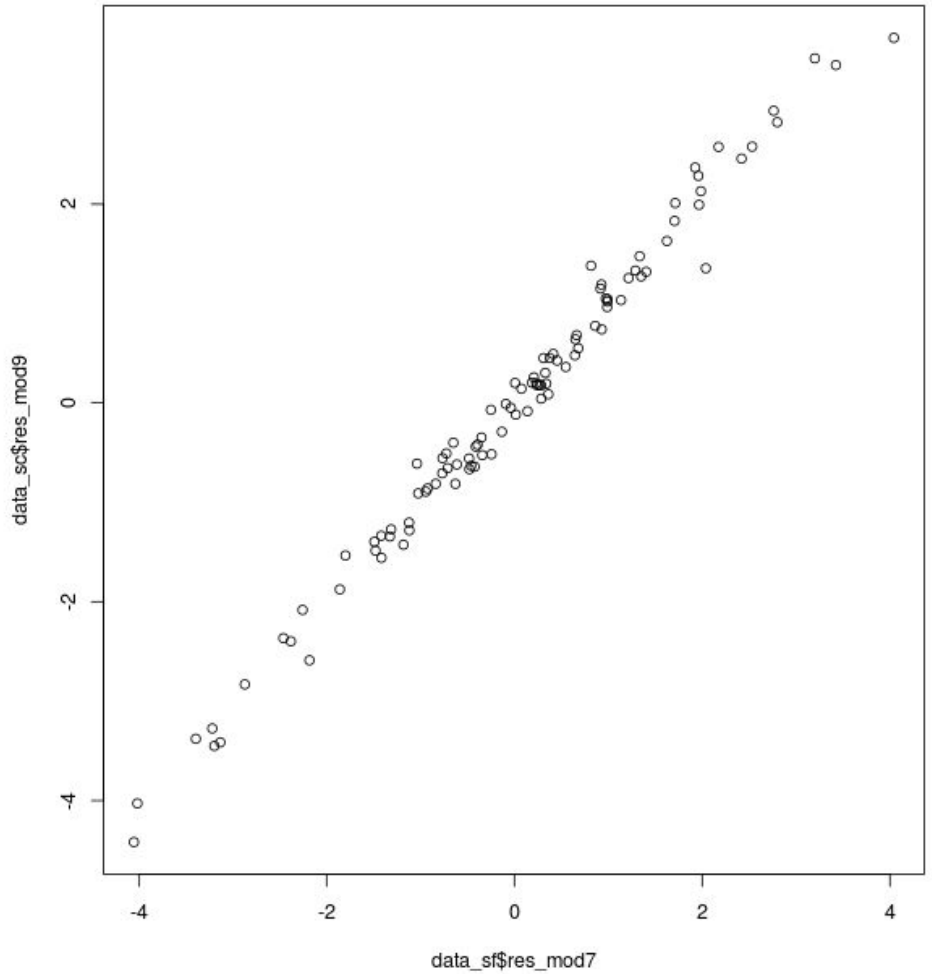
fig8

There appears to be a relationship between LST bias and residuals. Stratifying stations per land cover may help in distinguishing relationships.

Bias is overwhelmingly negative on January 3 2010 with cooler temperatures in LST.

CAI vs Fusion residuals on September 9,2010

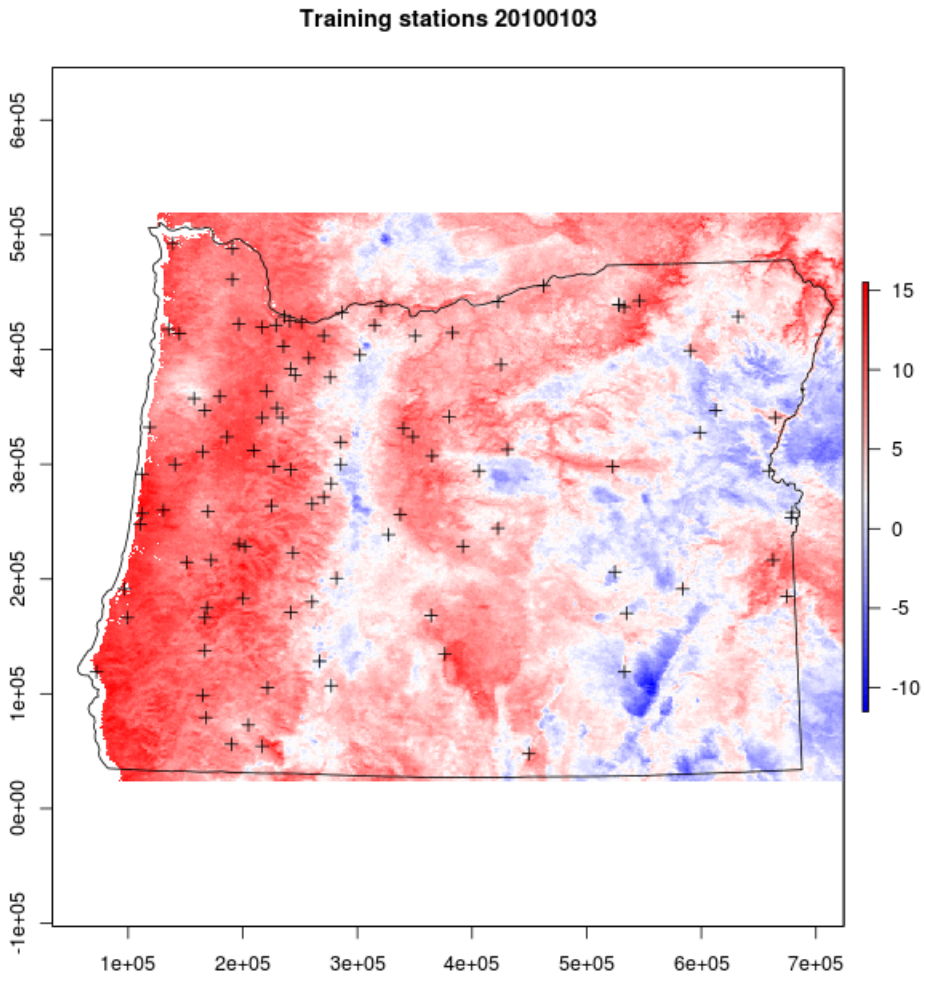


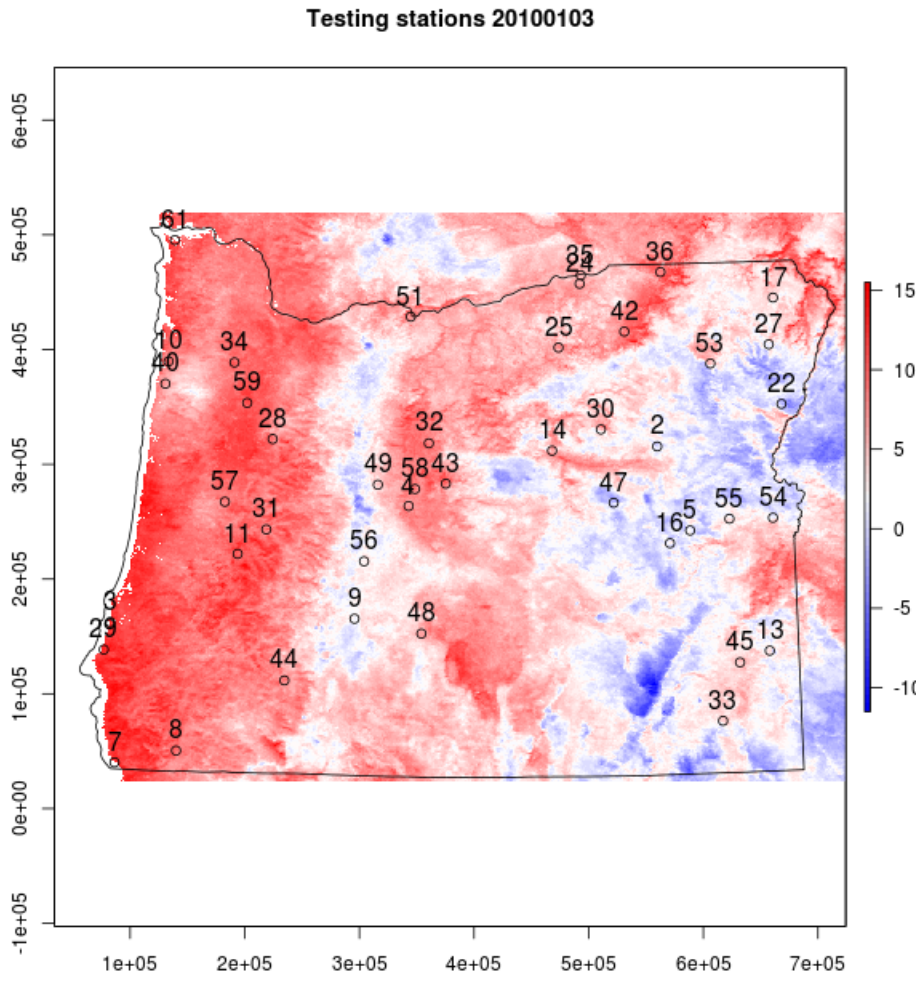


Cor=0.9975 Fig9? Cor=0.9935

The correlations between residuals for the testing and training stations are greater than 0.99. This suggests that differences in tmax predictions cannot be retrieved using station information.

DAY 20100103


Training stations 20100103
6e+05
5e+05
4e+05
3e+05
2e+05
1e+05
0e+00
-1e+05
1e+05
2e+05
3e+05
4e+05
5e+05
6e+05
7e+05
15
10
5
0
-5
-10


Testing stations 20100103
6e+05
5e+05
4e+05
3e+05
2e+05
1e+05
0e+00
-1e+05
1e+05
2e+05
3e+05
4e+05
5e+05
6e+05
7e+05
61
35
24
36
17
51
42
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13
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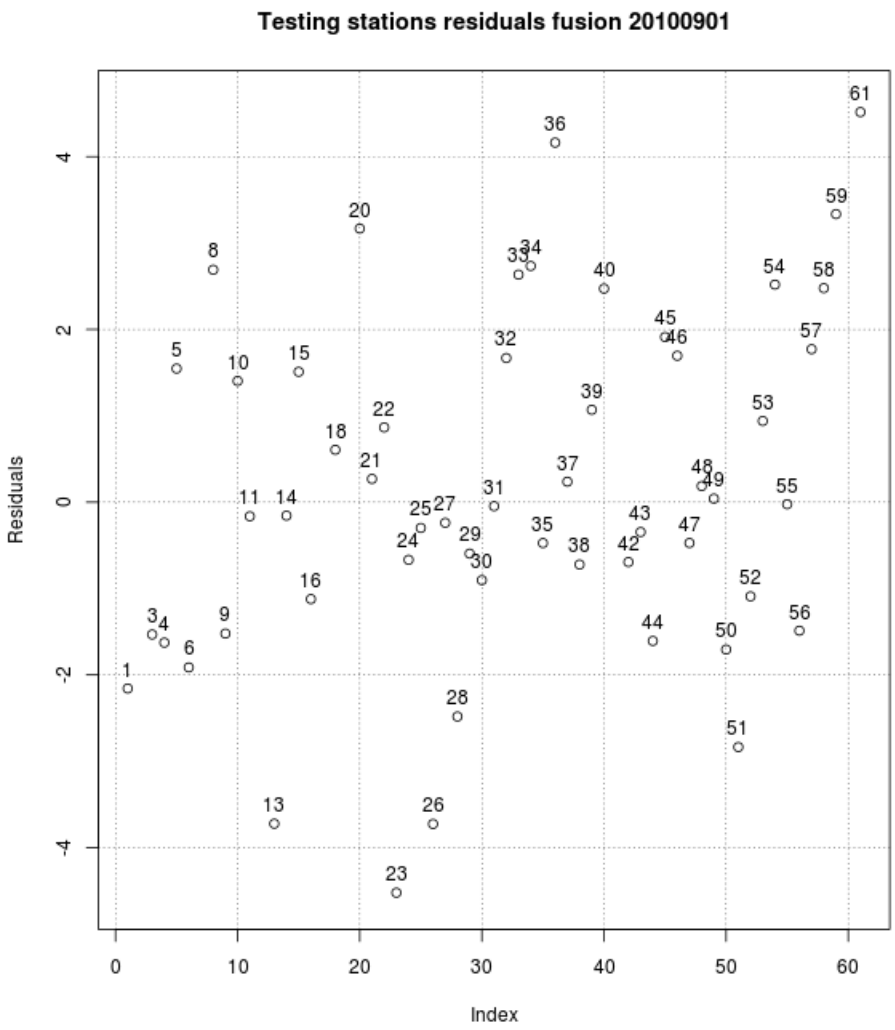
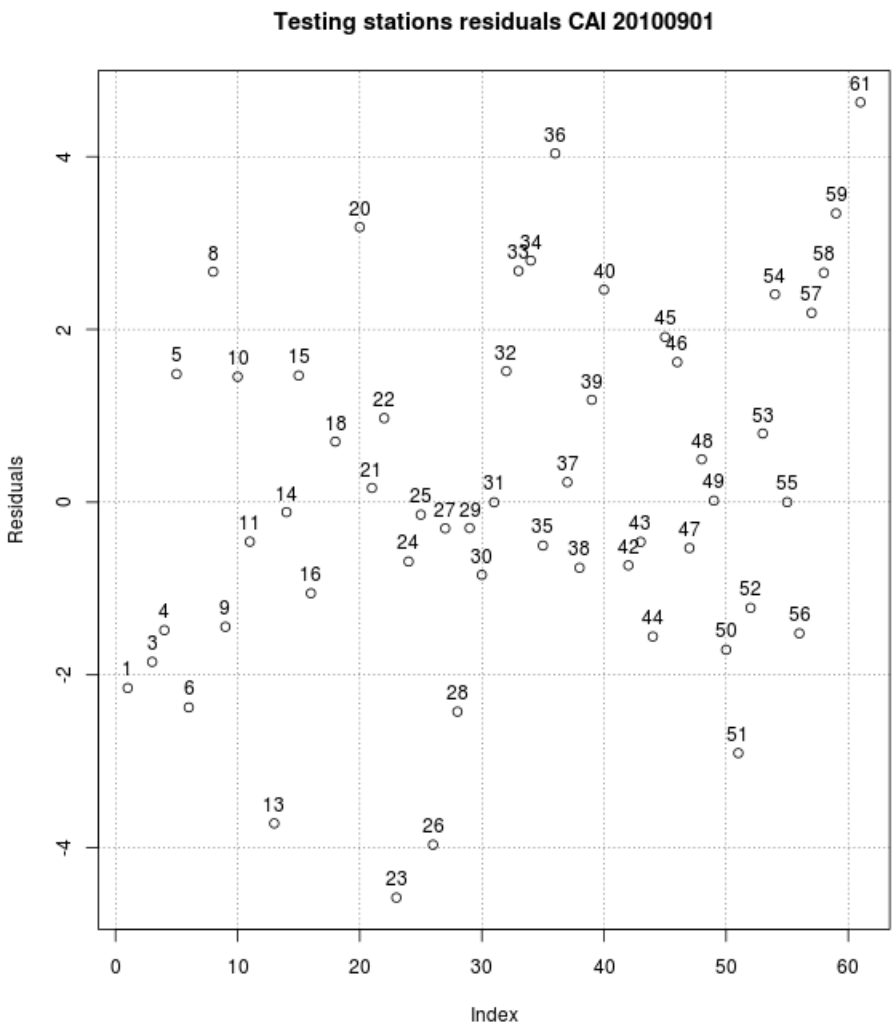
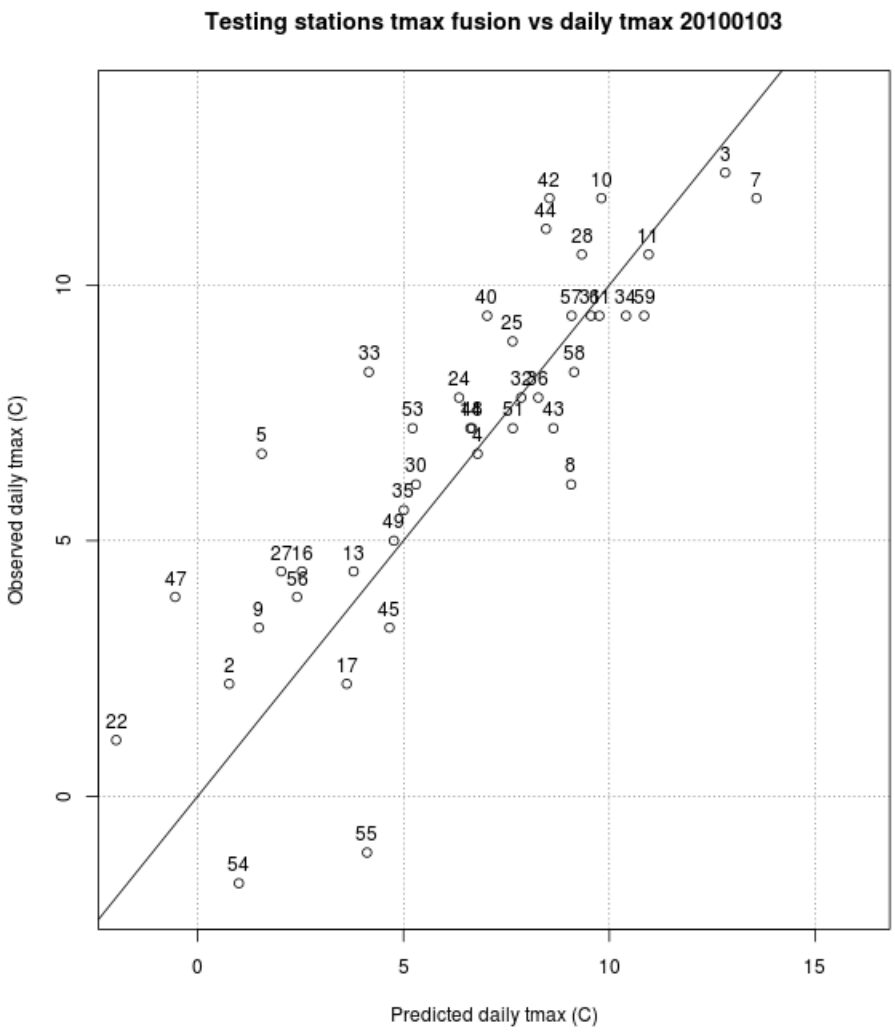
33
8
7

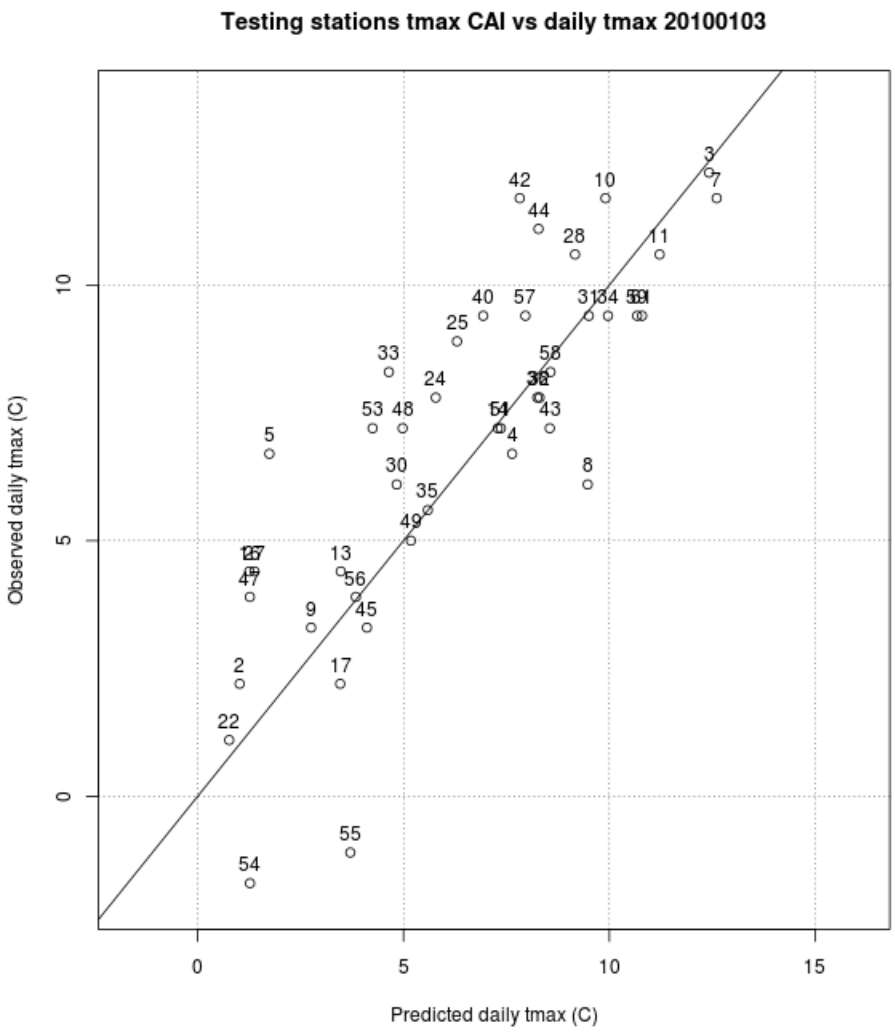
Insert fig1


Testing stations residuals fusion 20100901
Residuals
Index

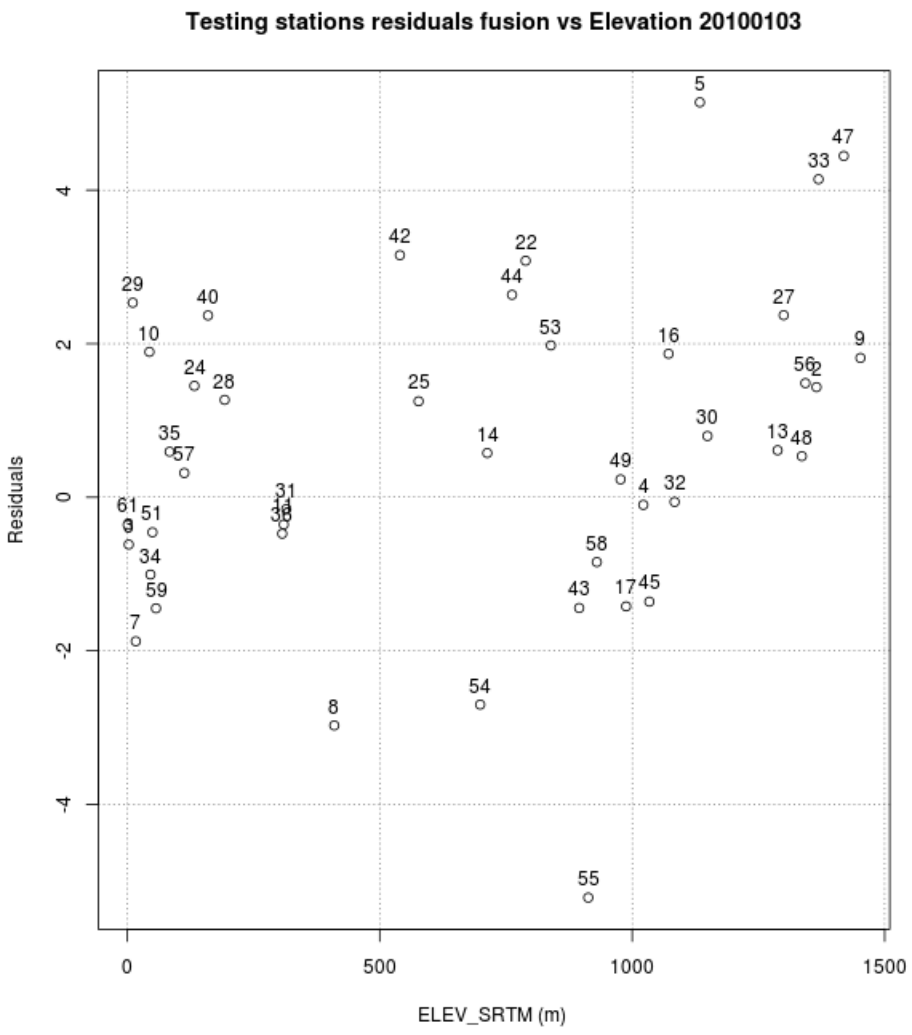

Testing stations residuals CAI 20100901
Residuals
Index

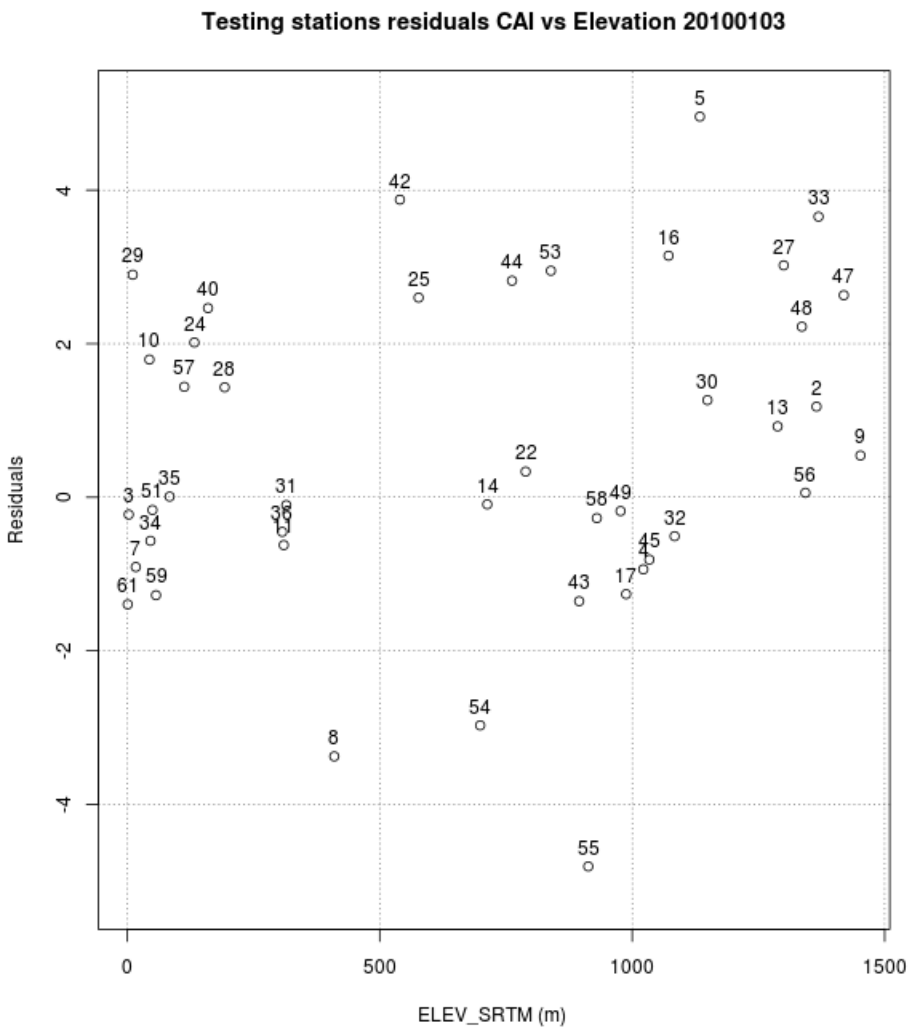
Insert fig2


Testing stations tmax fusion vs daily tmax 20100103
Observed daily tmax (C)
Predicted daily tmax (C)
0
5
10
15

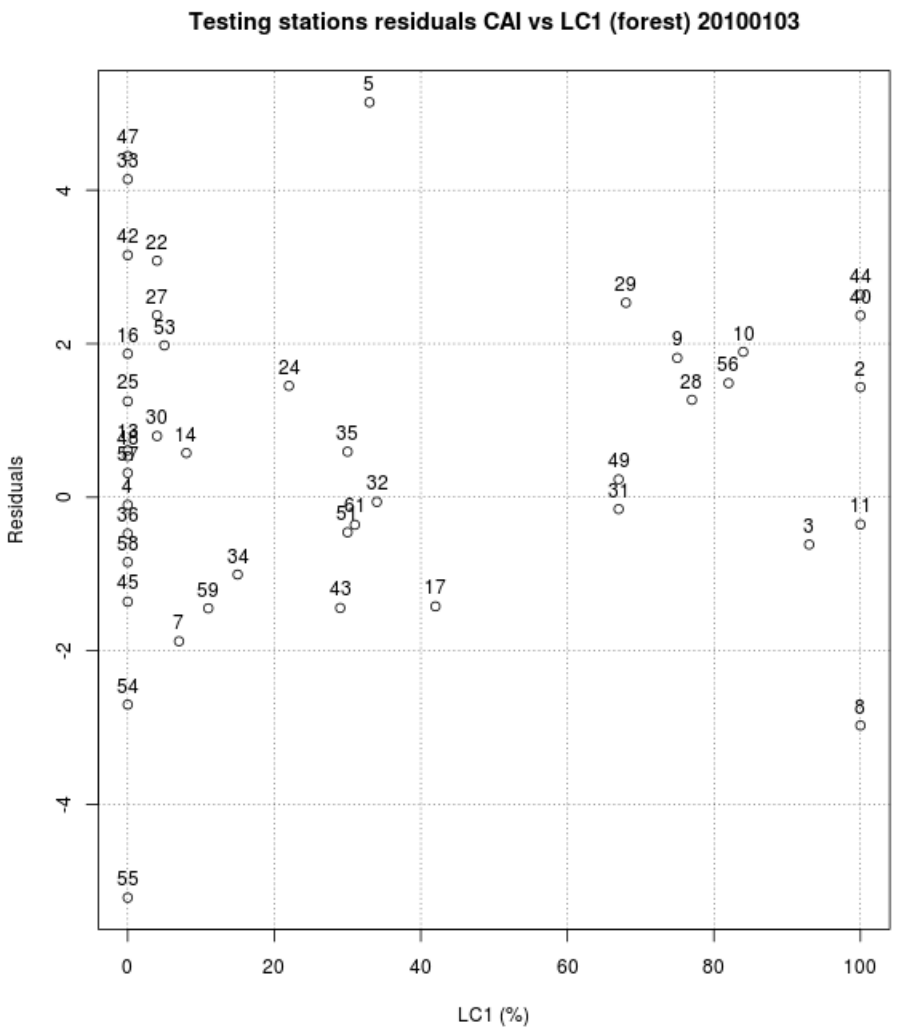

Testing stations tmax CAI vs daily tmax 20100103
Observed daily tmax (C)
Predicted daily tmax (C)
0
5
10
15

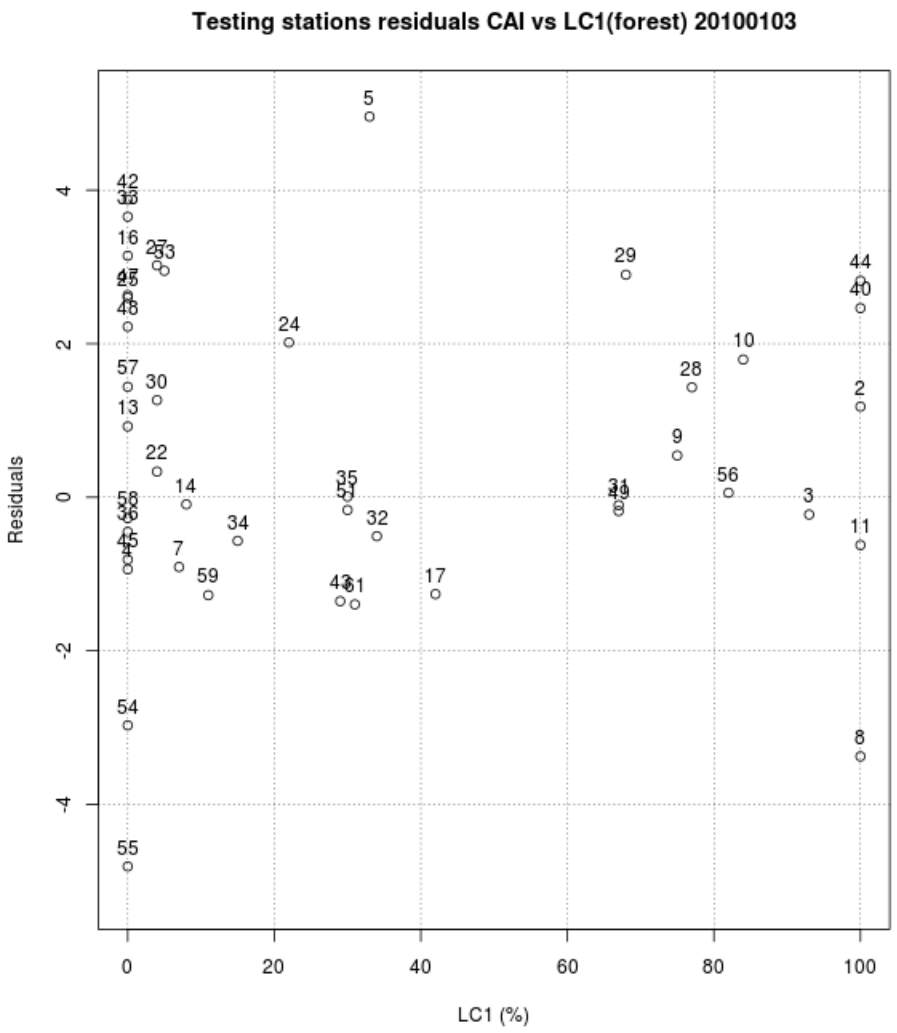
Insert fig3


Testing stations residuals fusion vs Elevation 20100103
Residuals
ELEV_SRTM (m)
0
500
1000
1500
-4
-2
0
2
4

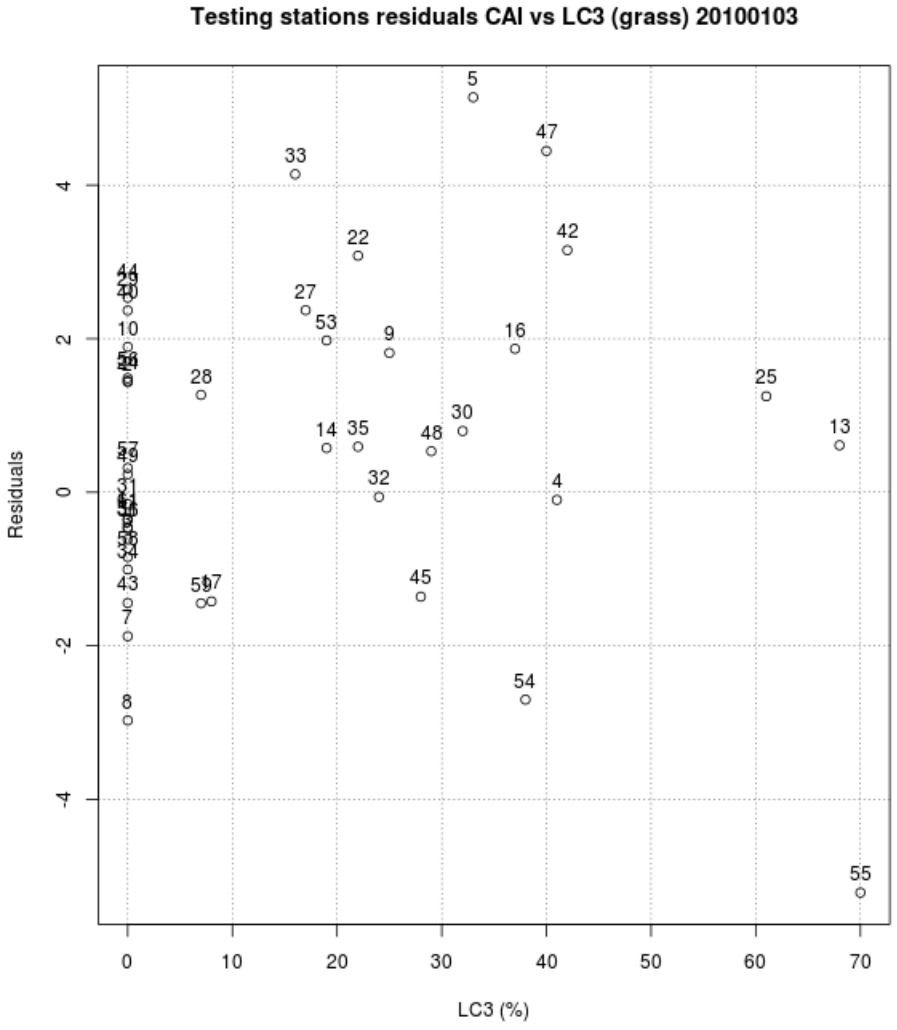

Testing stations residuals CAI vs Elevation 20100103
Residuals
ELEV_SRTM (m)
0
500
1000
1500
-4
-2
0
2
4

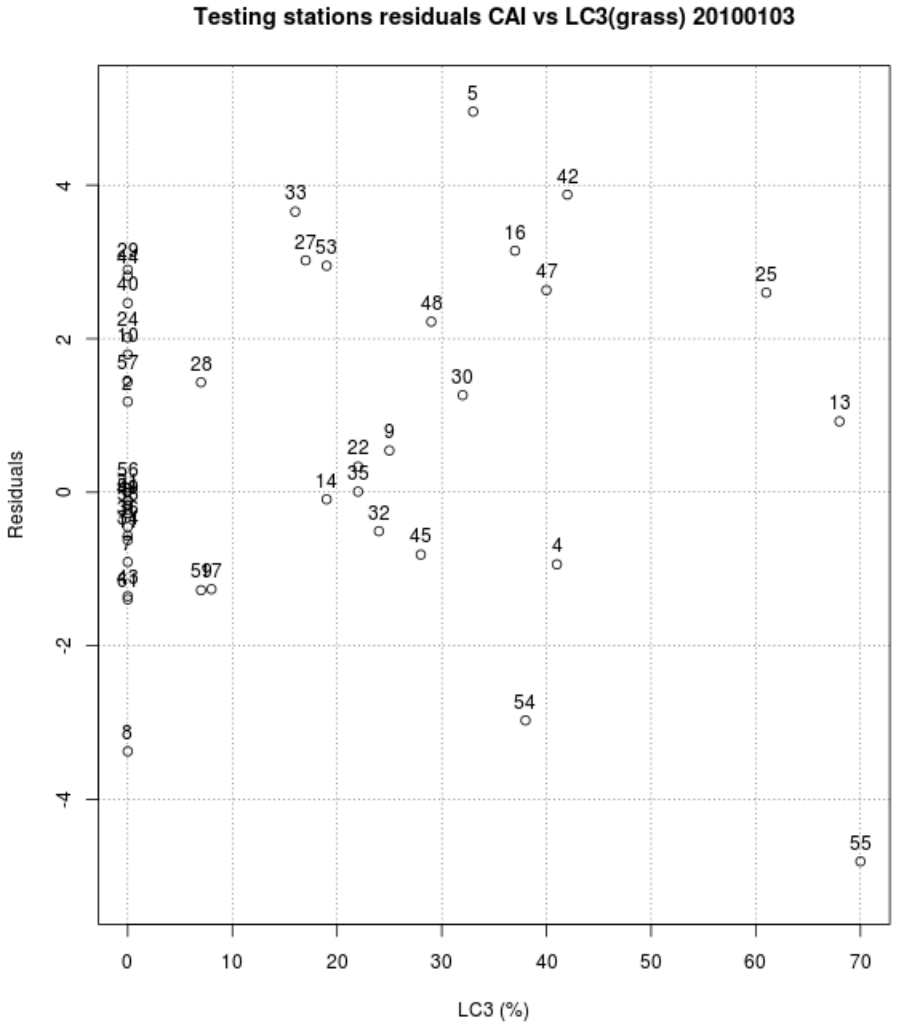
Insert fig4


Testing stations residuals CAI vs LC1 (forest) 20100103
Residuals
LC1 (%)
0
20
40
60
80
100
-4
-2
0
2
4


Testing stations residuals CAI vs LC1(forest) 20100103
Residuals
LC1 (%)
0
20
40
60
80
100
-4
-2
0
2
4

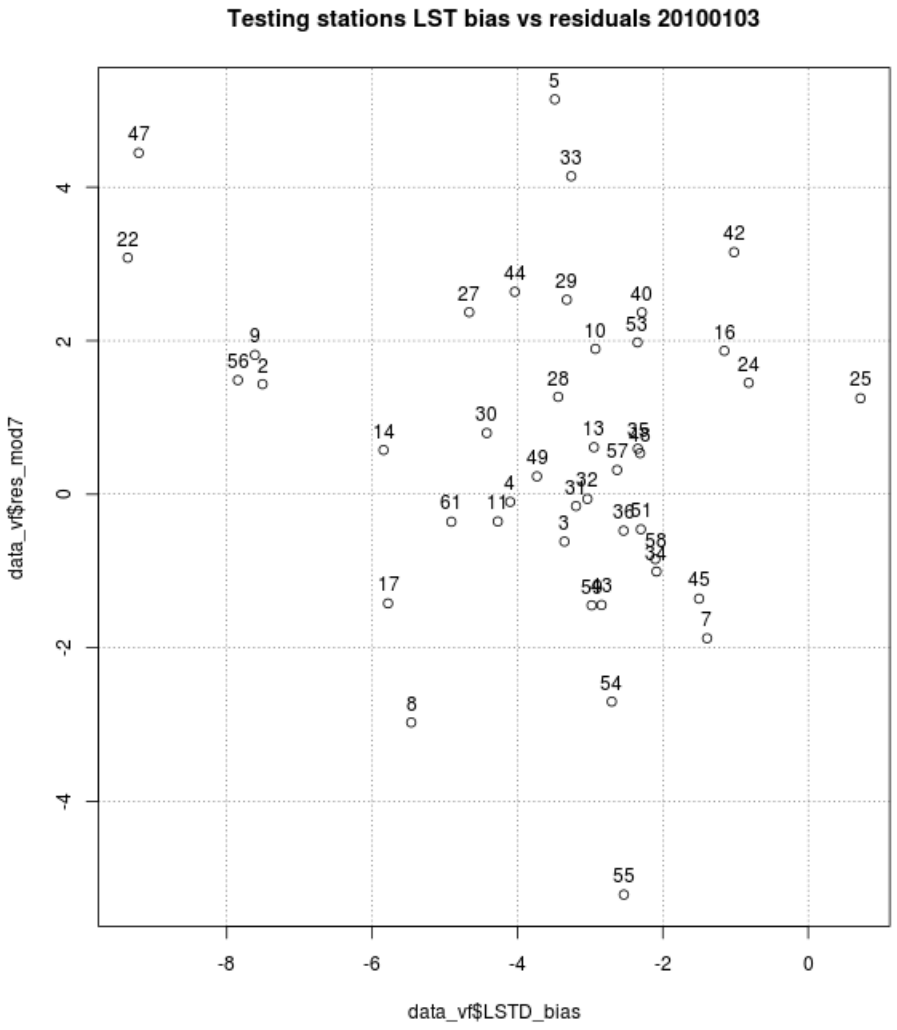
Insert fig5

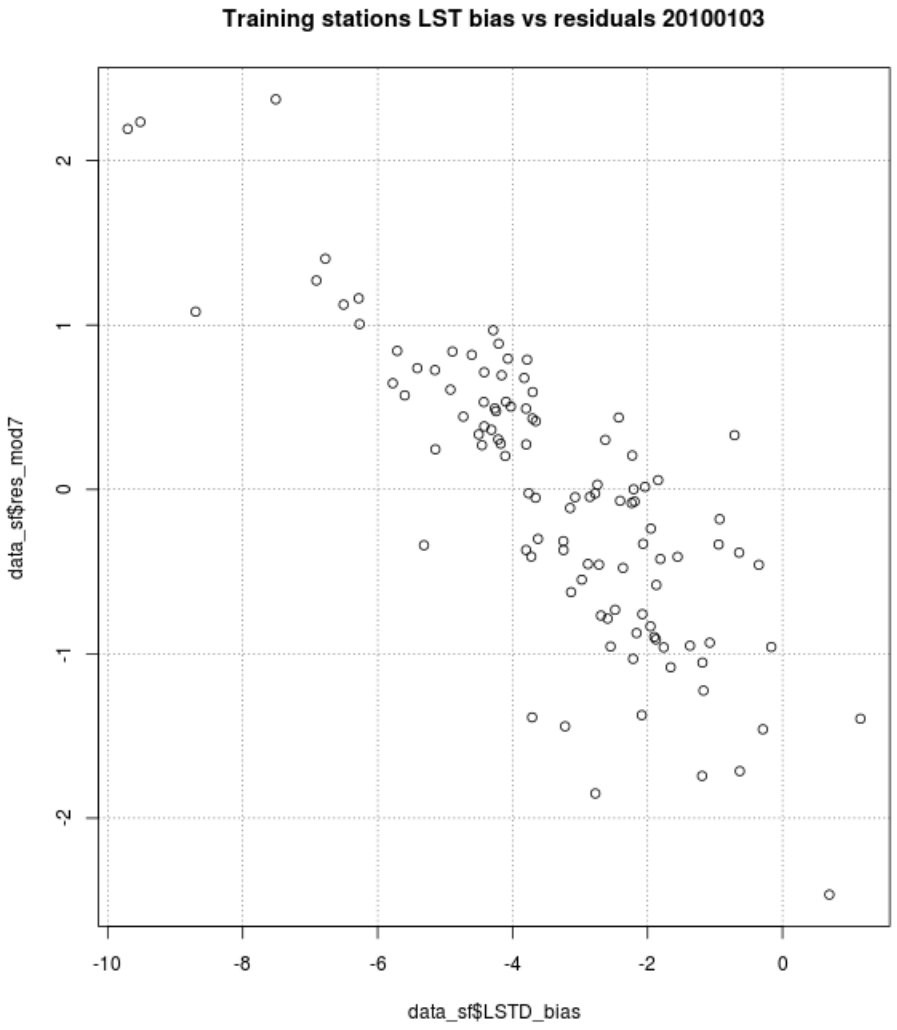

Testing stations residuals CAI vs LC3 (grass) 20100103
Residuals
LC3 (%)


Testing stations residuals CAI vs LC3(grass) 20100103
Residuals
LC3 (%)

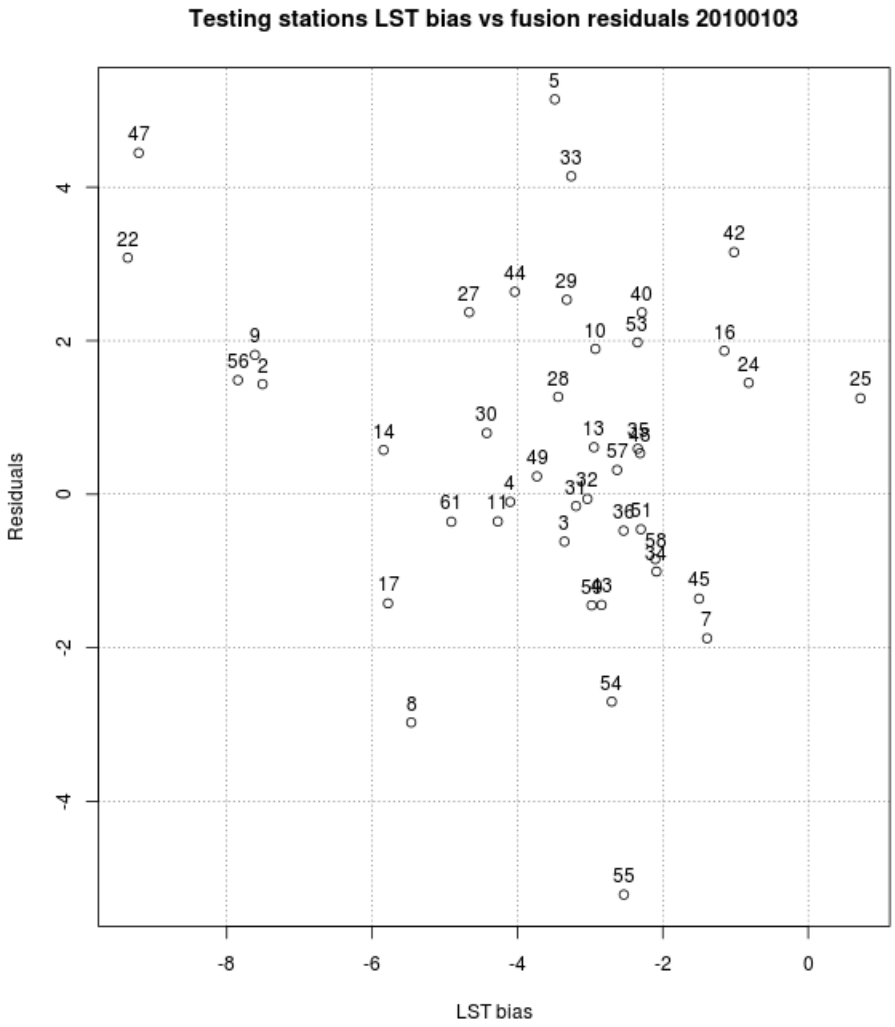
Insert fig6

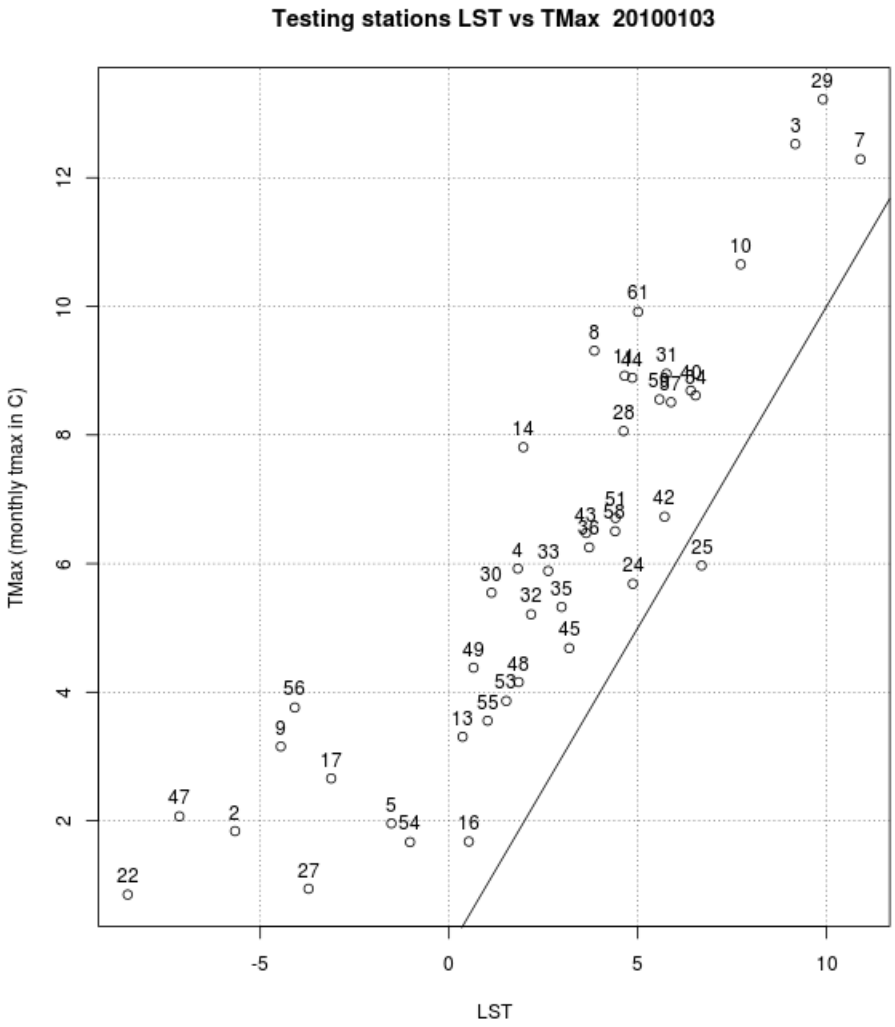
RESIDUALS FROM FUSION AND LST BIAS





Insert fig7


Testing stations LST bias vs fusion residuals 20100103
Residuals
LST bias


Testing stations LST vs TMax 20100103
TMax (monthly tmax in C)
LST

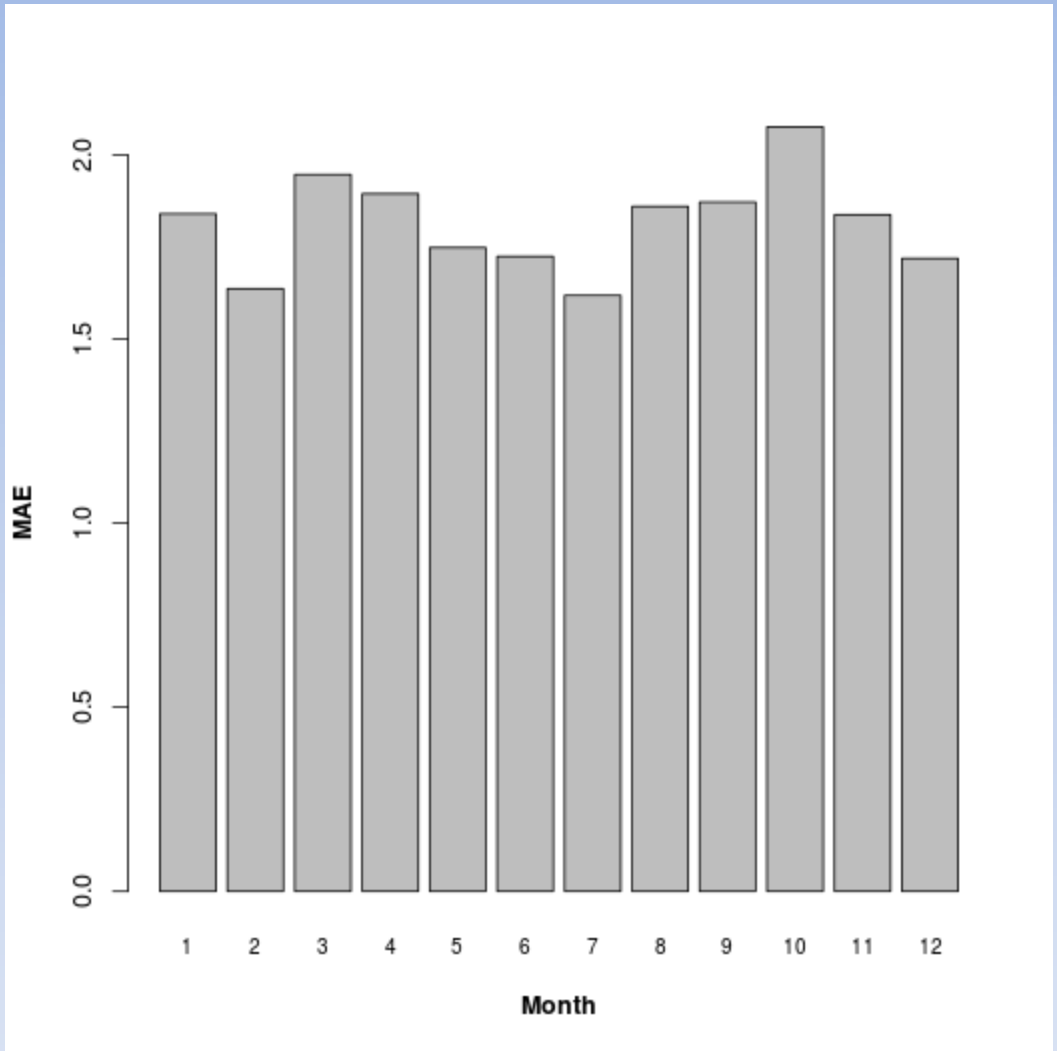
Insert fig8

STATION DIFFERENCES

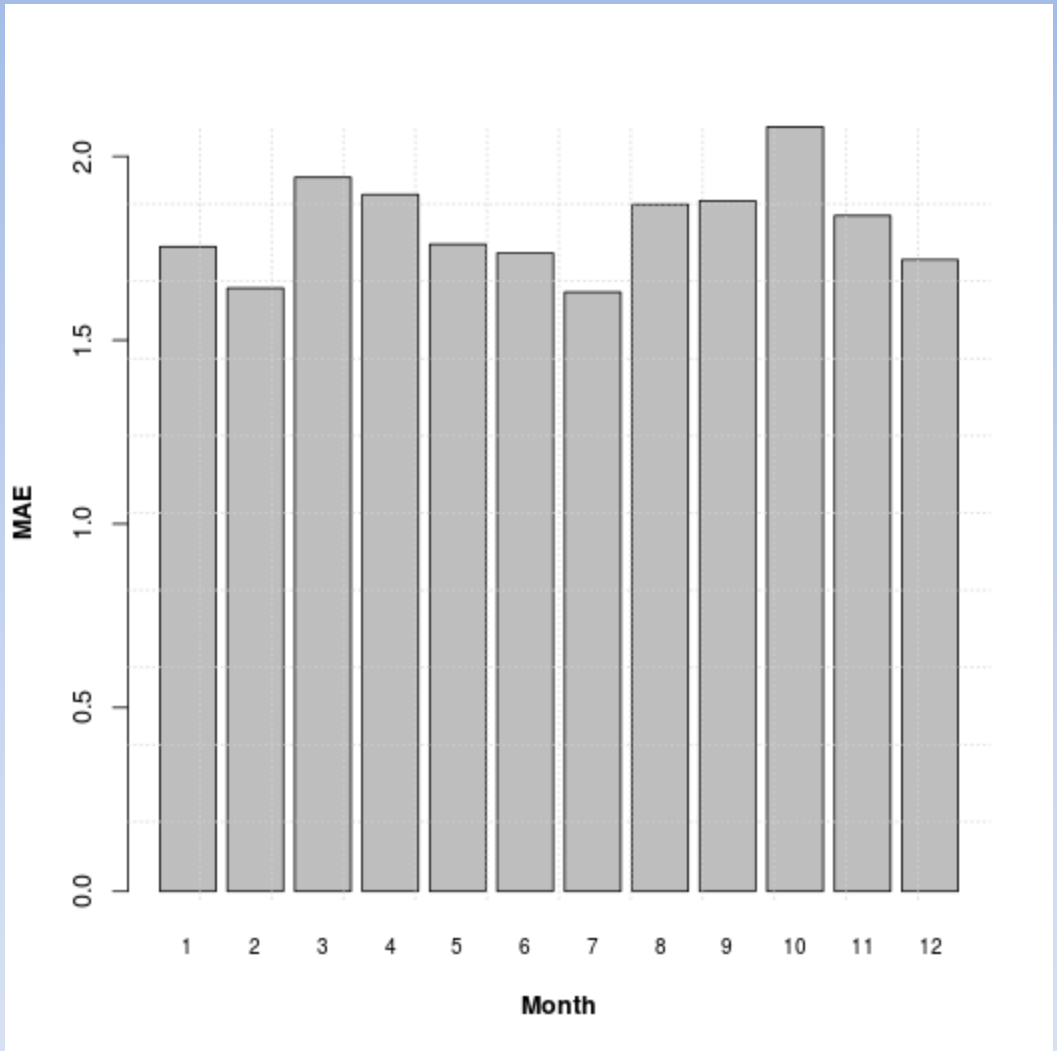
Diff between CAI and fusion and relationship with covar…

II. TEMPORAL PATTERNS RESIDUALS AND PREDICTIONS

MAE per month for validation FUSION



MAE per month for validation CAI

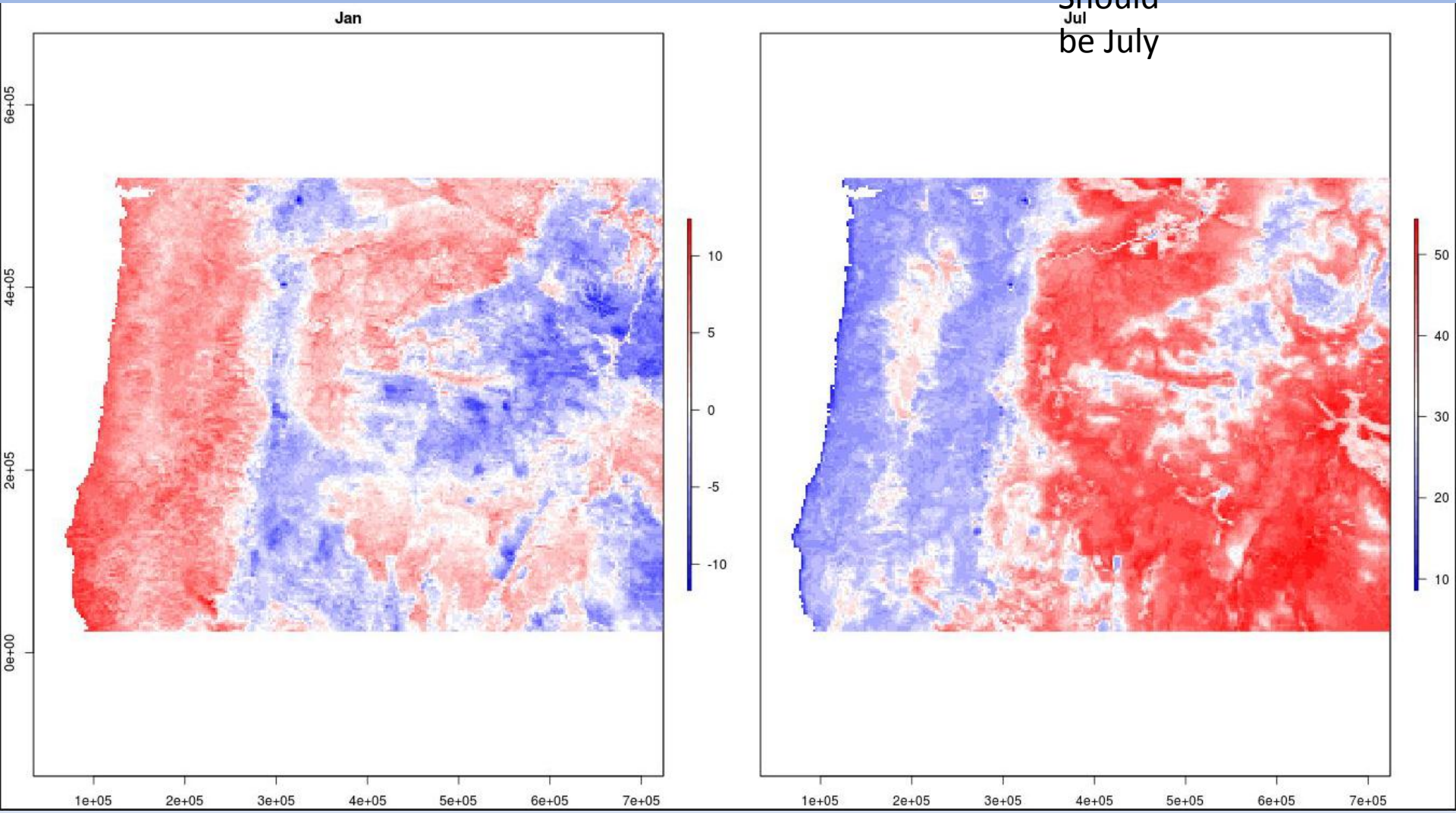


III. DIFFERENCE: COMPARISON BETWEEN CAI AND FUSION

1. Study area
2. Covariates and data input
3. Interpolation methods
4. Workflow for method comparison
5. Model runs and sampling scheme

LST SPATIAL PATTERN

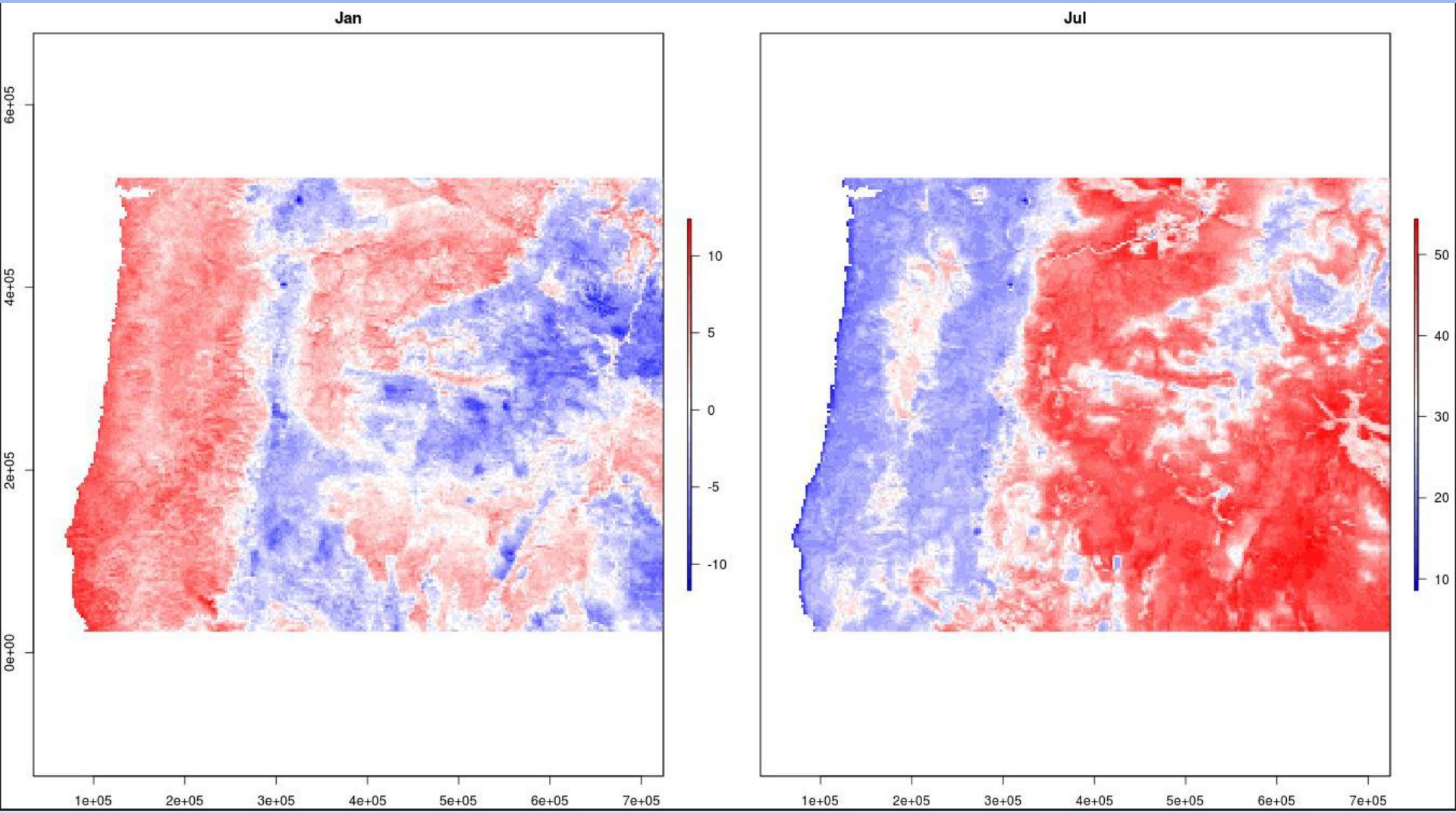
Should be July



- Spatial patterns in the LST images also make sense with:
- Forest areas cooler than surrounding areas in Summer,
- Area near the coast warmer in Winter
- Valley and crop area standing out in July.

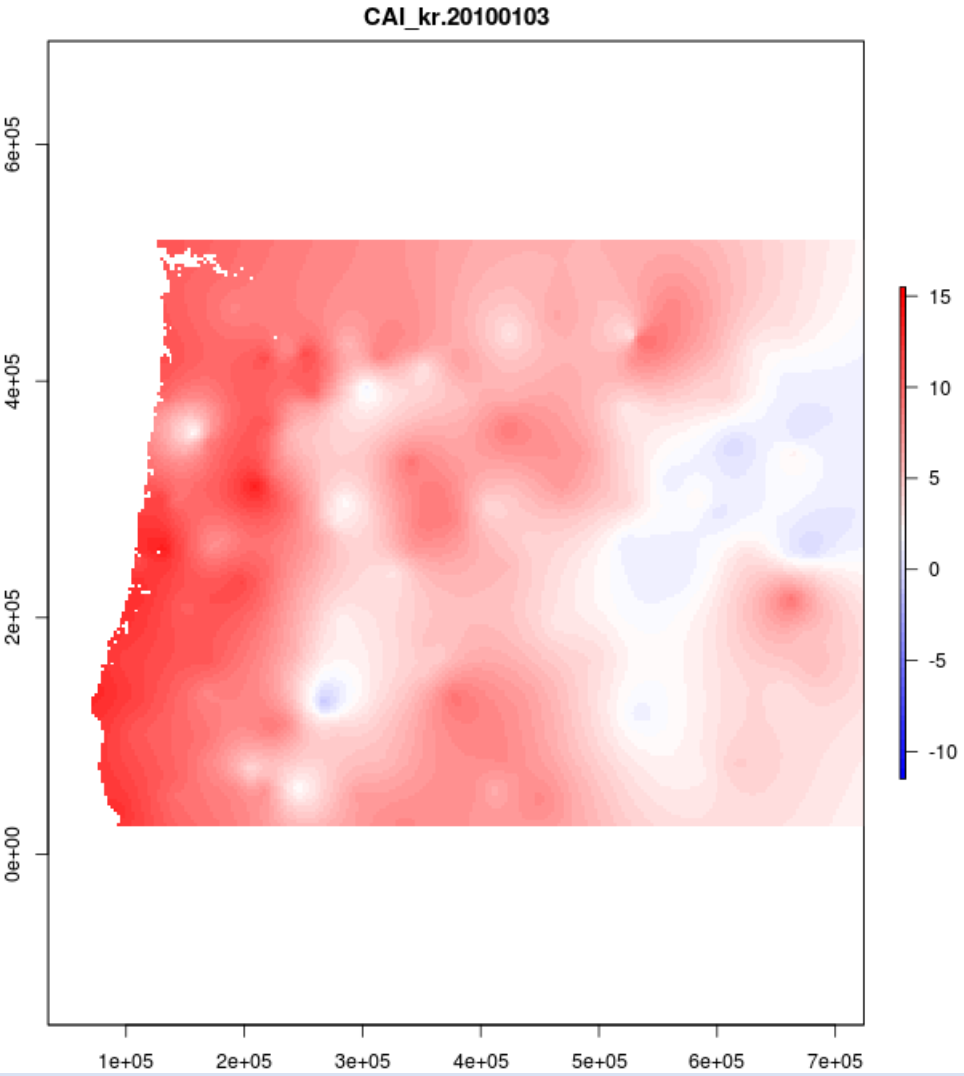
Delta surface

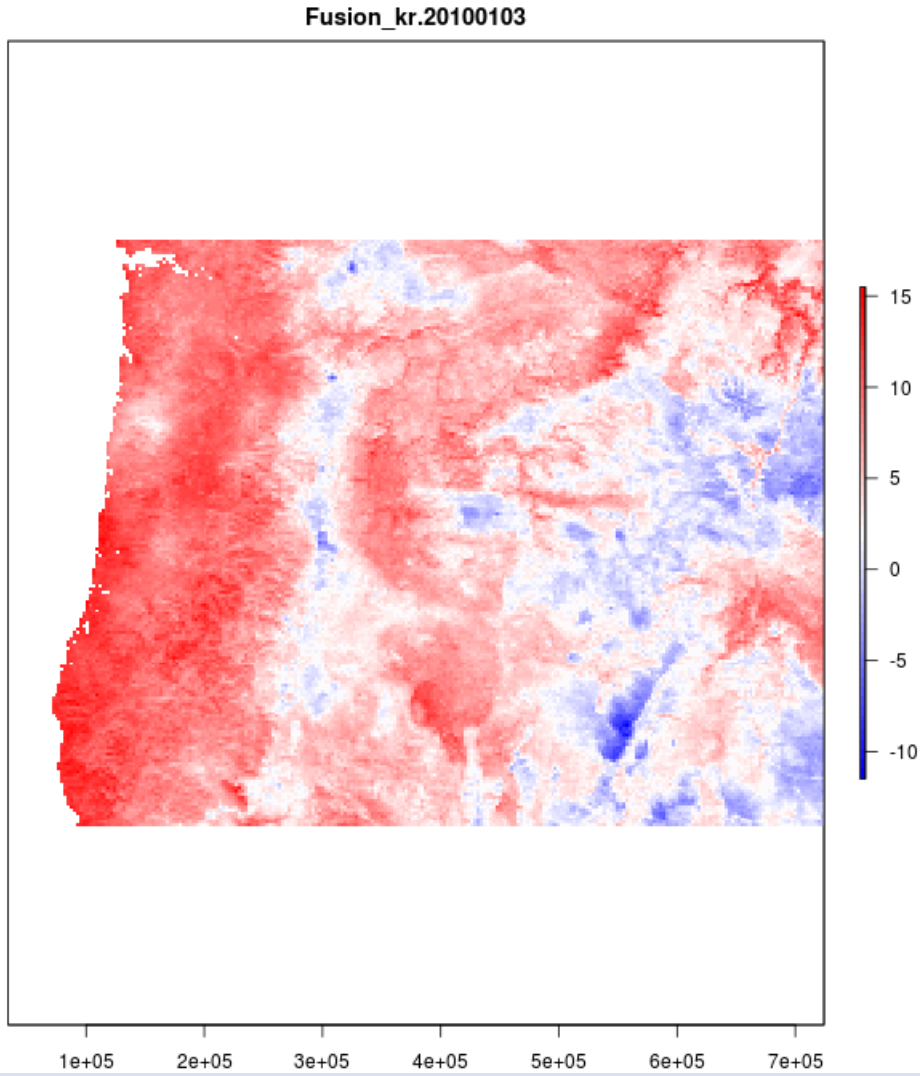
Should be July



- Spatial patterns in the LST images also make sense with:
- Forest areas cooler than surrounding areas in Summer,
- Area near the coast warmer in Winter
- Valley and crop area standing out in July.

Maximum temperature prediction maps on January 3, 2010

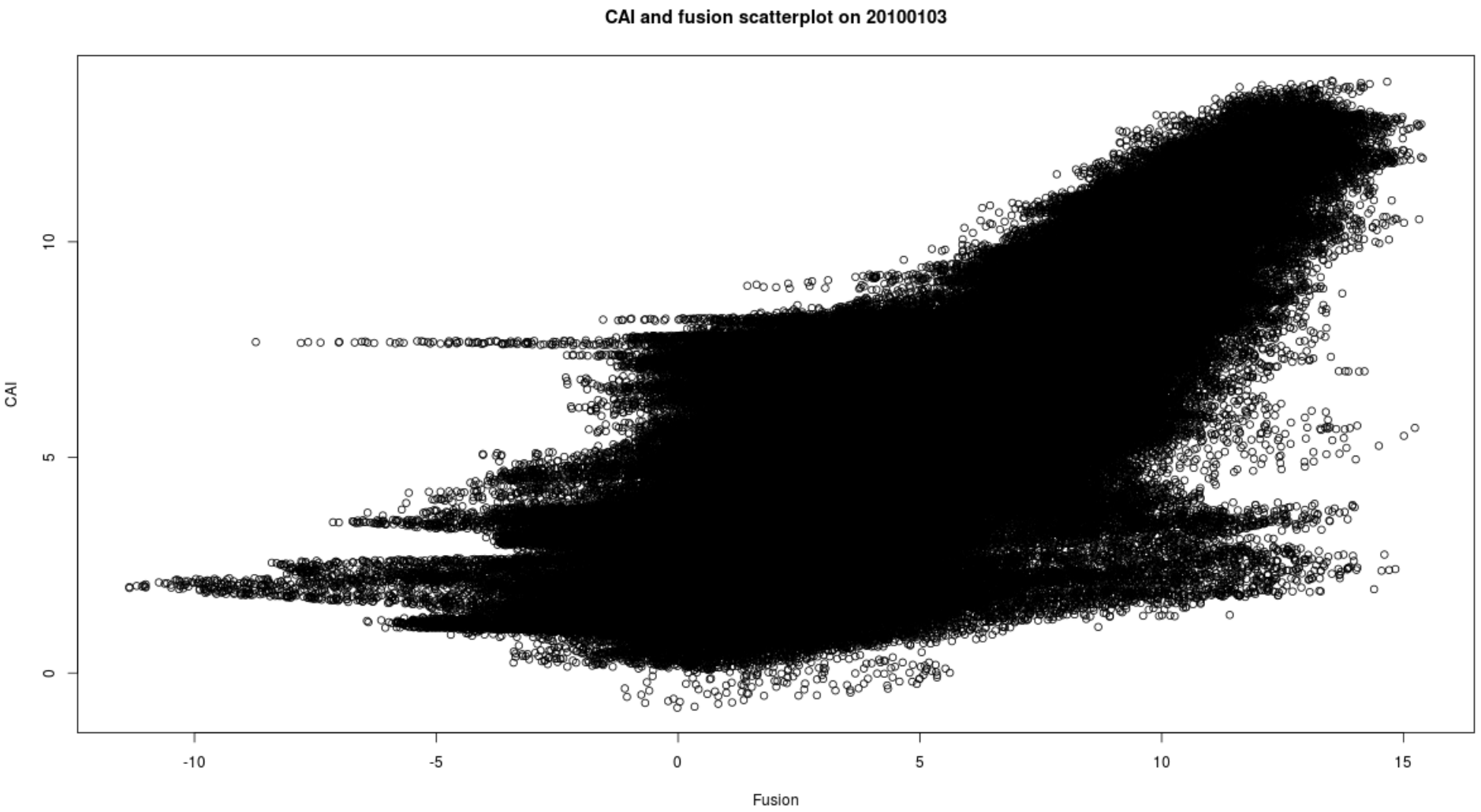




CAI fusion surface (left) is smoother than Fusion surface (right)

Fig diff3

Maximum temperature prediction scatterplot on January 3, 2010



The scatterplot shows that the predictions are clearly different with clouds of point exhibiting some extreme cluster. Note the difference in range is greater in the Fusion image [-12,-15] compared to CAI [-2,15].

Fig diff4

Outliers study for difference in prediction on January 3, 2010

Outliers: 2 standard deviation…

? check

River?
Canyon

Higher
elevation

Std=…
Mean=

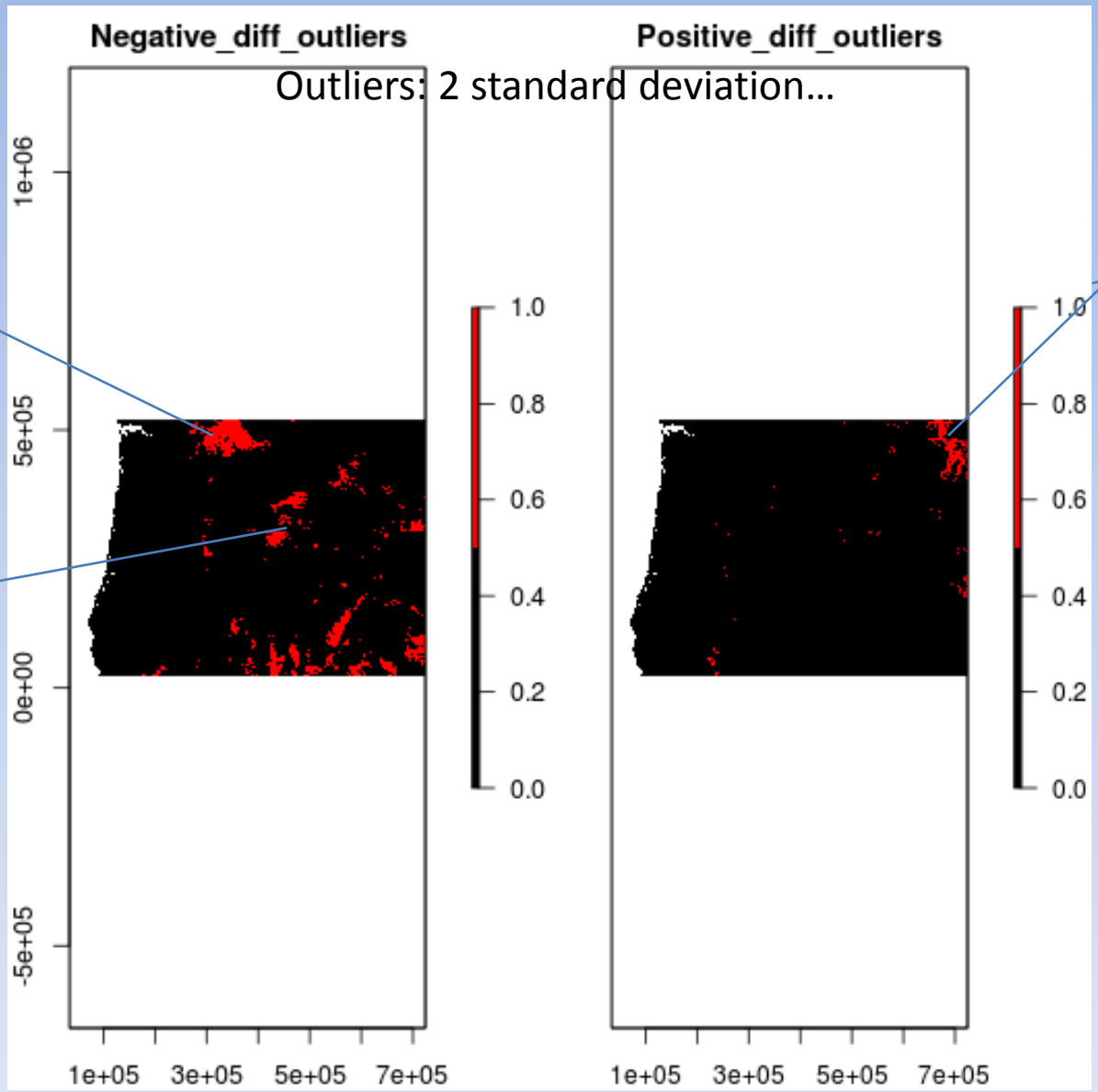
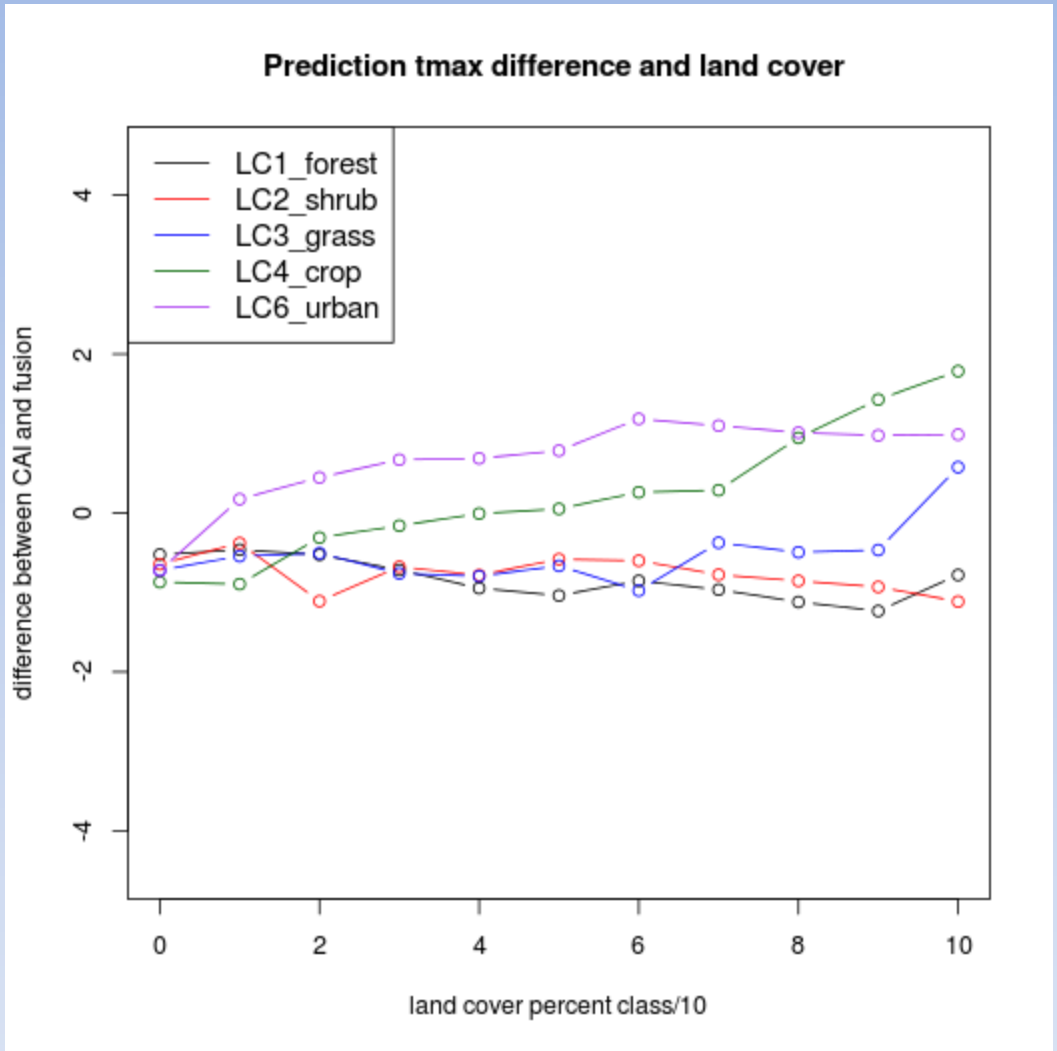


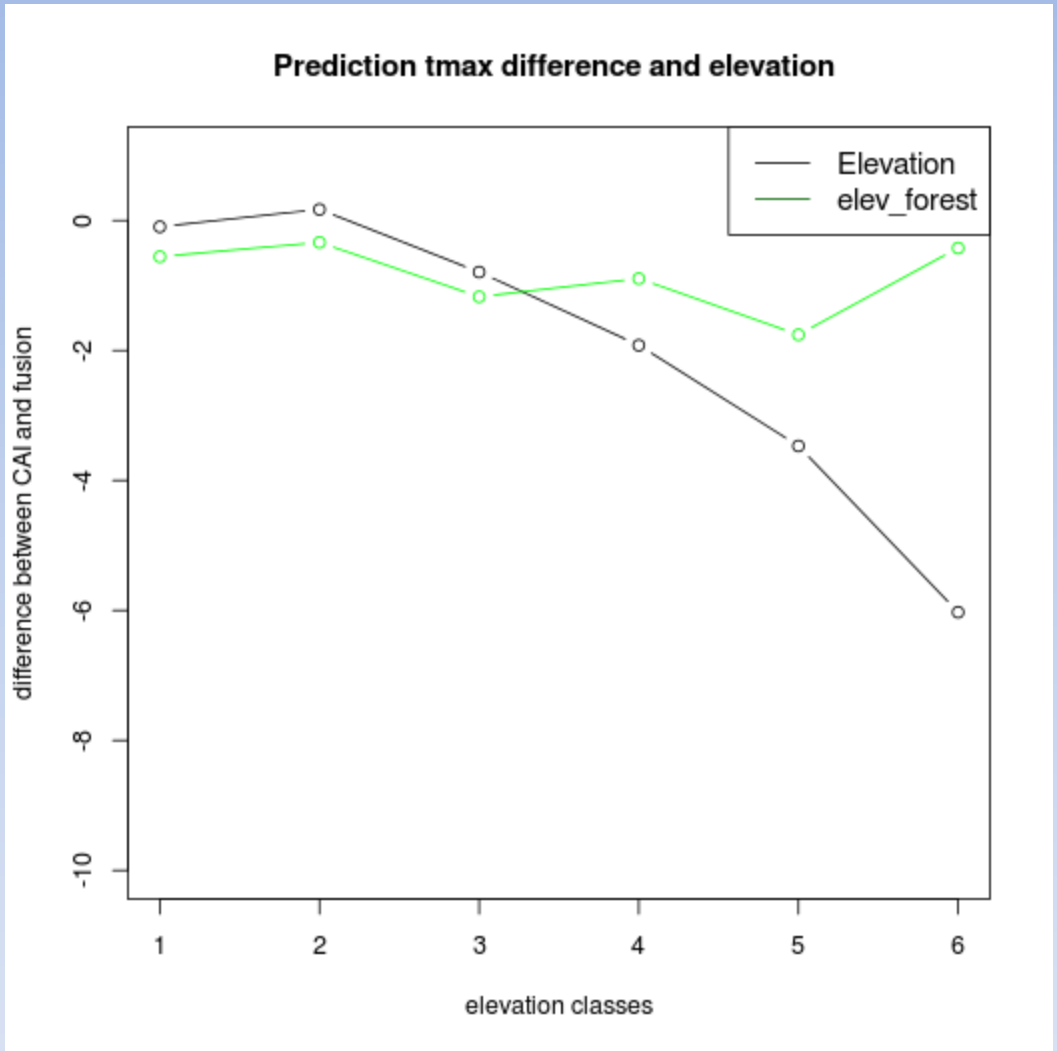
Fig diff4



We found that difference between CAI and fusion increases when the prportion grass, crop and urban increases. These differences are however low: about 1 to 1.5 degree C warmer for the fusion method.

Fig diff5

January 3, 2012…

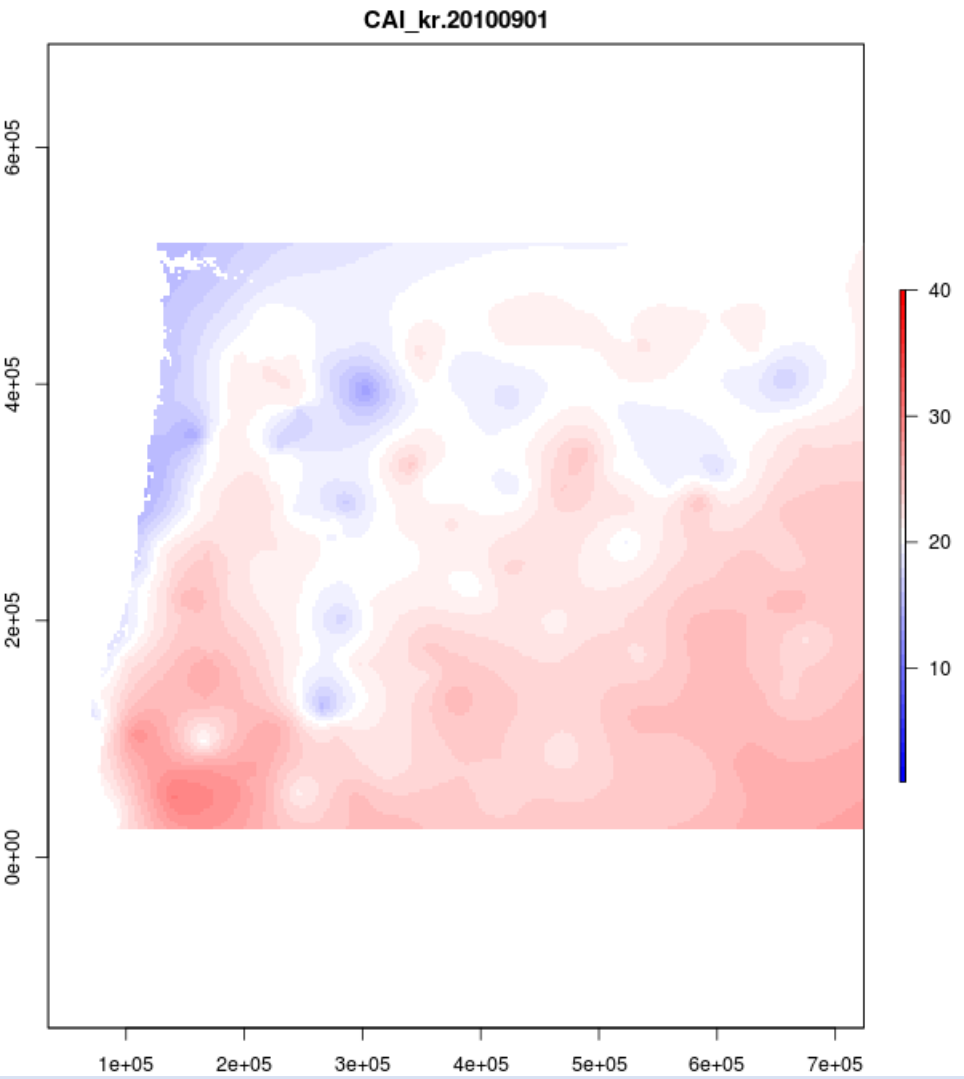


Is it significant given the large standard deviation?

Fig diff7

We found that difference between CAI and fusion increases when elevation increases. This is mostly true for elevation classes starting at 1000m.

Date 2: 09/01/2012


CAI_kr.20100901
6e+05
4e+05
2e+05
0e+00
1e+05
2e+05
3e+05
4e+05
5e+05
6e+05
7e+05
40
30
20
10

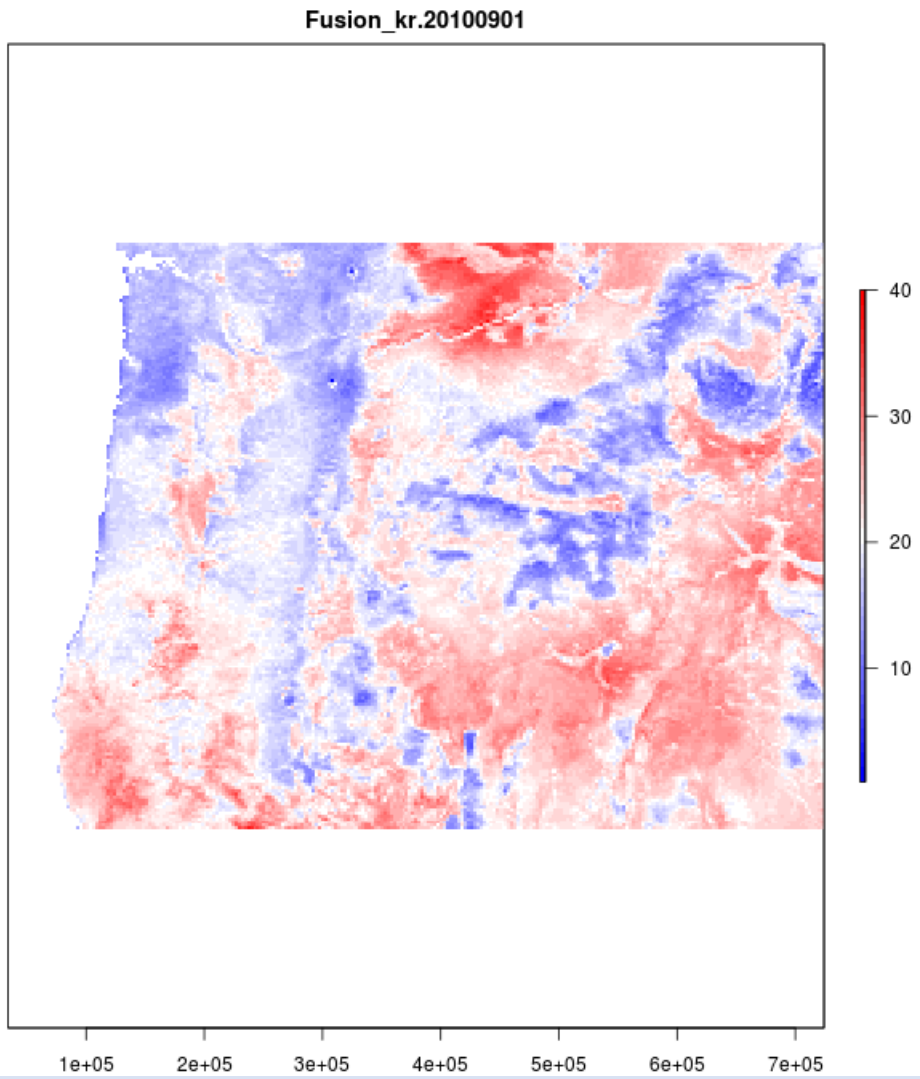

Fusion_kr.20100901
1e+05
2e+05
3e+05
4e+05
5e+05
6e+05
7e+05
40
30
20
10

Fig diff3

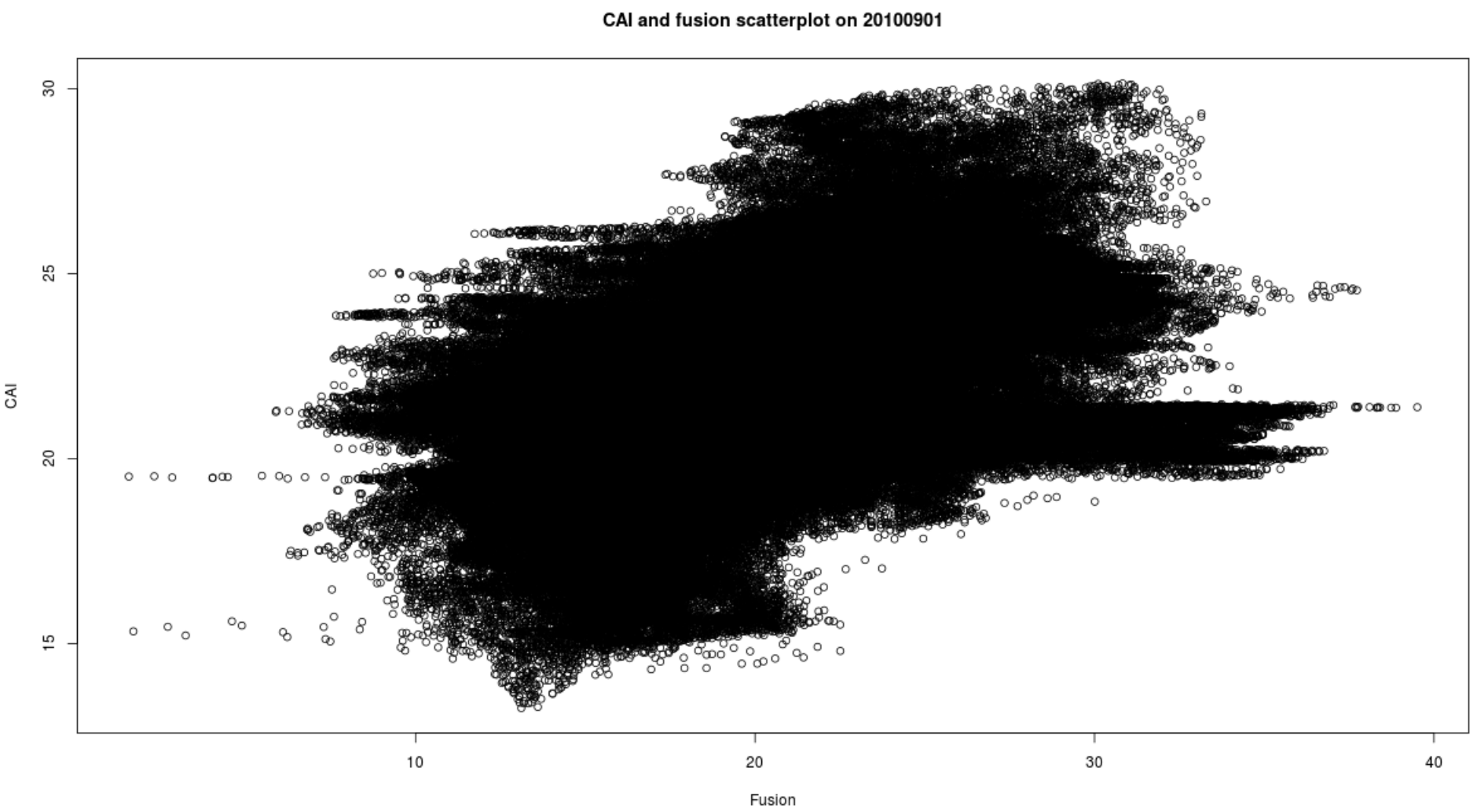
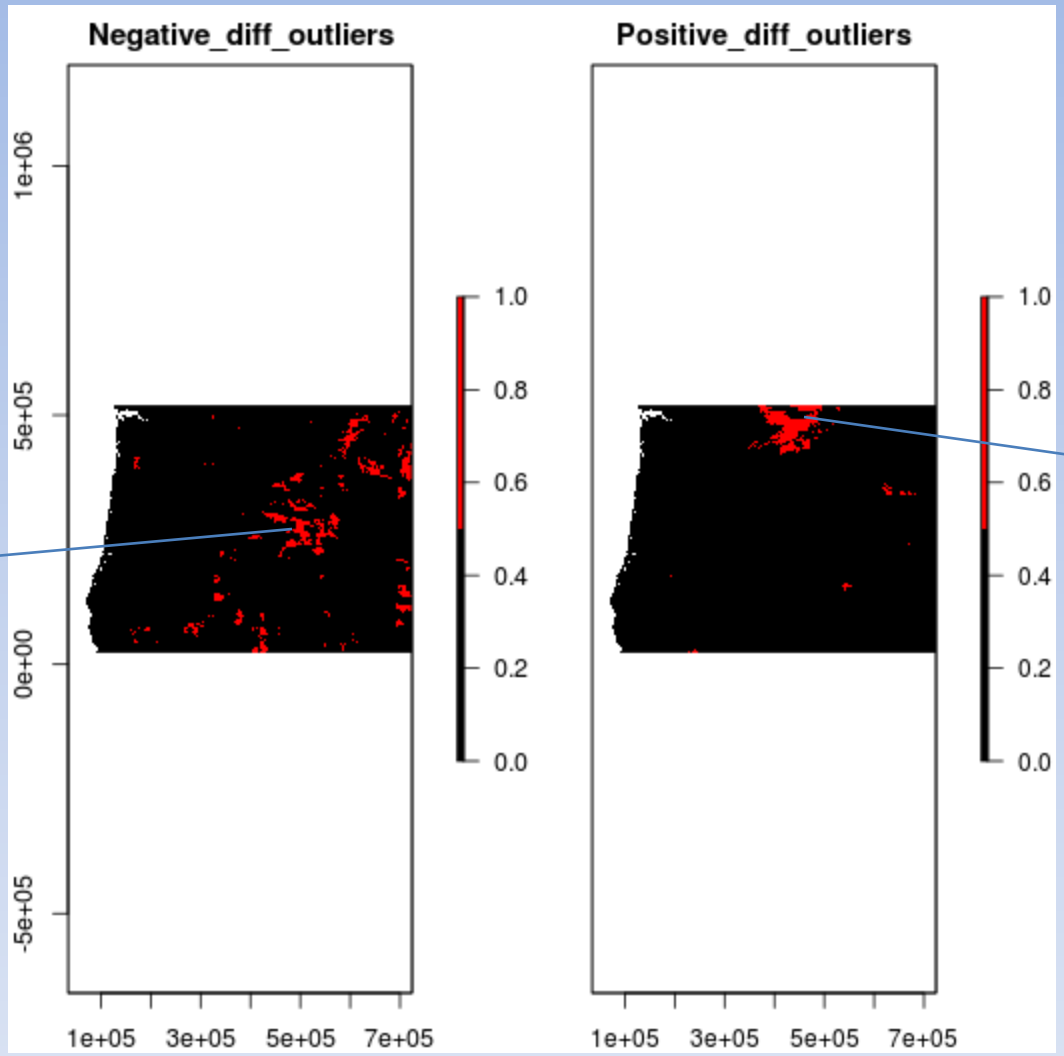

CAI and fusion scatterplot on 20100901
CAI
Fusion
15
20
25
30
10
20
30
40

Fig diff4

Outliers: 09-01-2012

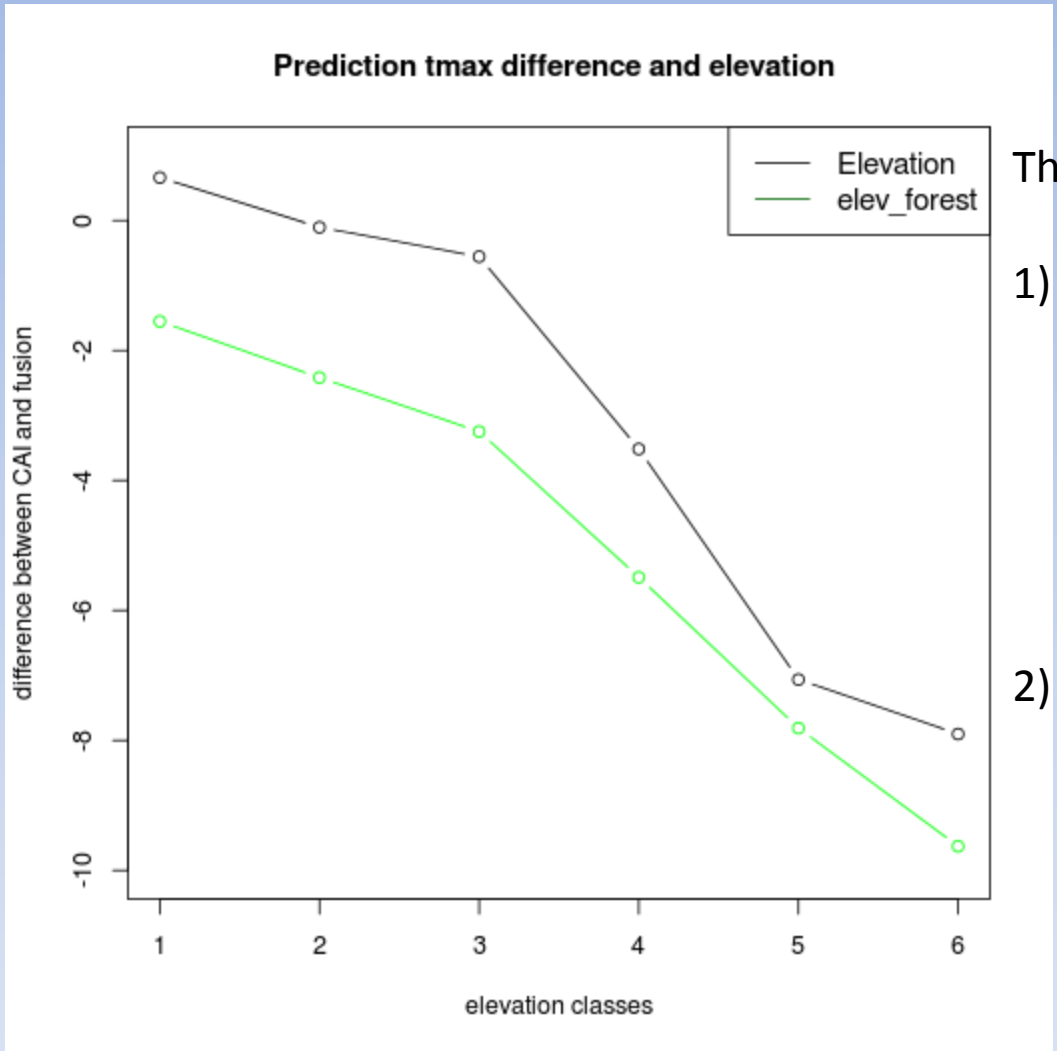


High elevation areas…

Crop/grass areas…

Fig diff5

This shows outliers areas for the difference surface (Fusion-CAI) on September 9, 2012. Outliers areas were defined as being 2 standard deviation away from the mean.

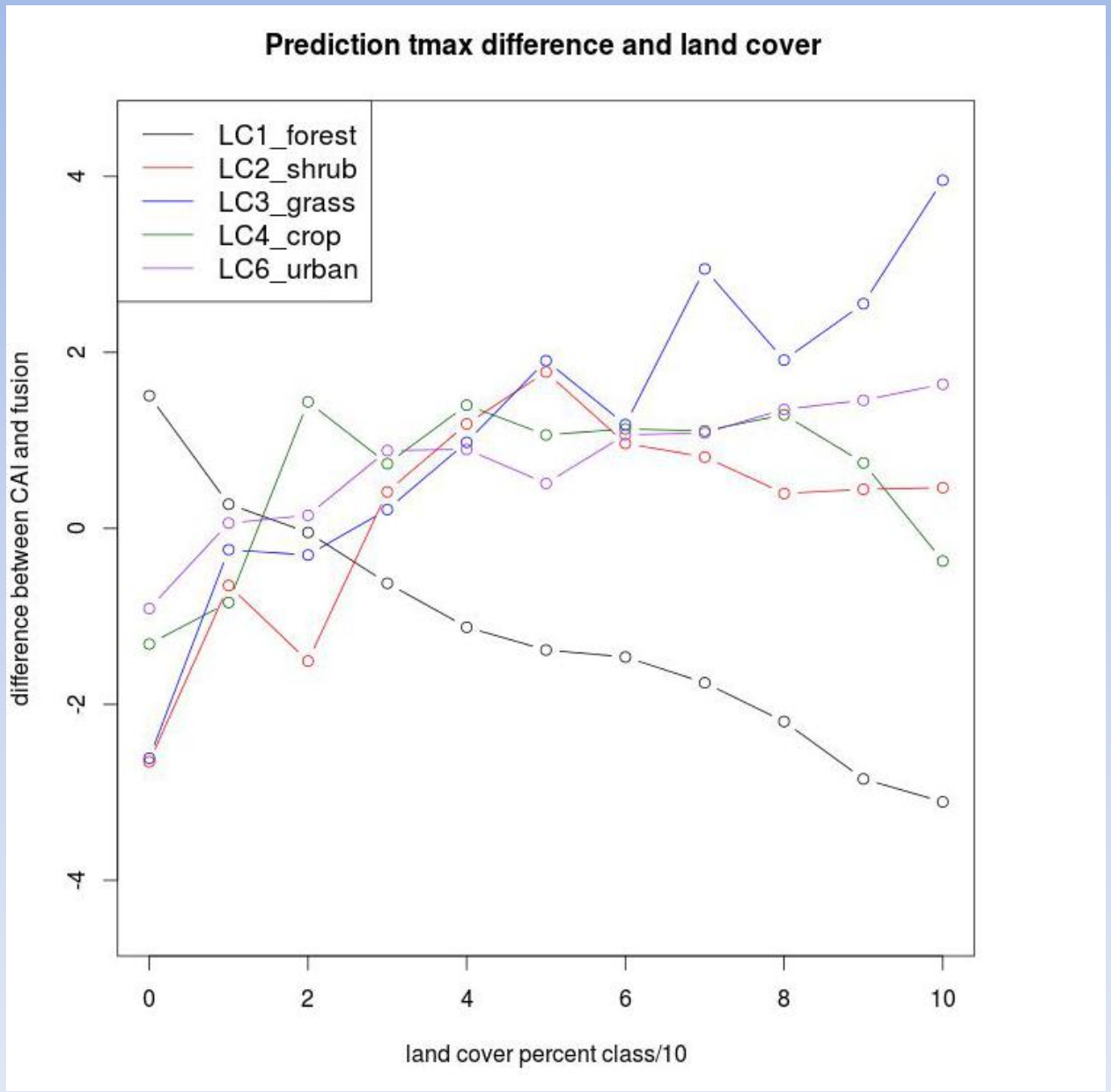


This indicates that …

1) Fusion tmax is lower than CAI in high elevation areas, the higher the altitude the more important the cooling is.
2) Fusion tmax is greater than CA in grass areas, the more grass the more important the warming is.

Fig diff6

PLOT AVERAGE TMAX AT MONTHLY TIME SCALE AND COMPARE CAI AND FUSION



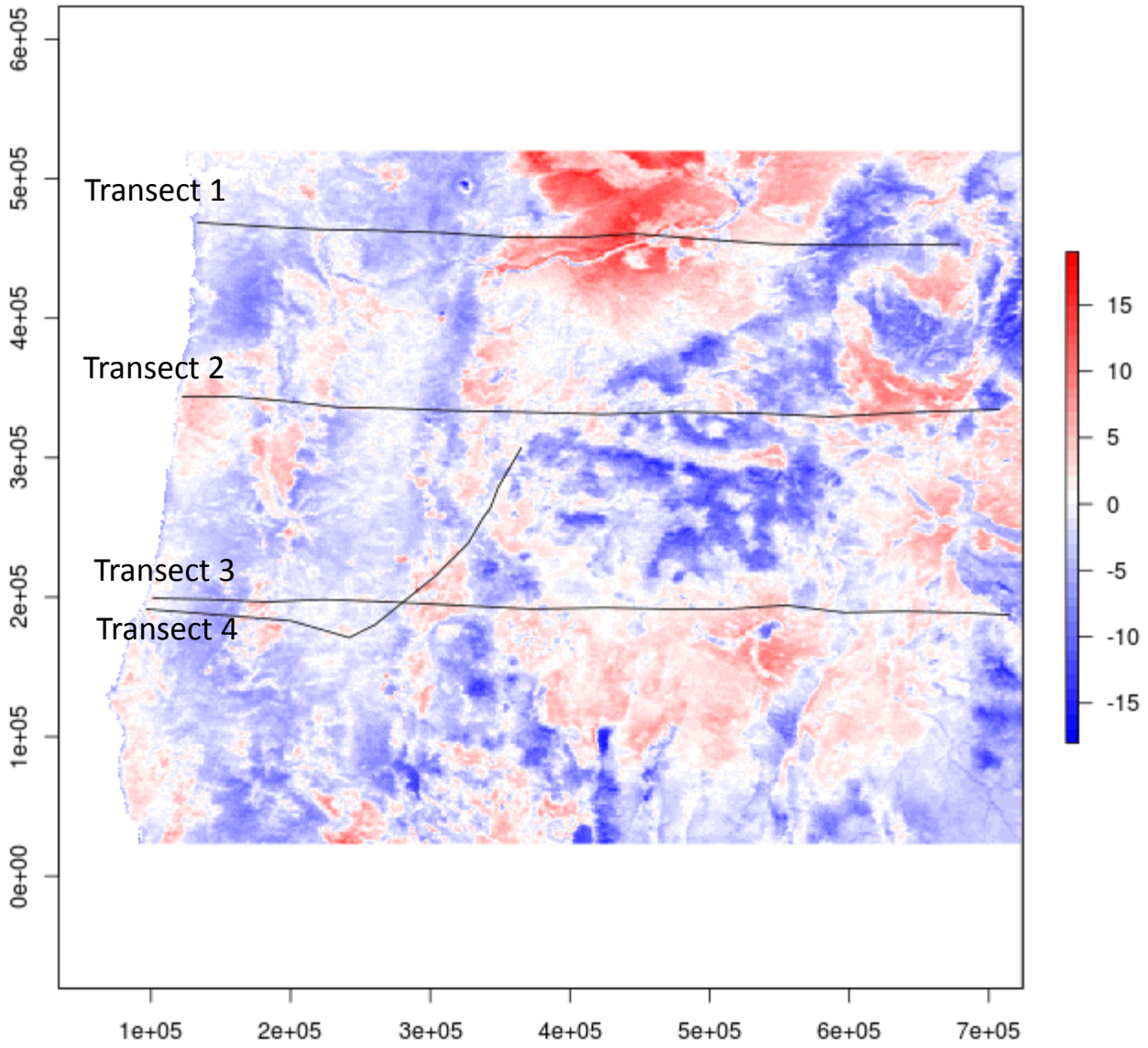
This indicates that …

1) Fusion tmax is lower than CAI in forest areas, the more forest there is the more important the cooling is.
2) Fusion tmax is greater than CA in grass areas, the more grass the more important the warming is.

IV. SPATIAL TRANSECTS ANALYSES

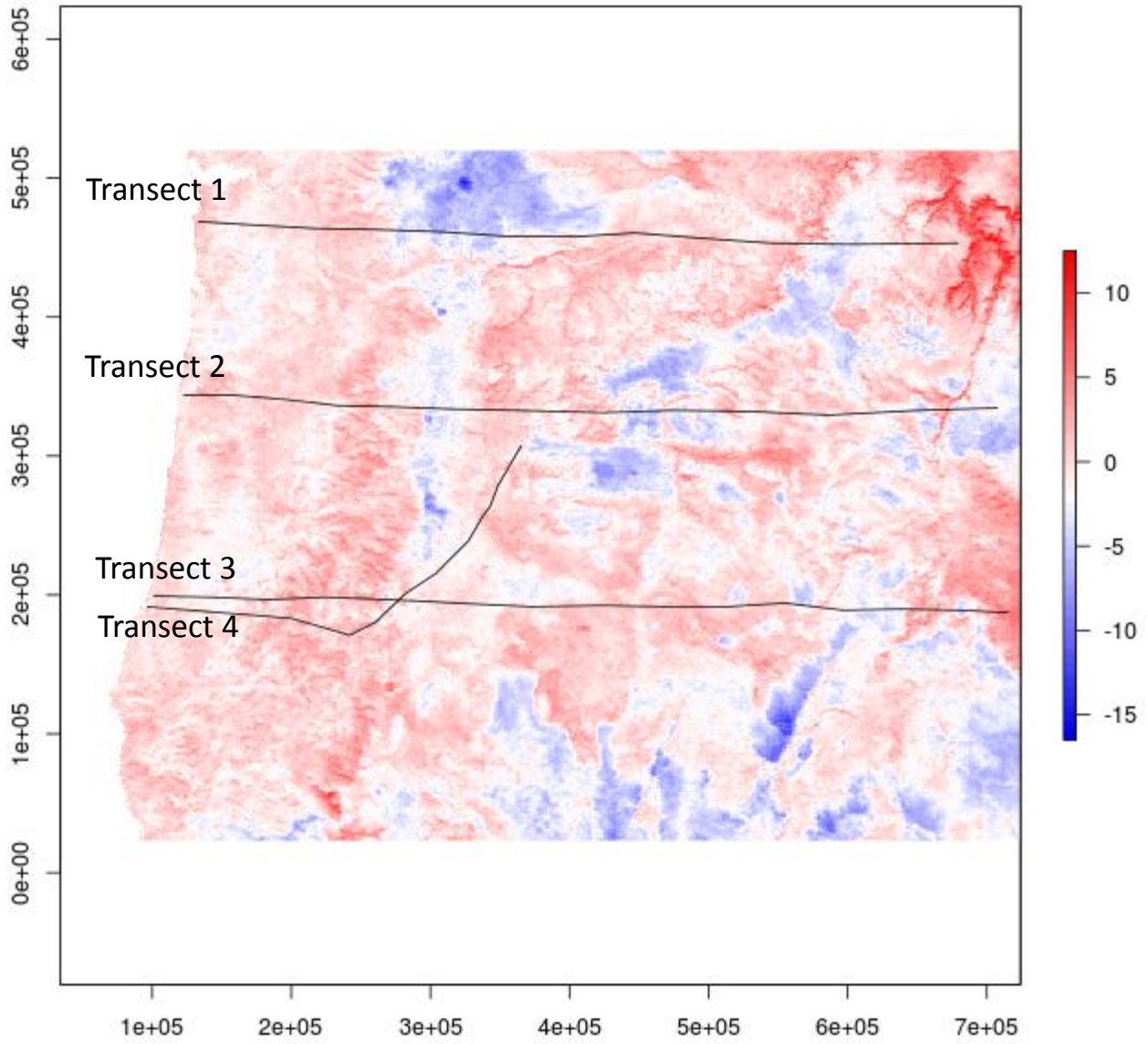
1. Transects map
2. Date 1 transects profiles
3. Date 2 transects profiles

SPATIAL PROFILE: TRANSECT AND TMAX PREDICTION



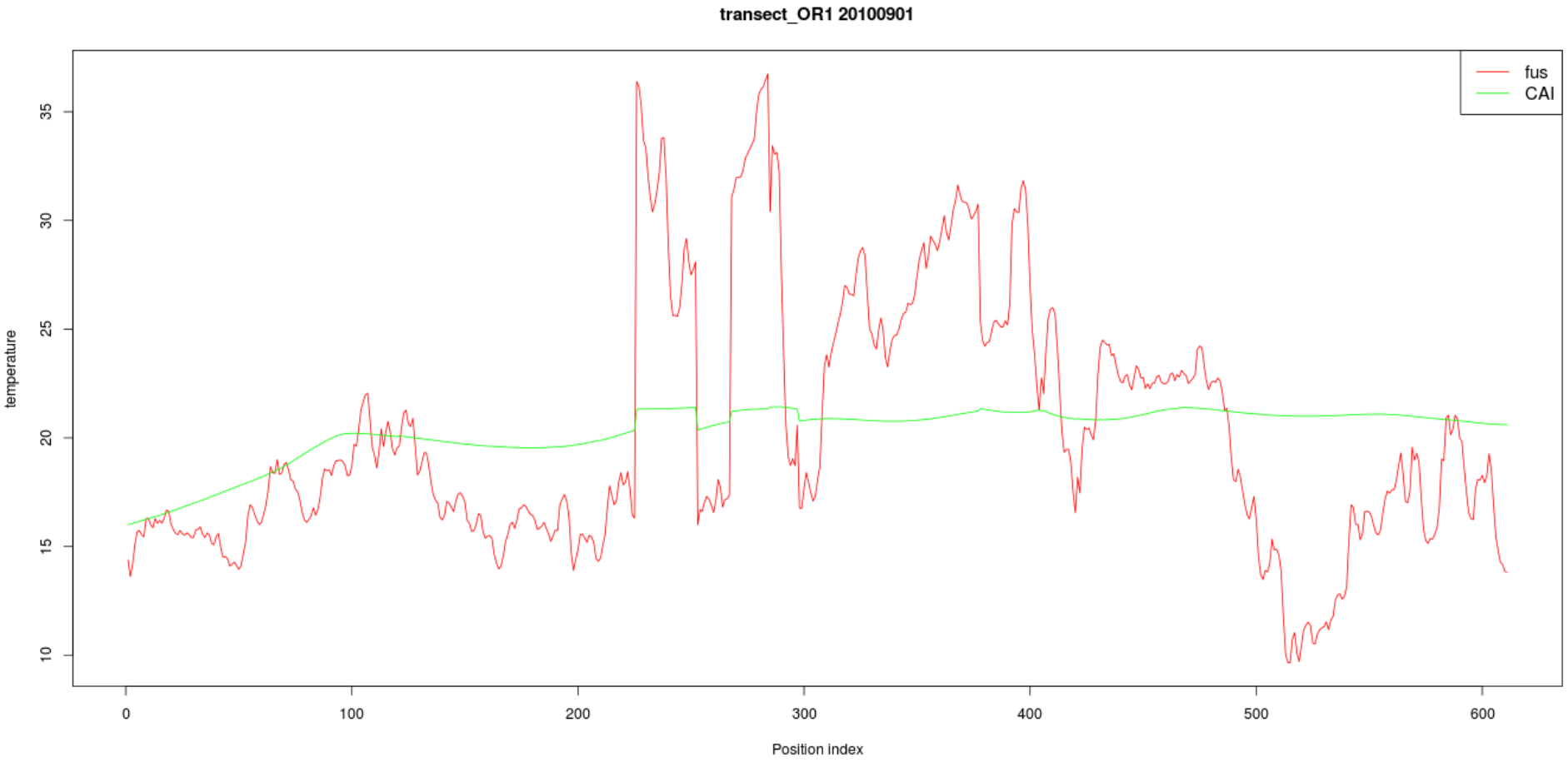
For transect 4, we selected a sequence of 11 meteorological station to create a transect of maximum temperature across the landscape transitioning from coastal to mountainous areas in the interior.

SPATIAL PROFILE: TRANSECT AND TMAX PREDICTION



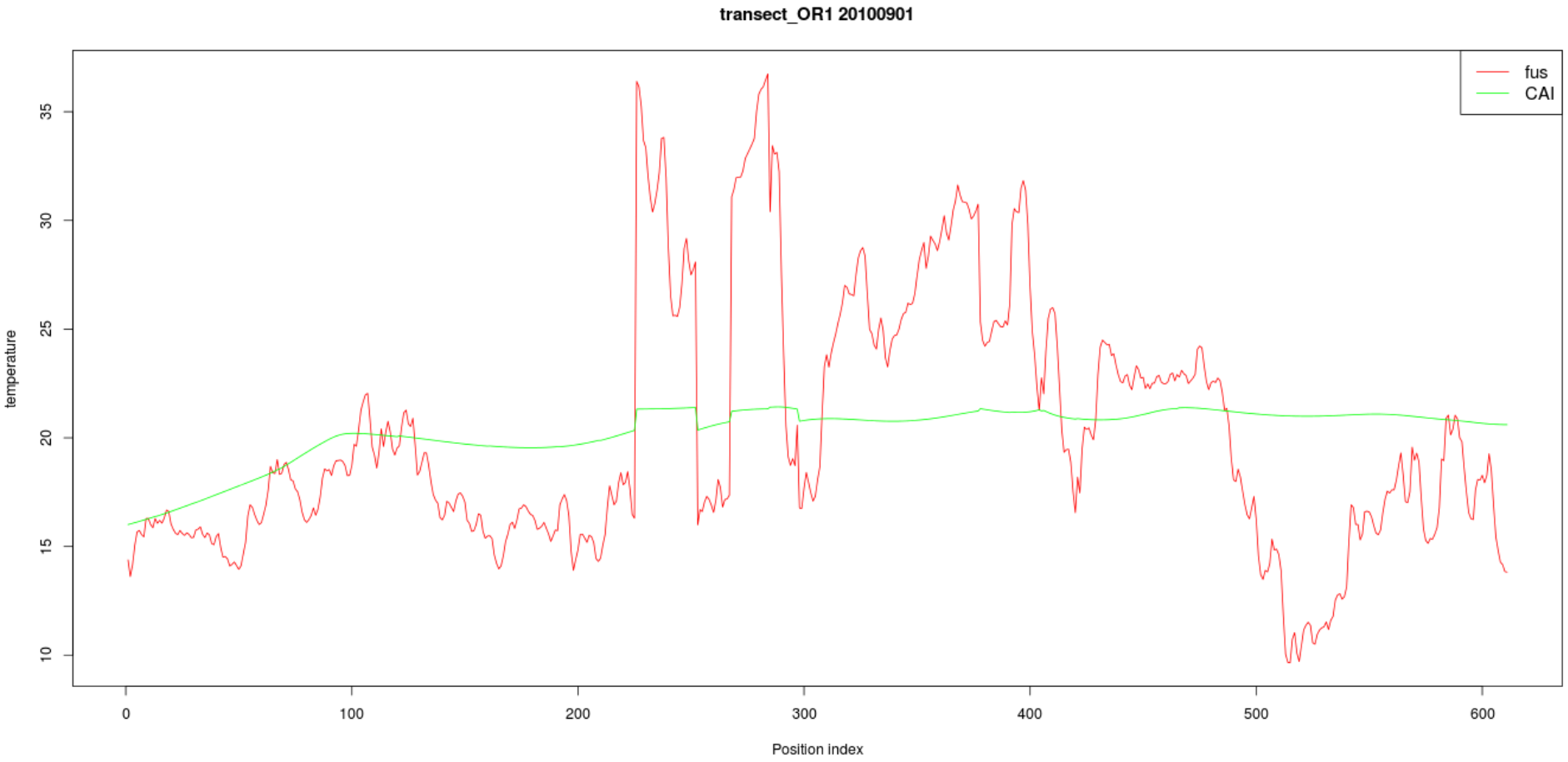
For transect 4, we selected a sequence of 11 meteorological station to create a transect of maximum temperature across the landscape transitioning from coastal to mountainous areas in the interior.

Date 1: SPATIAL TRANSECT 1: SEPTEMBER 1,2010

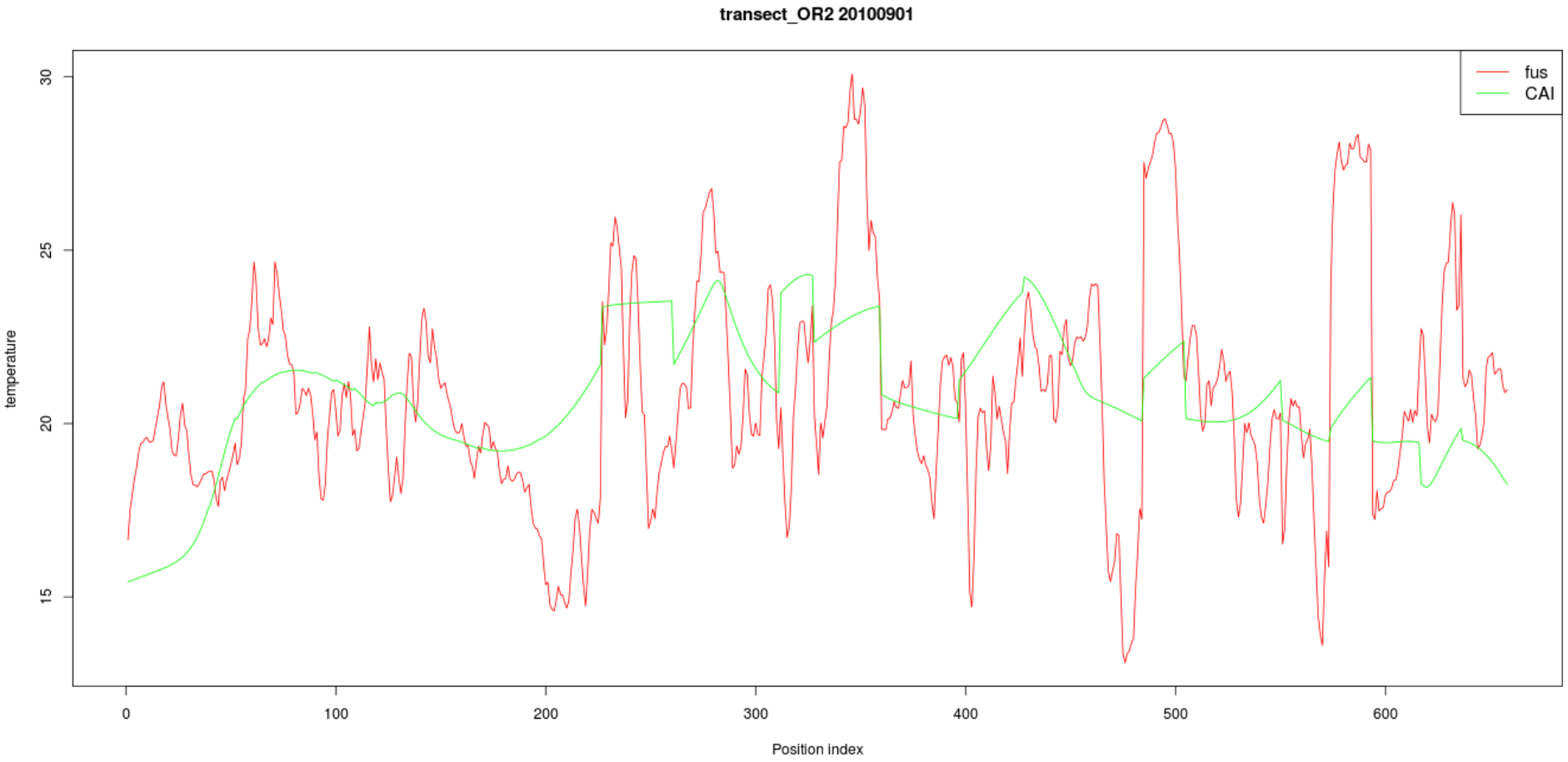


Note the peak realted to spike in temperature from crop areas.

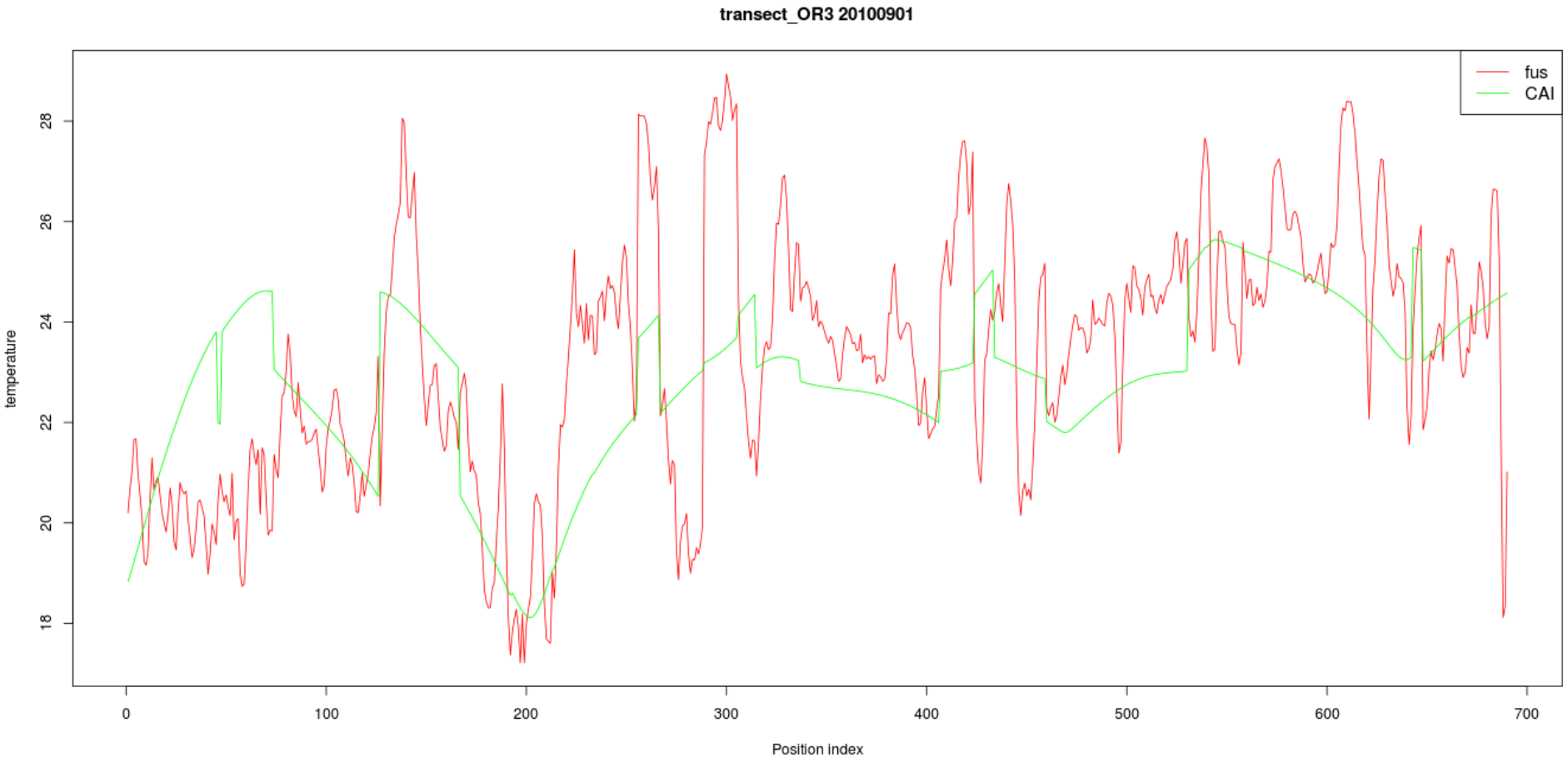
SPATIAL TRANSECT 1: SEPTEMBER 2,2010



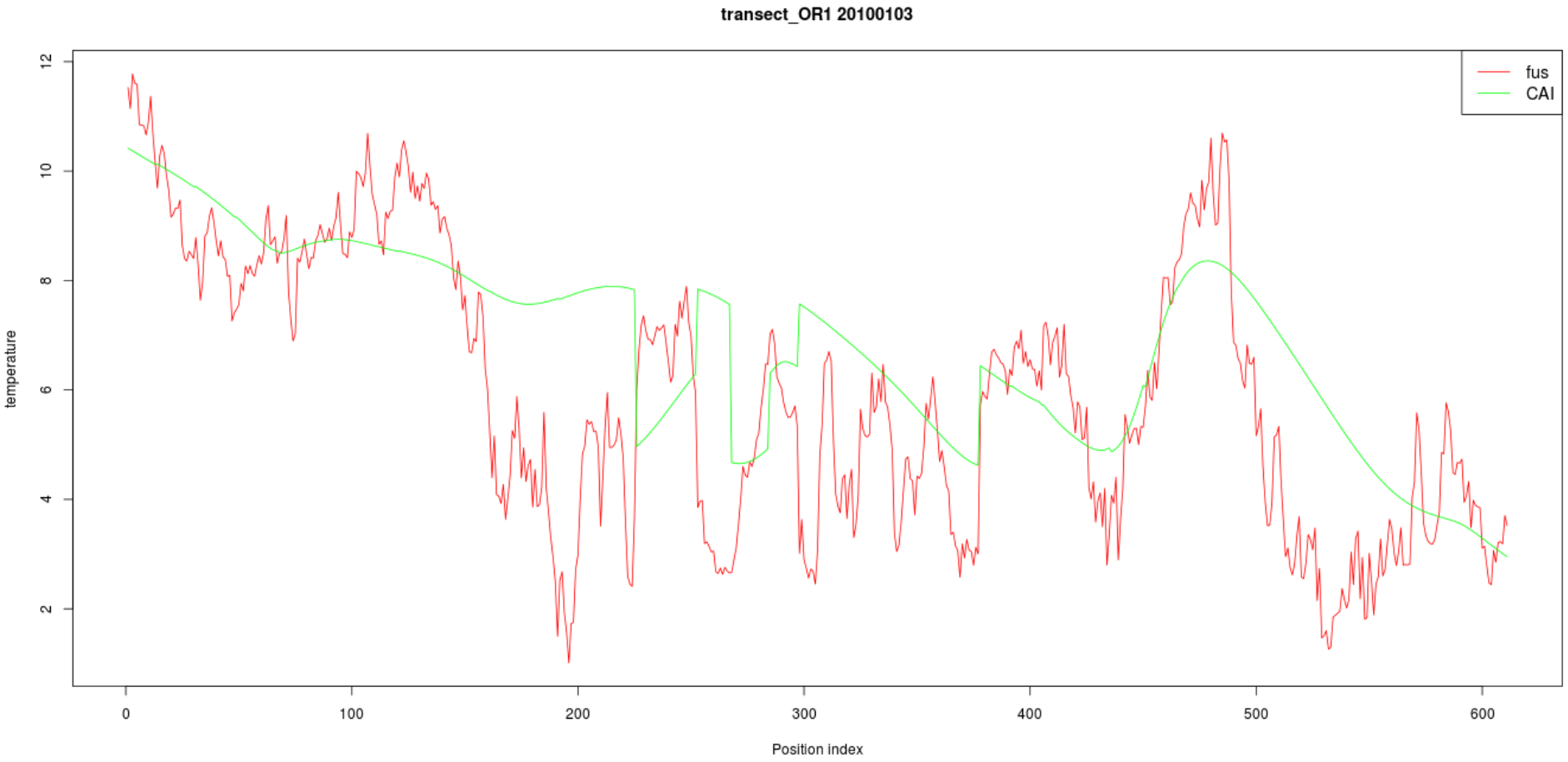
SPATIAL TRANSECT 2: SEPTEMBER 1,2010



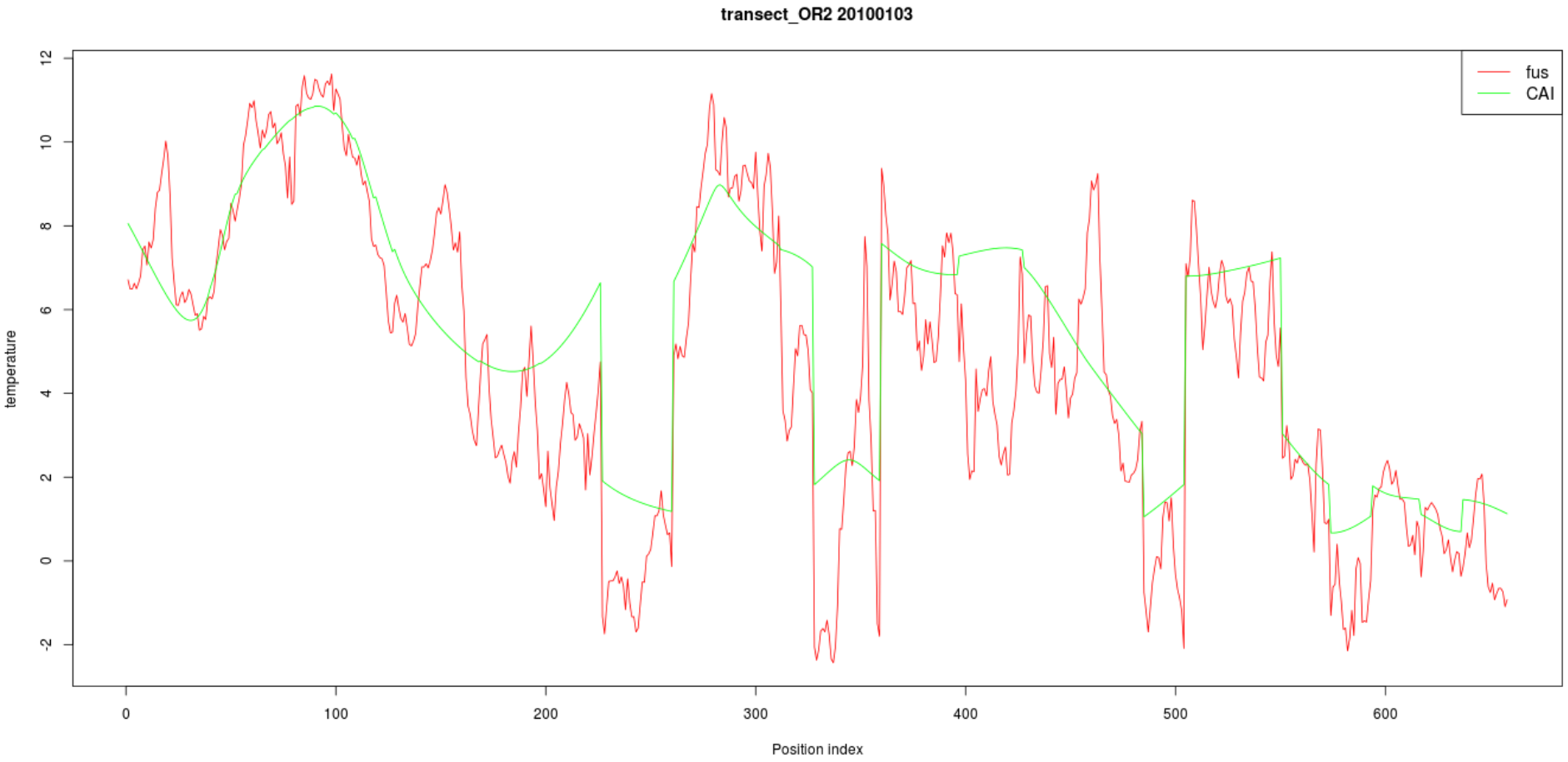
SPATIAL TRANSECT 3: SEPTEMBER 2,2010



SPATIAL TRANSECT 1: January 3, 2010

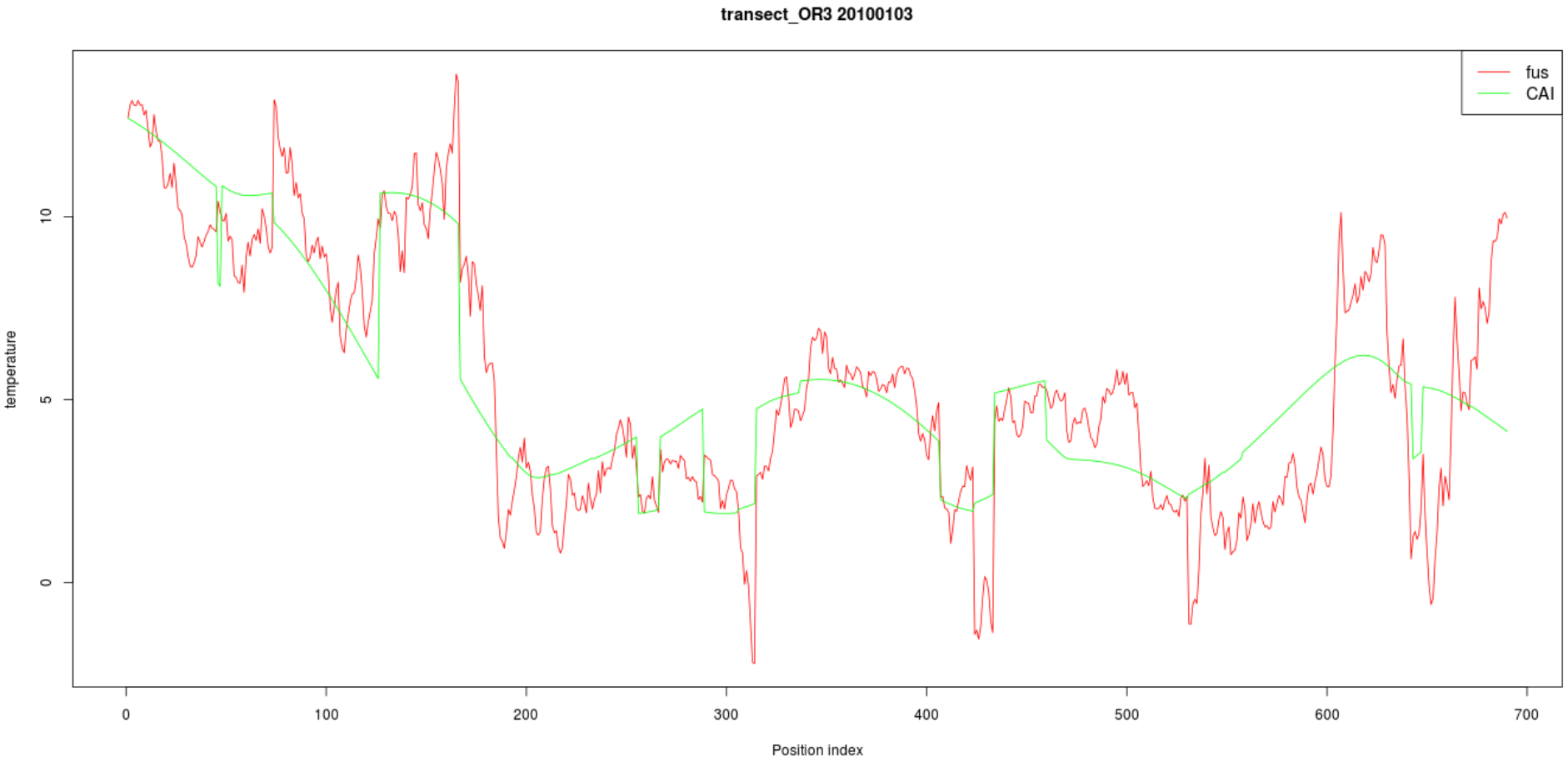


SPATIAL TRANSECT 2: January 3, 2010



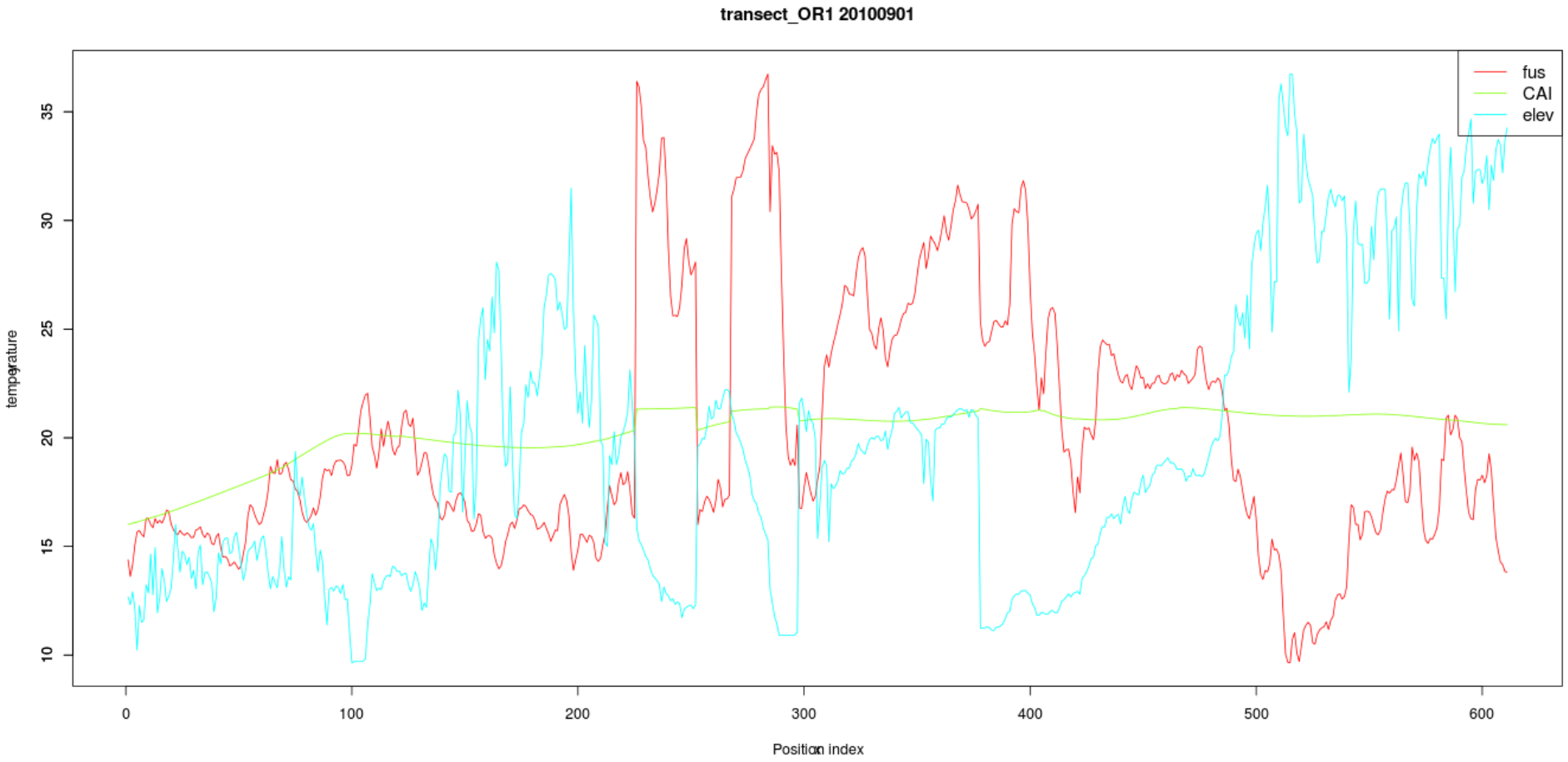
Maximum temperature prediction

SPATIAL TRANSECT 3: January 3, 2010



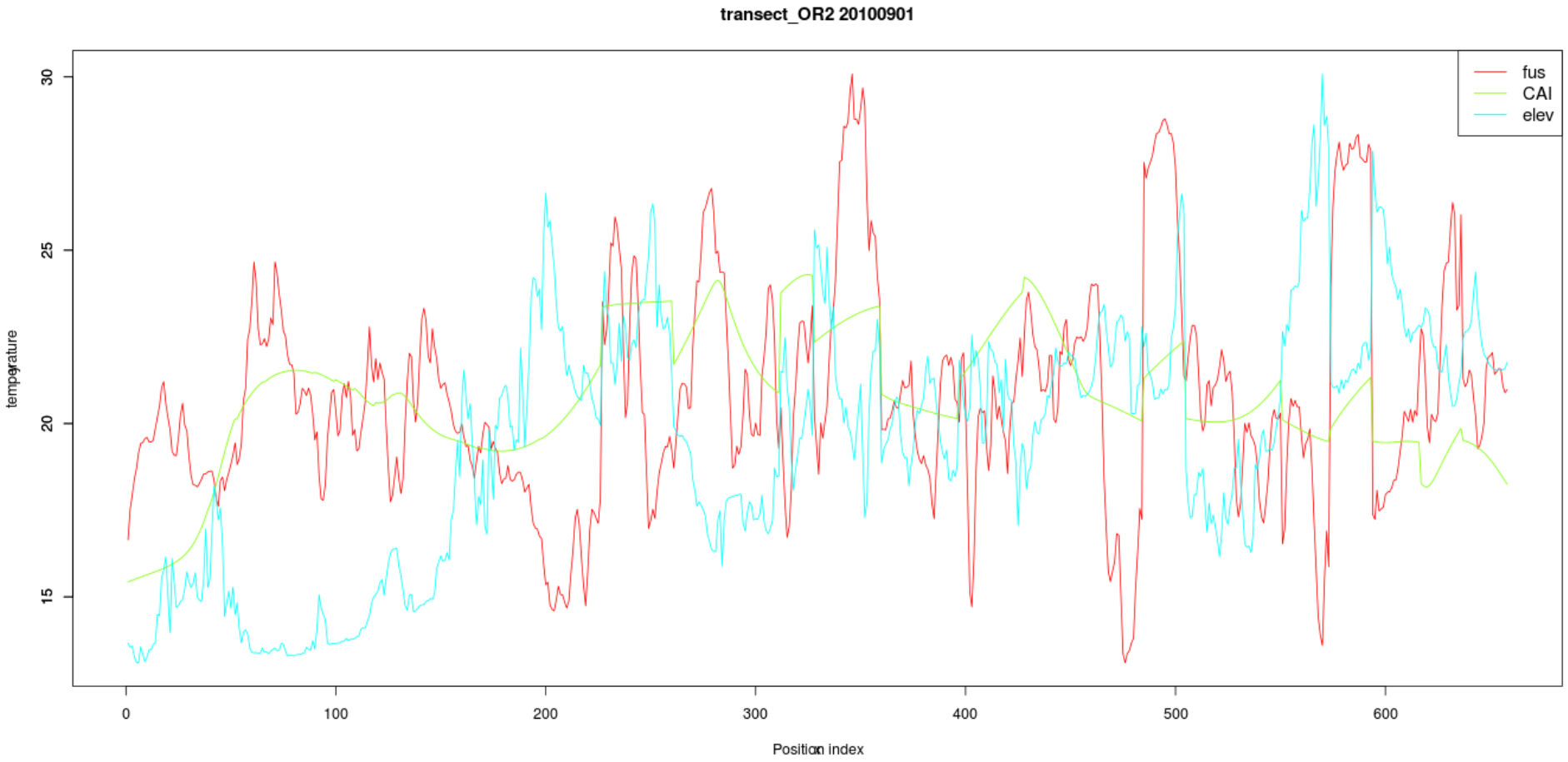
SPATIAL TRANSECTS: ELEVATION AND TEMPERATURE PREDICTIONS

Transect 1: 20100901



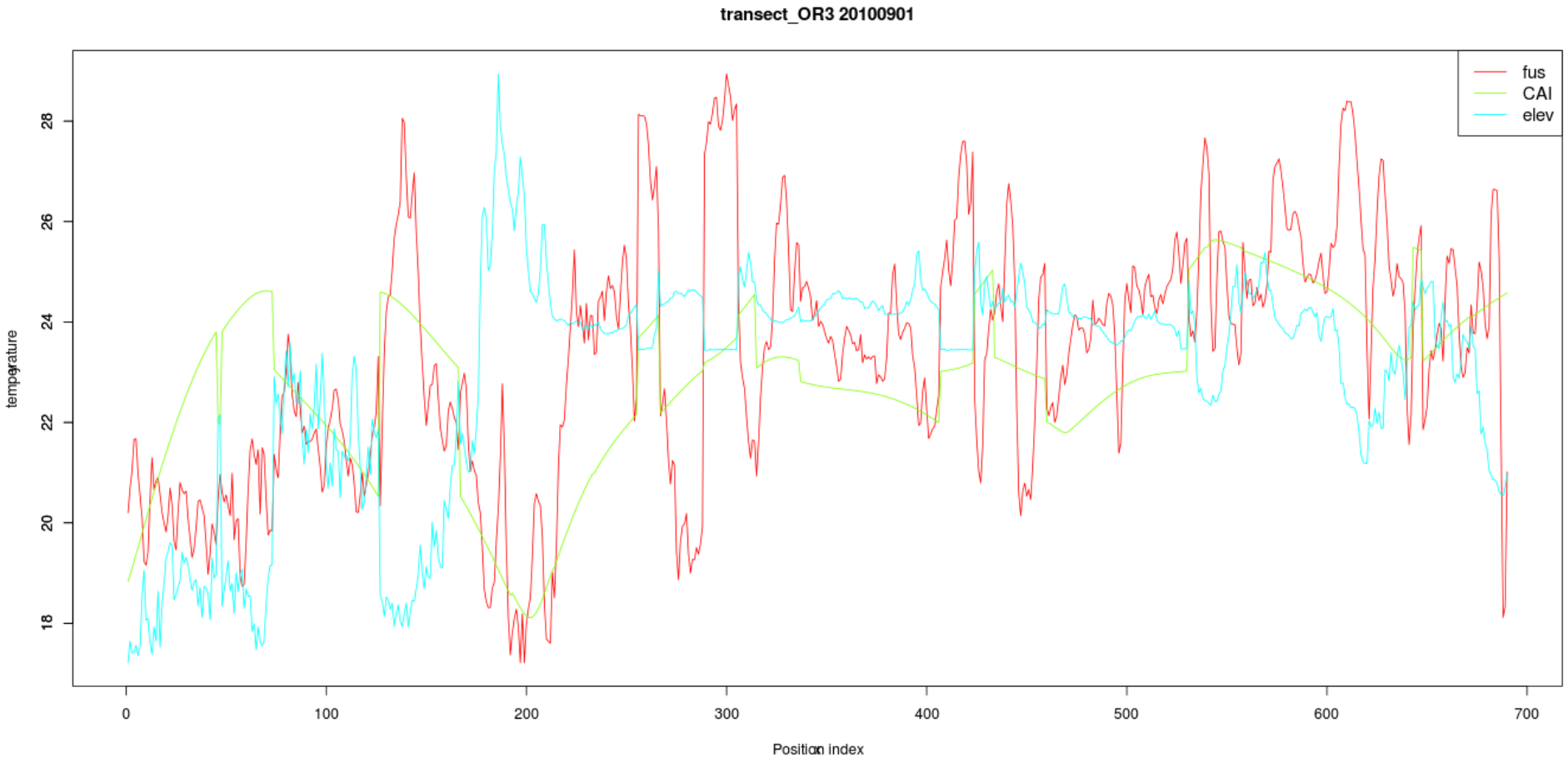
Correlation fus and elev: -0.40
Correlation fus and cai : 0.46
Correlation cai and elev : 0.28

Transect 2: 20100901



Correlation fus and elev: -0.10
Correlation fus and cai : 0.34
Correlation cai and elev : 0.19

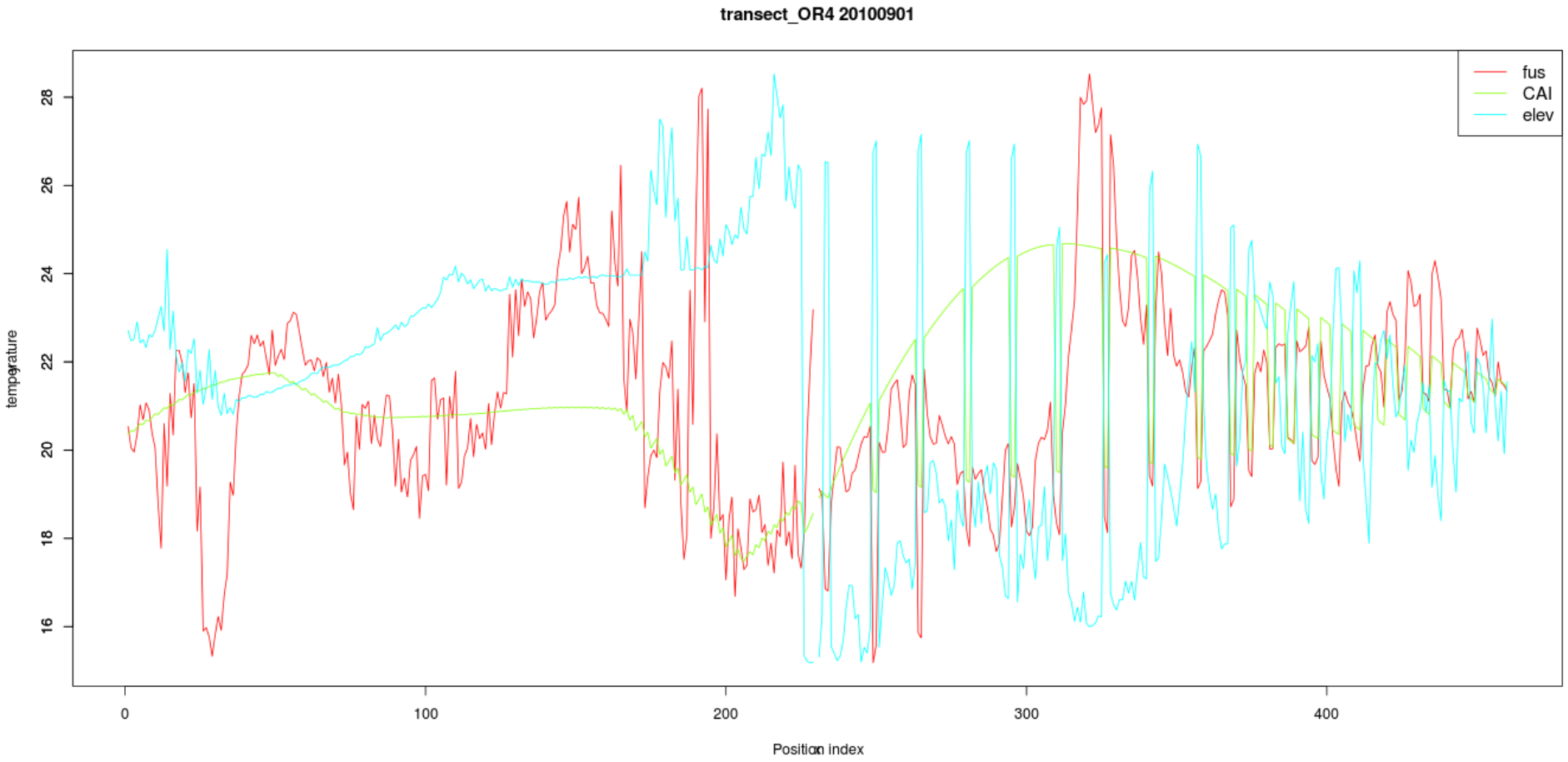
Transect 3: 20100901



Correlation fus and elev: 0.16
Correlation fus and cai : 0.52
Correlation cai and elev : -0.14

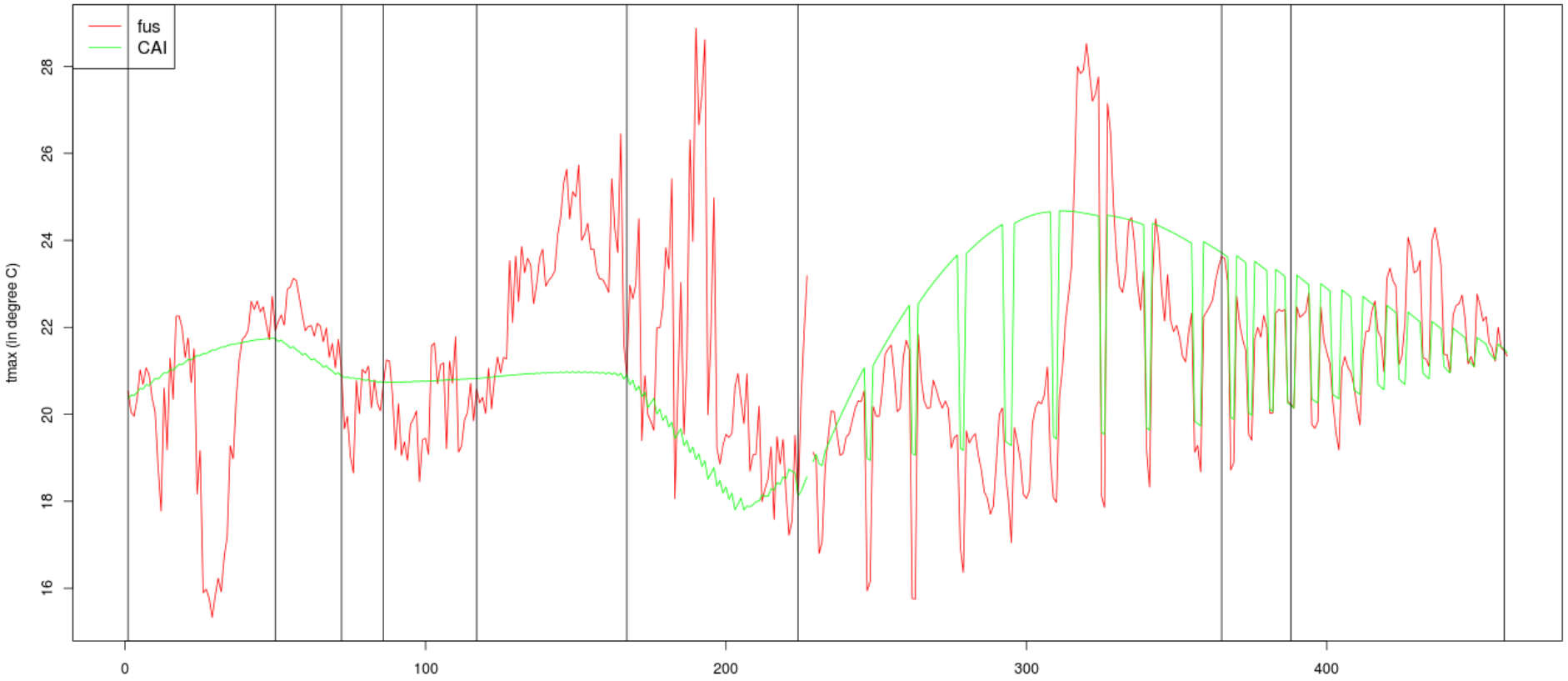
Calculate correlation and environmental gradient

PLOT TRANSECT 4…



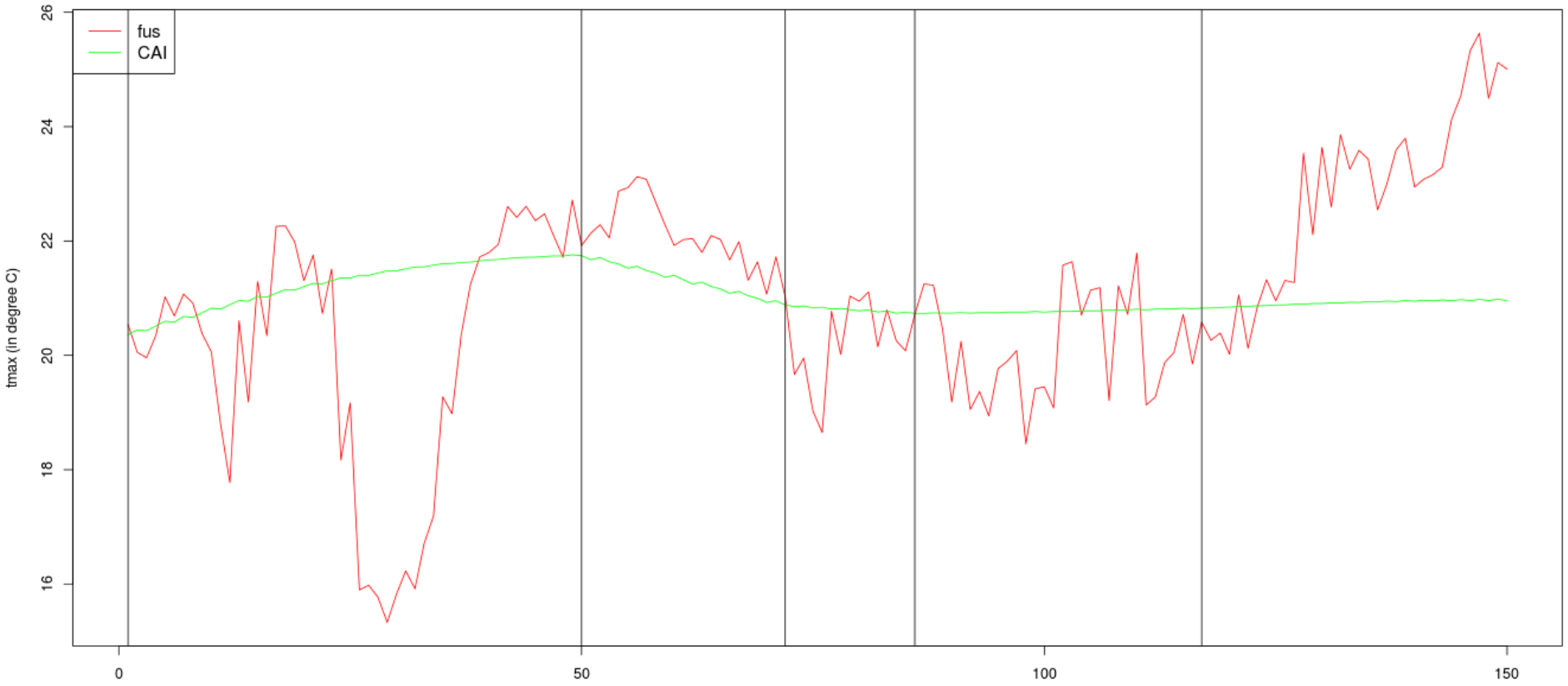
Calculate correlation and environmental gradient

PLOT TRANSECT 4…

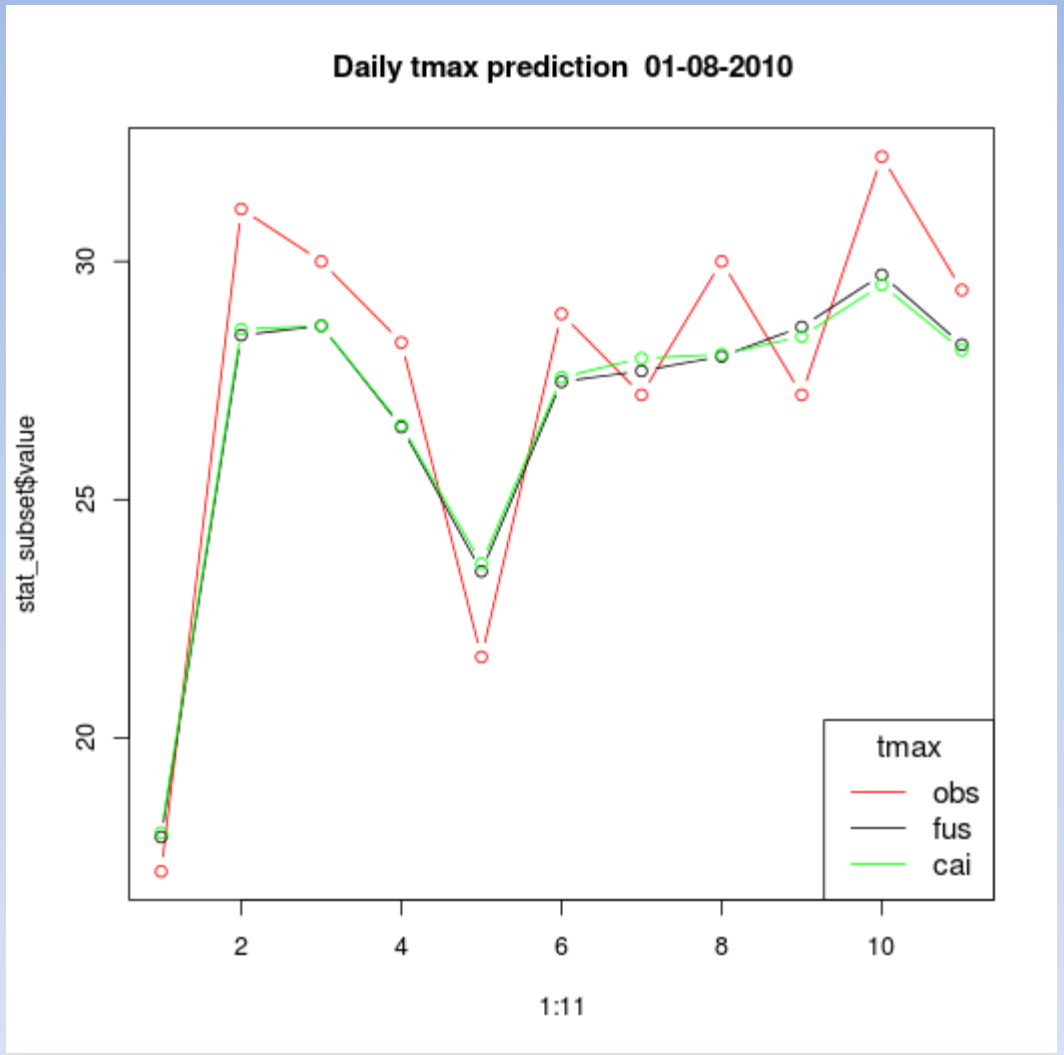


Calculate correlation and environmental gradient

Trnasect 4



Dark line transect loc



Change labels