

Supporting information for “Daily calibration of the fluxgate magnetometer onboard the Cluster spacecraft”

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This document contains the plots of the Cluster FGM calibration parameters evolution over the entire duration of the mission. Parameters which remain constant over time (`offset_r2`, `Matrix_sc`, `Matrix_dr`) are omitted. The names of the parameters are those used in the `cfgnew` calibration files. Elements of the matrices are plotted in subplots arranged in the same order as in the matrix. The labels correspond to the calibration matrix Eq.(8) in the main paper.

For each spacecraft there are three sets of plots:

Plots of the long term variation of the daily calibration parameters: The panels have the same format as the panels in Figures 4 and 7 in the main paper. The daily parameters are represented with blue dots, the yearly averages are plotted with orange dots. The error-bars are the standard deviations for each year.

Plots of the daily calibration parameters versus the electronics box temperature: The blue dots represent the average over 0.1 °C electronics box temperature bins of calibration parameter represented in the panel.

Plots of the daily calibration parameters versus the outboard sensor temperature: The blue dots represent the average over 0.1 °C outboard sensor temperature bins of calibration parameter represented in the panel.

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1 Cluster 1 calibration parameters

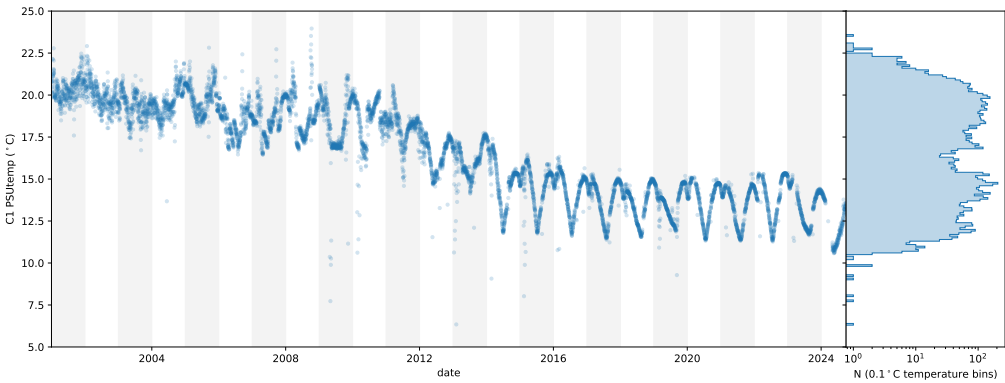


Figure S1: Cluster 1 electronics box temperature

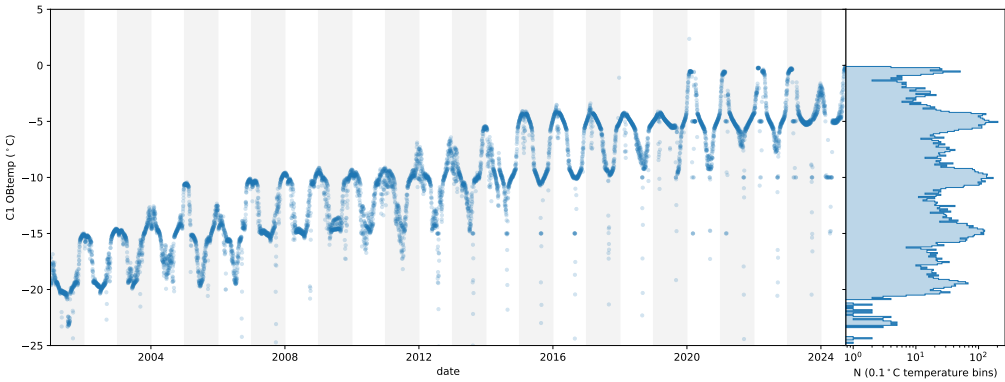


Figure S2: Cluster 1 outboard sensor temperature

1.1 Daily calibration parameters long term variation

8

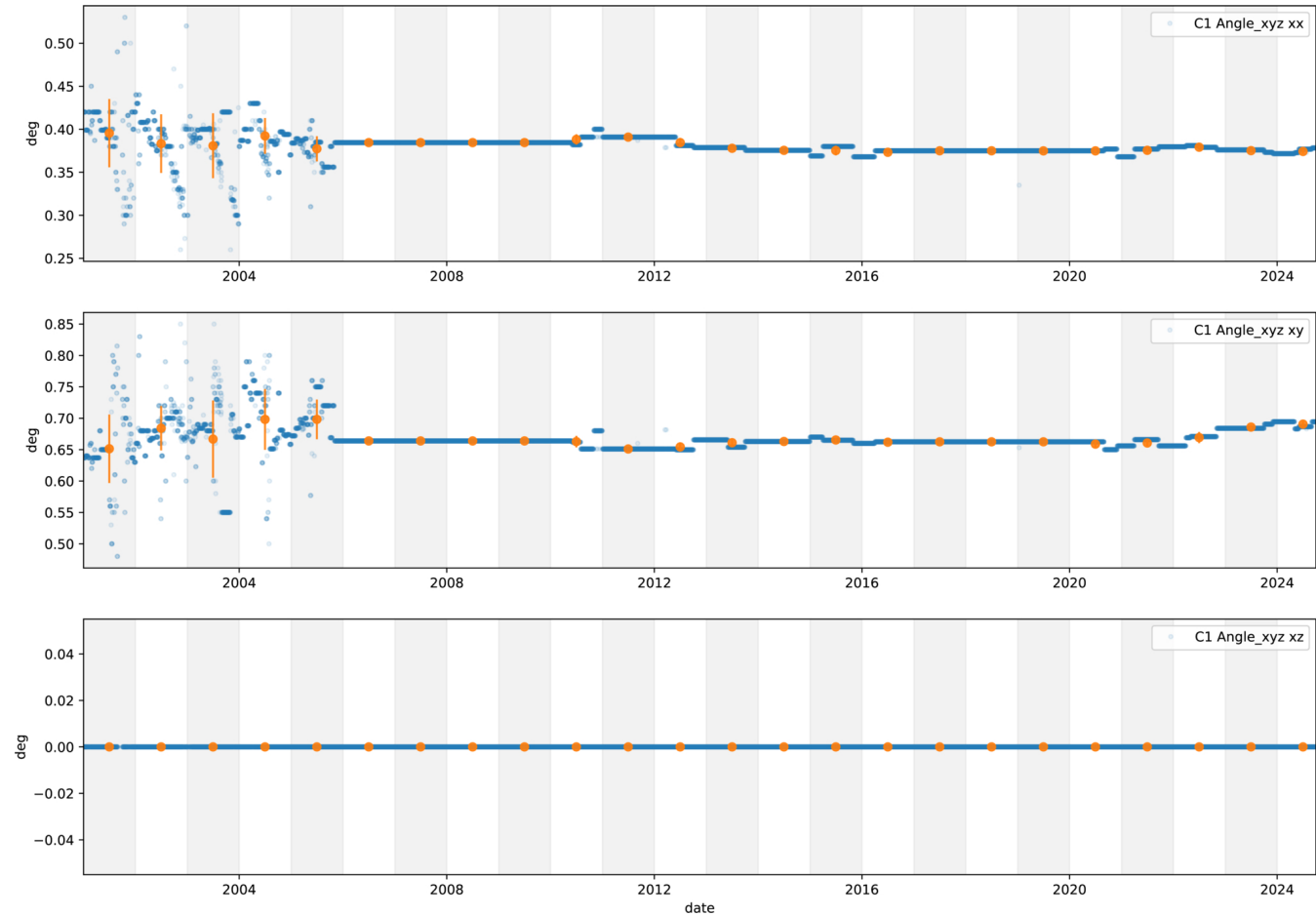


Figure S3: Cluster 1 Angle_xyz long term variation

6

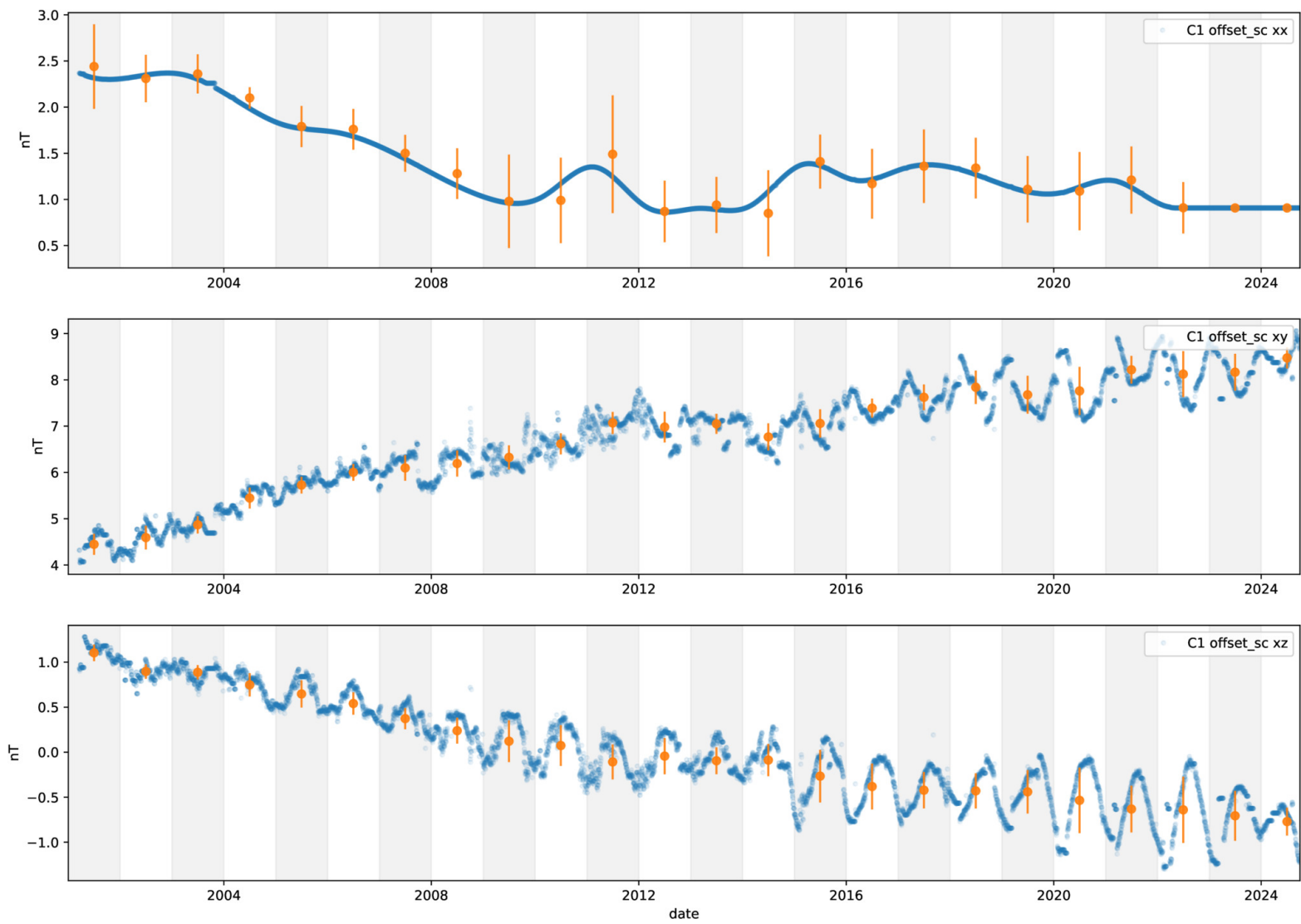


Figure S4: Cluster 1 offset_sc long term variation

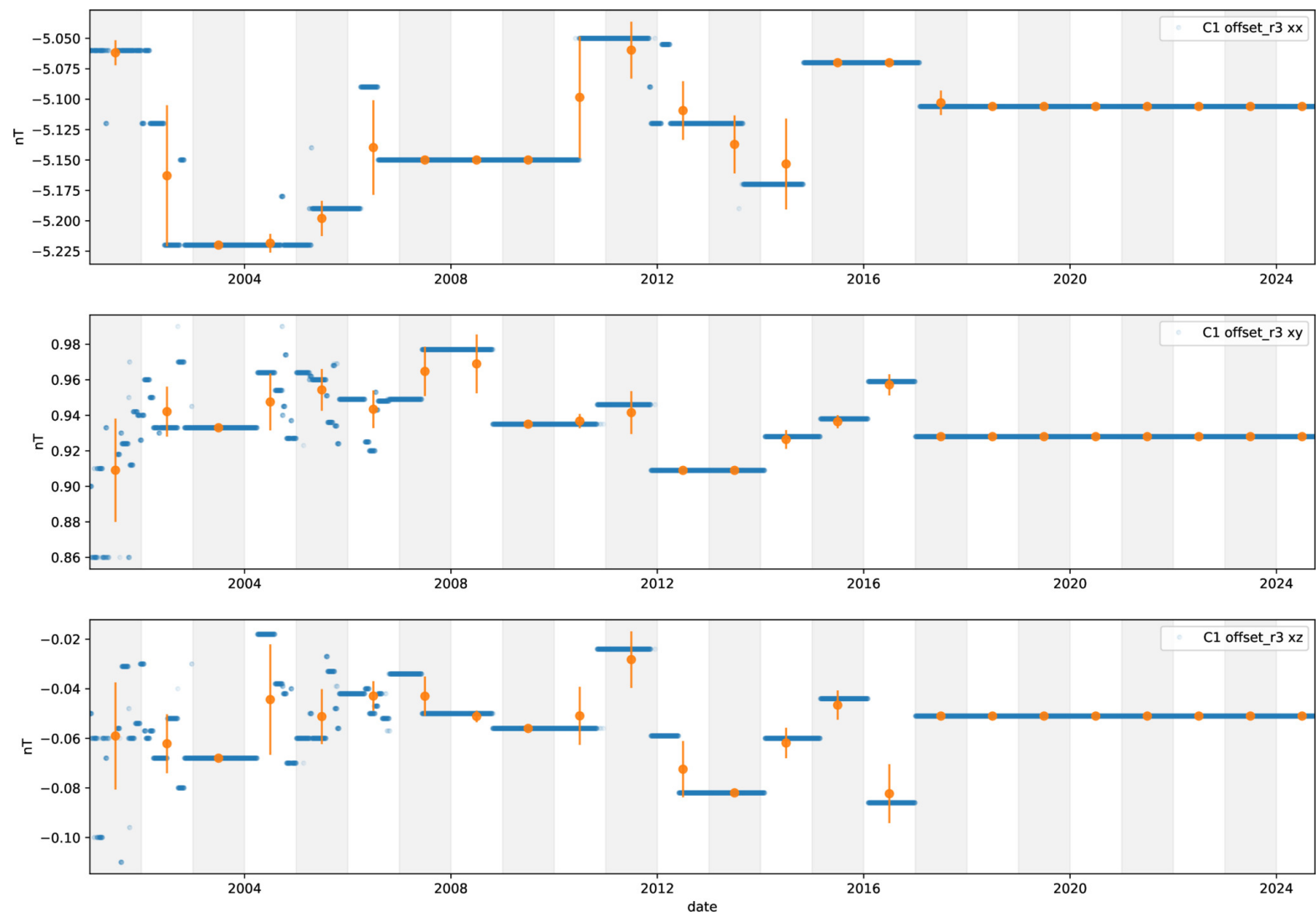


Figure S5: Cluster 1 offset_r3 long term variation

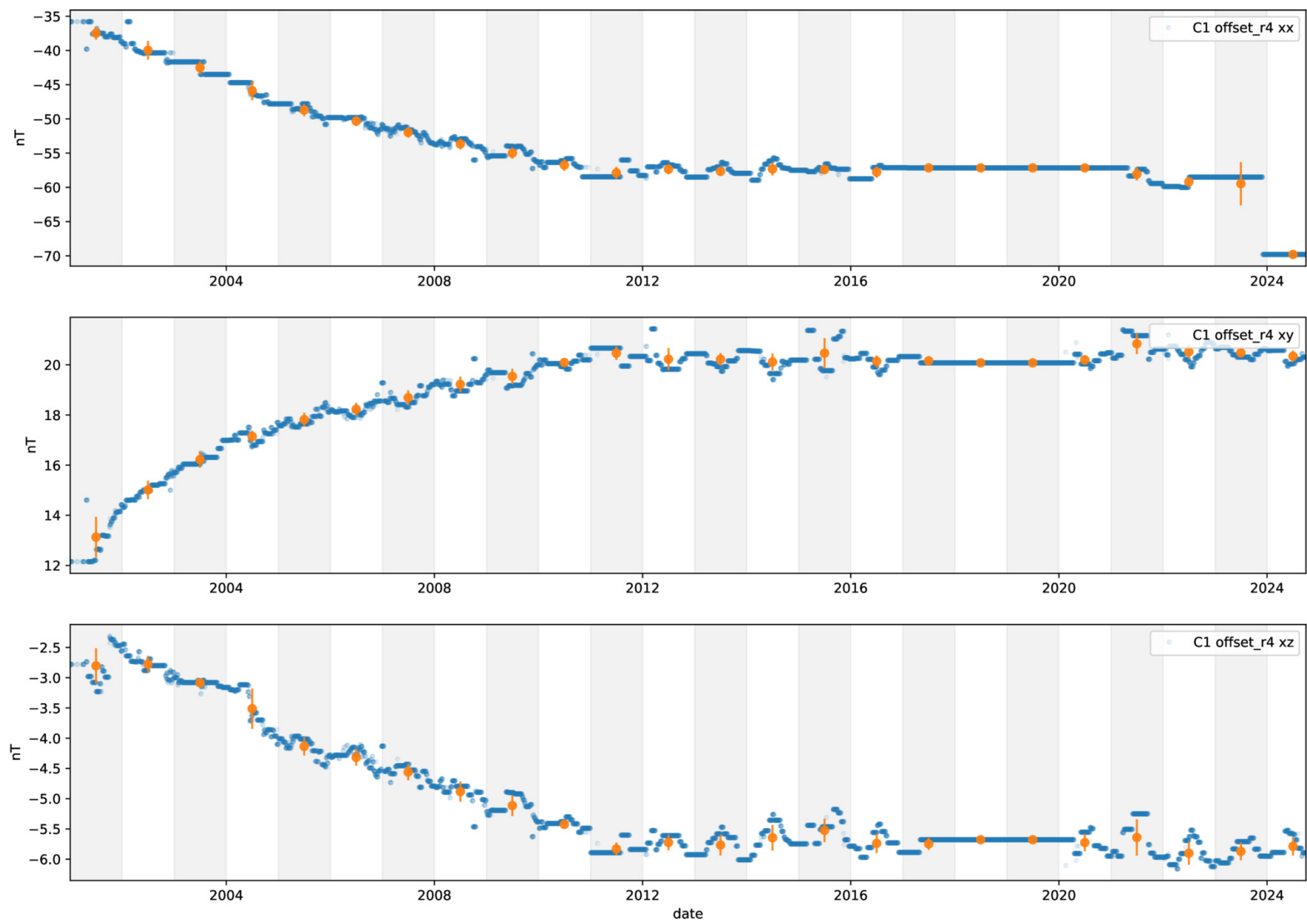


Figure S6: Cluster 1 offset_r4 long term variation

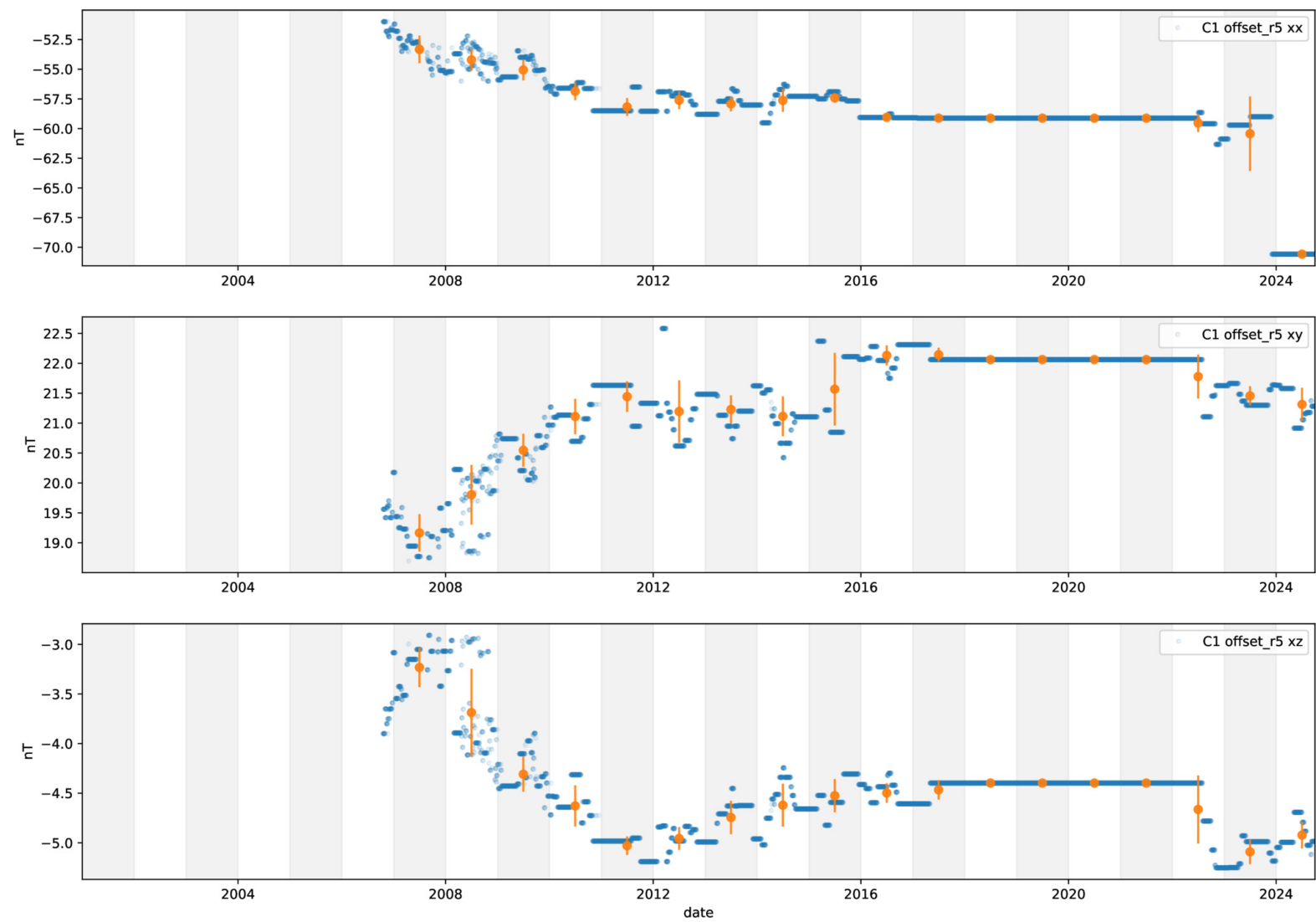


Figure S7: Cluster 1 offset_r5 long term variation

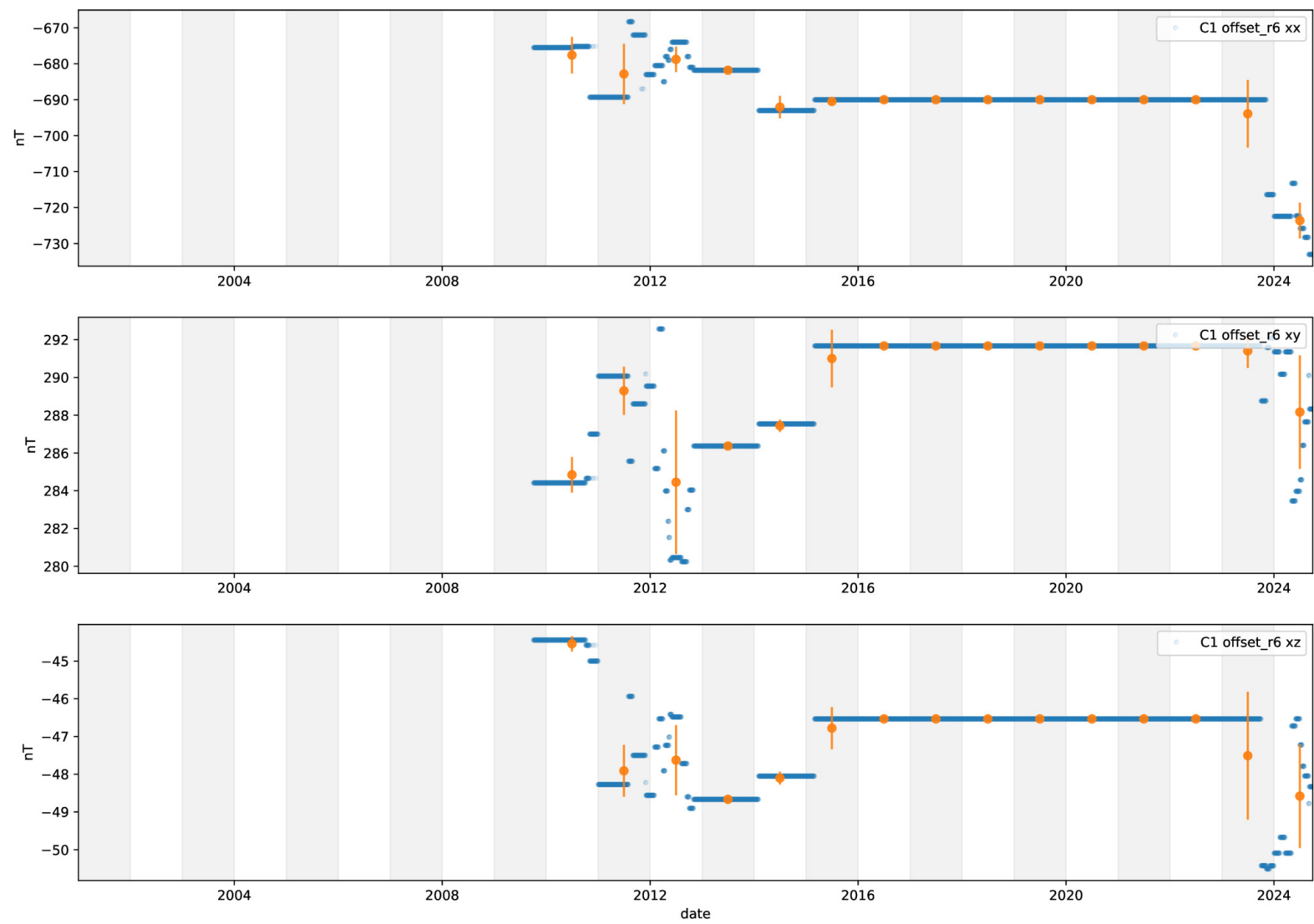


Figure S8: Cluster 1 offset_r6 long term variation

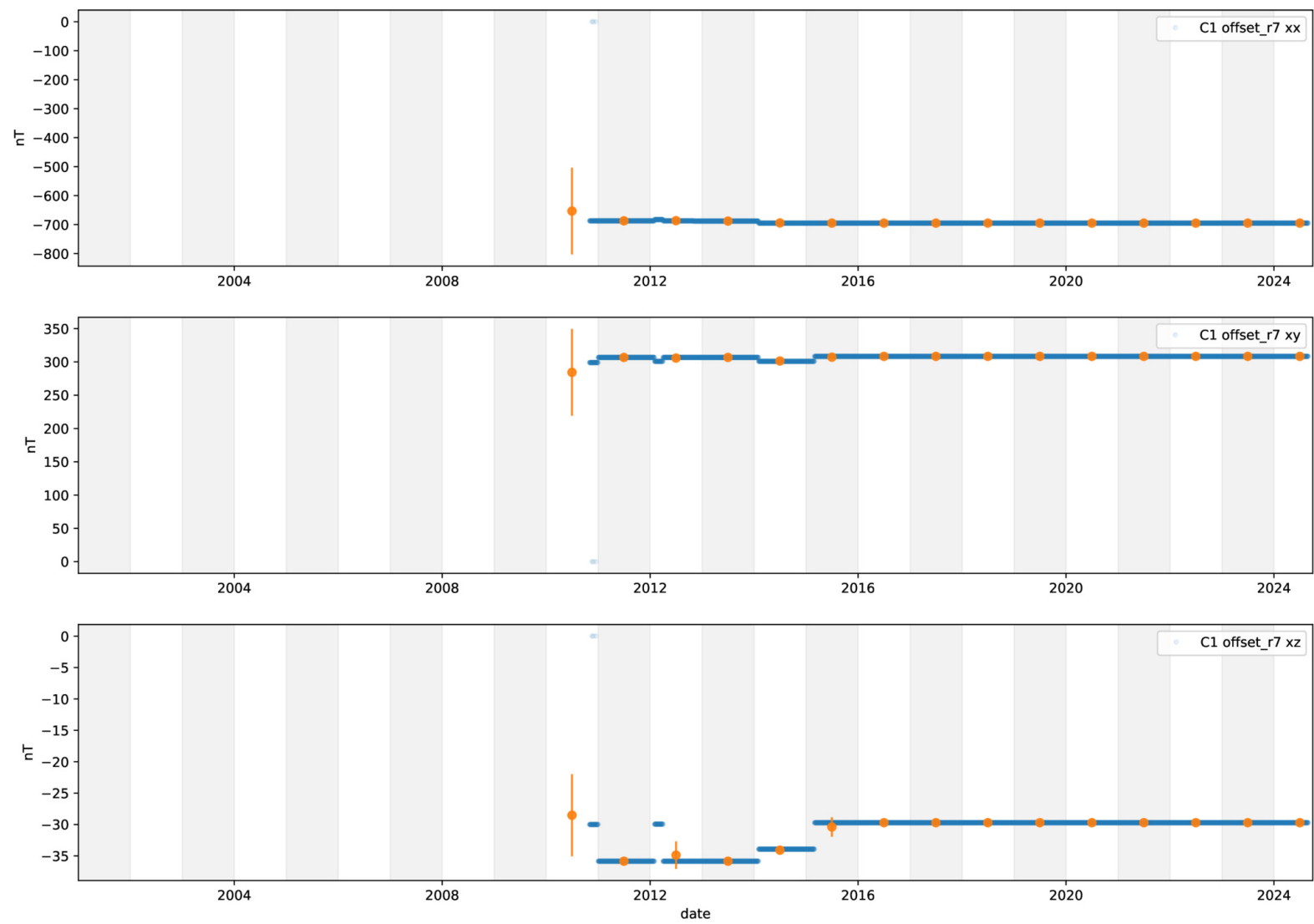


Figure S9: Cluster 1 offset_r7 long term variation

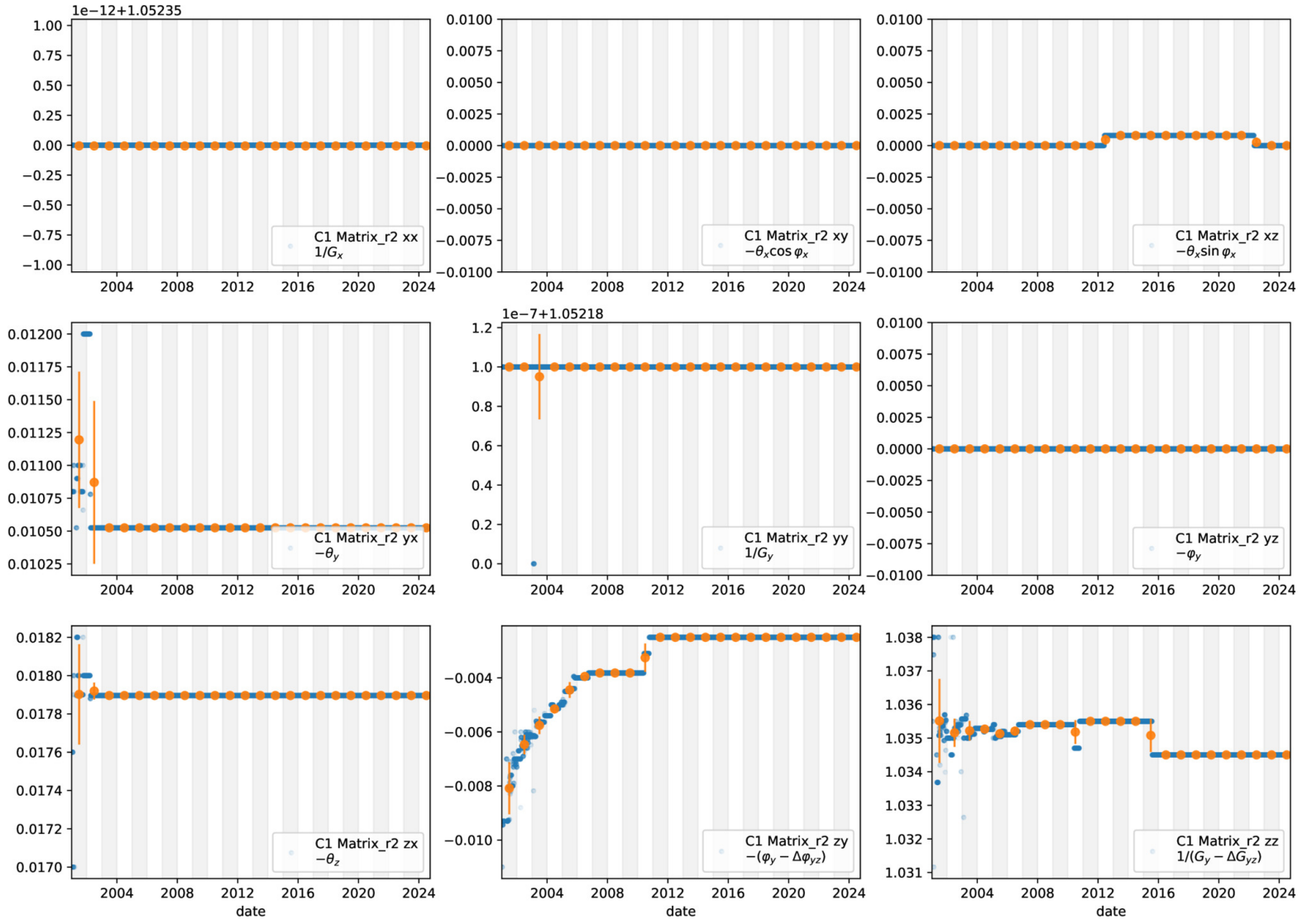


Figure S10: Cluster 1 Matrix_r2 long term variation

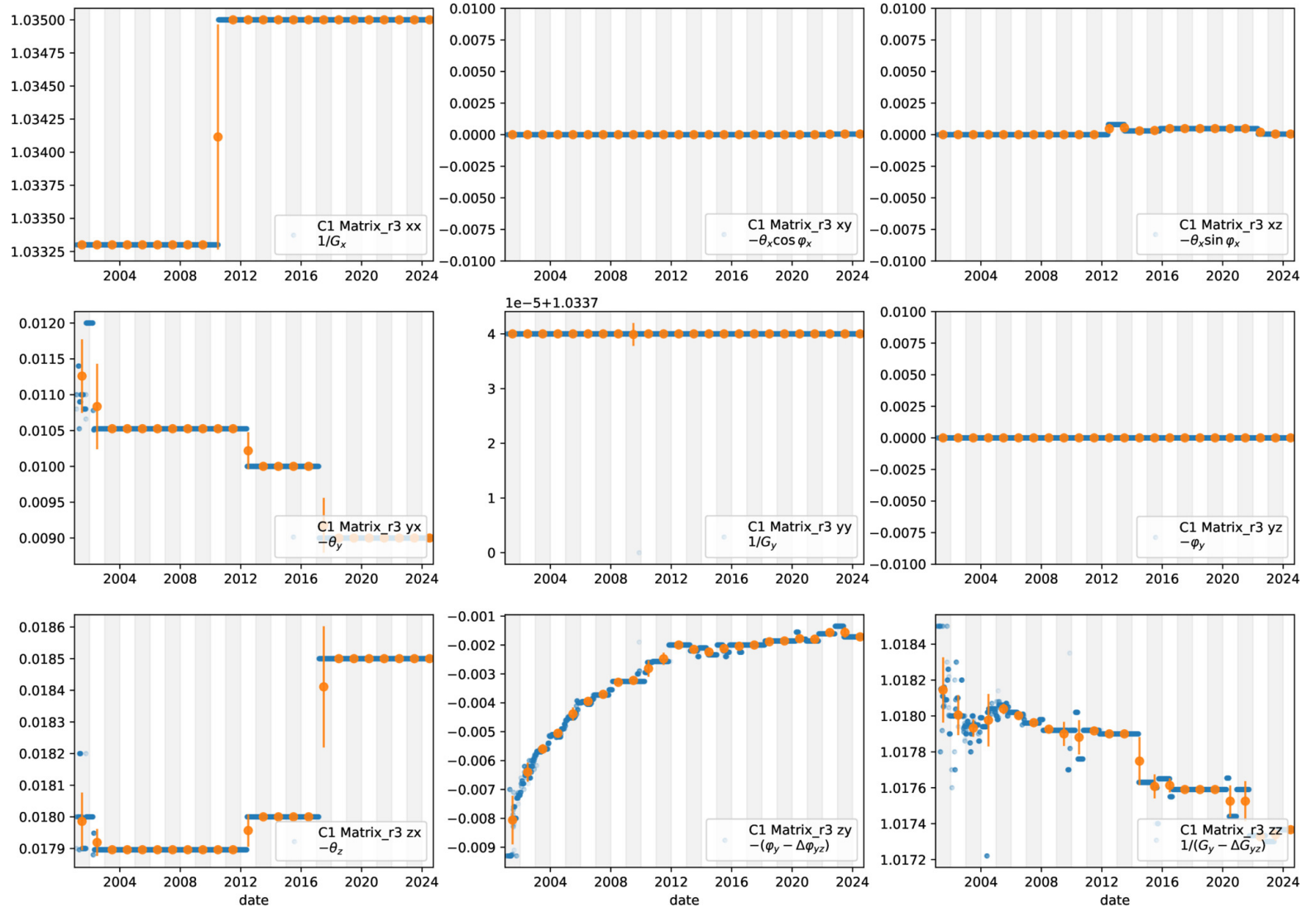


Figure S11: Cluster 1 Matrix_r3 long term variation

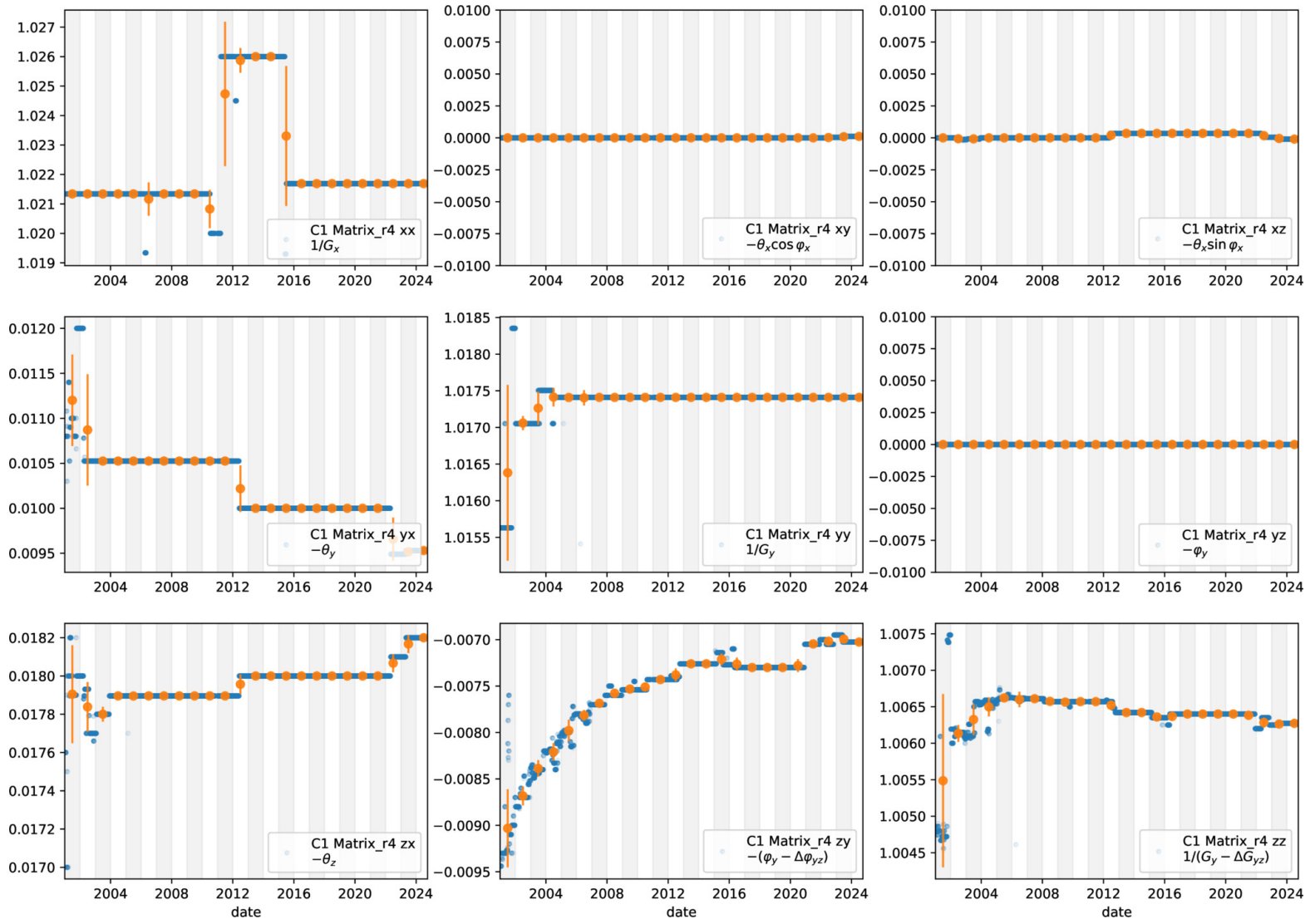


Figure S12: Cluster 1 Matrix_r4 long term variation

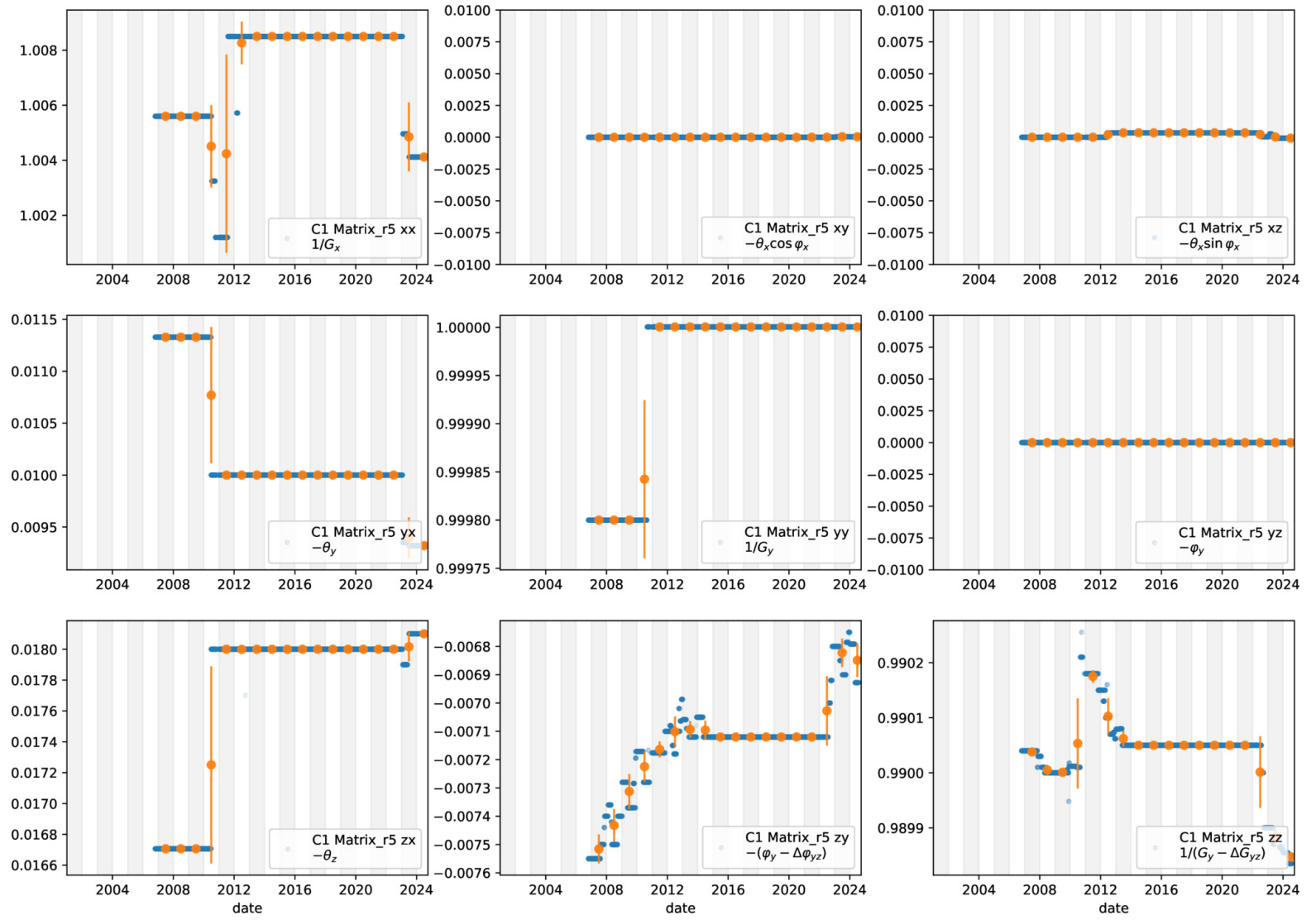


Figure S13: Cluster 1 Matrix_r5 long term variation

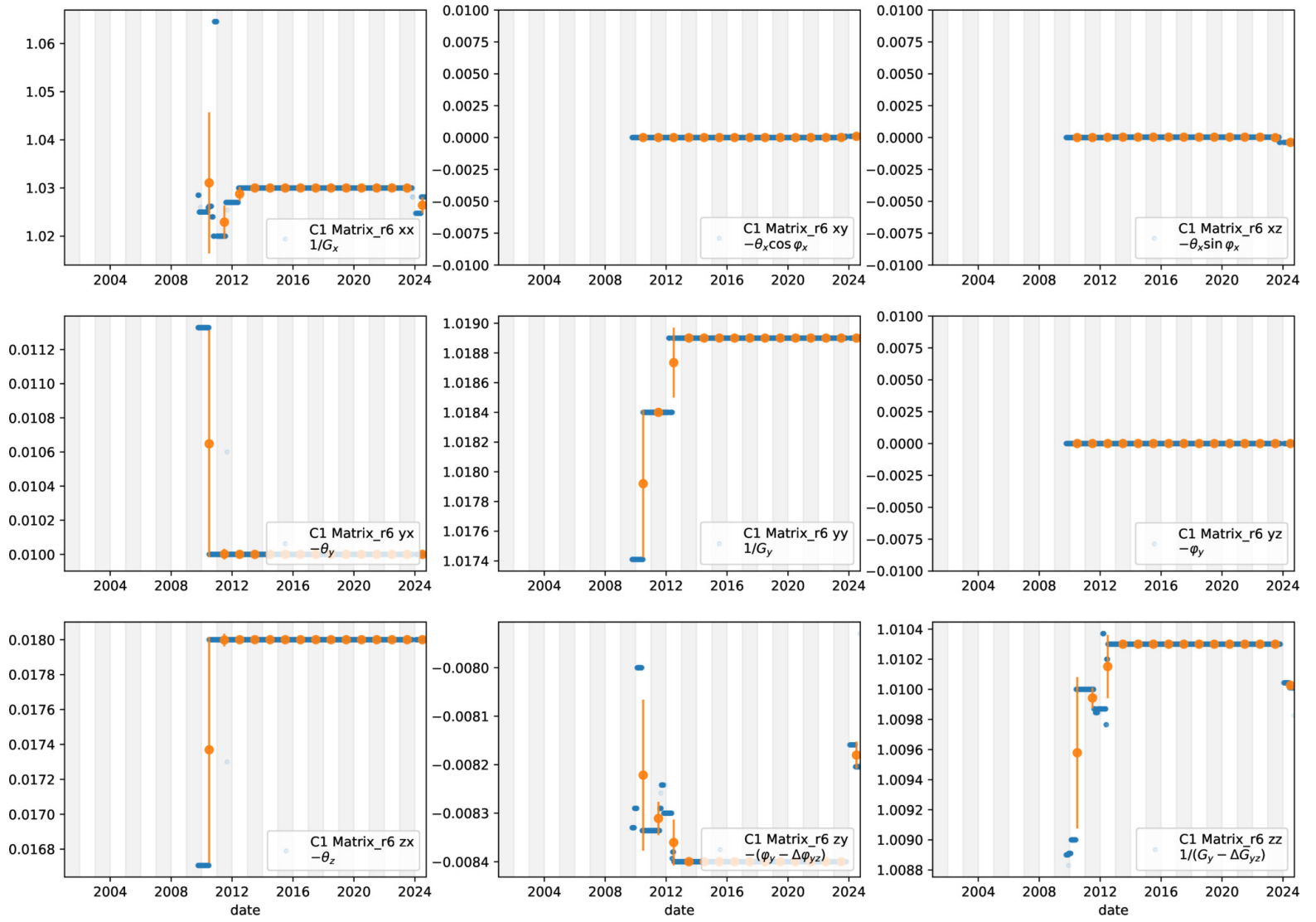


Figure S14: Cluster 1 Matrix_r6 long term variation

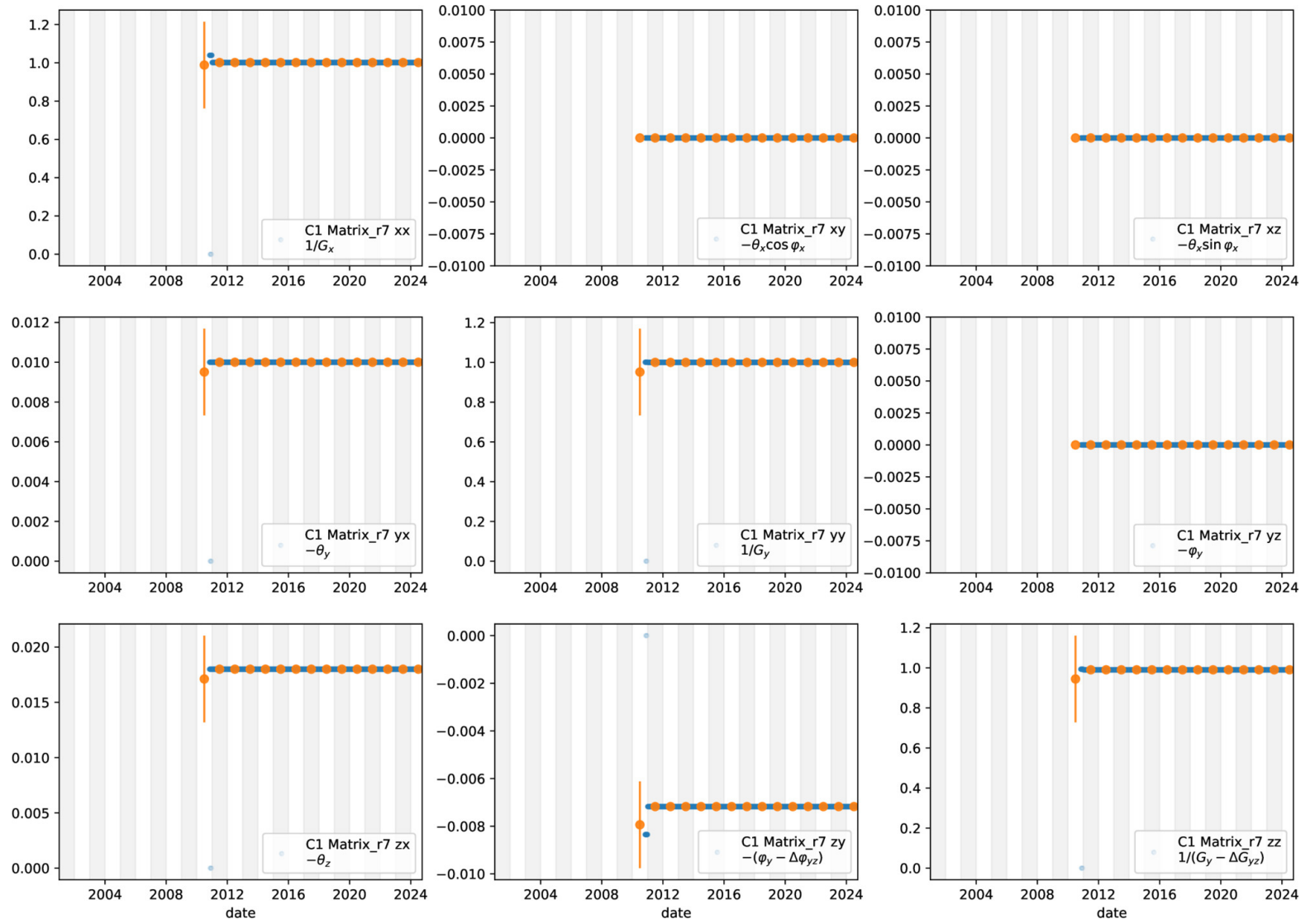


Figure S15: Cluster 1 Matrix_r7 long term variation

1.2 Daily calibration parameters versus the electronics box temperature

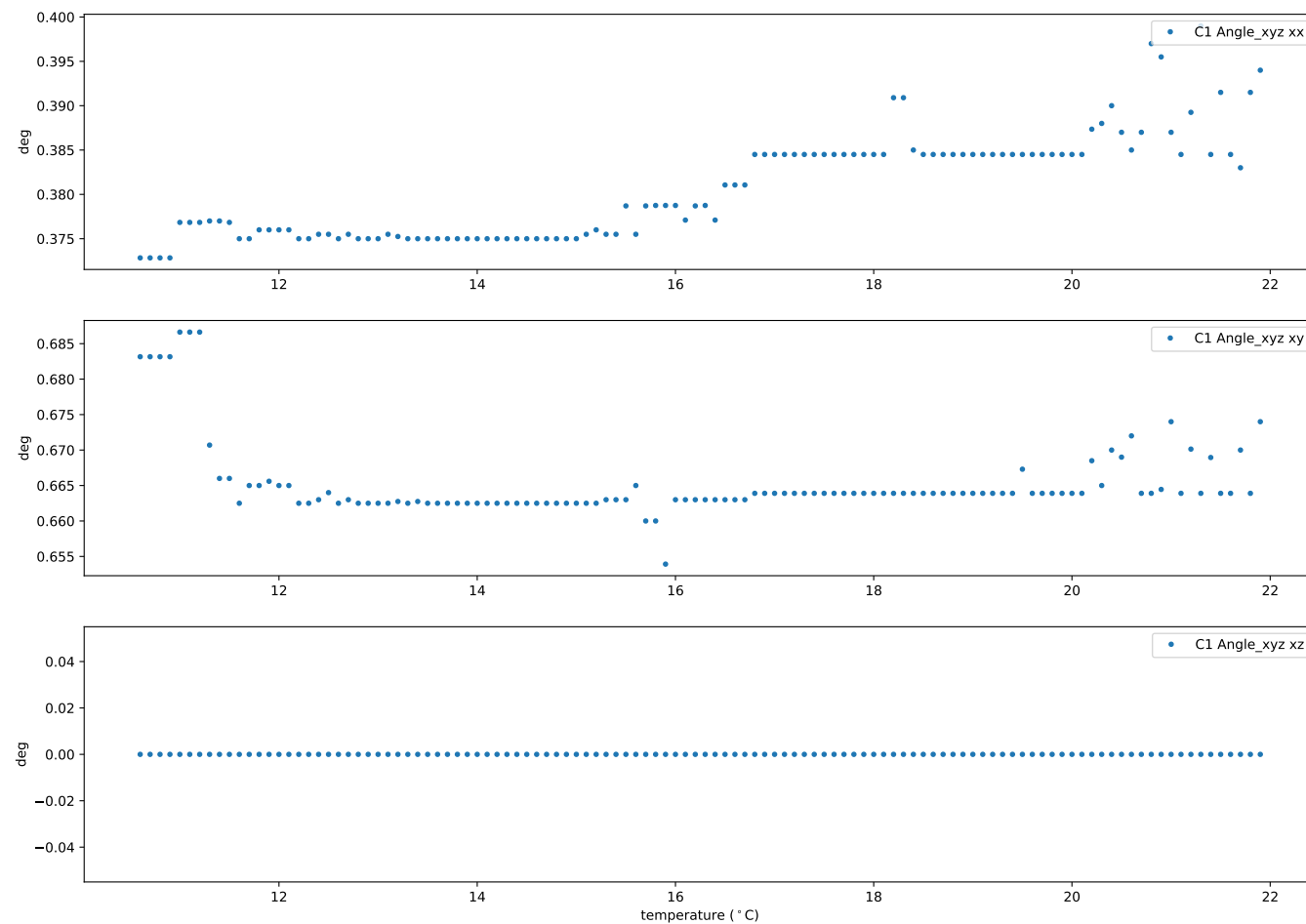


Figure S16: Cluster 1 Angle_xyz versus the electronics box temperature

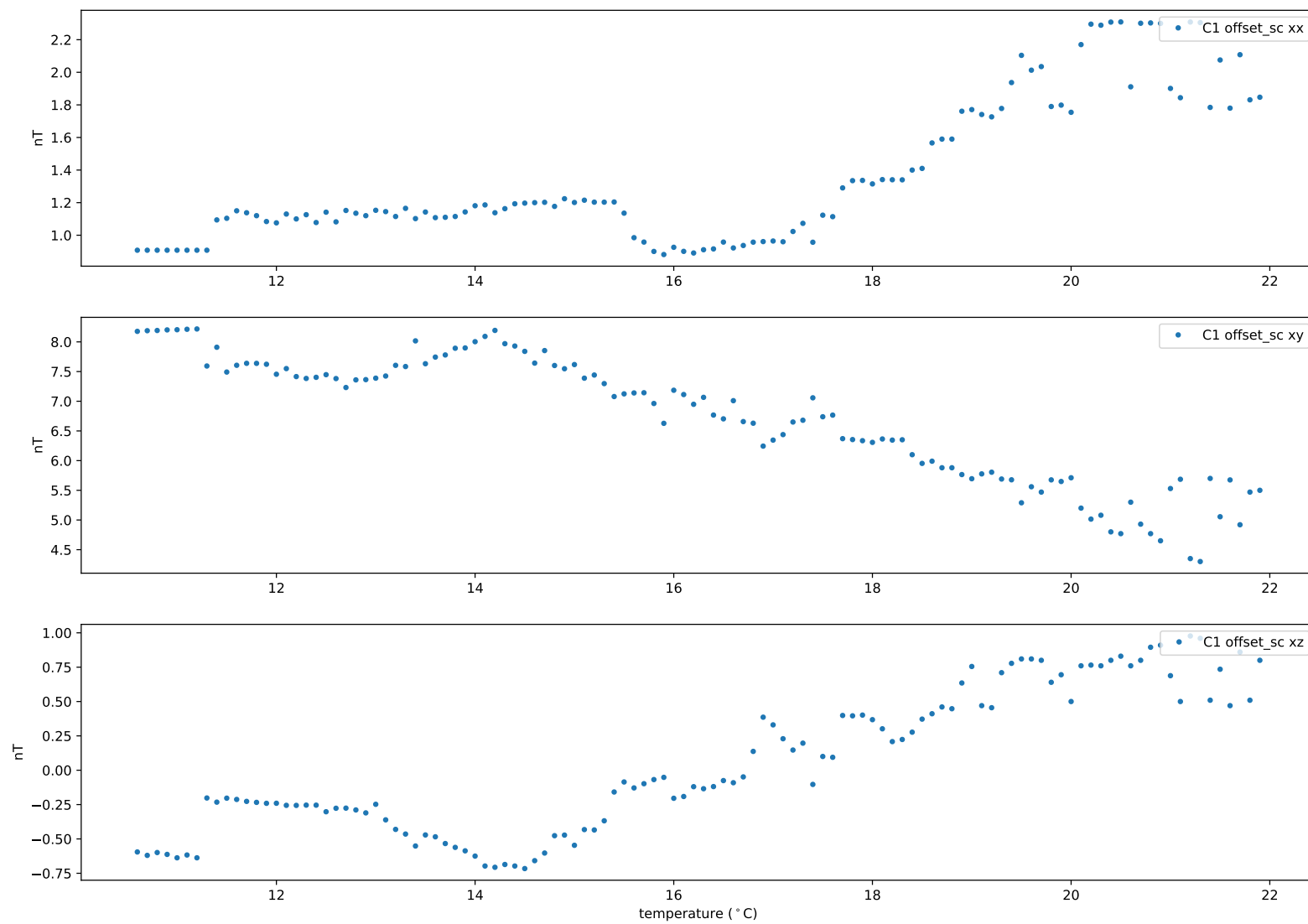


Figure S17: Cluster 1 offset_sc versus the electronics box temperature

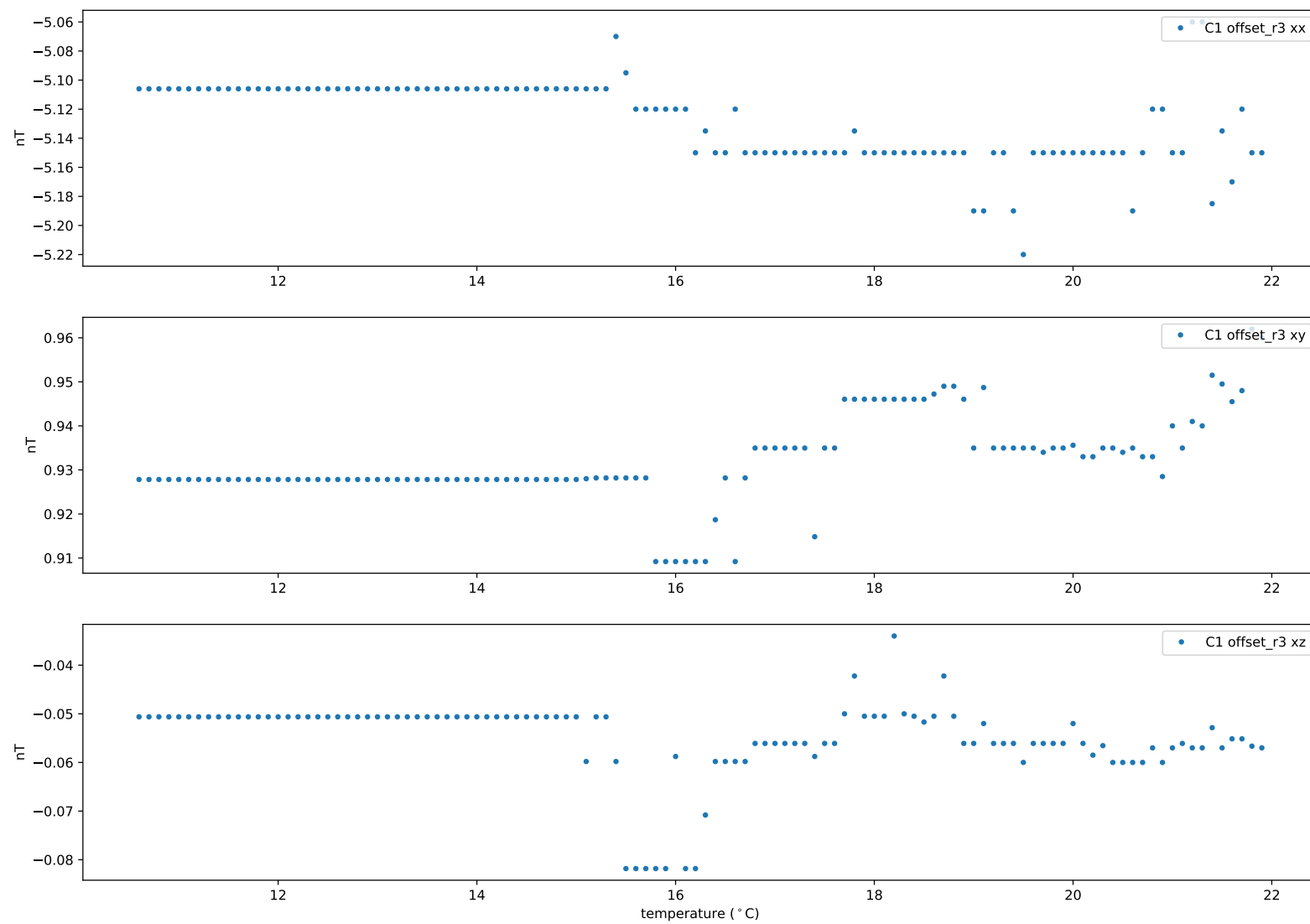


Figure S18: Cluster 1 offset_r3 versus the electronics box temperature

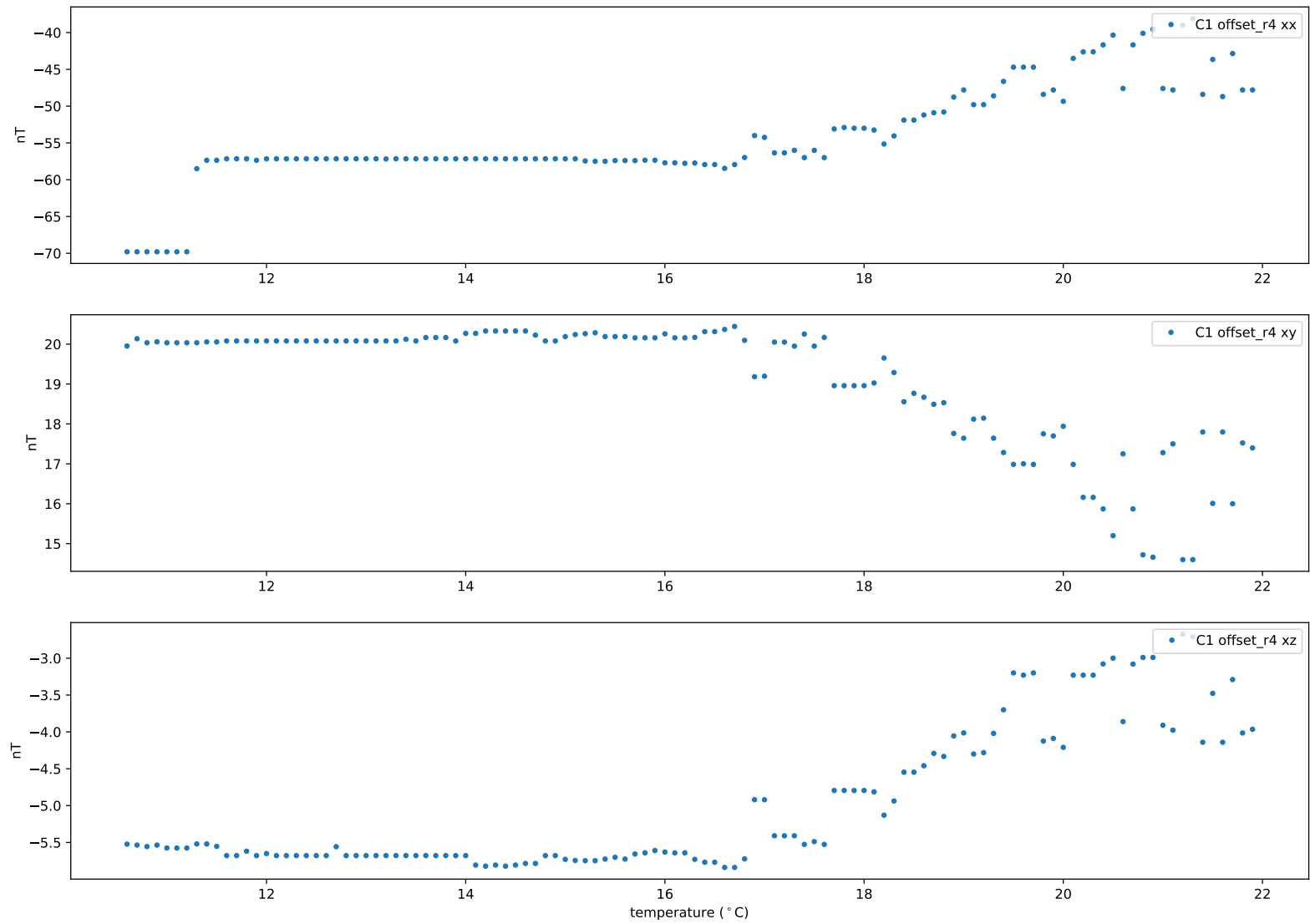


Figure S19: Cluster 1 offset_r4 versus the electronics box temperature

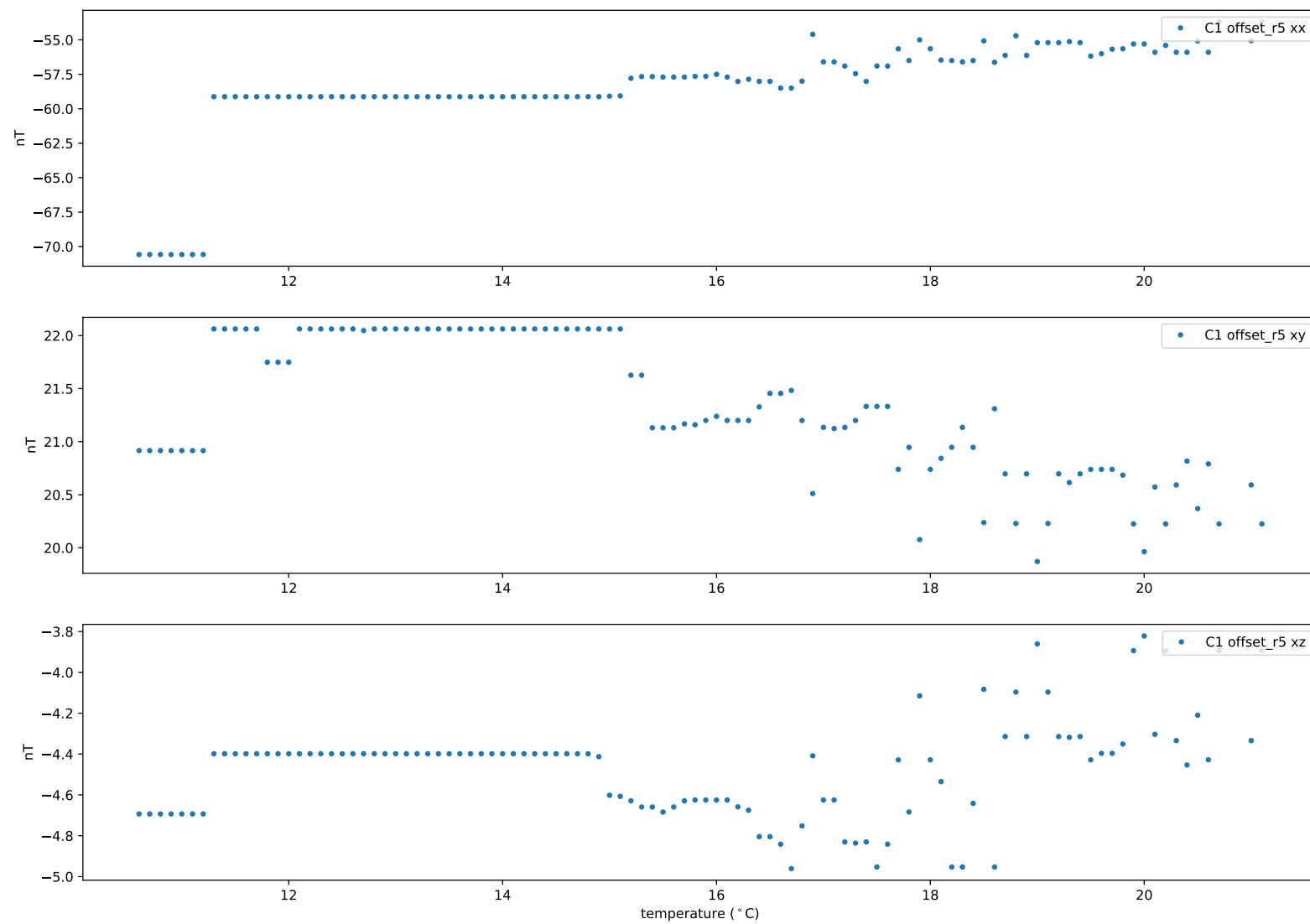


Figure S20: Cluster 1 offset_r5 versus the electronics box temperature

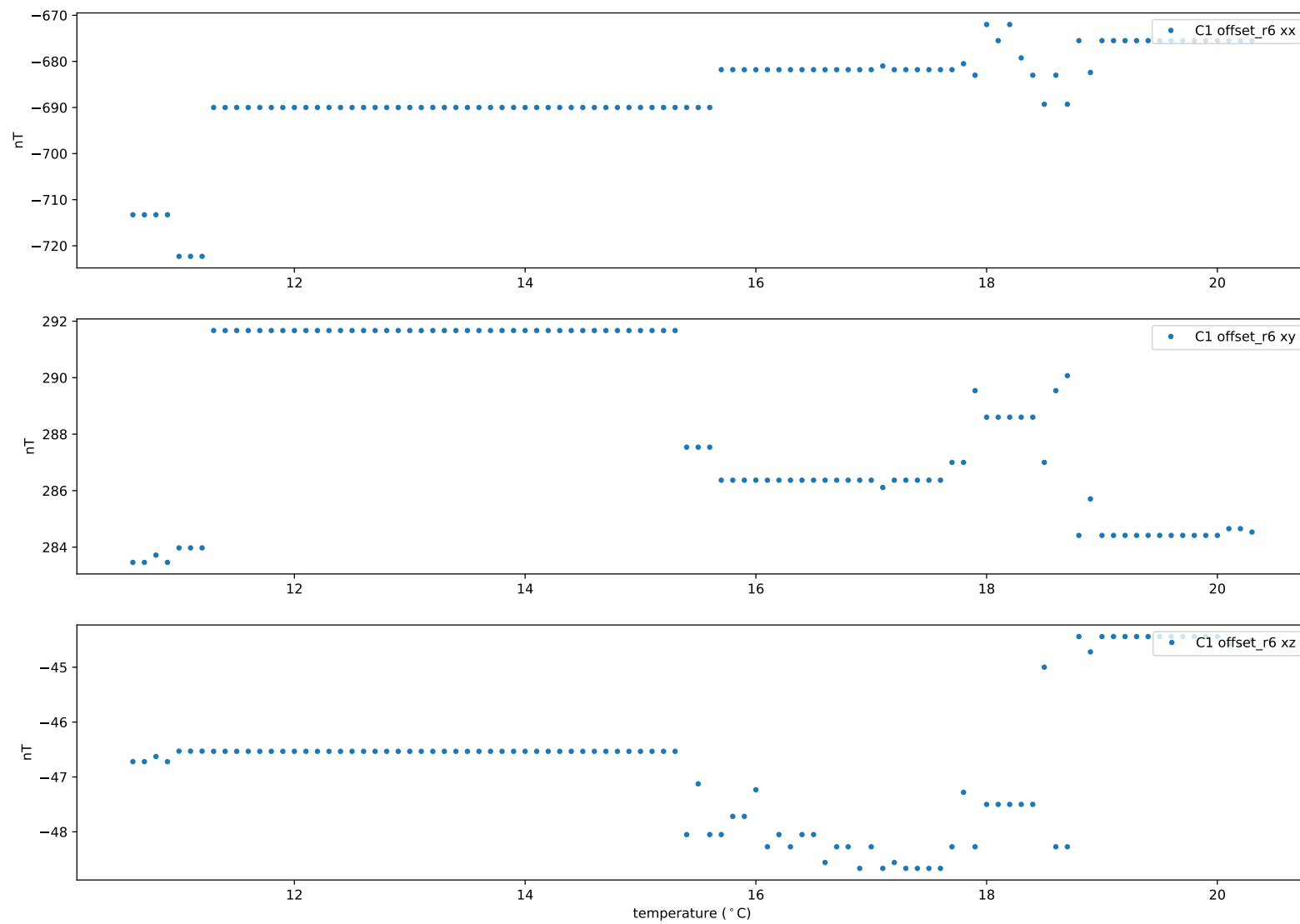


Figure S21: Cluster 1 offset_r6 versus the electronics box temperature

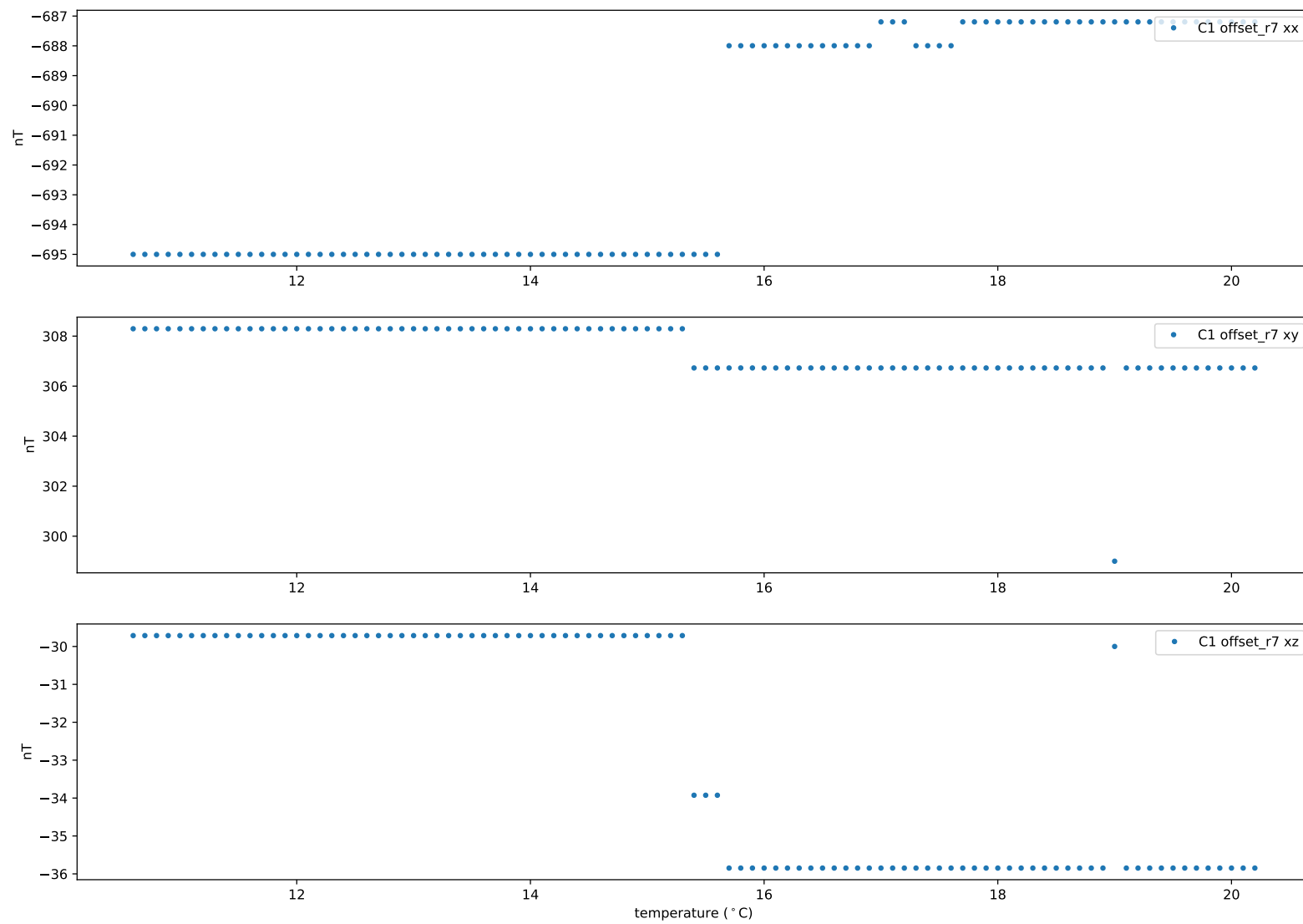


Figure S22: Cluster 1 offset_r7 versus the electronics box temperature

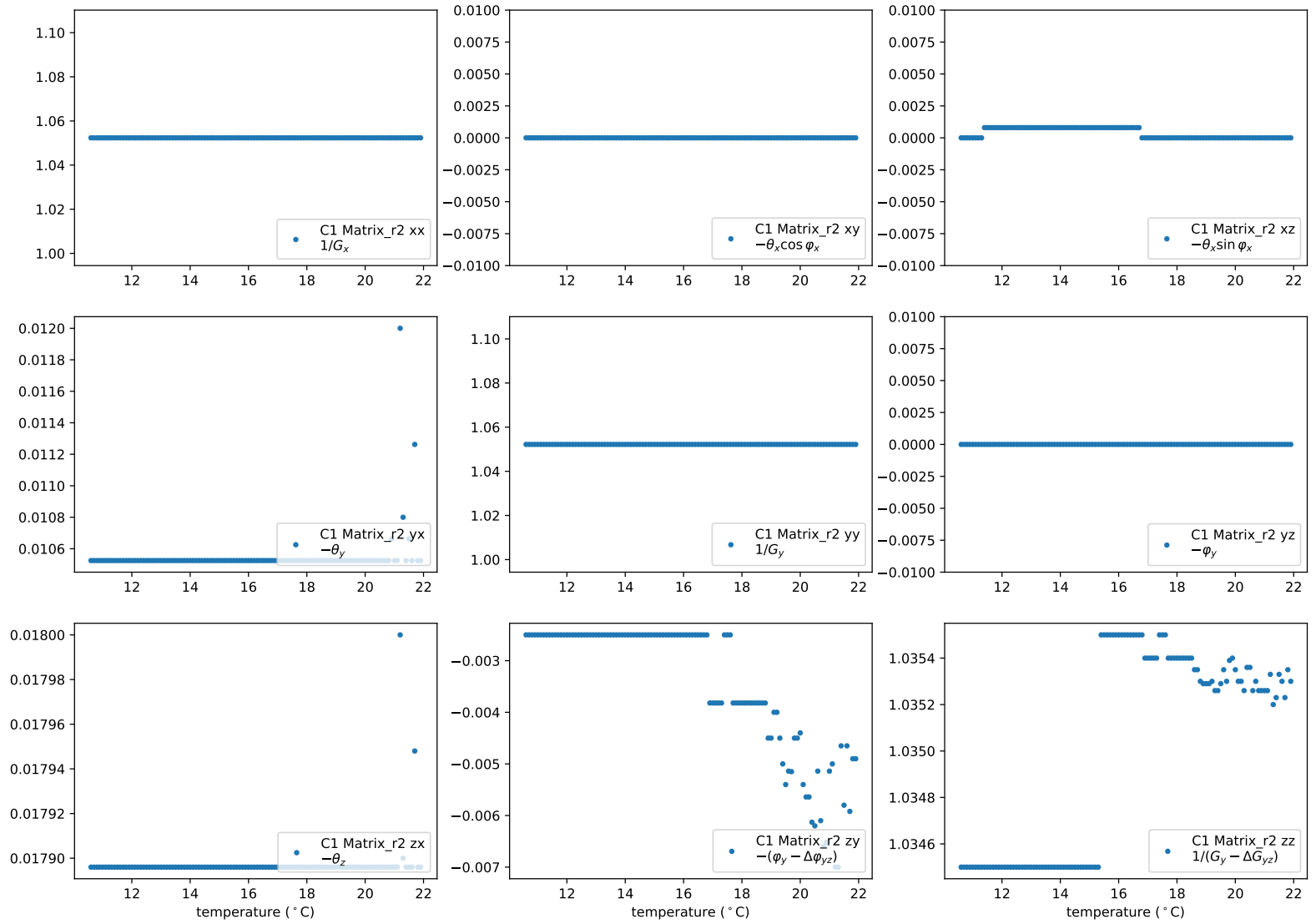


Figure S23: Cluster 1 Matrix_r2 versus the electronics box temperature

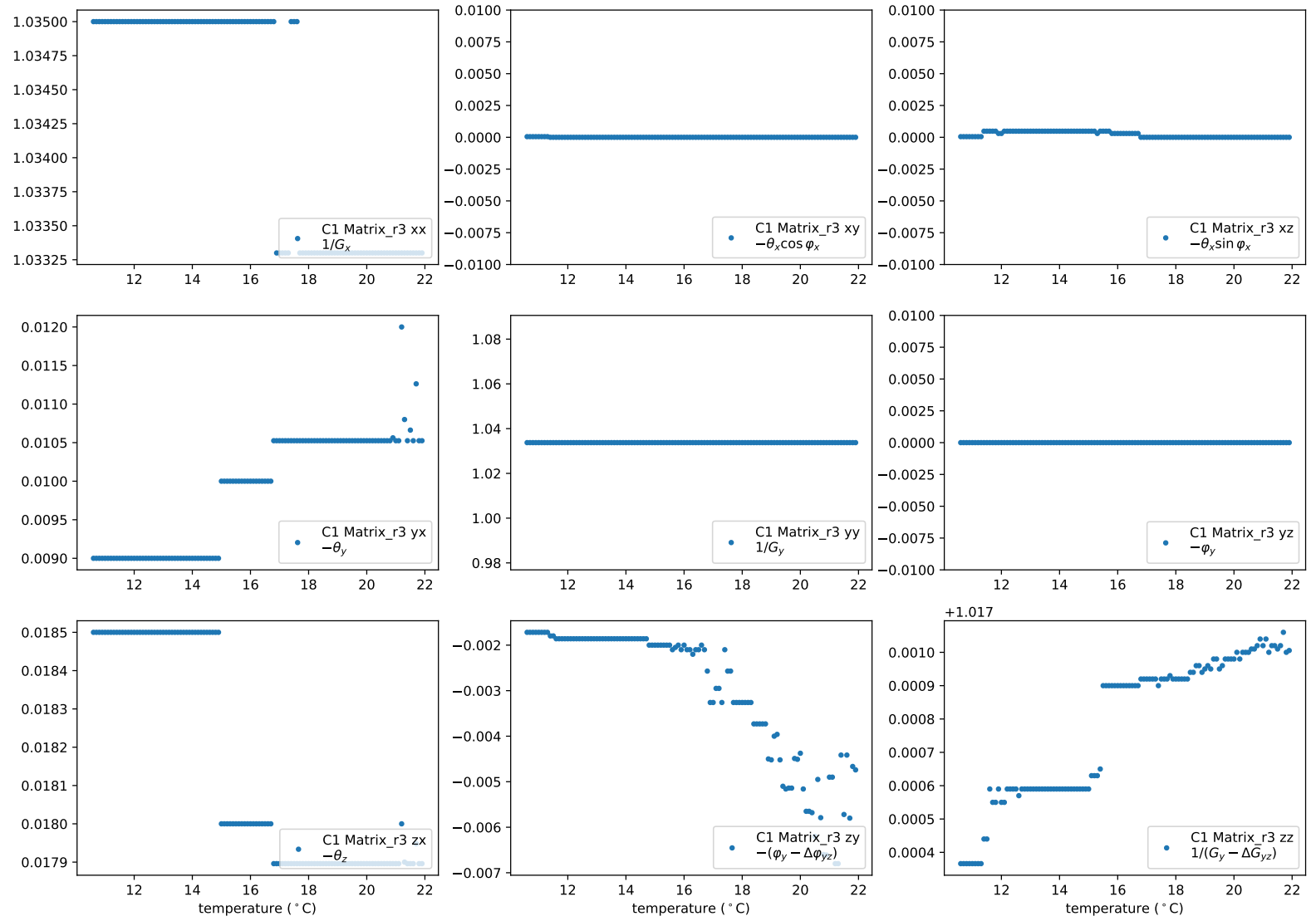


Figure S24: Cluster 1 Matrix_r3 versus the electronics box temperature

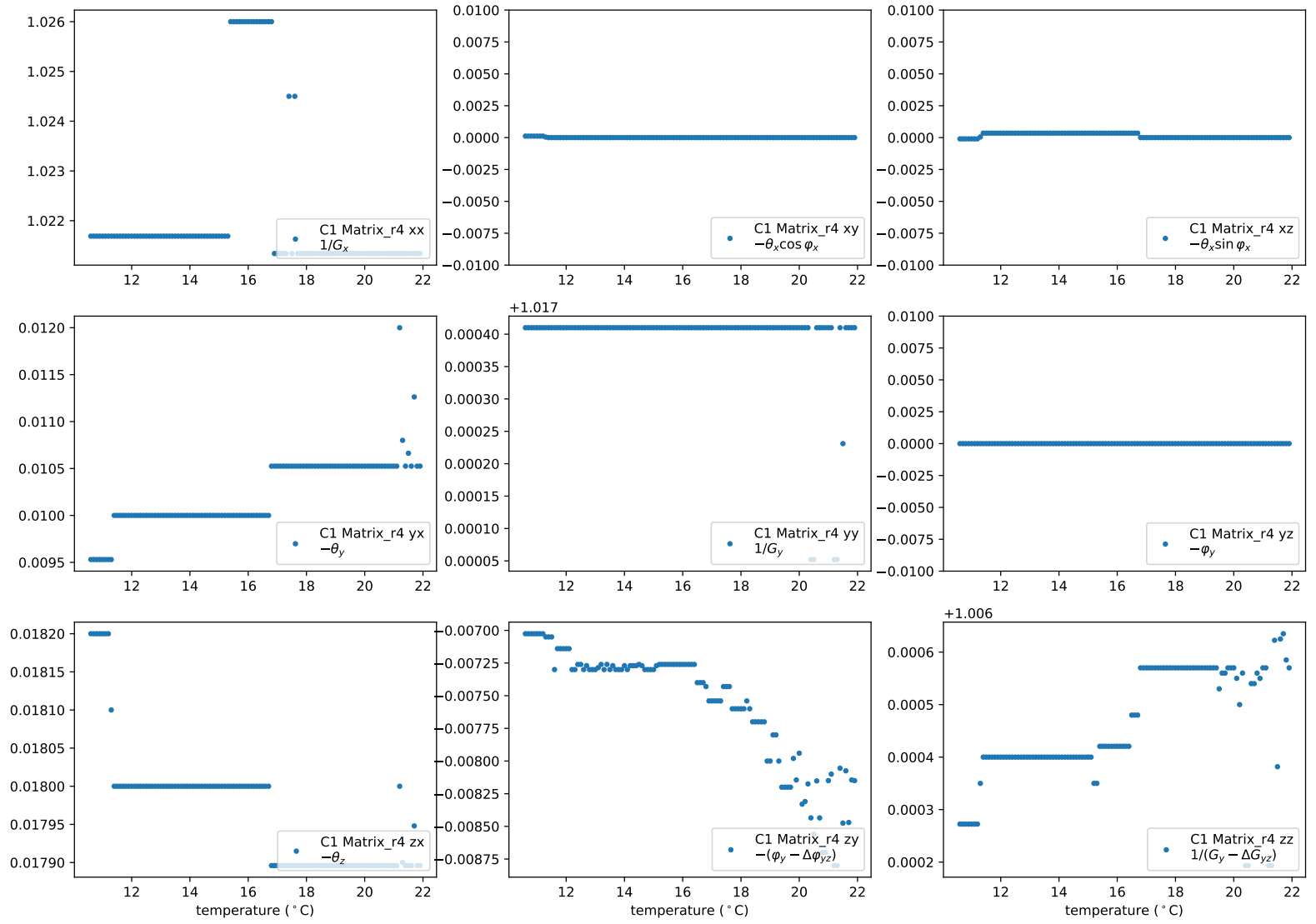


Figure S25: Cluster 1 Matrix_r4 versus the electronics box temperature

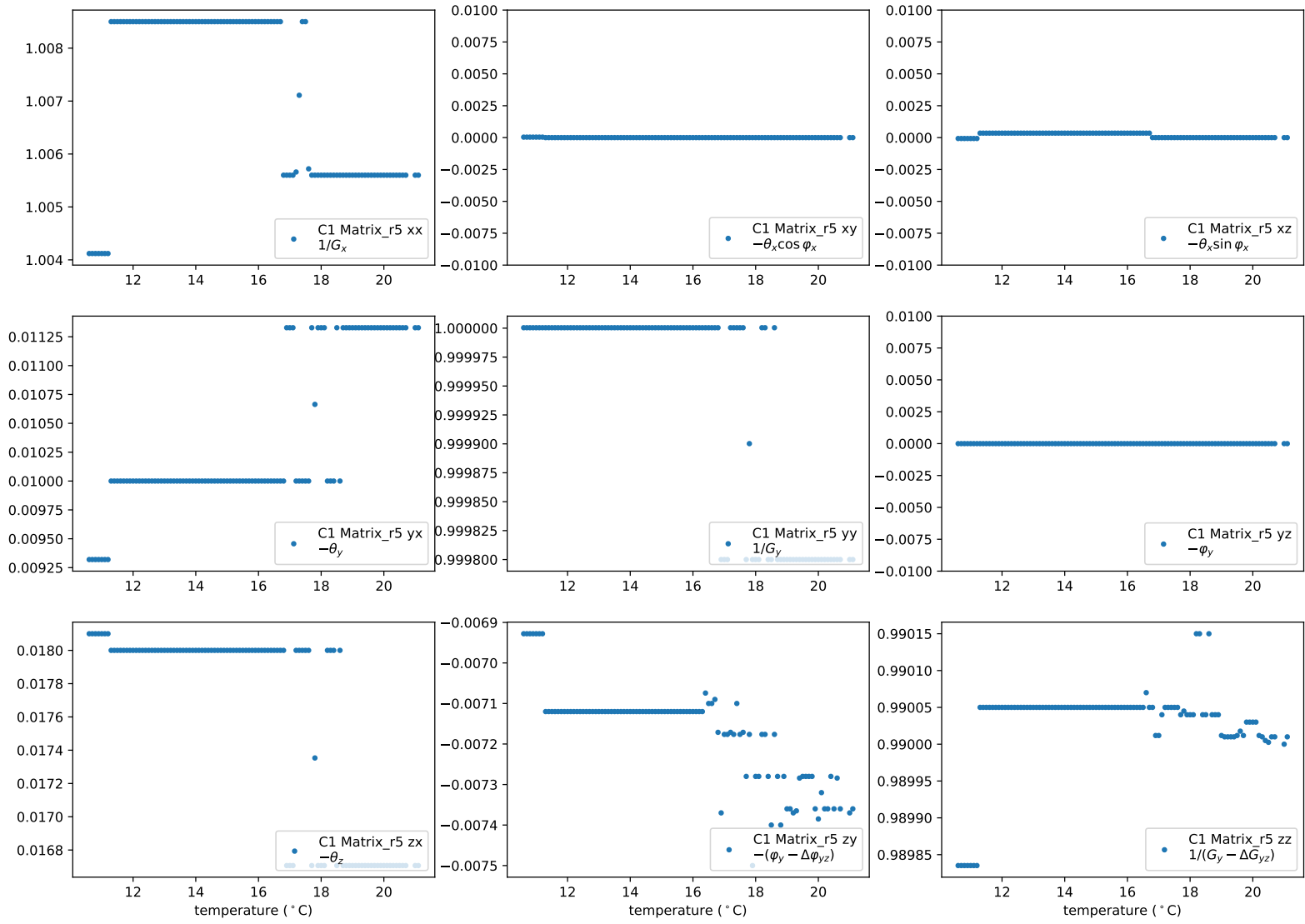


Figure S26: Cluster 1 Matrix_r5 versus the electronics box temperature

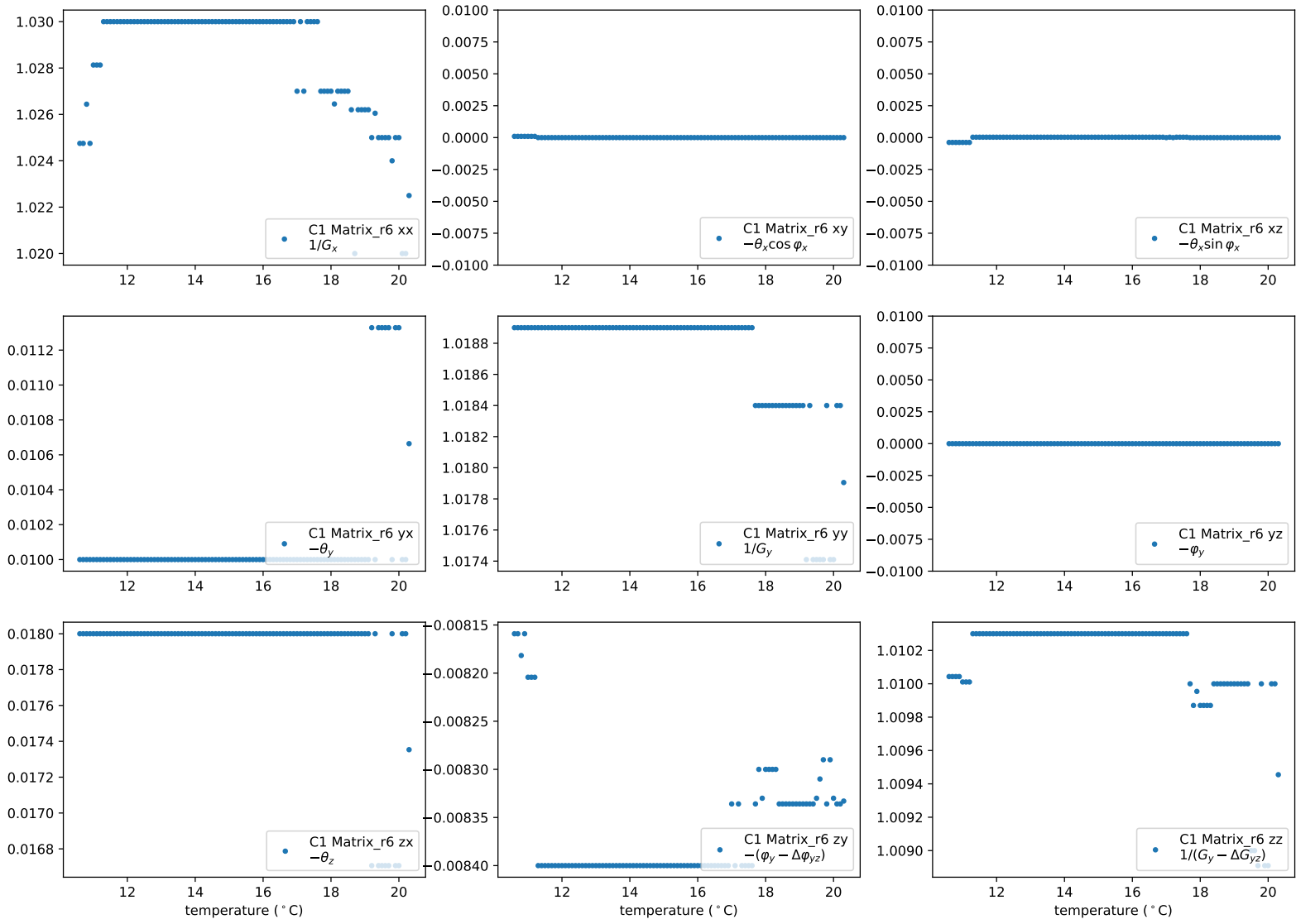


Figure S27: Cluster 1 Matrix_r6 versus the electronics box temperature

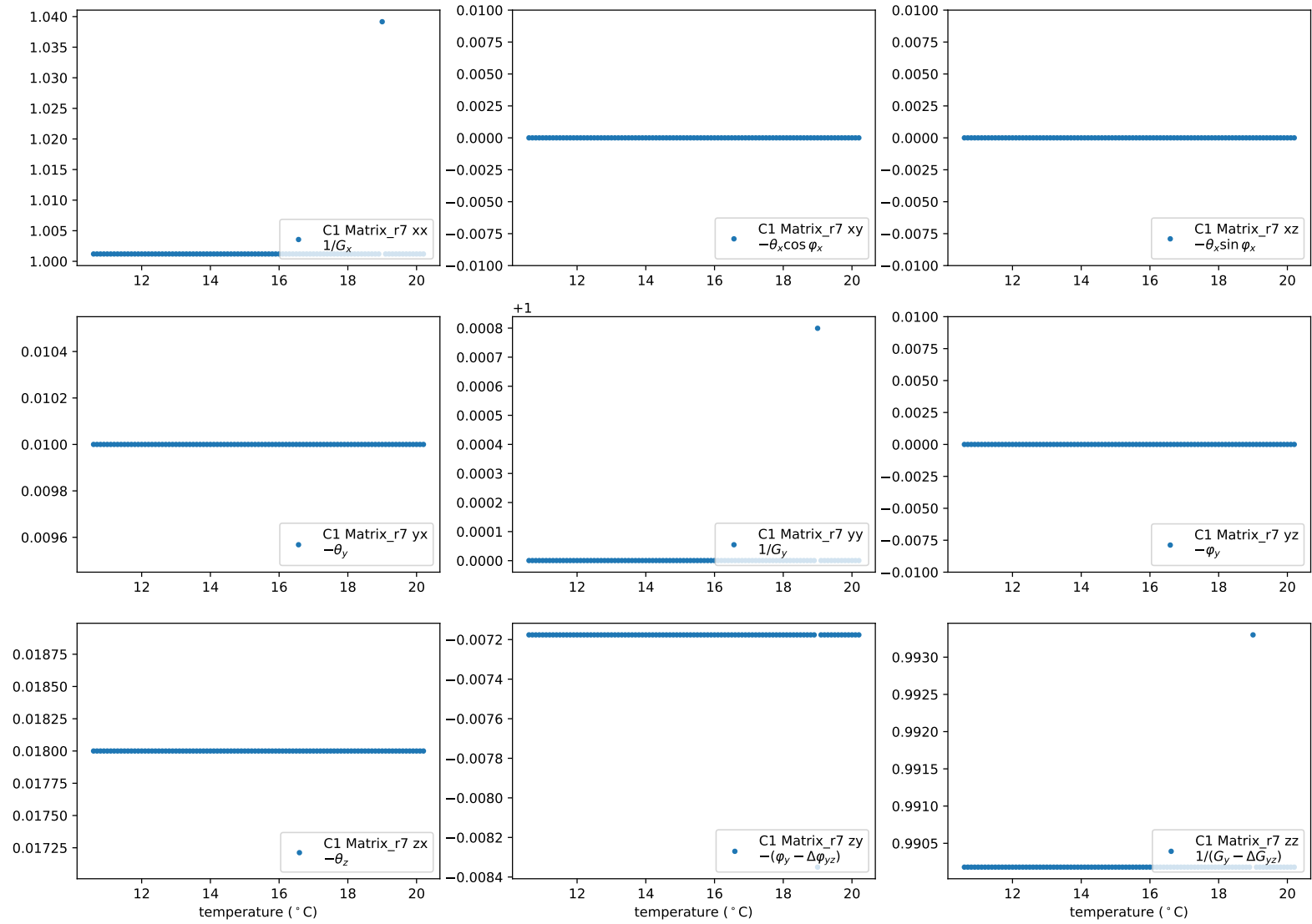


Figure S28: Cluster 1 Matrix_r7 versus the electronics box temperature

1.3 Daily calibration parameters versus the outboard sensor temperature

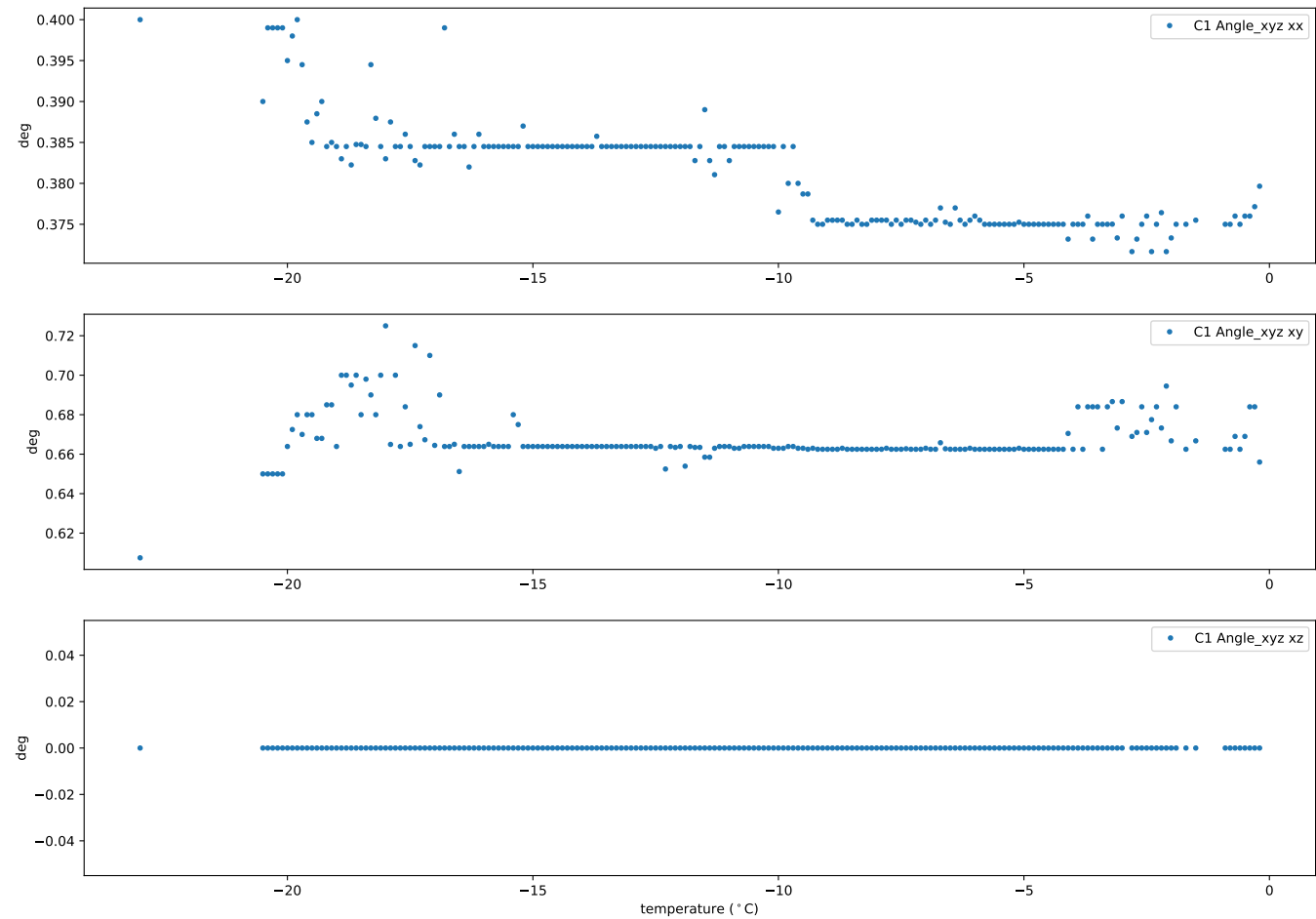


Figure S29: Cluster 1 Angle_xyz versus the outboard sensor temperature

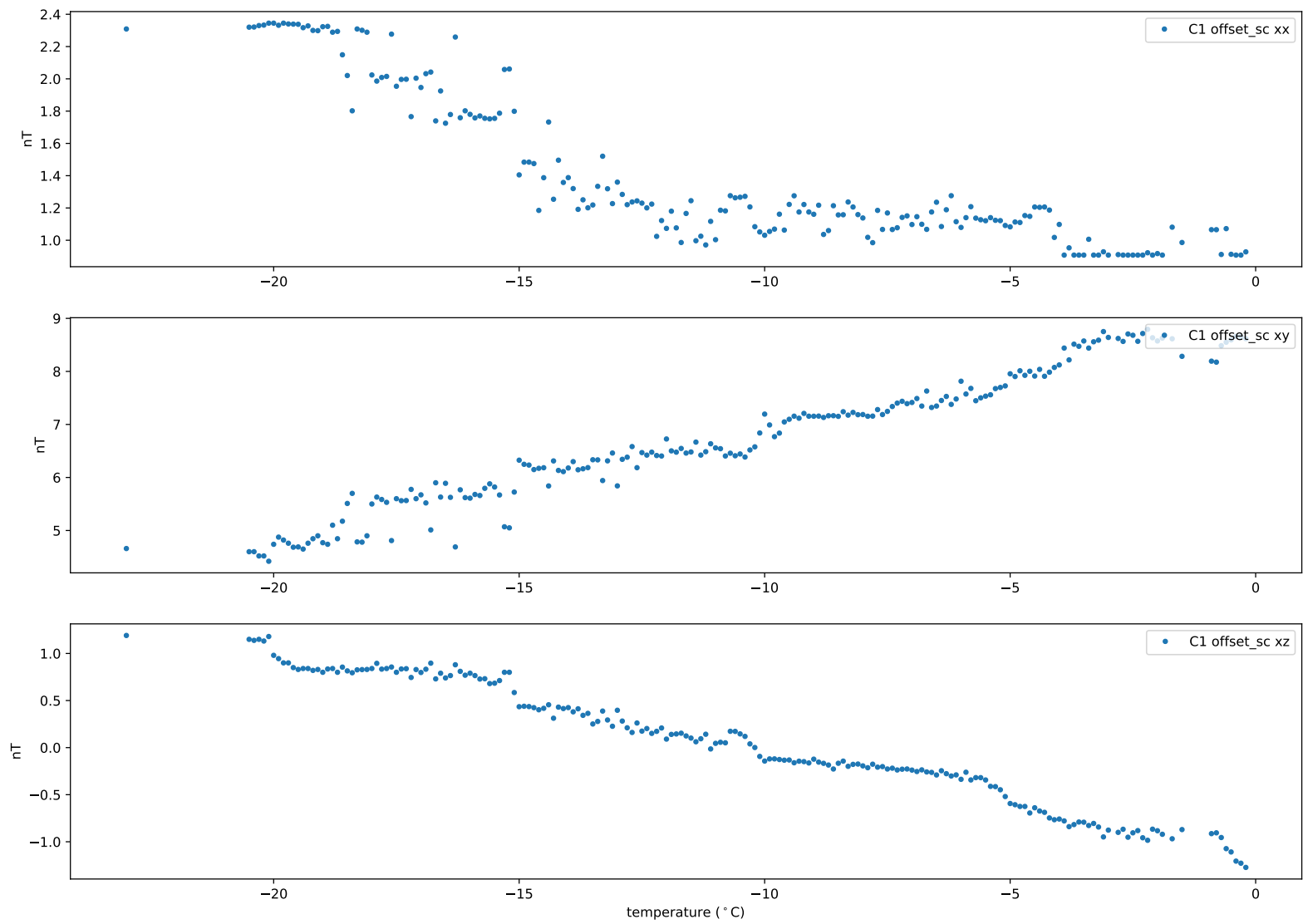


Figure S30: Cluster 1 offset_sc versus the outboard sensor temperature

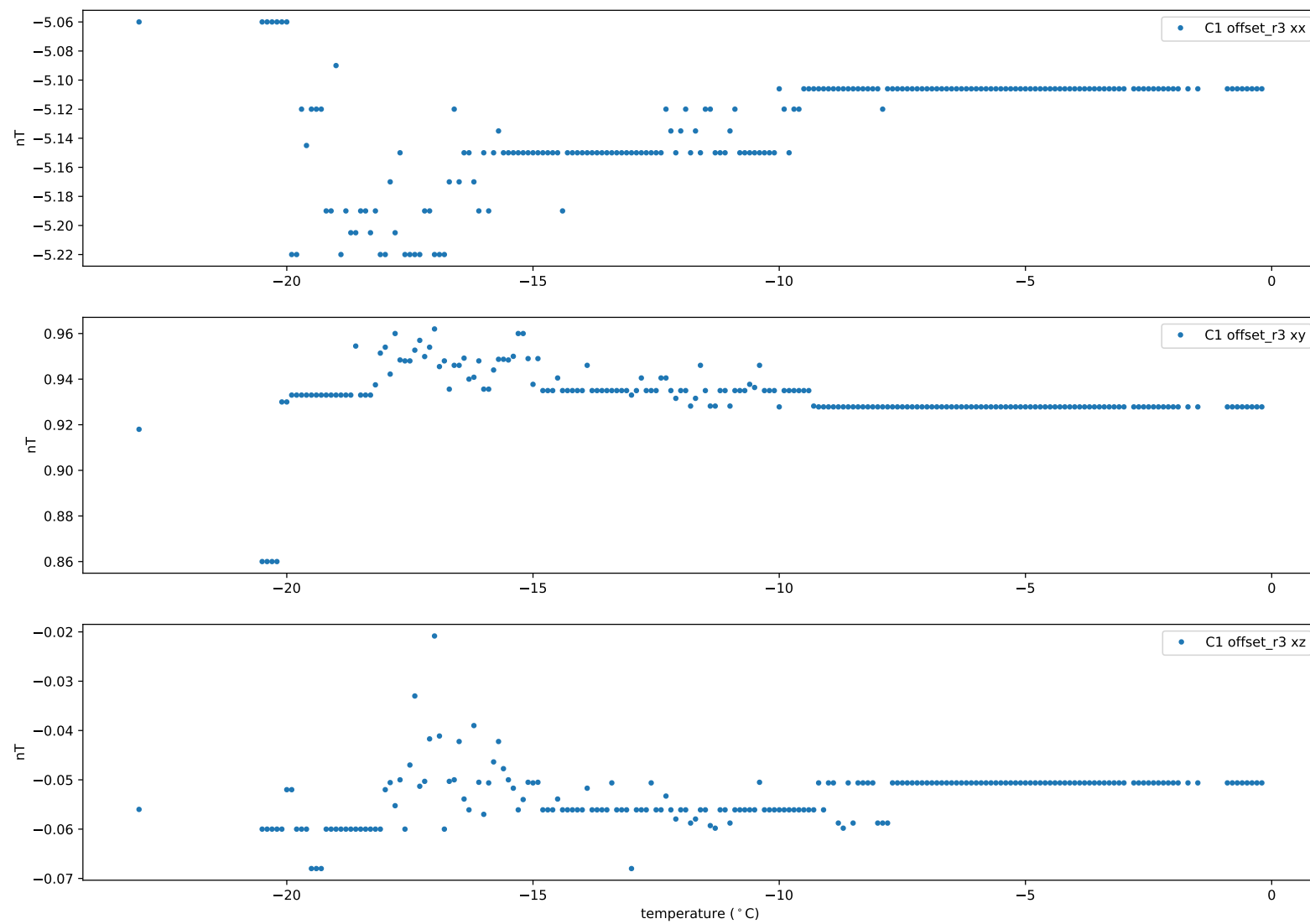


Figure S31: Cluster 1 offset_r3 versus the outboard sensor temperature

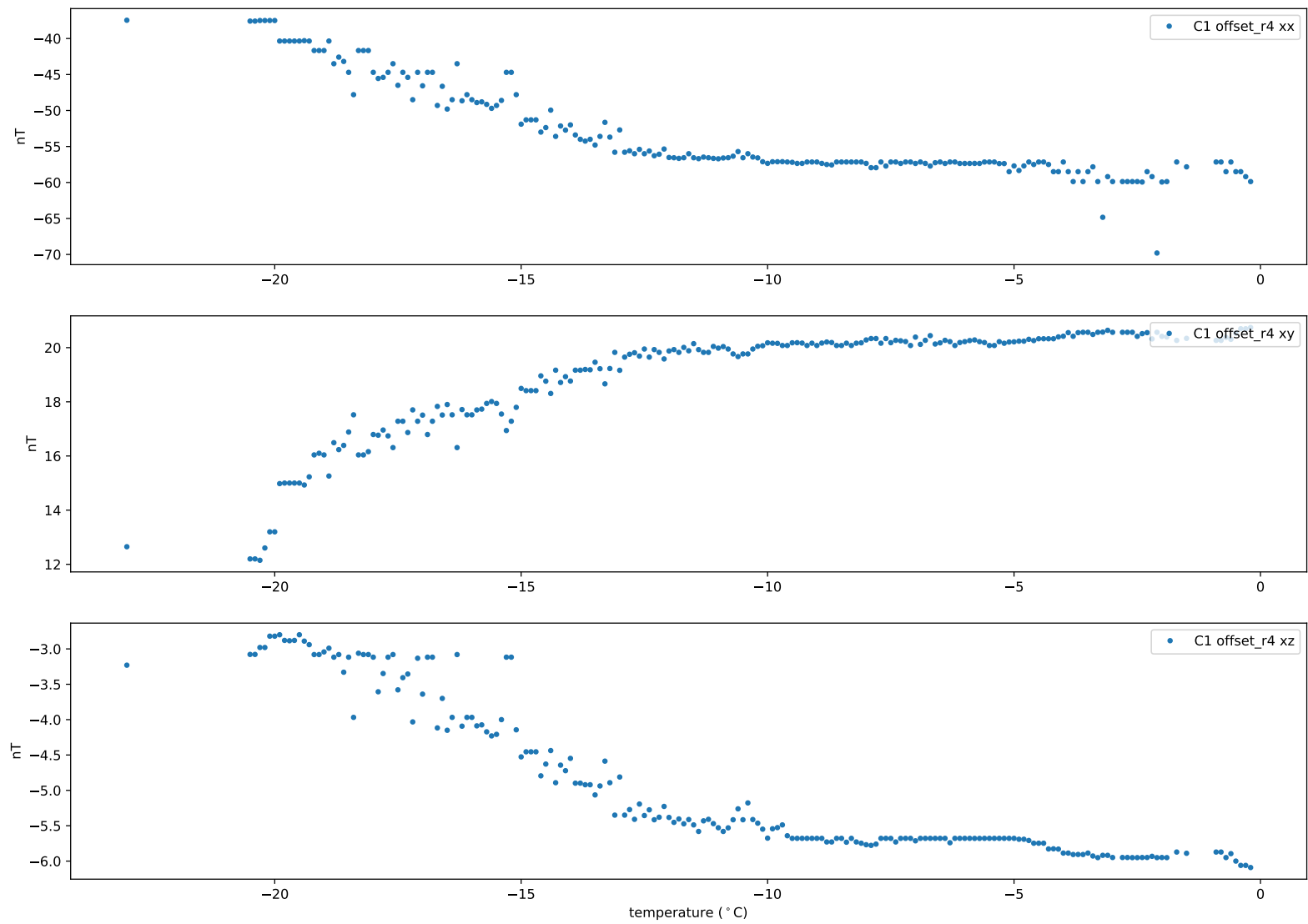


Figure S32: Cluster 1 offset_r4 versus the outboard sensor temperature

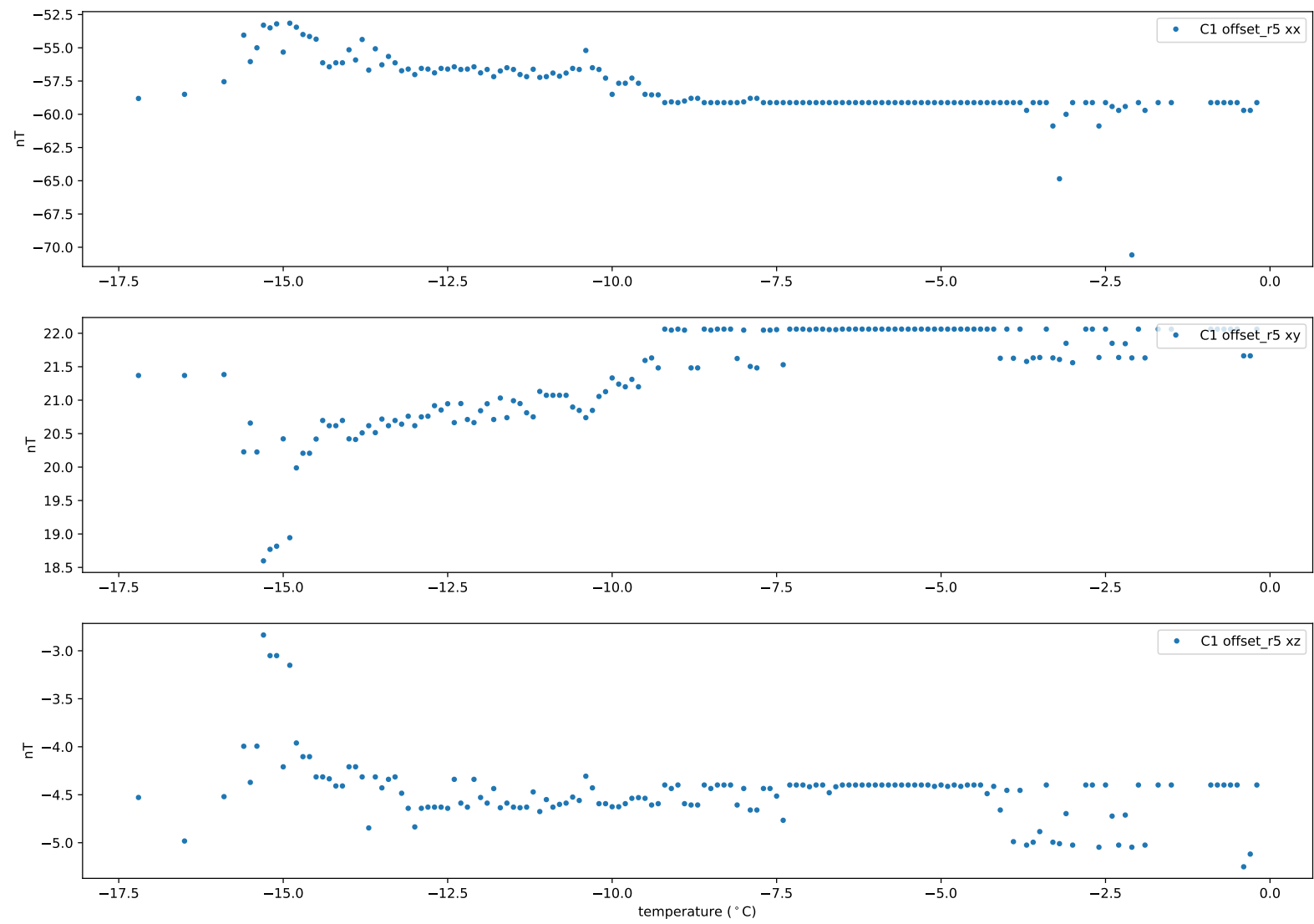


Figure S33: Cluster 1 offset_r5 versus the outboard sensor temperature

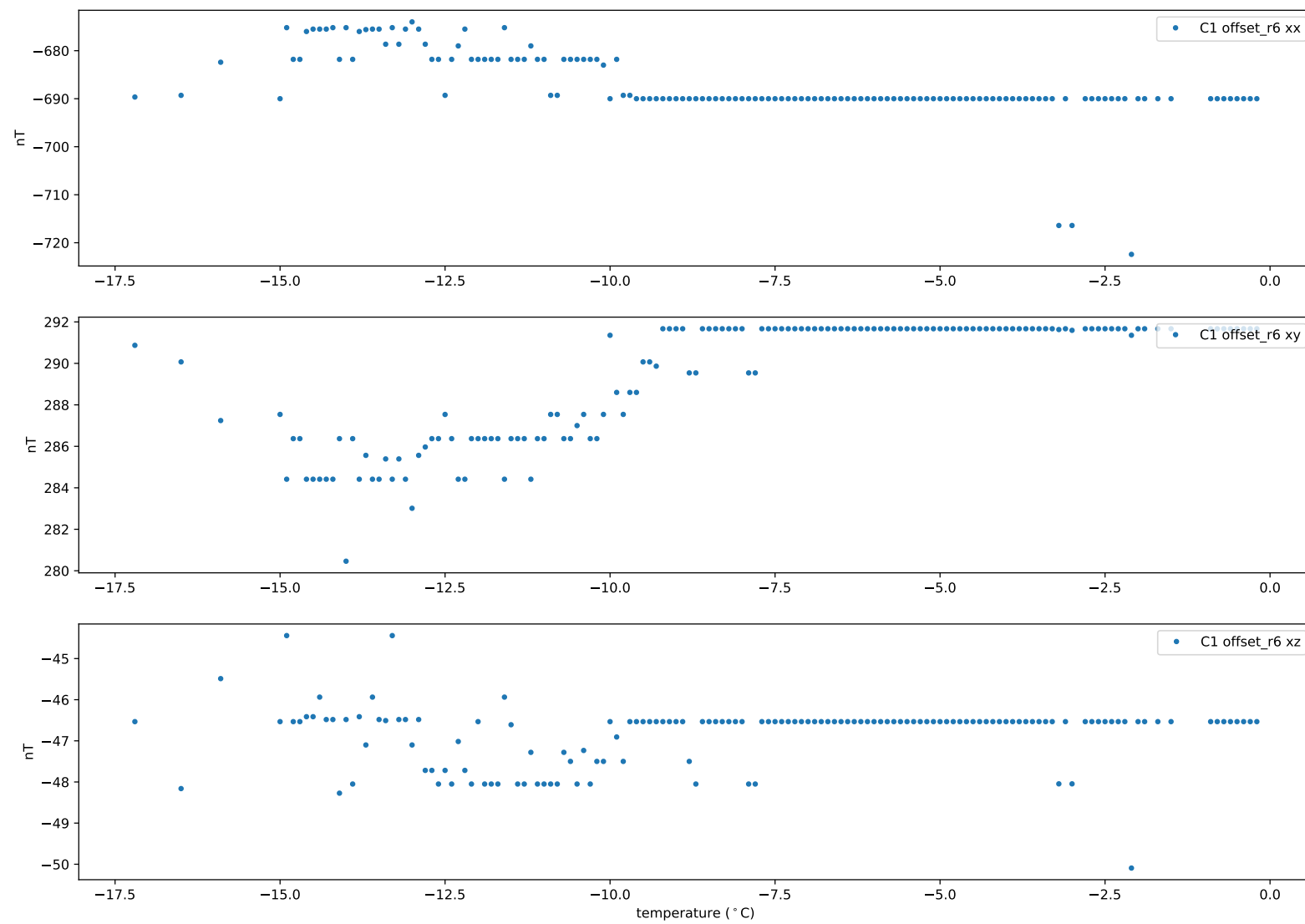


Figure S34: Cluster 1 offset_r6 versus the outboard sensor temperature

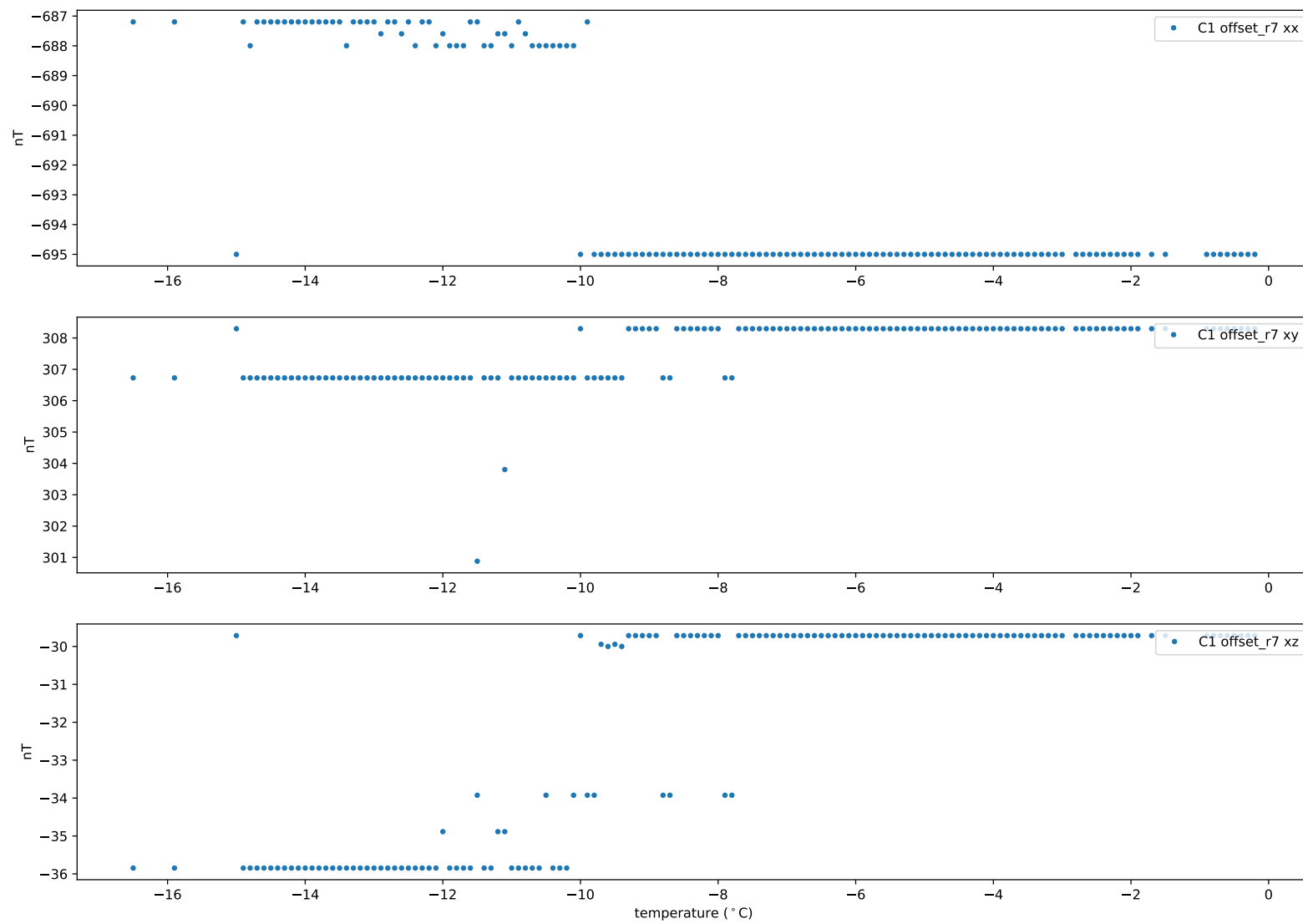


Figure S35: Cluster 1 offset_r7 versus the outboard sensor temperature

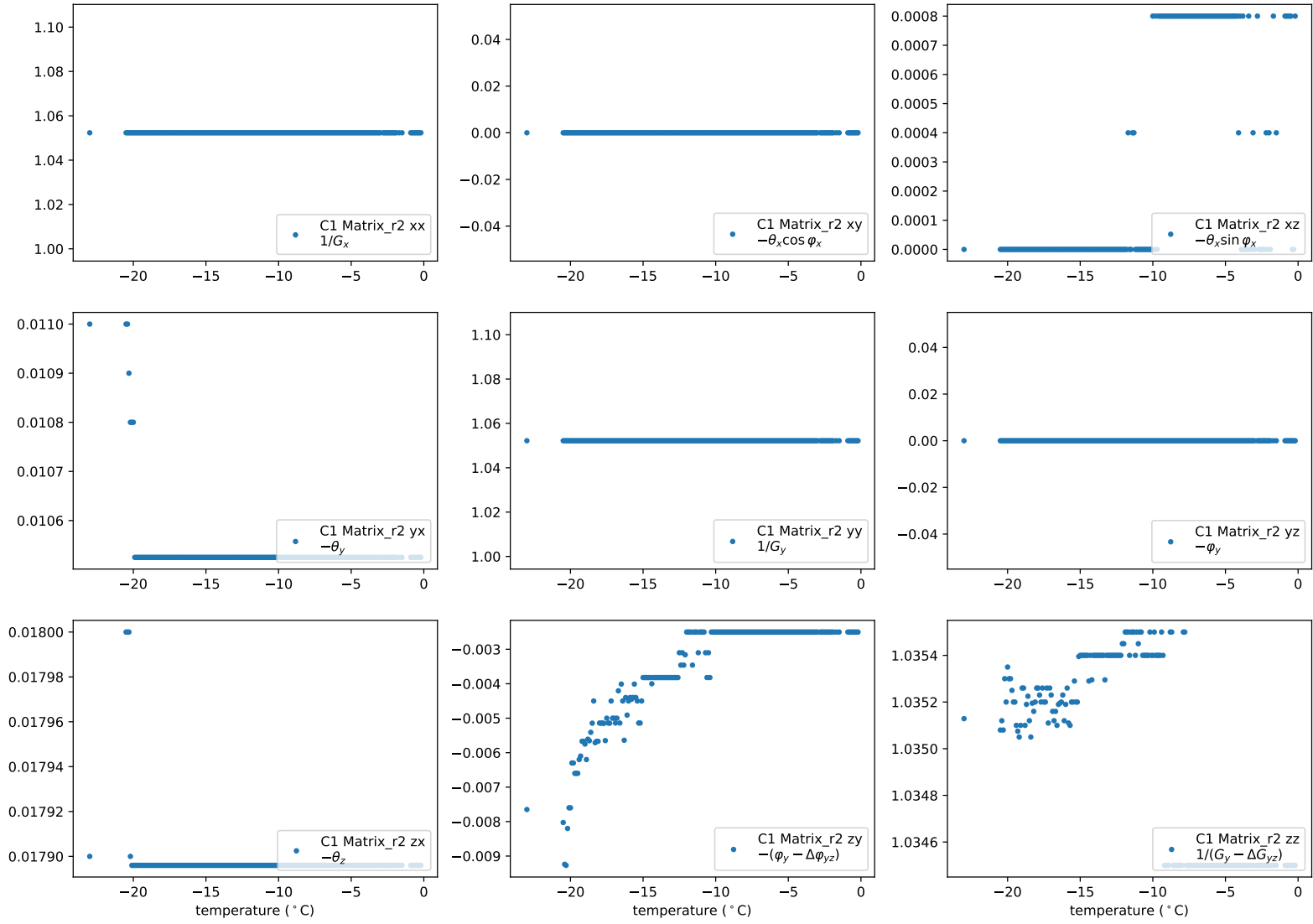


Figure S36: Cluster 1 Matrix_r2 versus the outboard sensor temperature

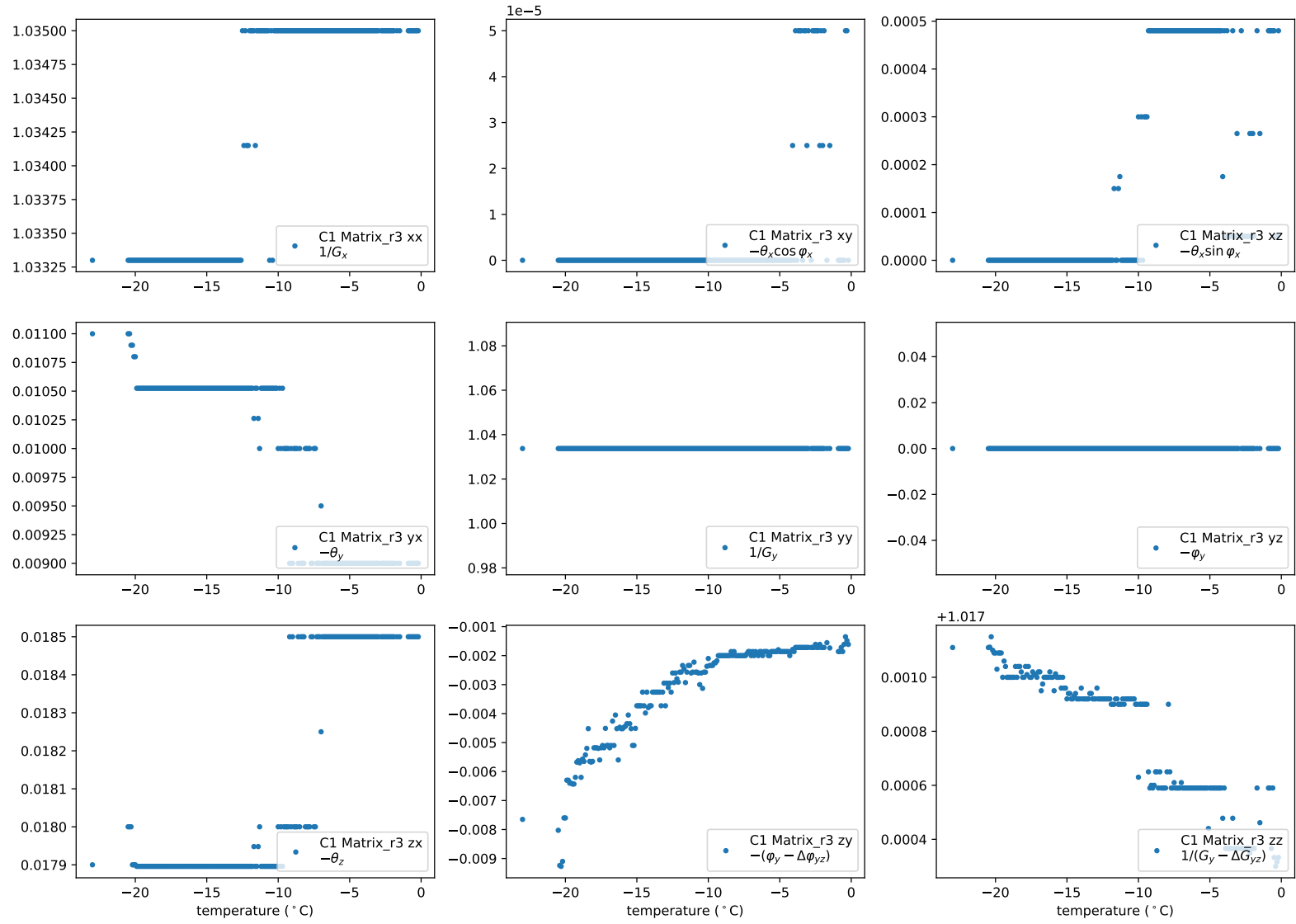


Figure S37: Cluster 1 Matrix_r3 versus the outboard sensor temperature

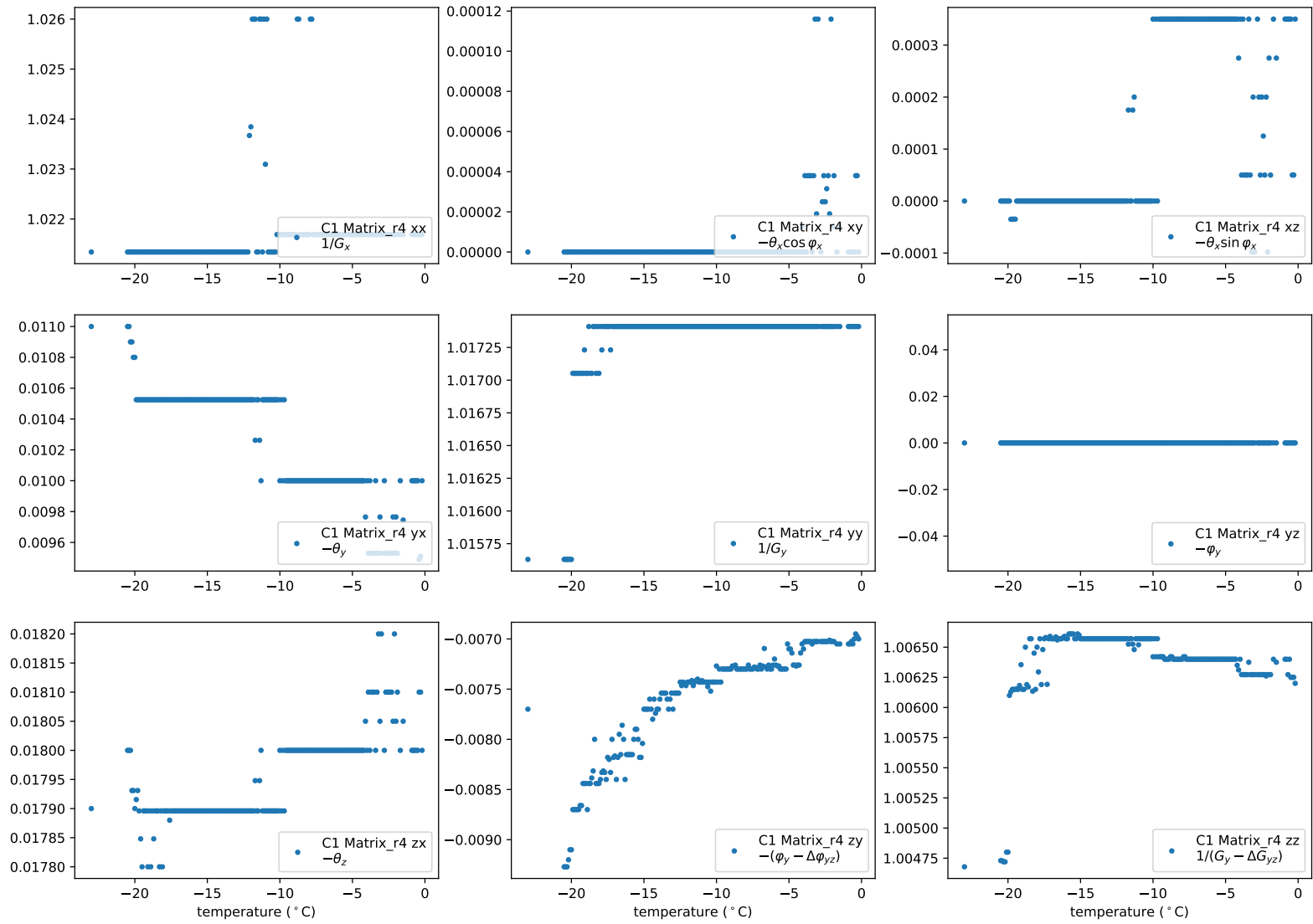


Figure S38: Cluster 1 Matrix_r4 versus the outboard sensor temperature

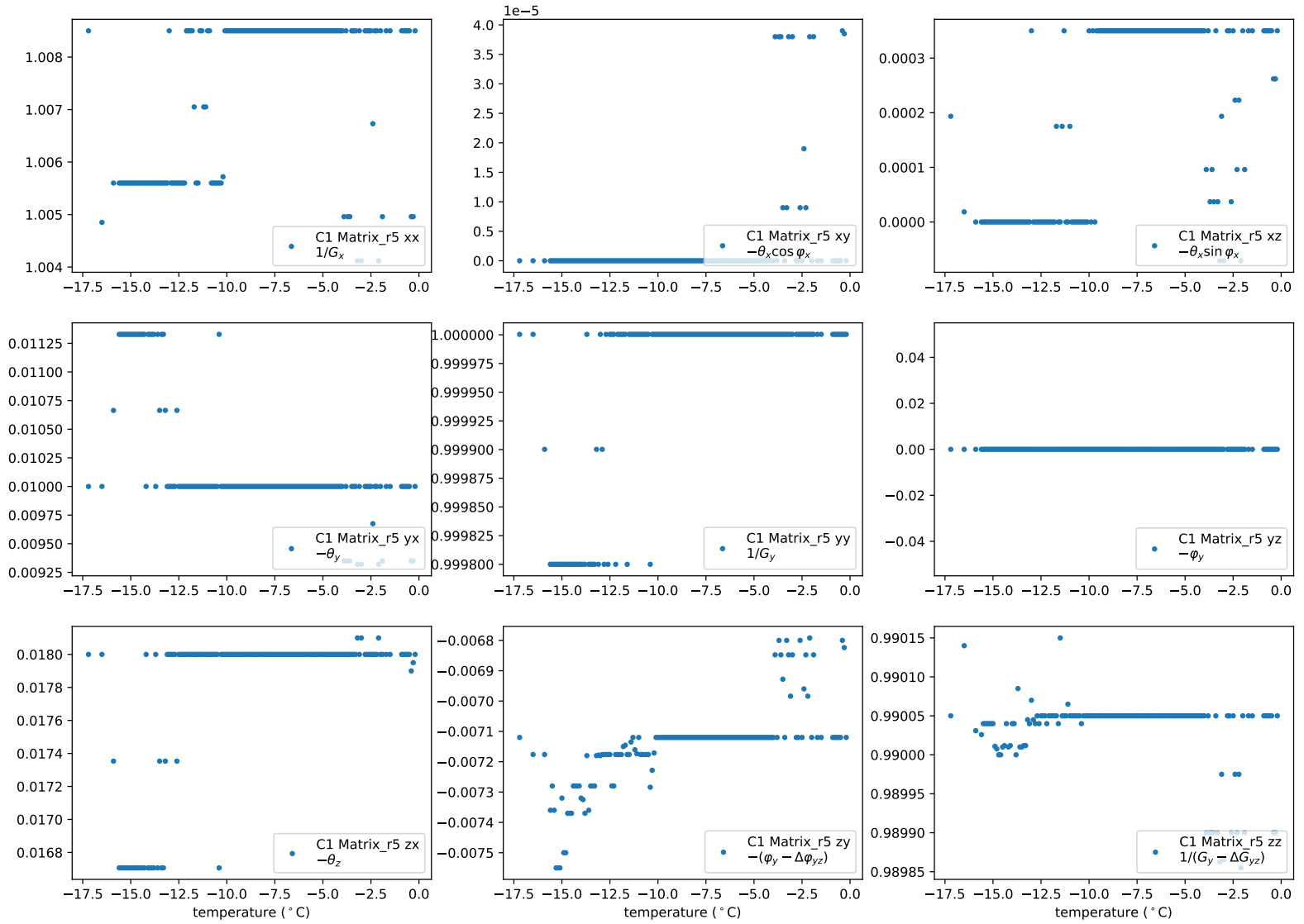


Figure S39: Cluster 1 Matrix_r5 versus the outboard sensor temperature

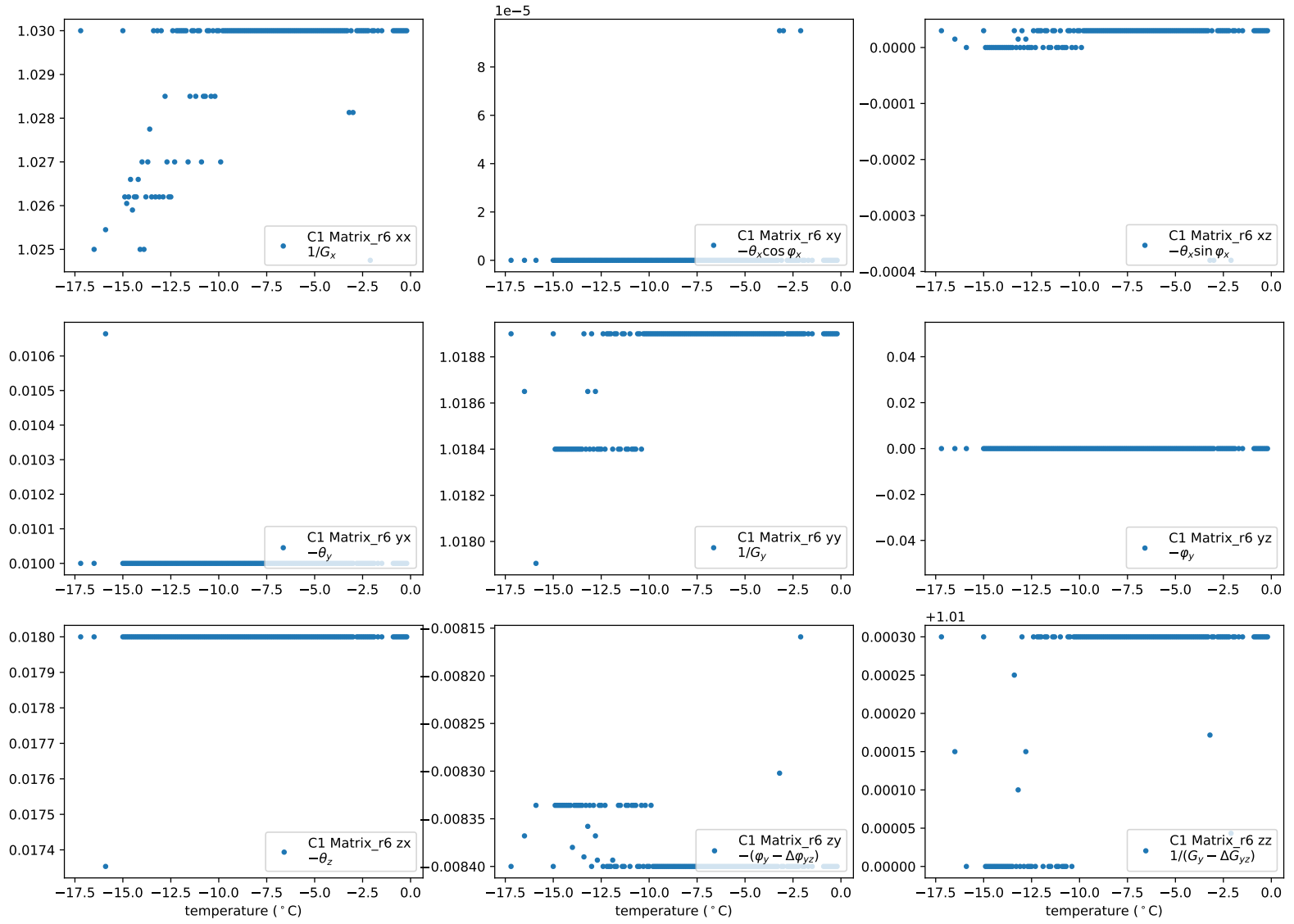


Figure S40: Cluster 1 Matrix_r6 versus the outboard sensor temperature

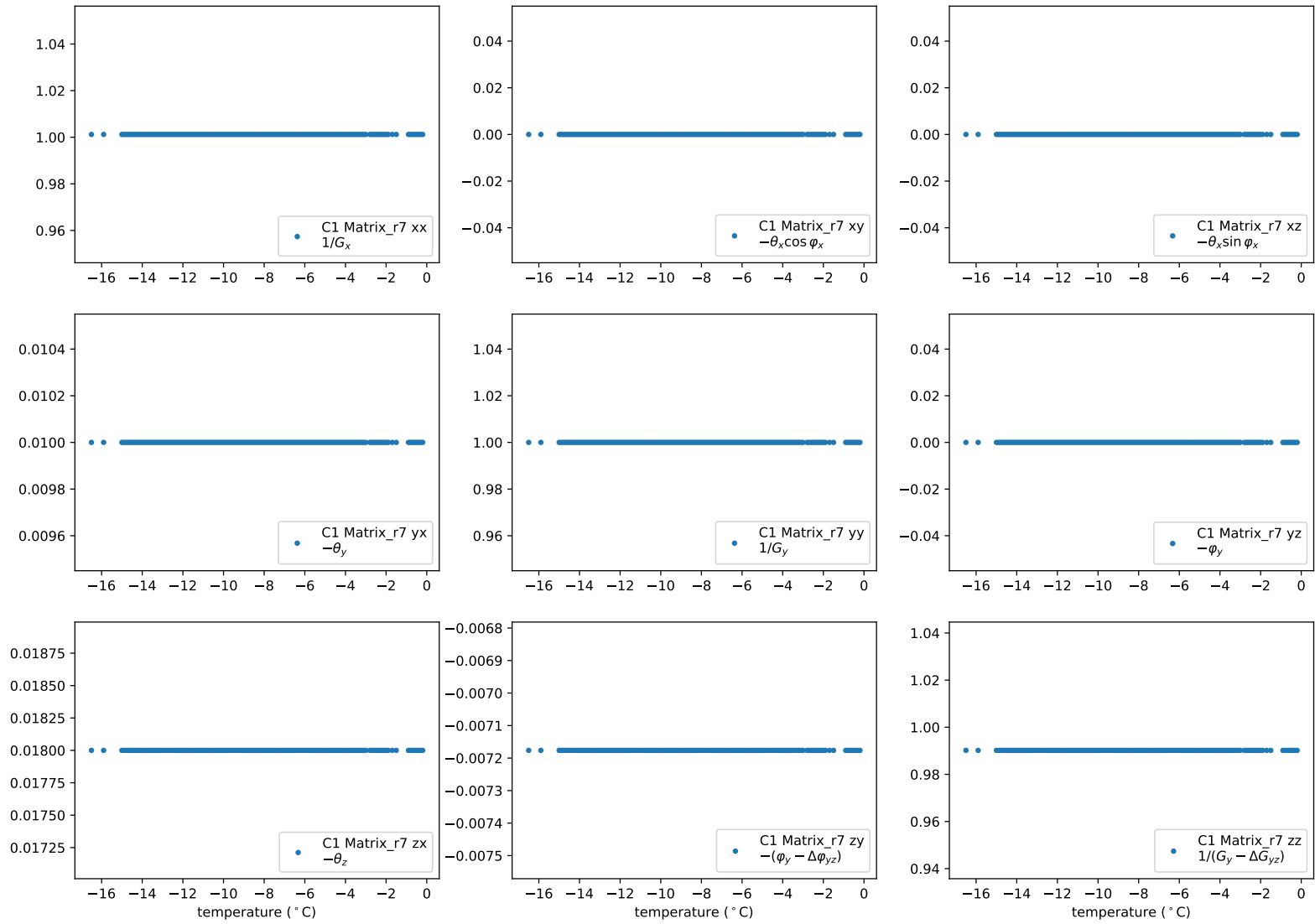


Figure S41: Cluster 1 Matrix_r7 versus the outboard sensor temperature

2 Cluster 2 calibration parameters

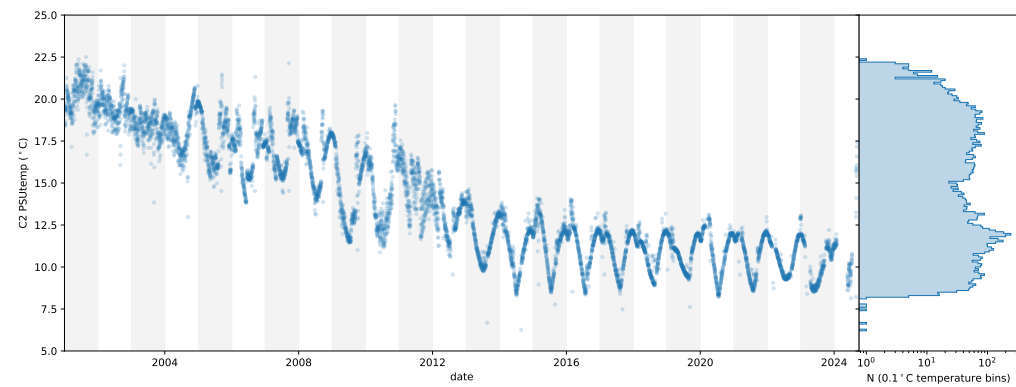


Figure S42: Cluster 2 electronics box temperature

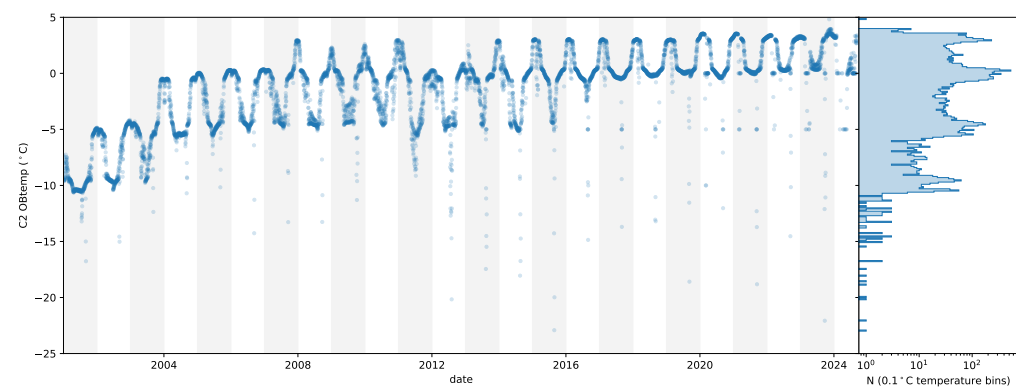


Figure S43: Cluster 2 outboard sensor temperature

2.1 Daily calibration parameters long term variation

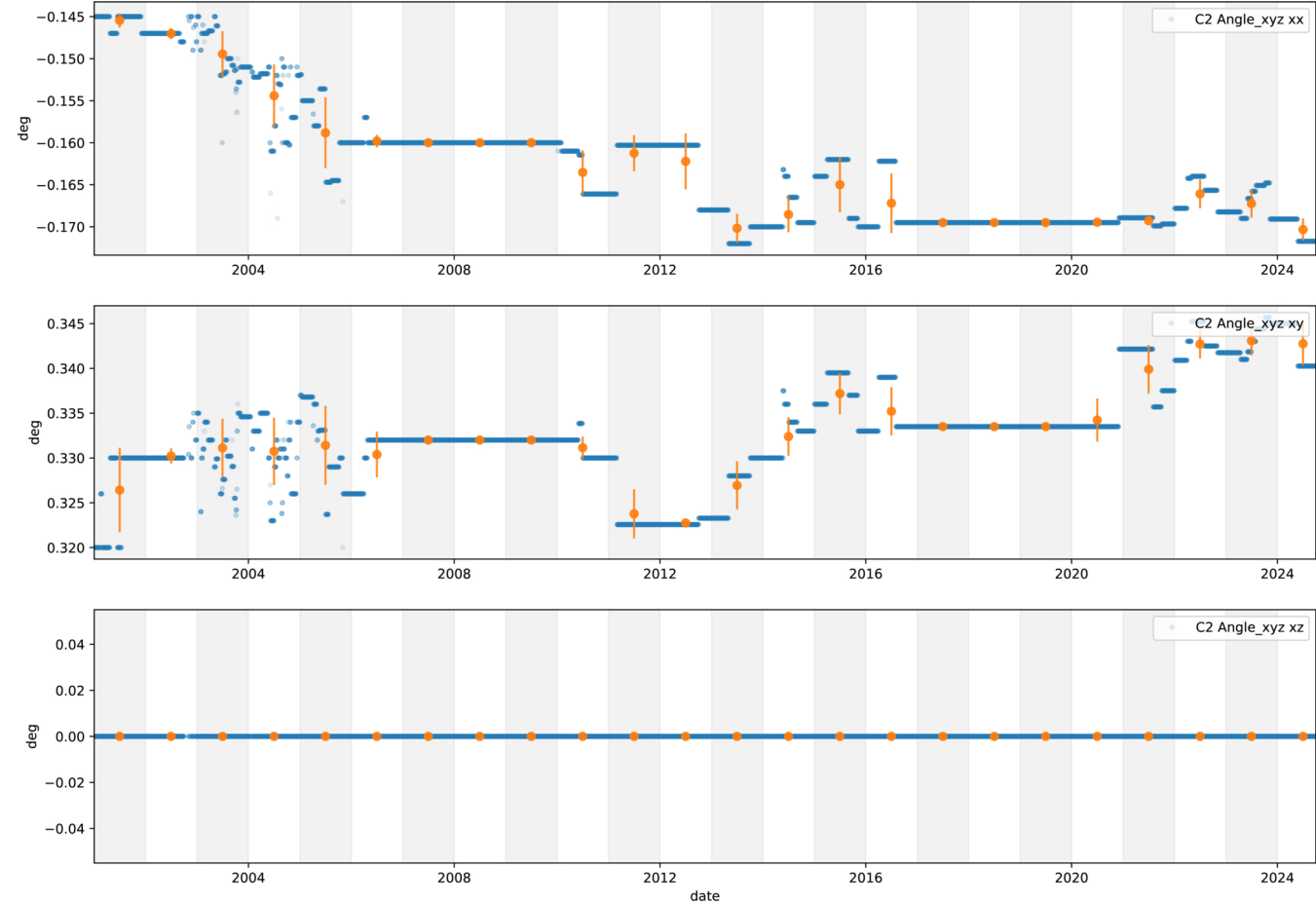


Figure S44: Cluster 2 Angle_xyz long term variation

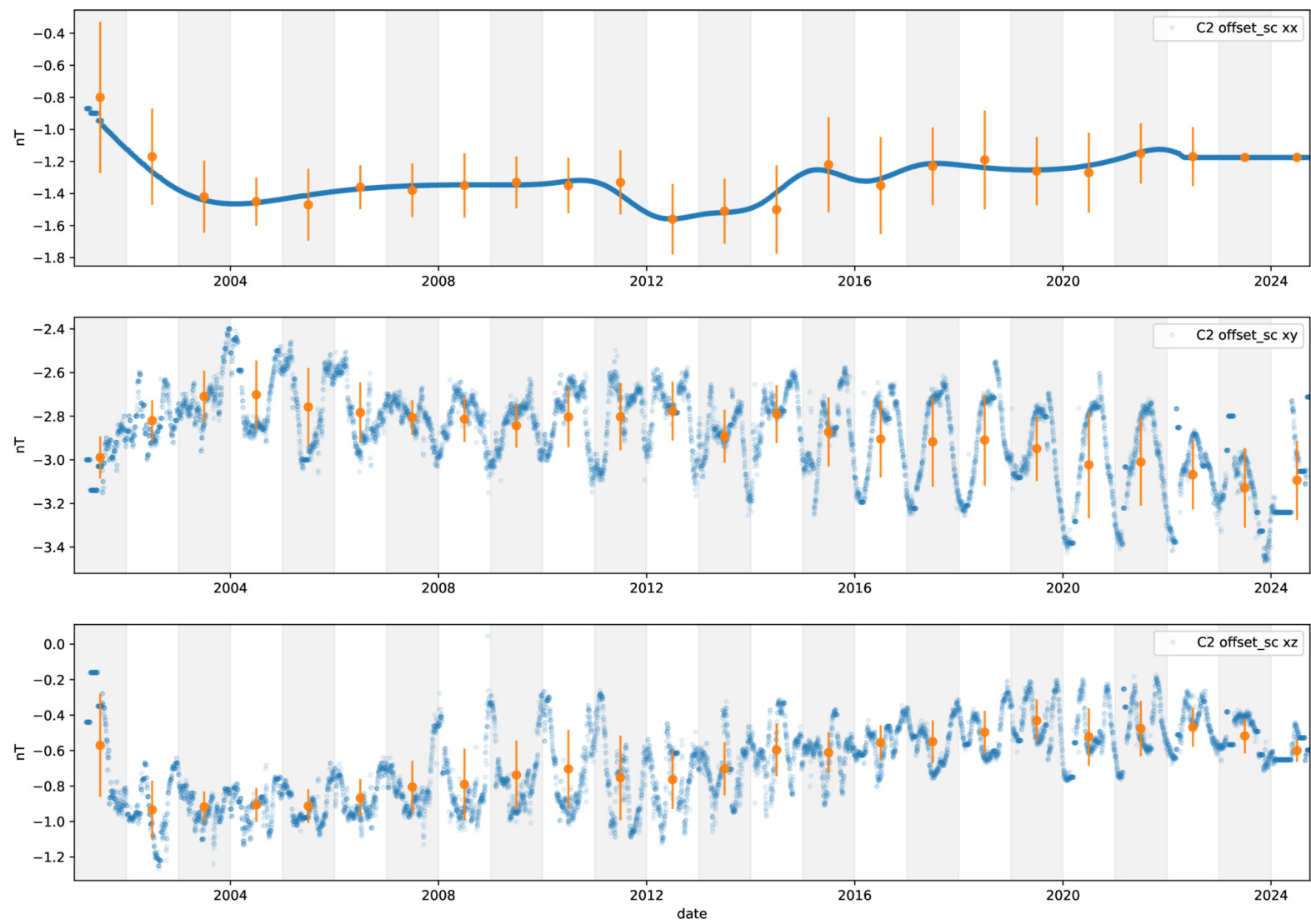


Figure S45: Cluster 2 offset_sc long term variation

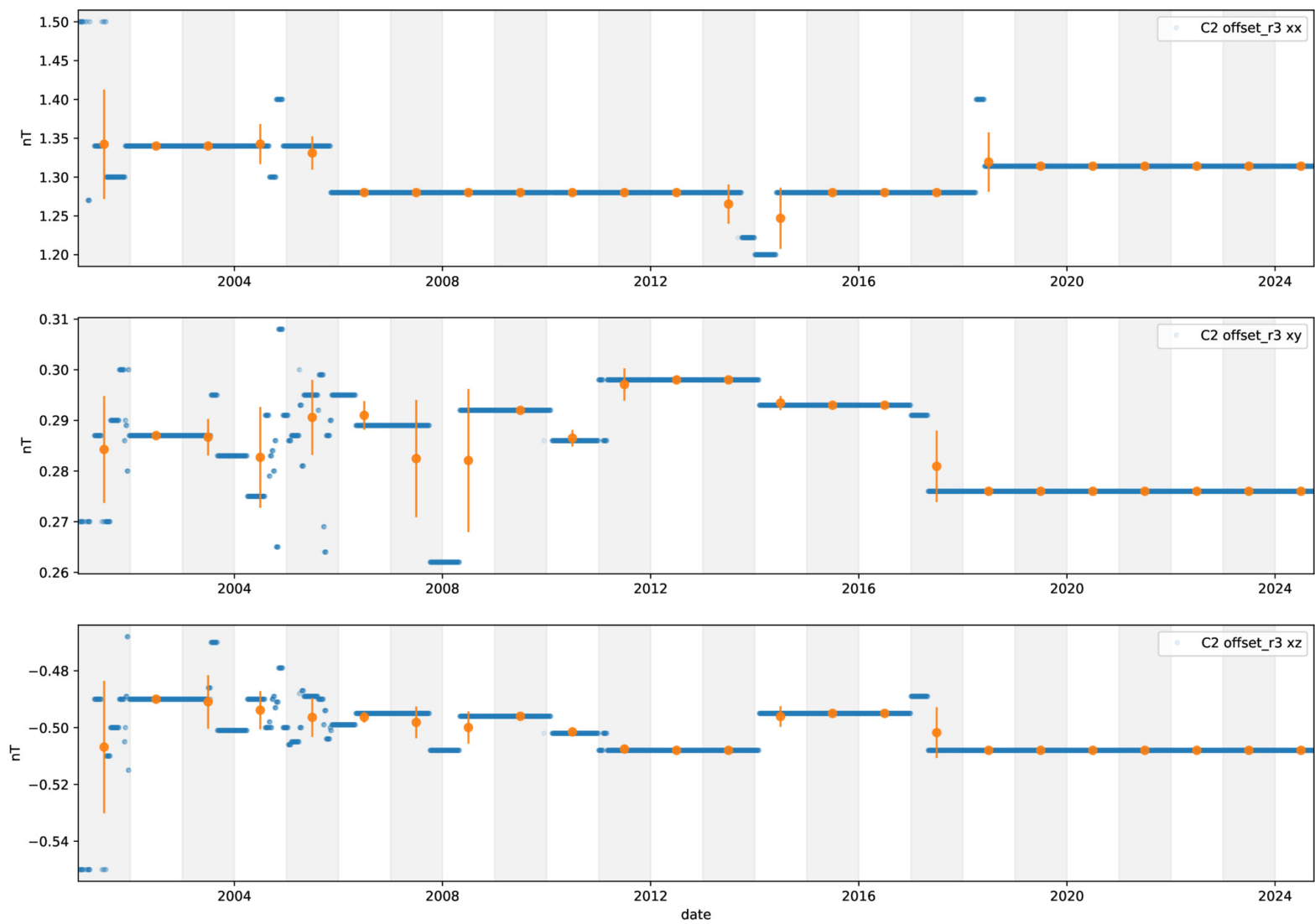


Figure S46: Cluster 2 offset_r3 long term variation

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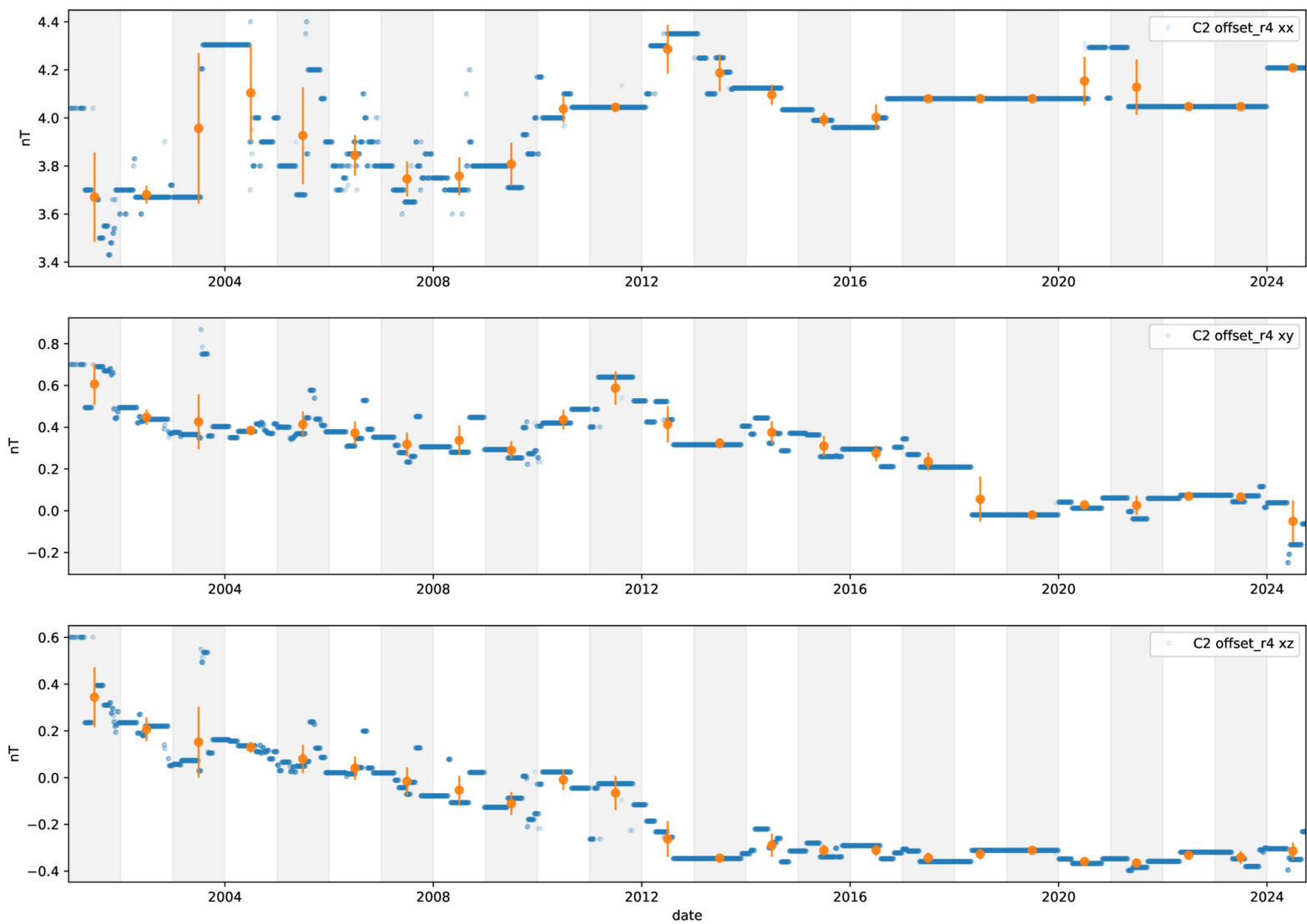


Figure S47: Cluster 2 offset_r4 long term variation

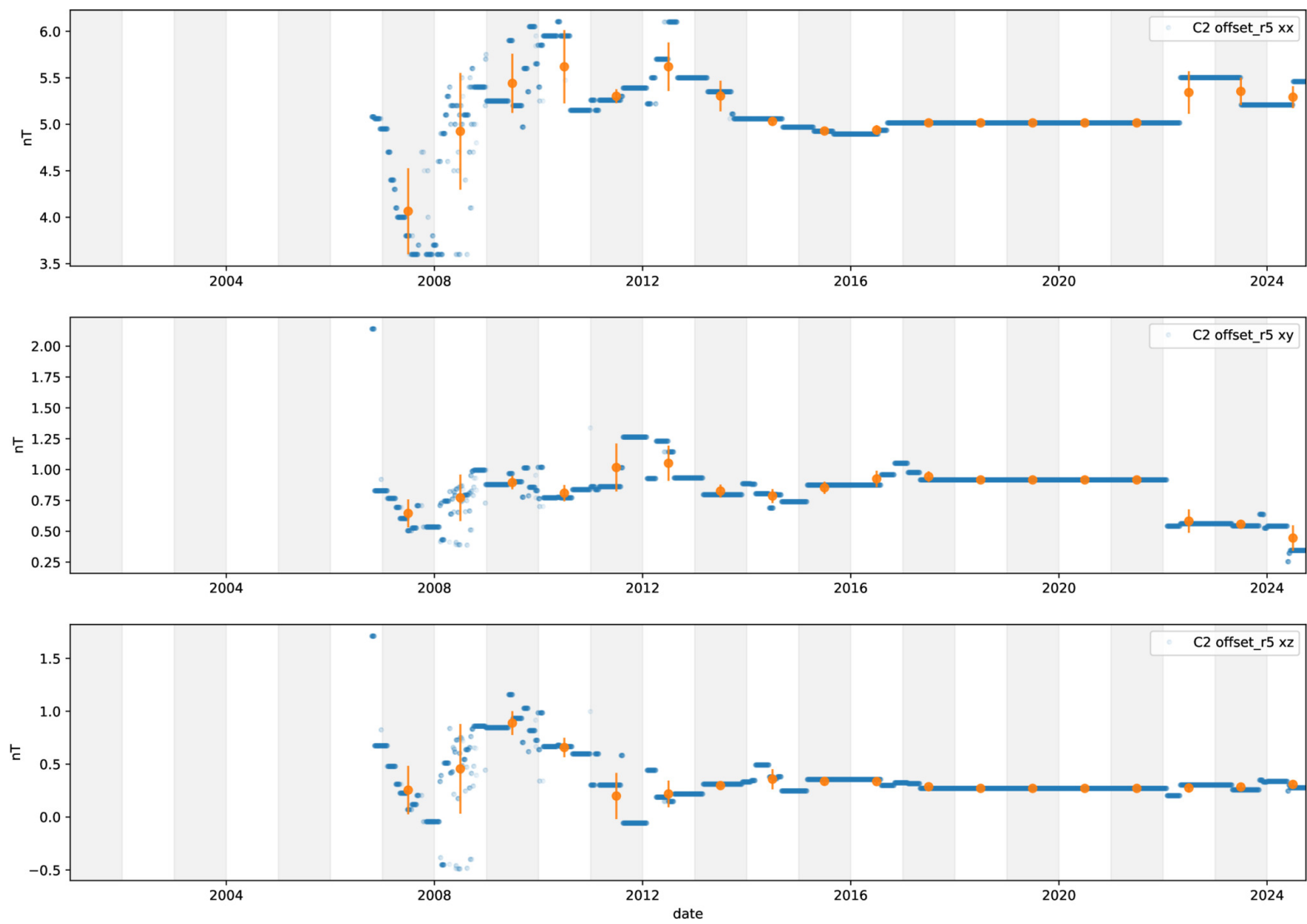


Figure S48: Cluster 2 offset_r5 long term variation

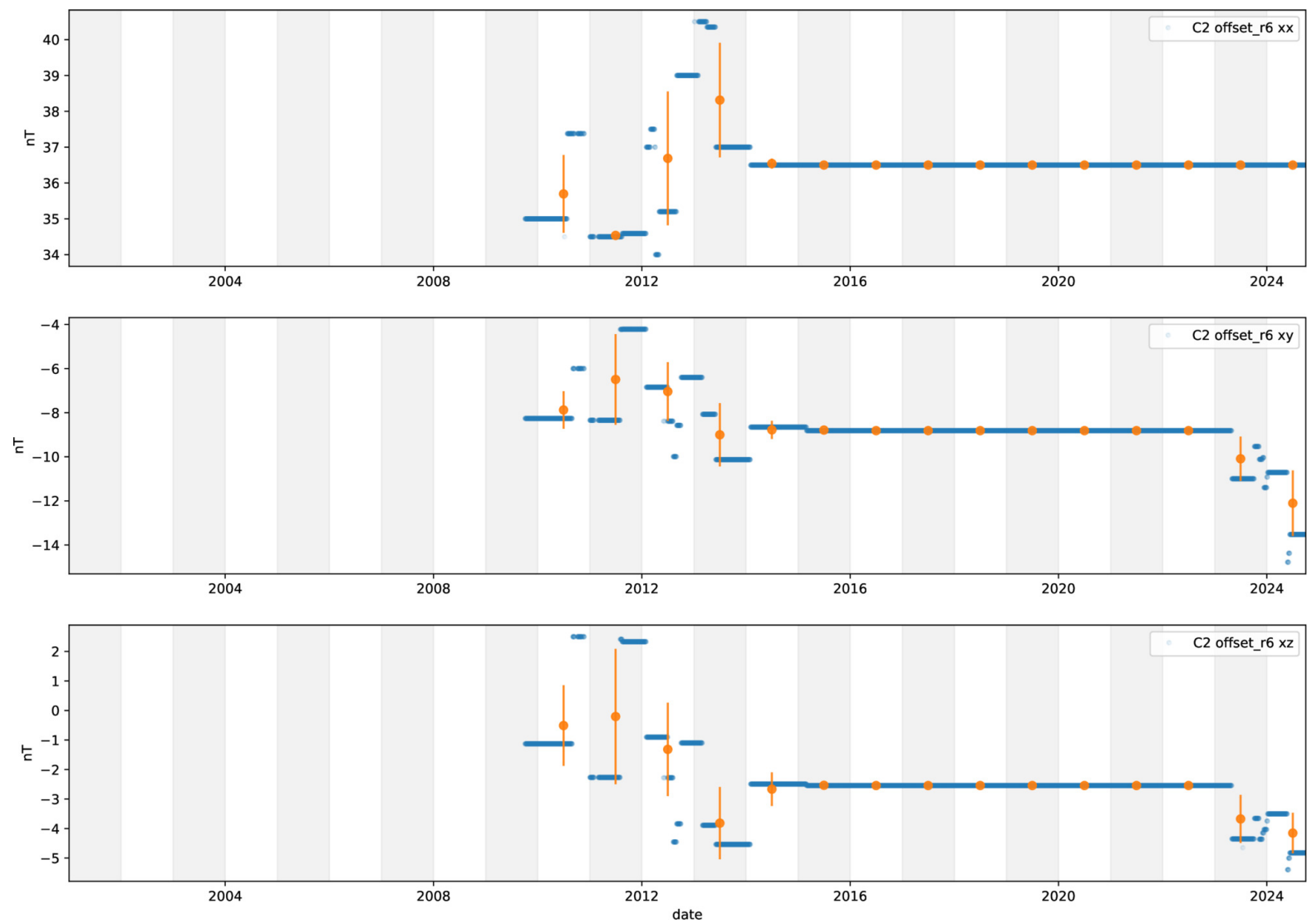


Figure S49: Cluster 2 offset_r6 long term variation

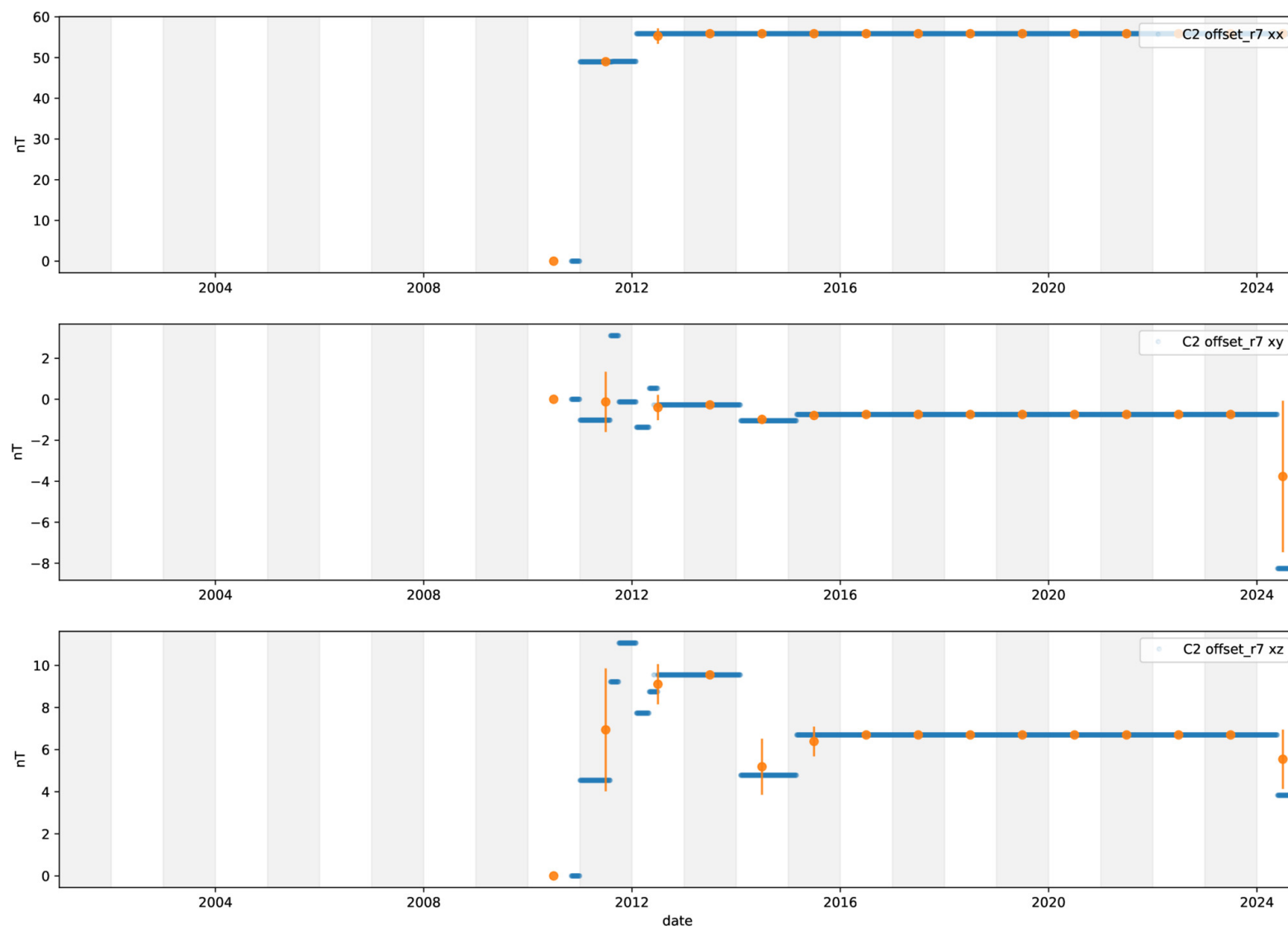


Figure S50: Cluster 2 offset_r7 long term variation

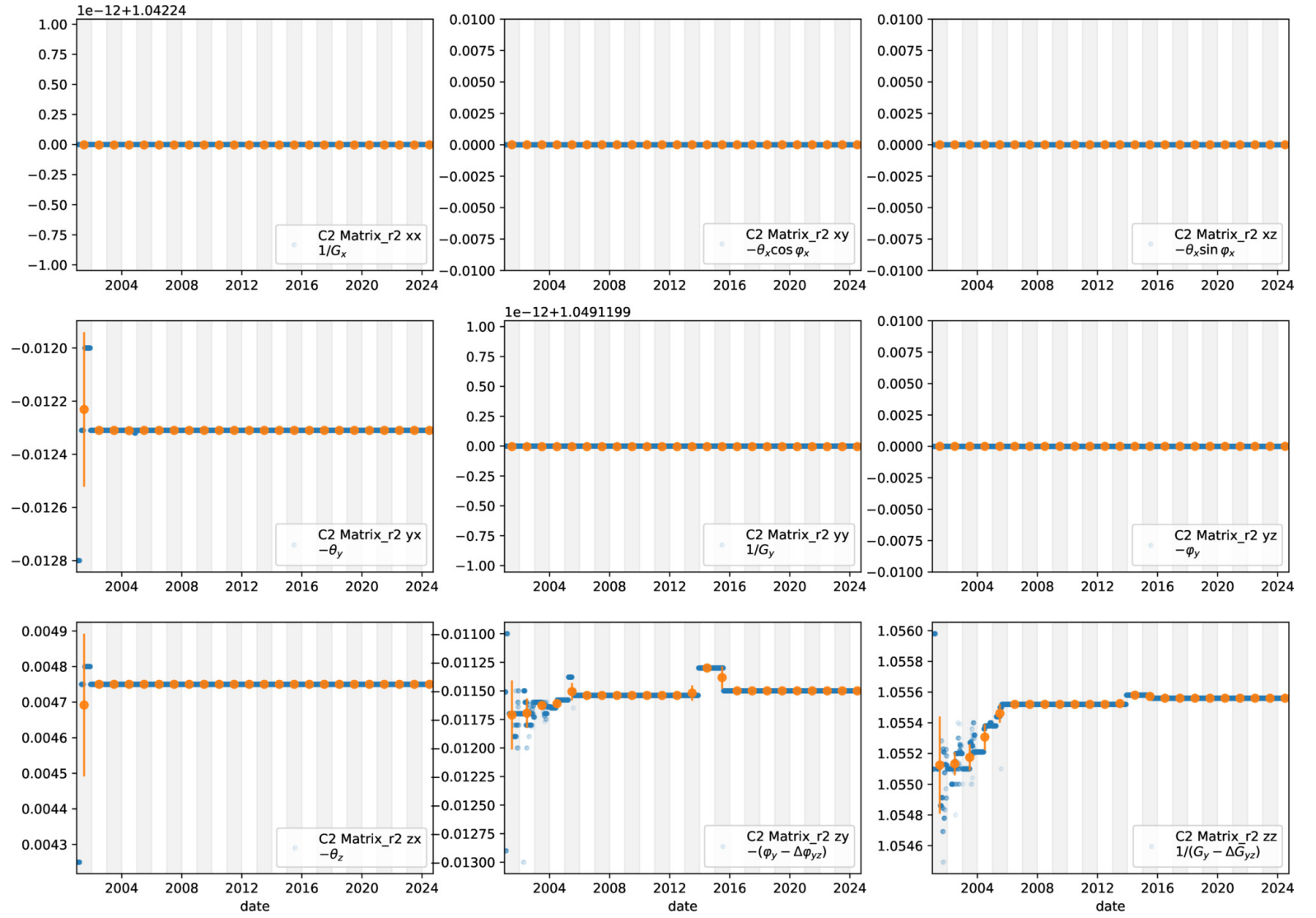


Figure S51: Cluster 2 Matrix_r2 long term variation

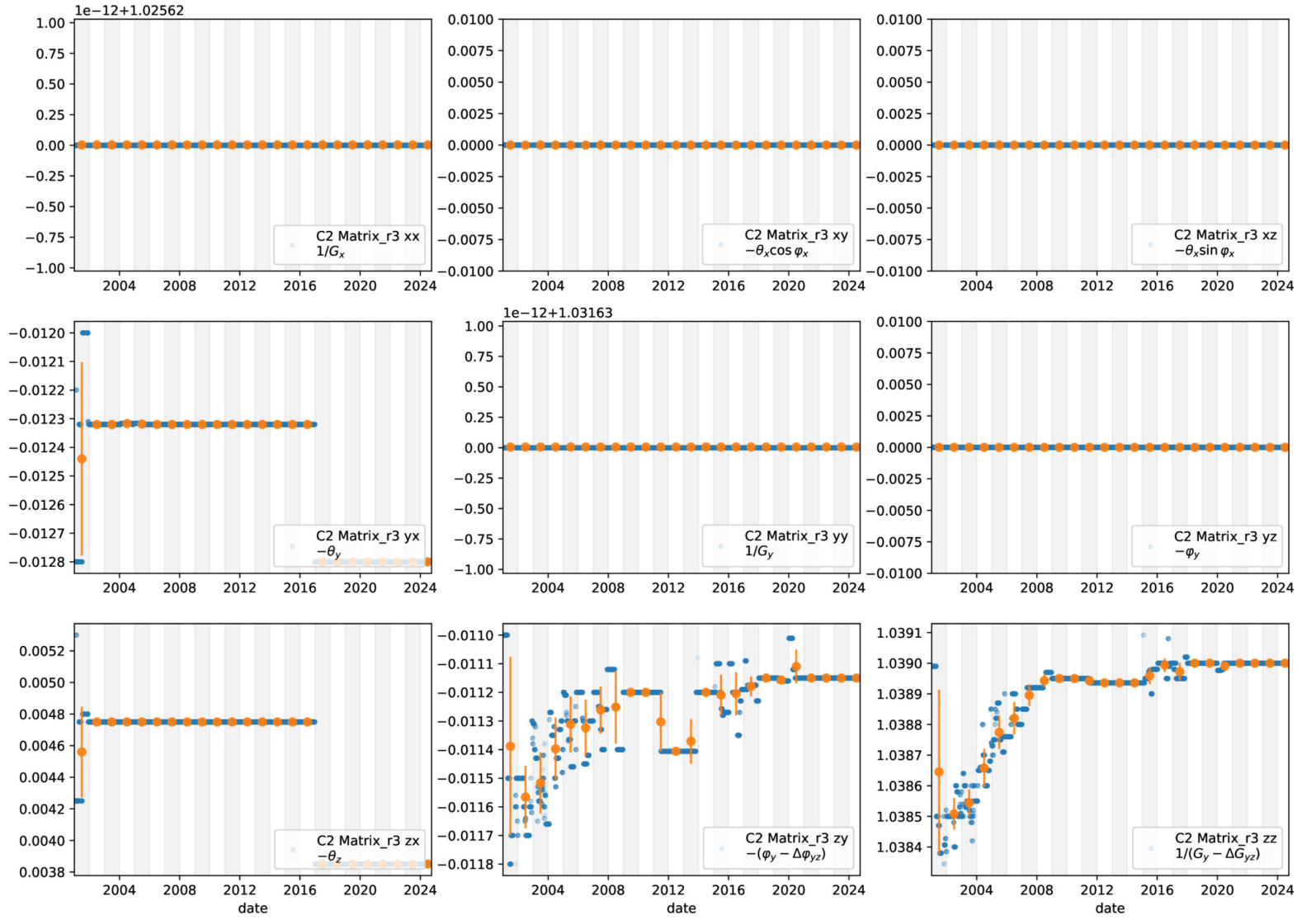


Figure S52: Cluster 2 Matrix_r3 long term variation

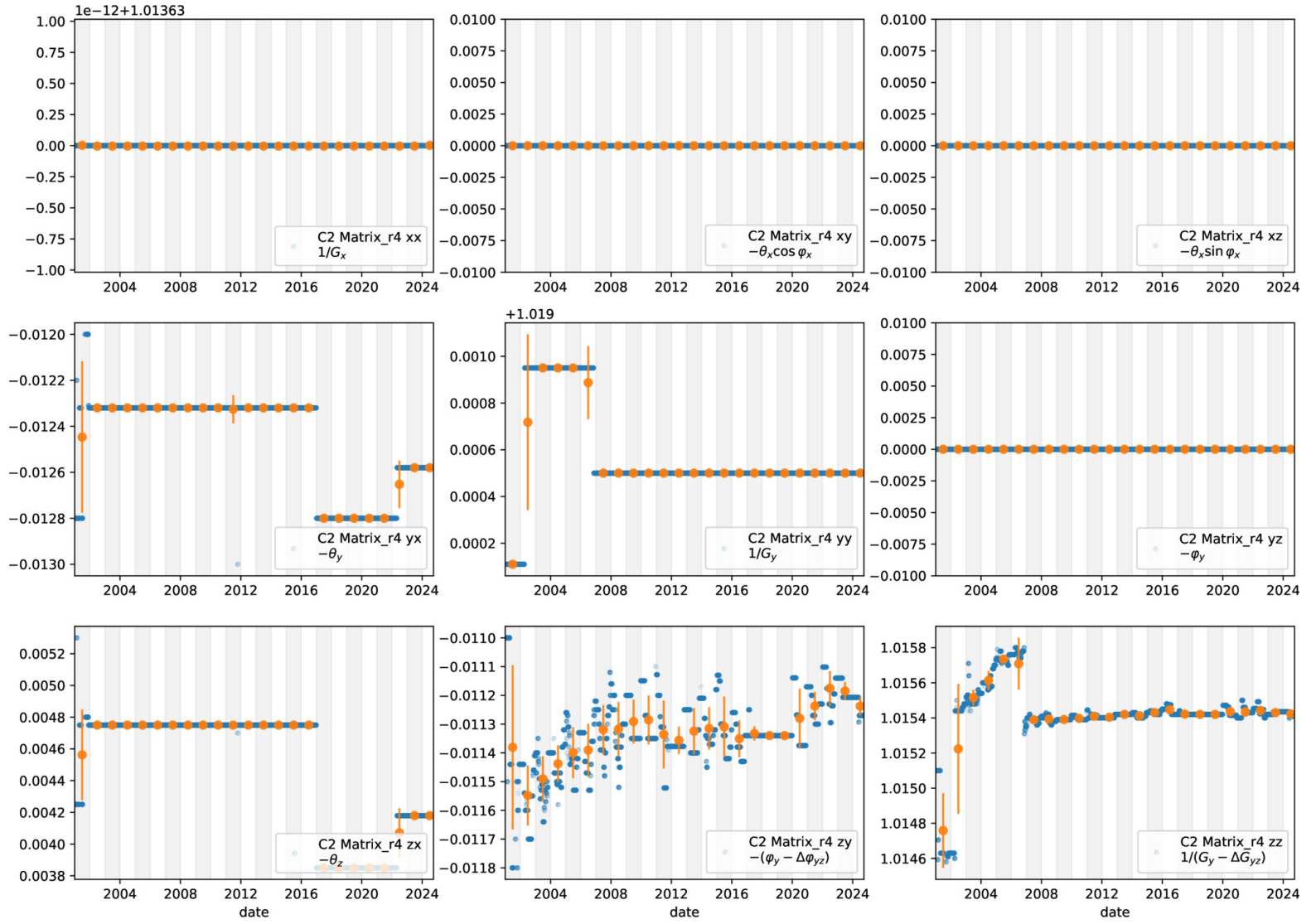


Figure S53: Cluster 2 Matrix_r4 long term variation

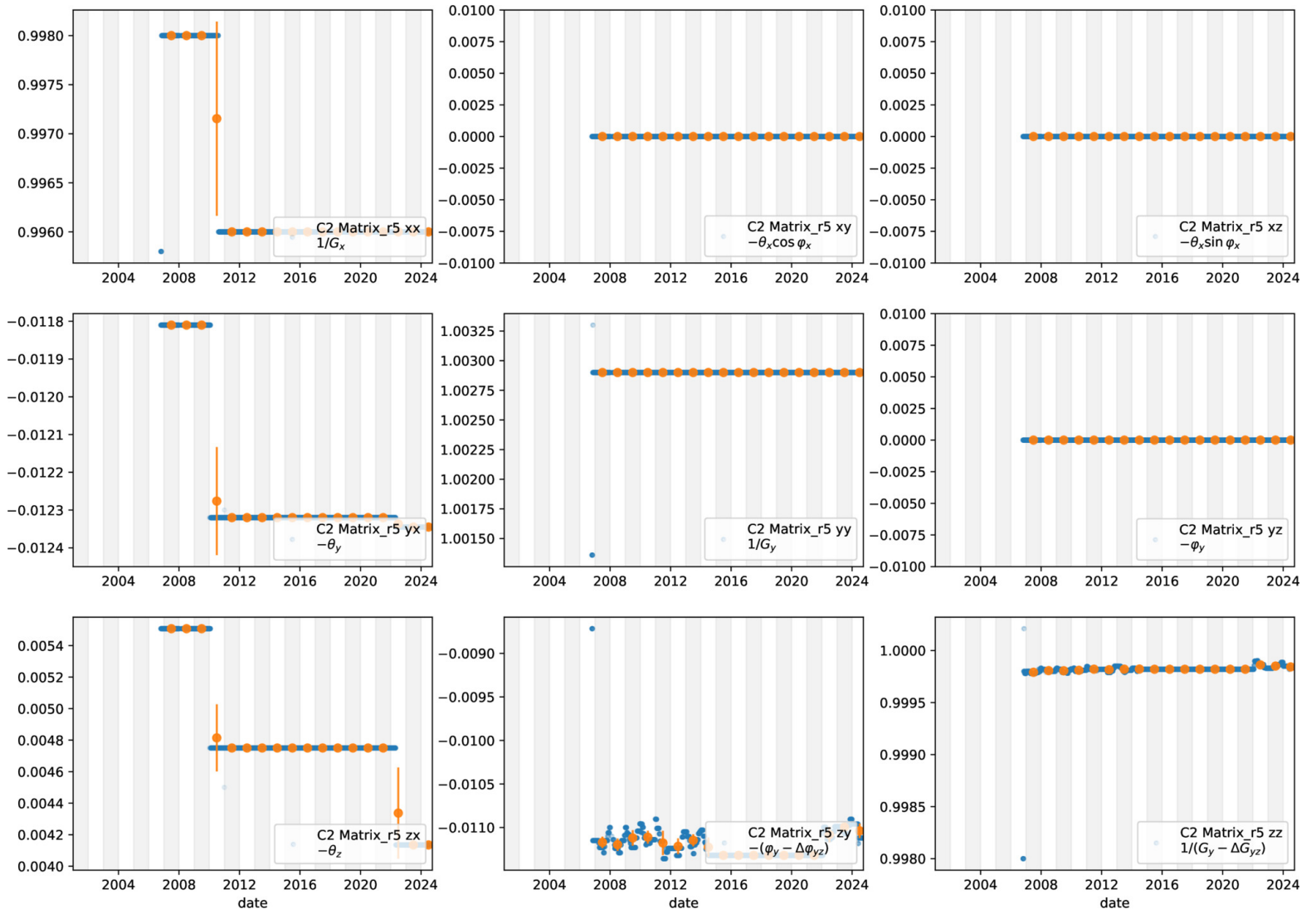


Figure S54: Cluster 2 Matrix_r5 long term variation

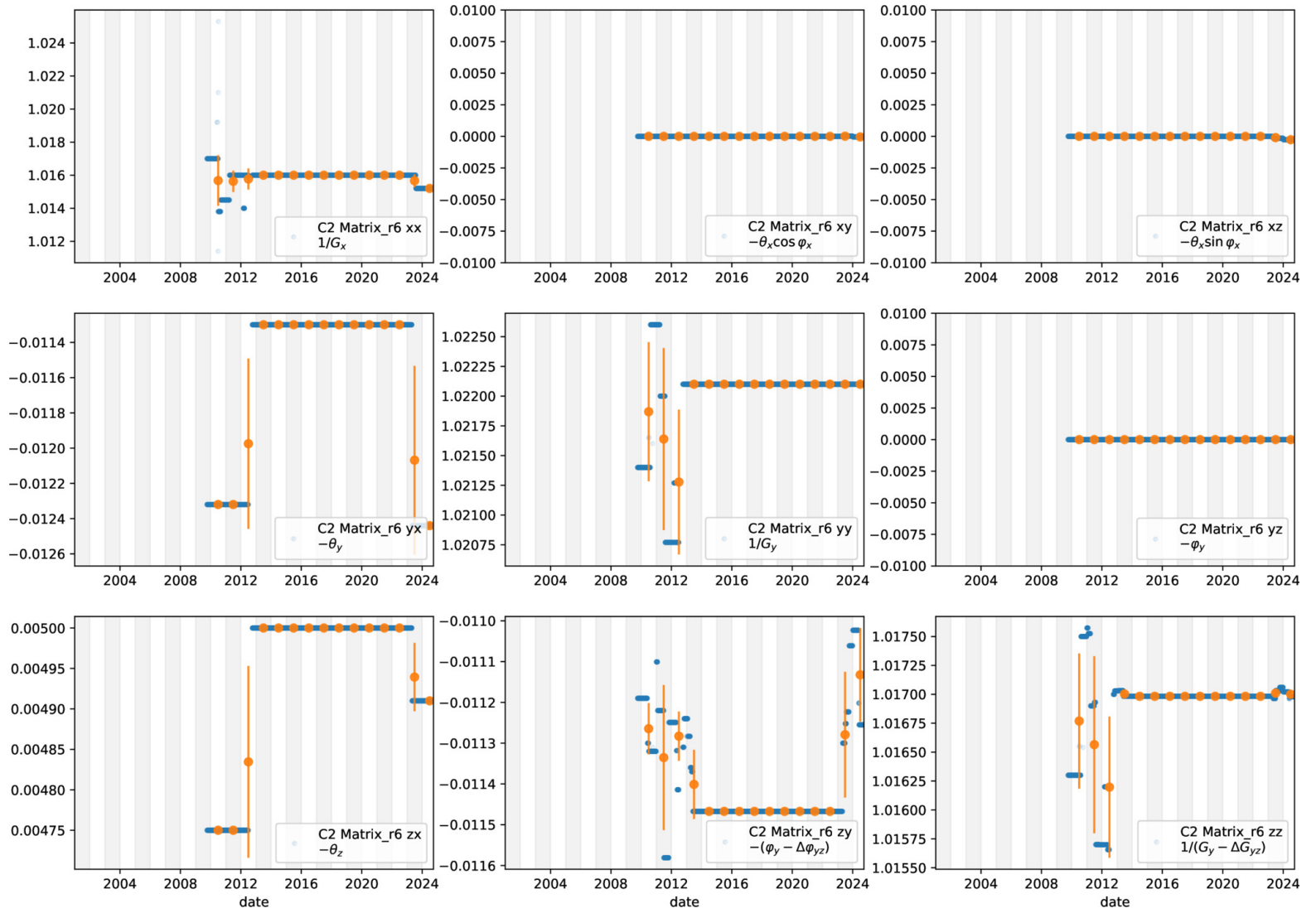


Figure S55: Cluster 2 Matrix_r6 long term variation

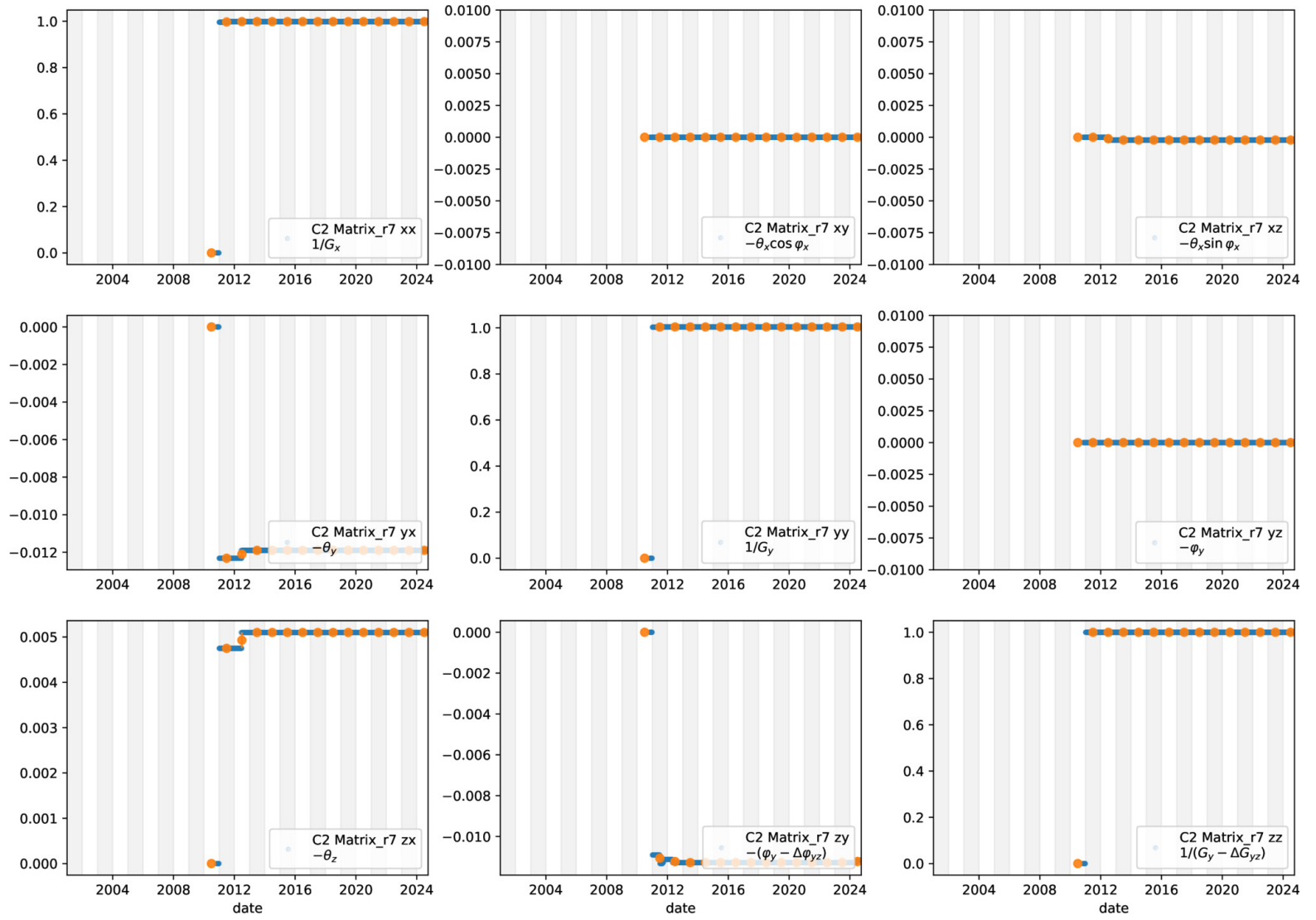


Figure S56: Cluster 2 Matrix_r7 long term variation

2.2 Daily calibration parameters versus the electronics box temperature

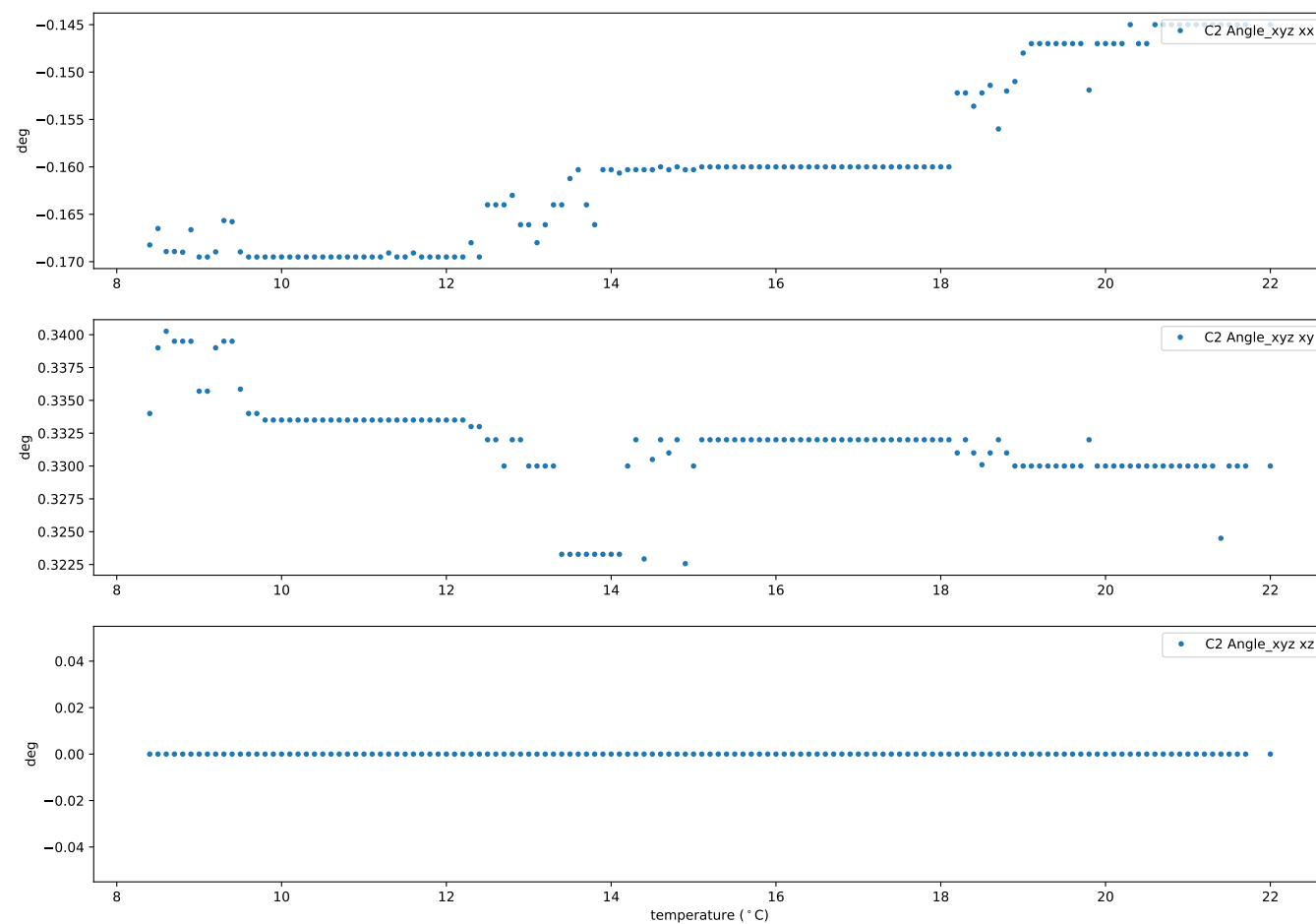


Figure S57: Cluster 2 Angle_xyz versus the electronics box temperature

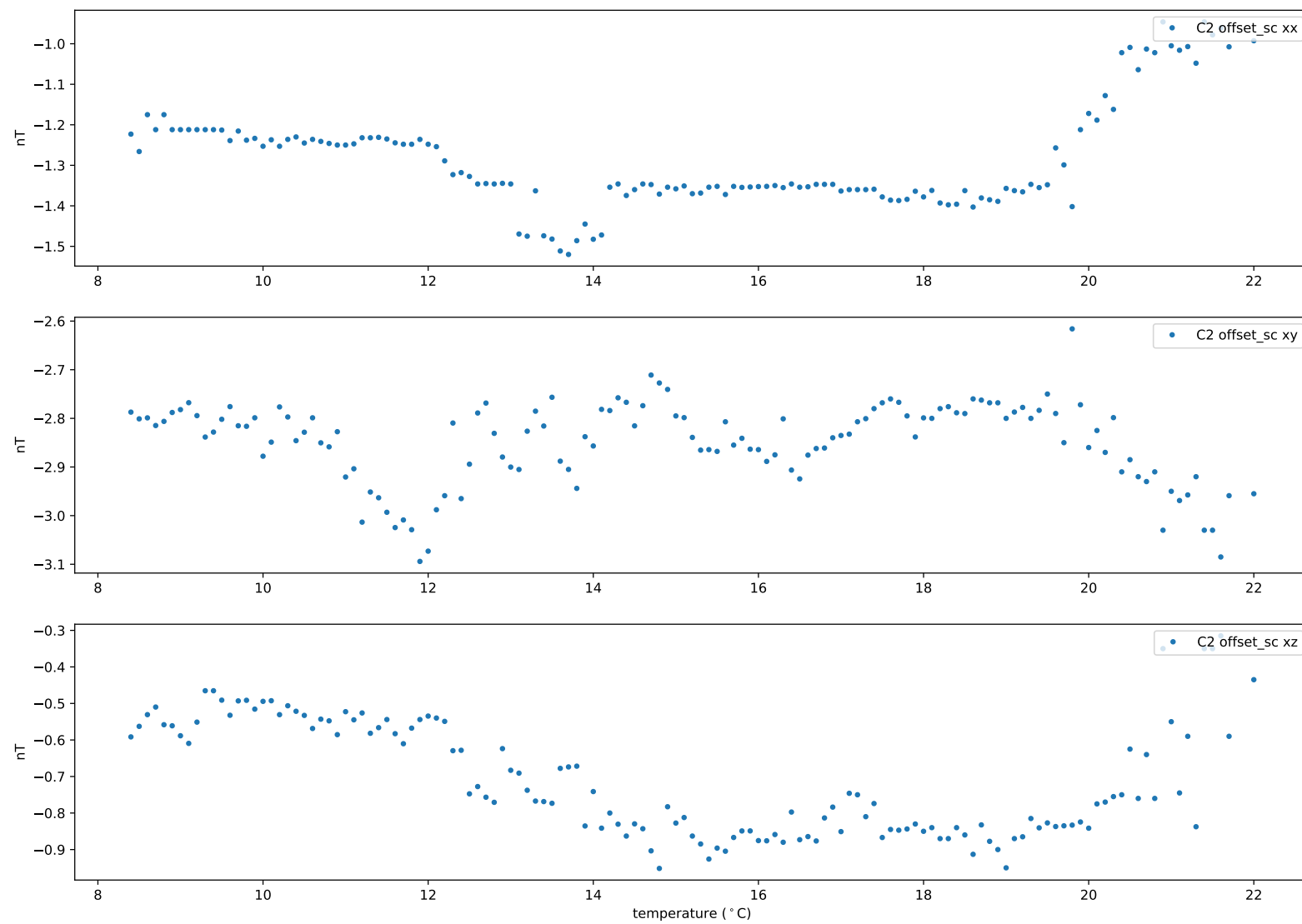


Figure S58: Cluster 2 offset_sc versus the electronics box temperature

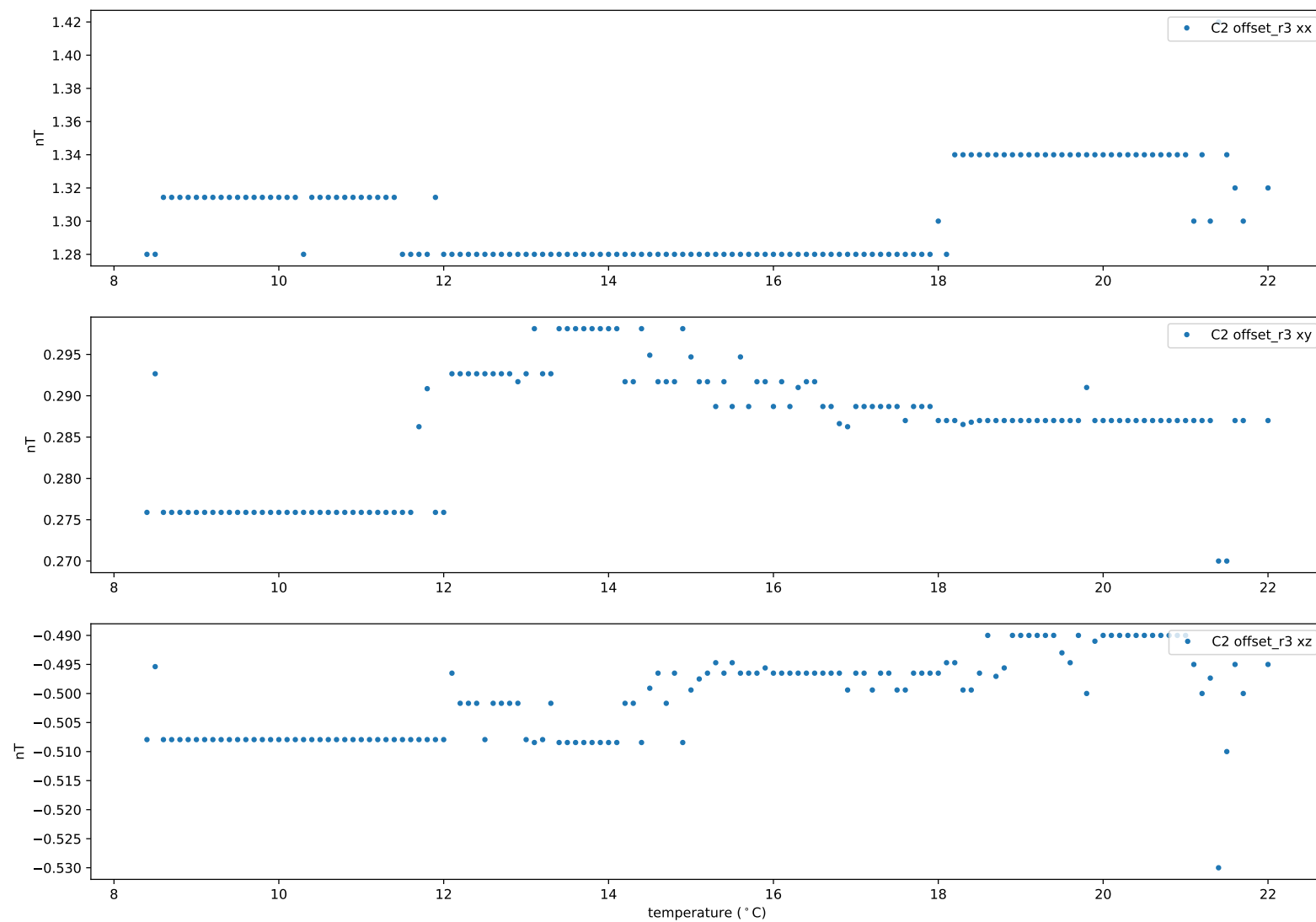


Figure S59: Cluster 2 offset_r3 versus the electronics box temperature

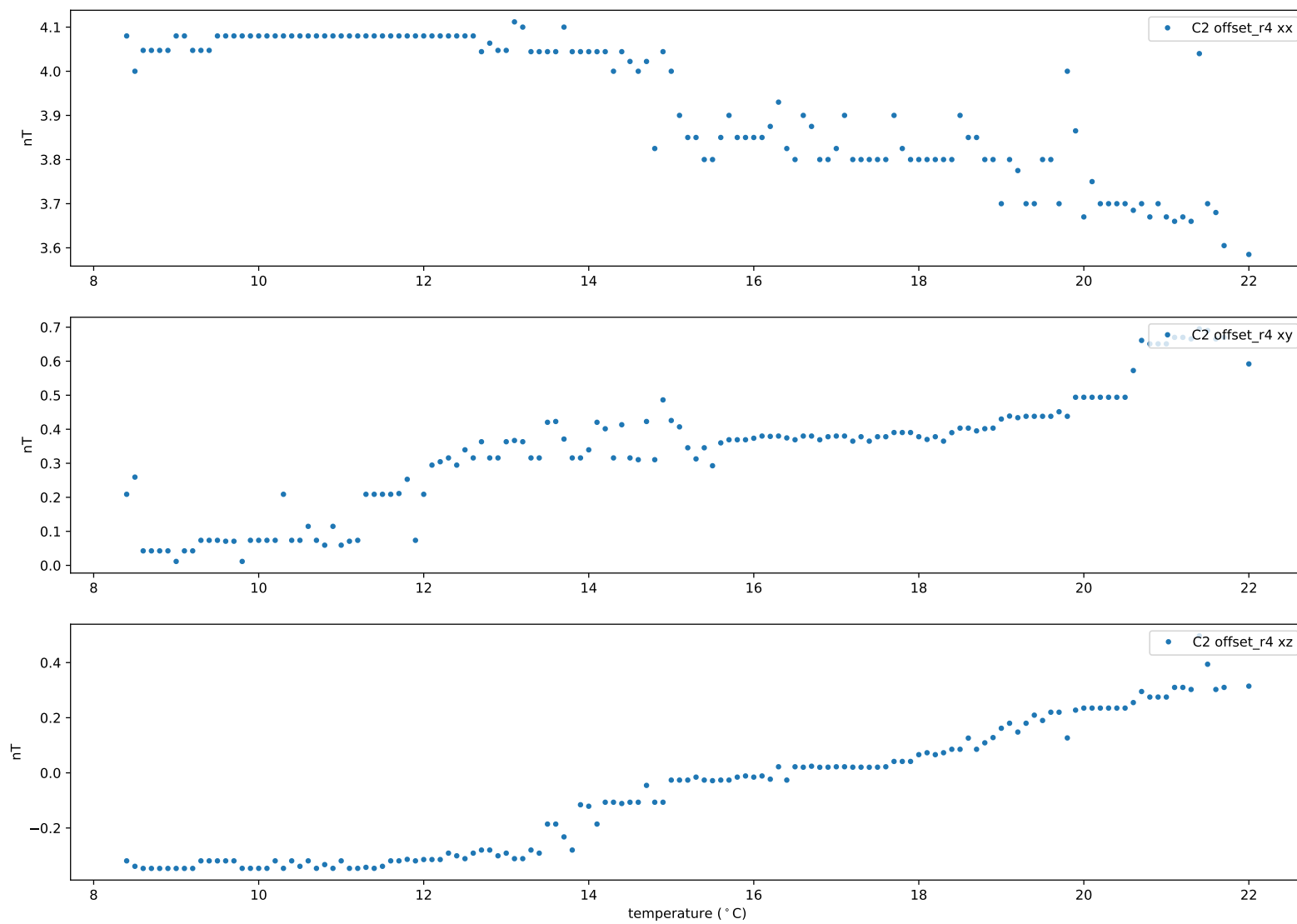


Figure S60: Cluster 2 offset_r4 versus the electronics box temperature

65

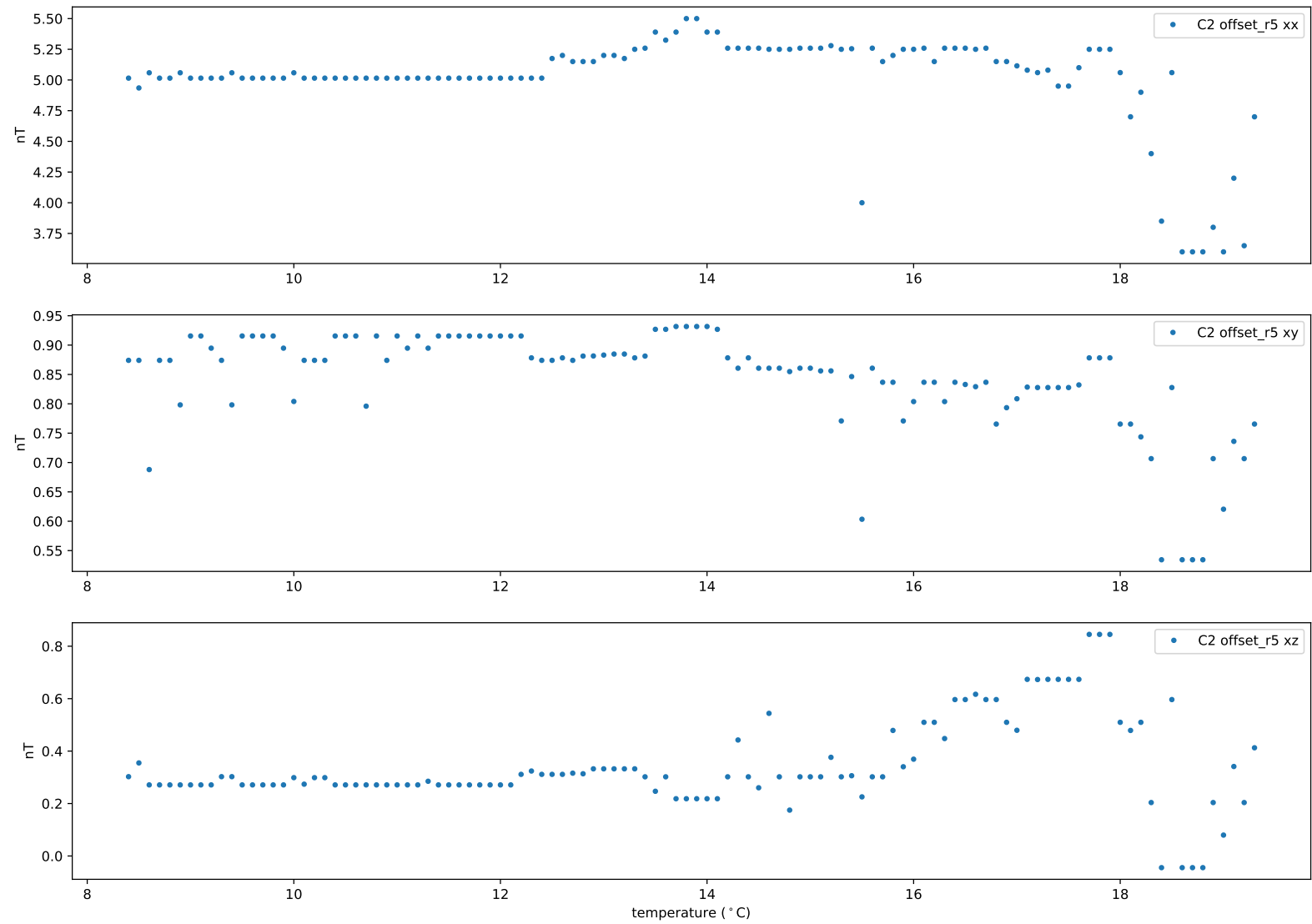


Figure S61: Cluster 2 offset_r5 versus the electronics box temperature

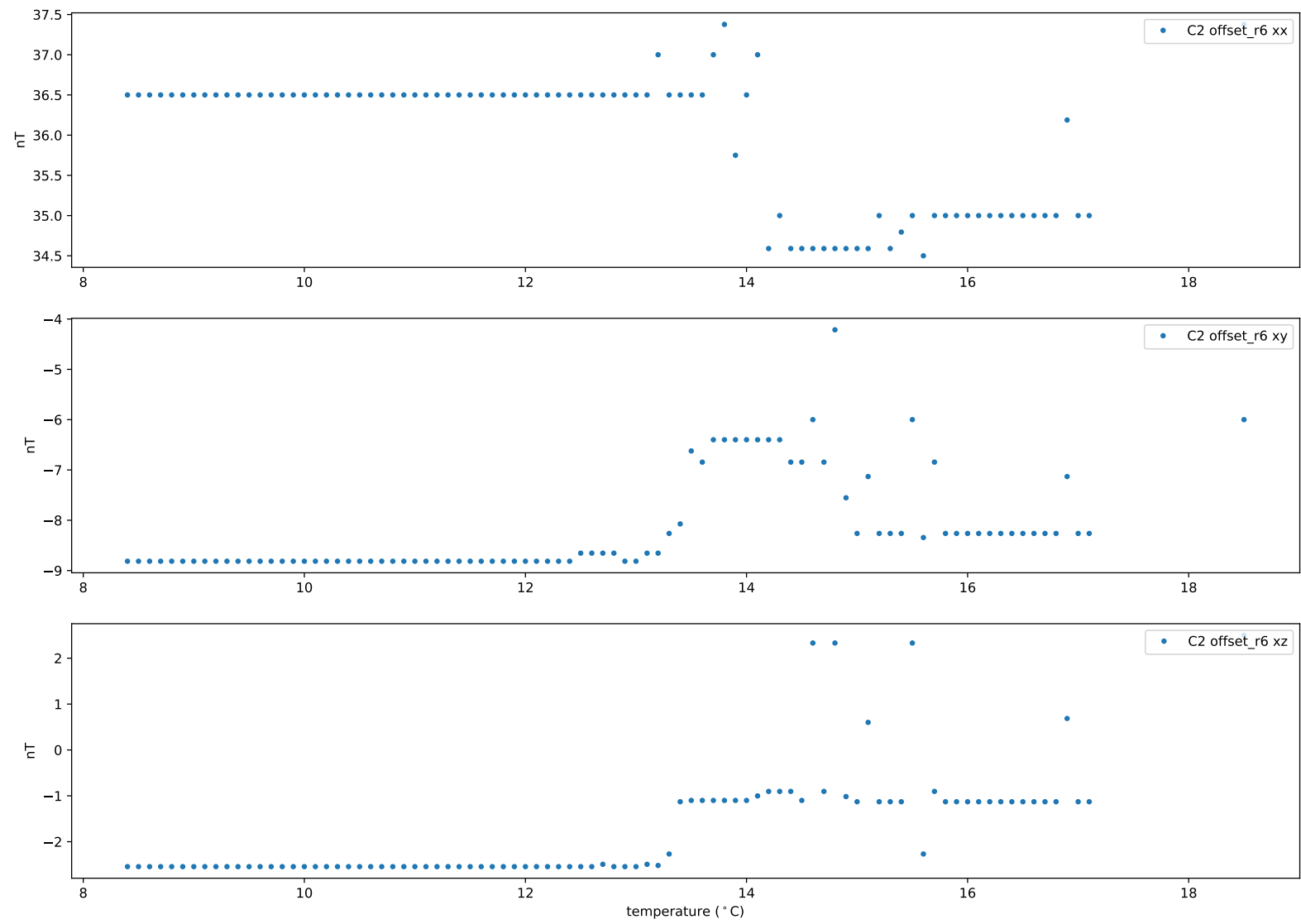


Figure S62: Cluster 2 offset_r6 versus the electronics box temperature

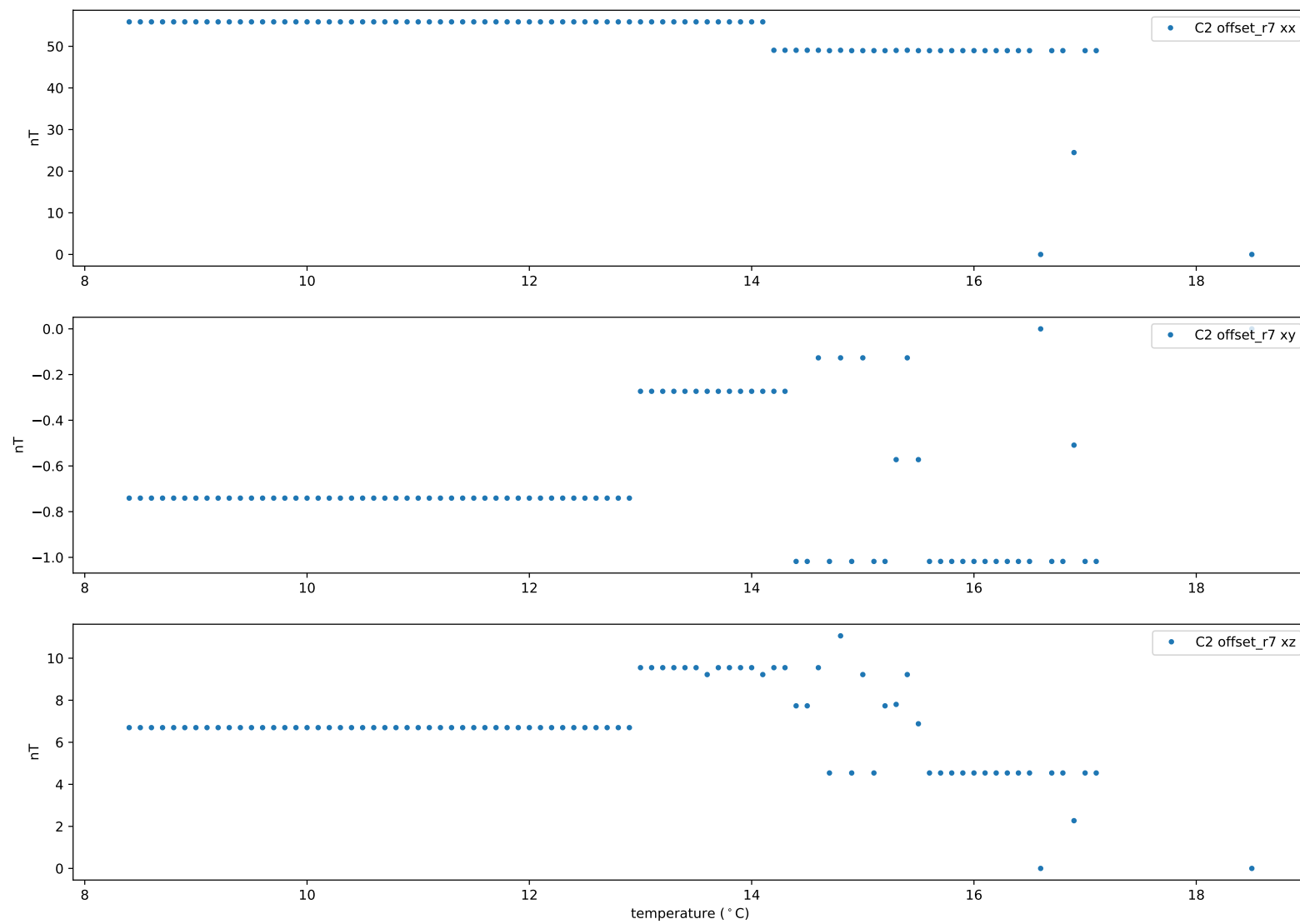


Figure S63: Cluster 2 offset_r7 versus the electronics box temperature

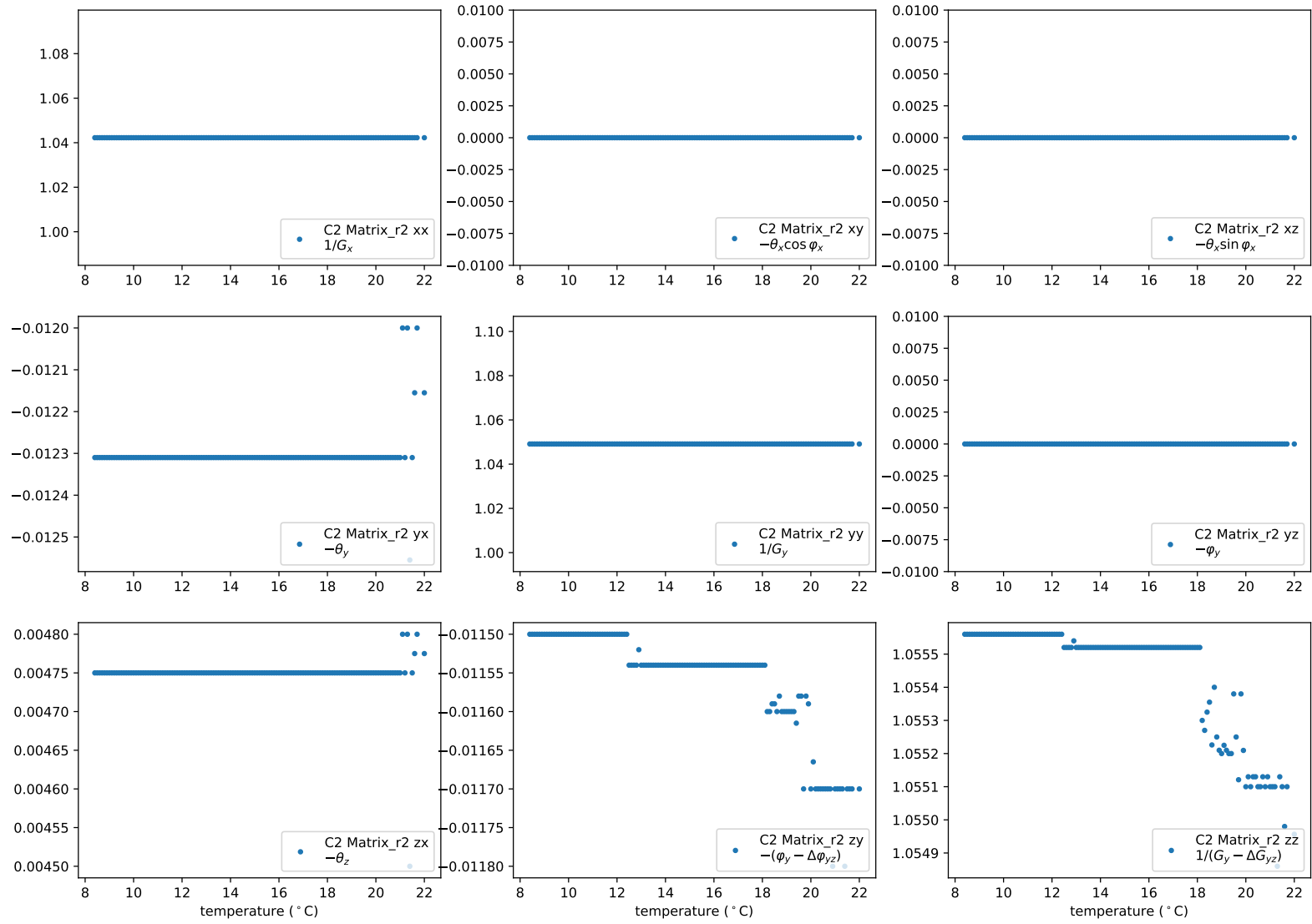


Figure S64: Cluster 2 Matrix_r2 versus the electronics box temperature

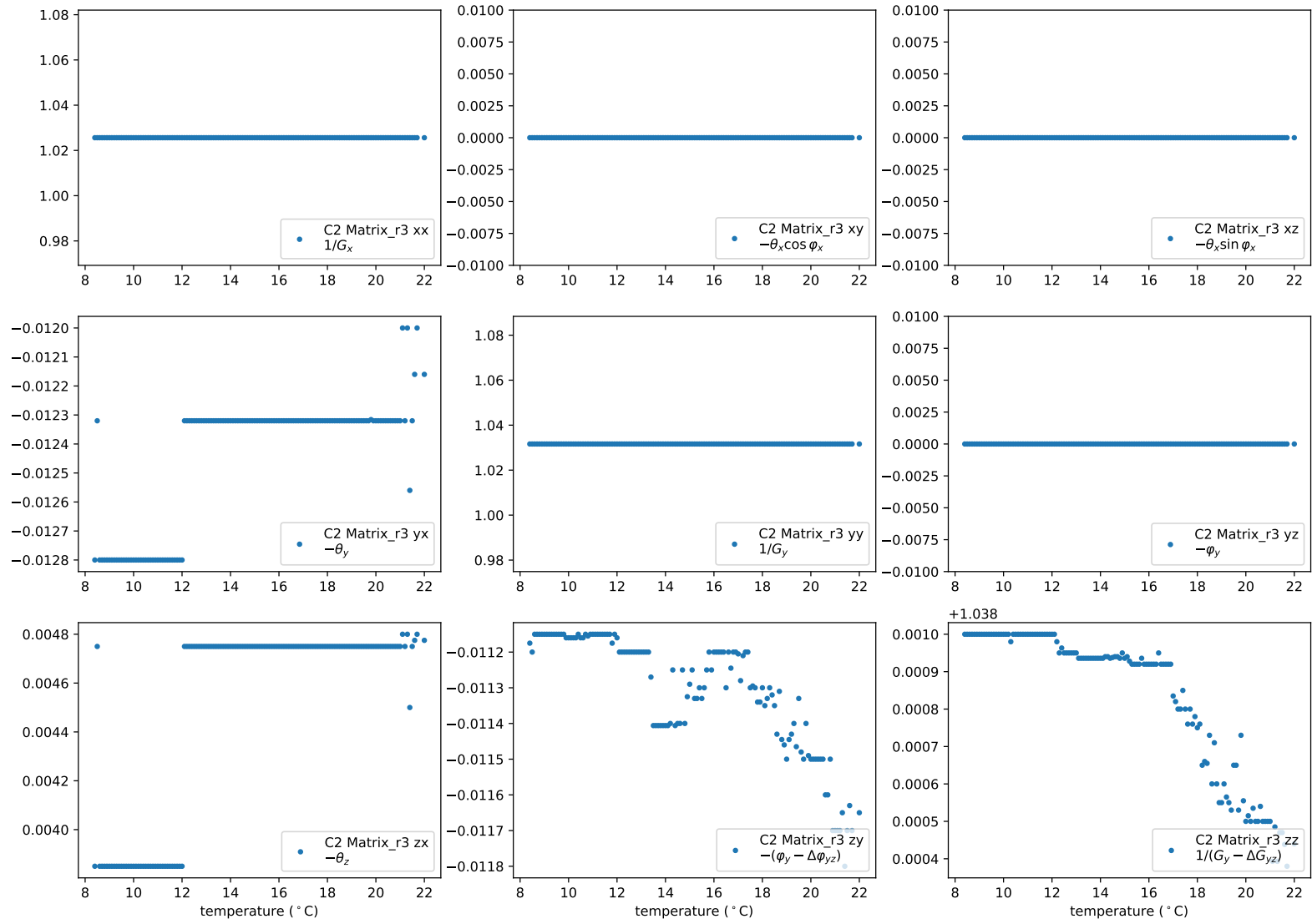


Figure S65: Cluster 2 Matrix_r3 versus the electronics box temperature

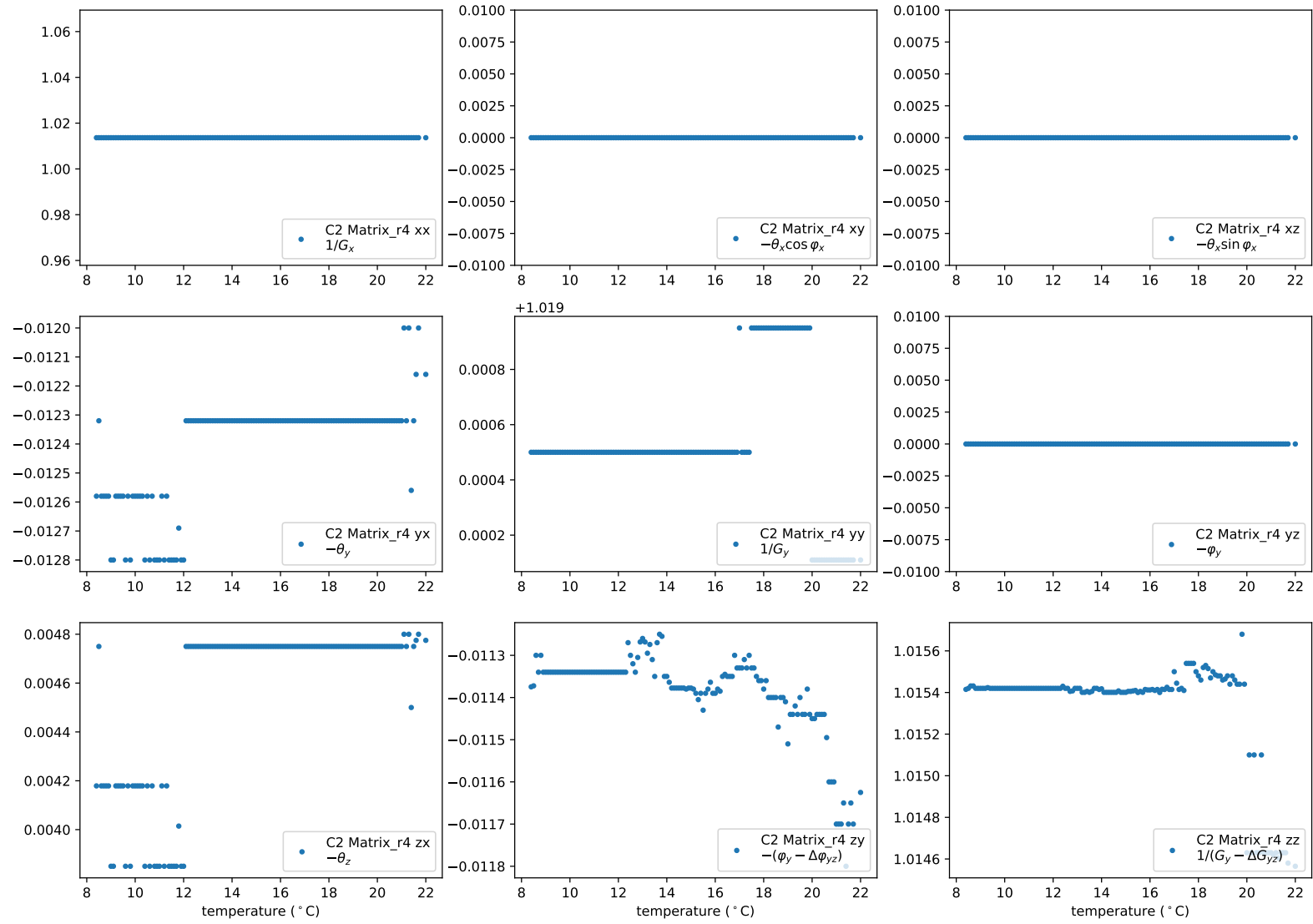


Figure S66: Cluster 2 Matrix_r4 versus the electronics box temperature

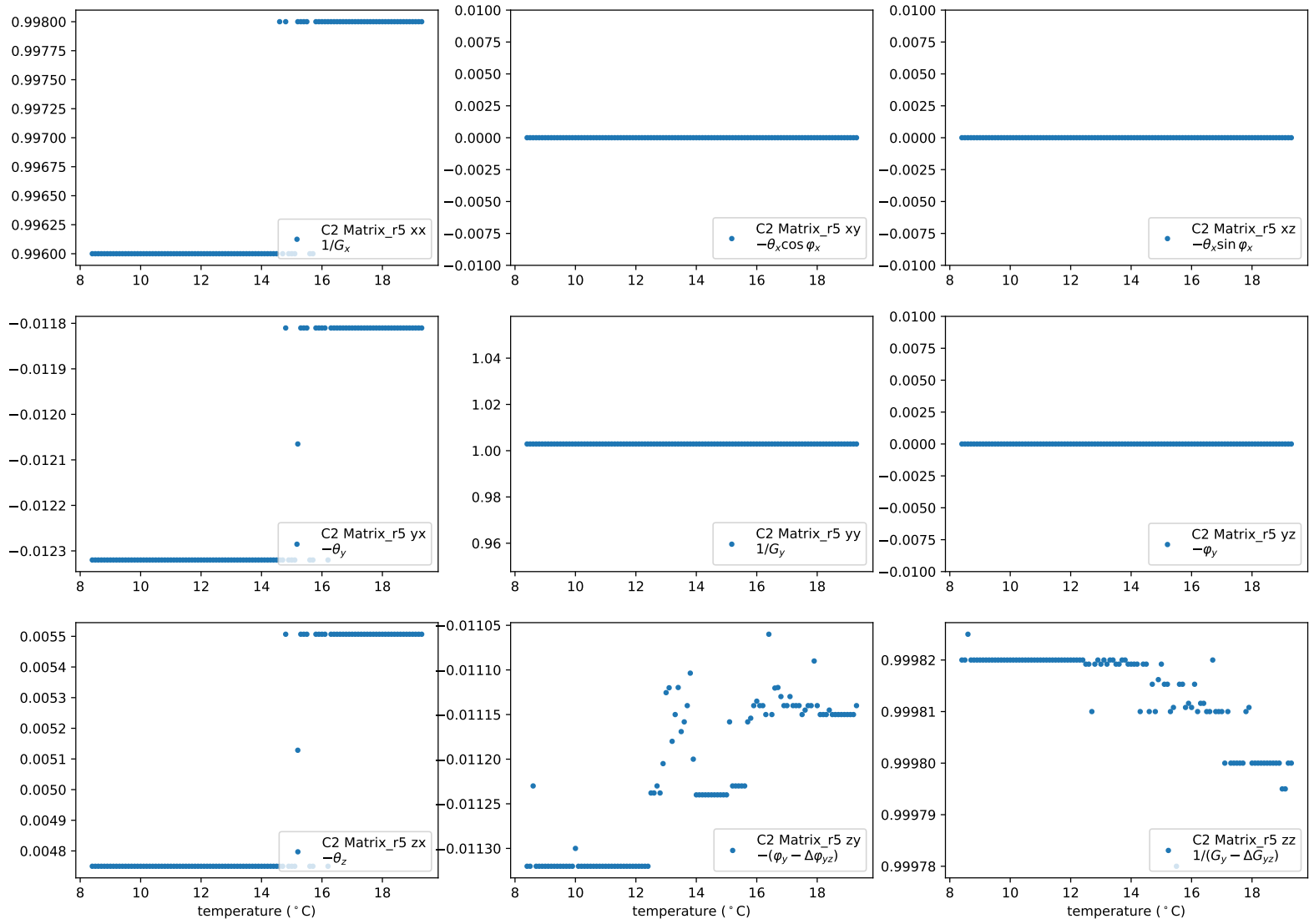


Figure S67: Cluster 2 Matrix_r5 versus the electronics box temperature

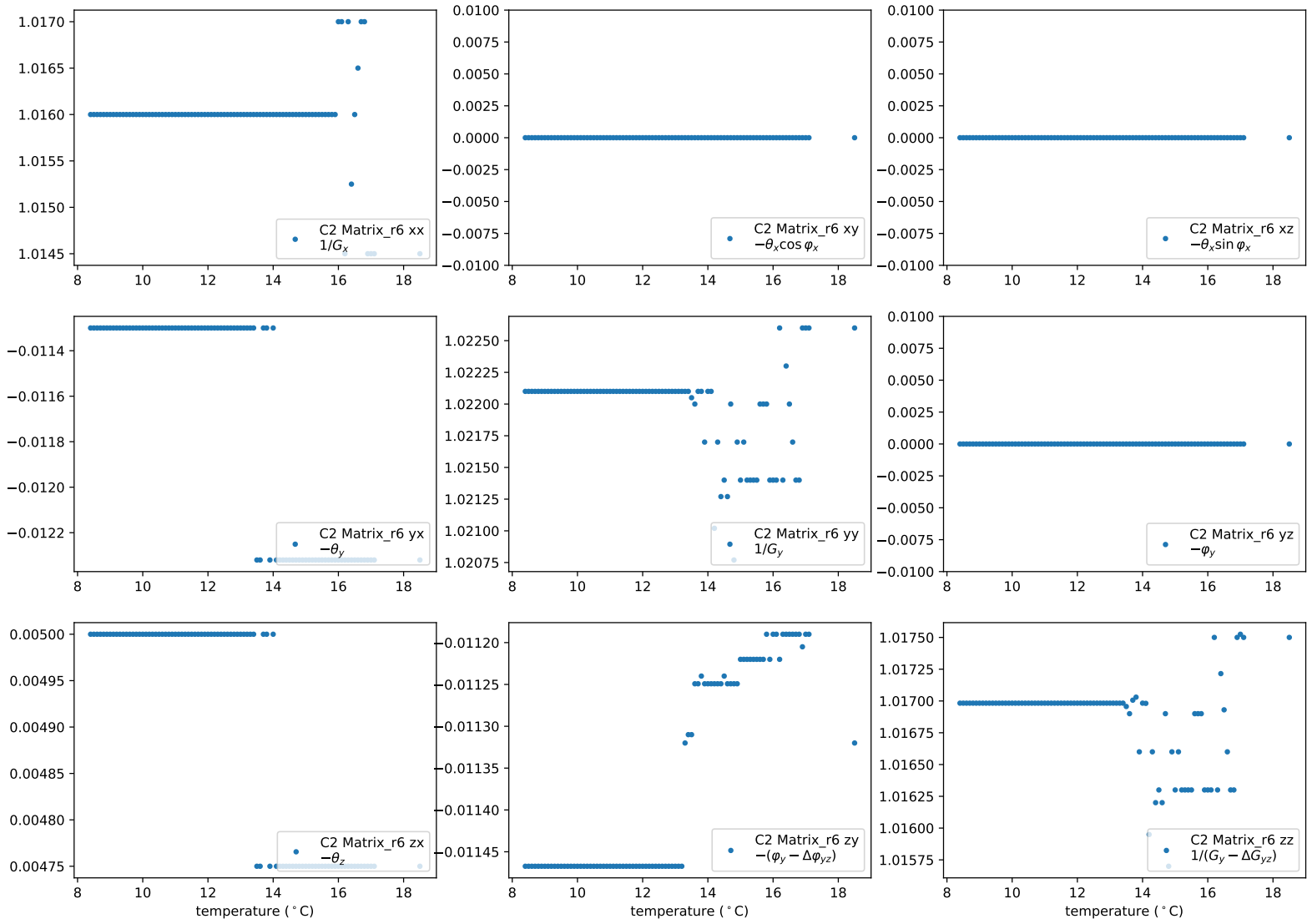


Figure S68: Cluster 2 Matrix_r6 versus the electronics box temperature

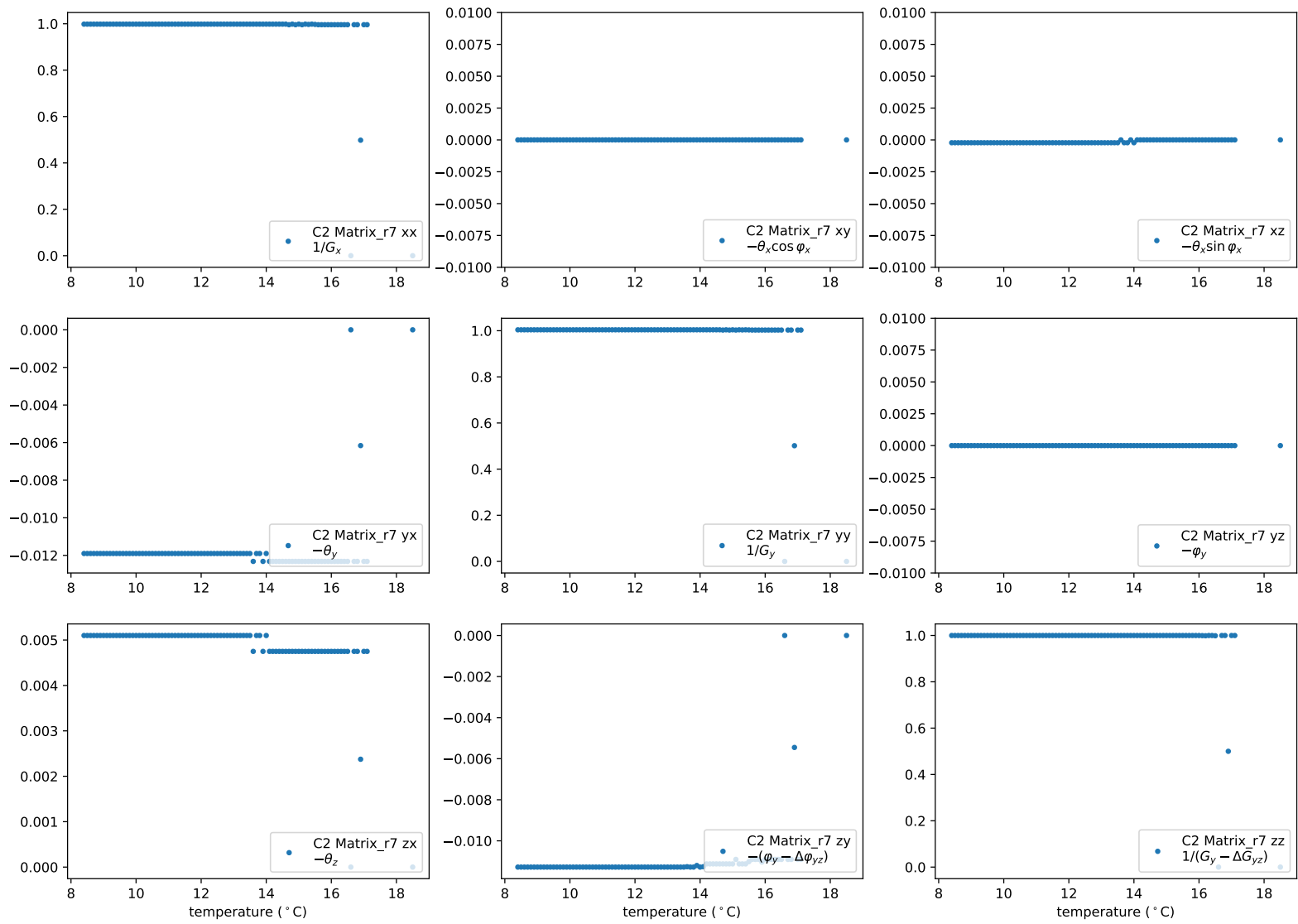


Figure S69: Cluster 2 Matrix_r7 versus the electronics box temperature

2.3 Daily calibration parameters versus the outboard sensor temperature

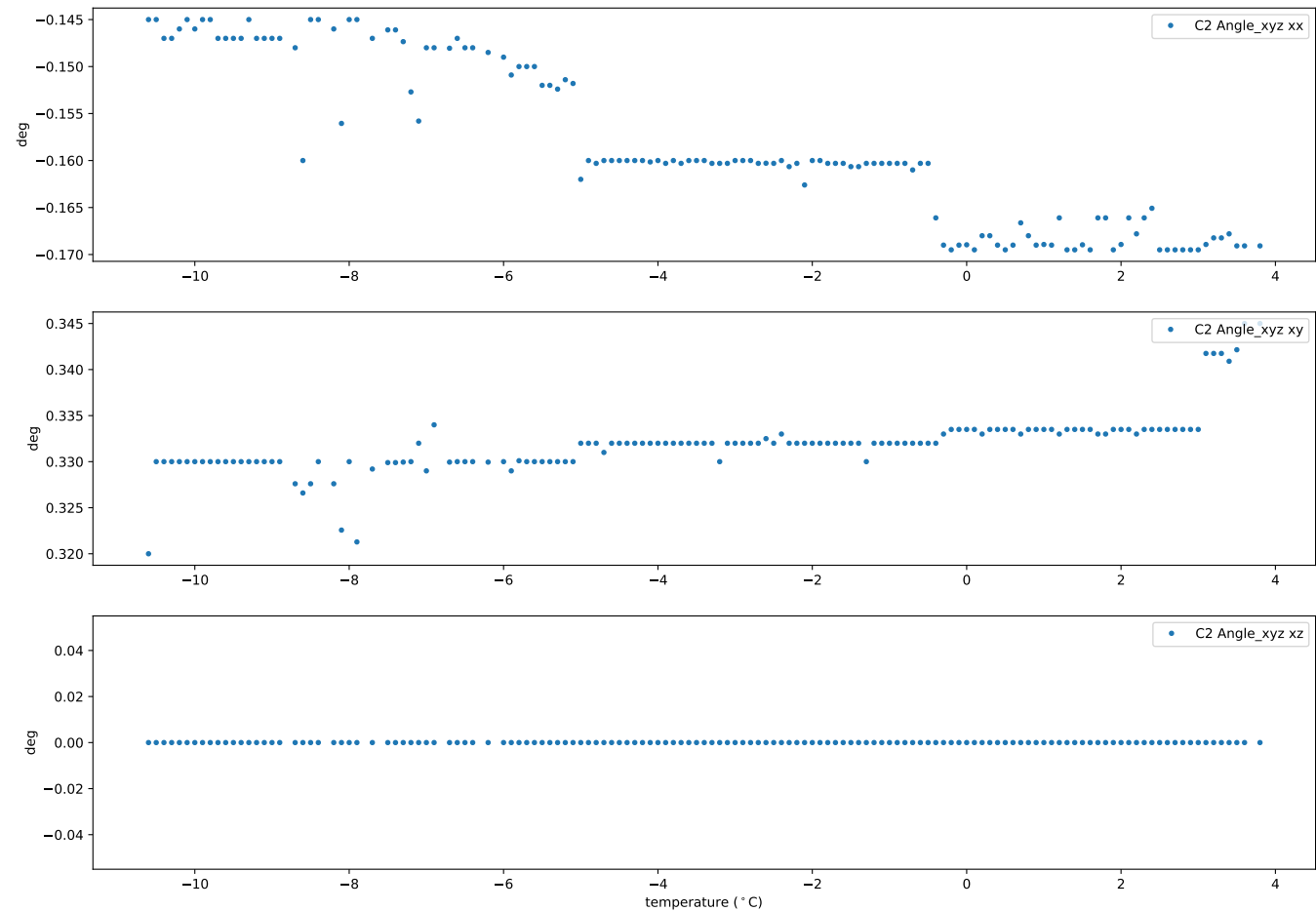


Figure S70: Cluster 2 Angle_xyz versus the outboard sensor temperature

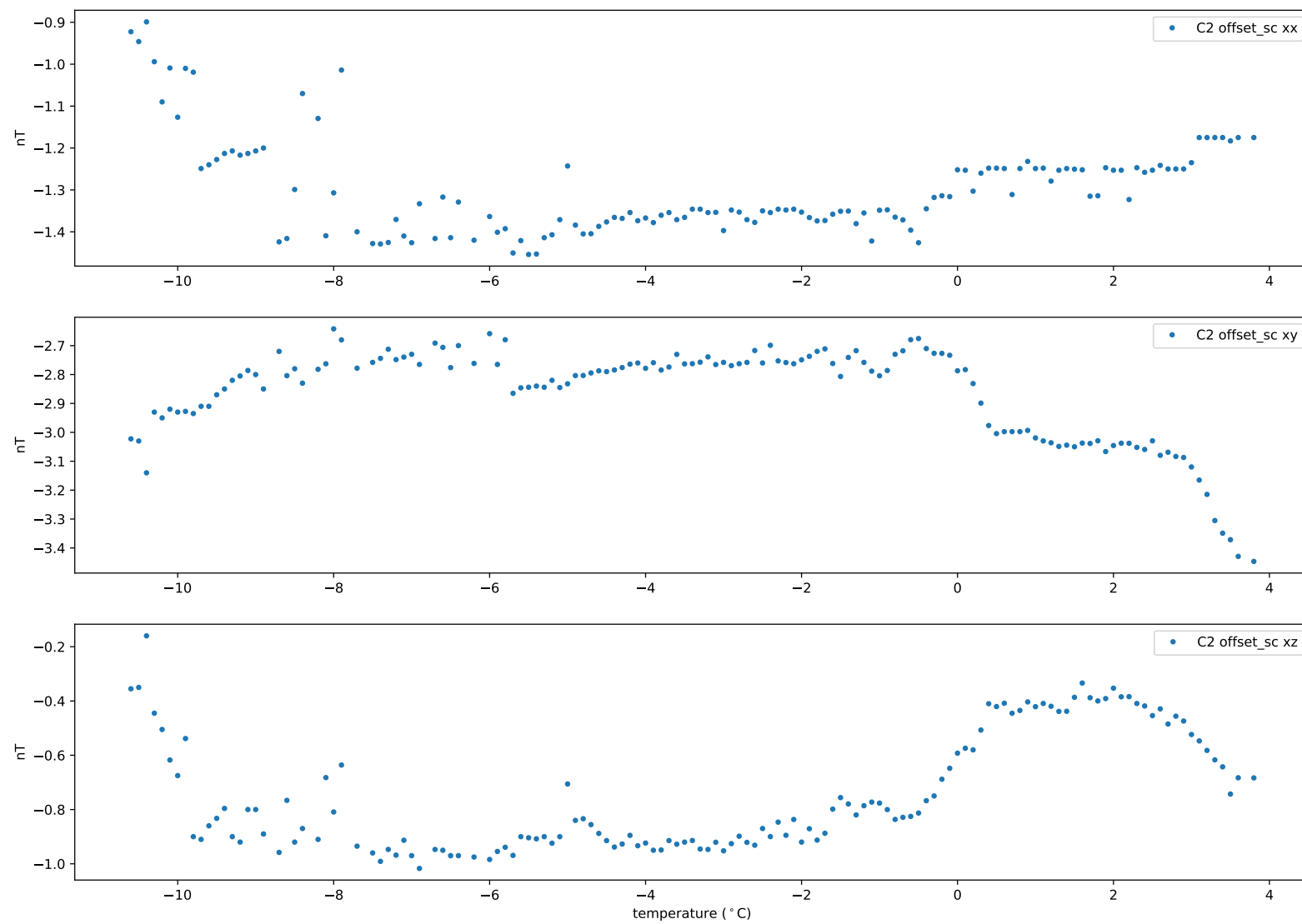


Figure S71: Cluster 2 offset_sc versus the outboard sensor temperature

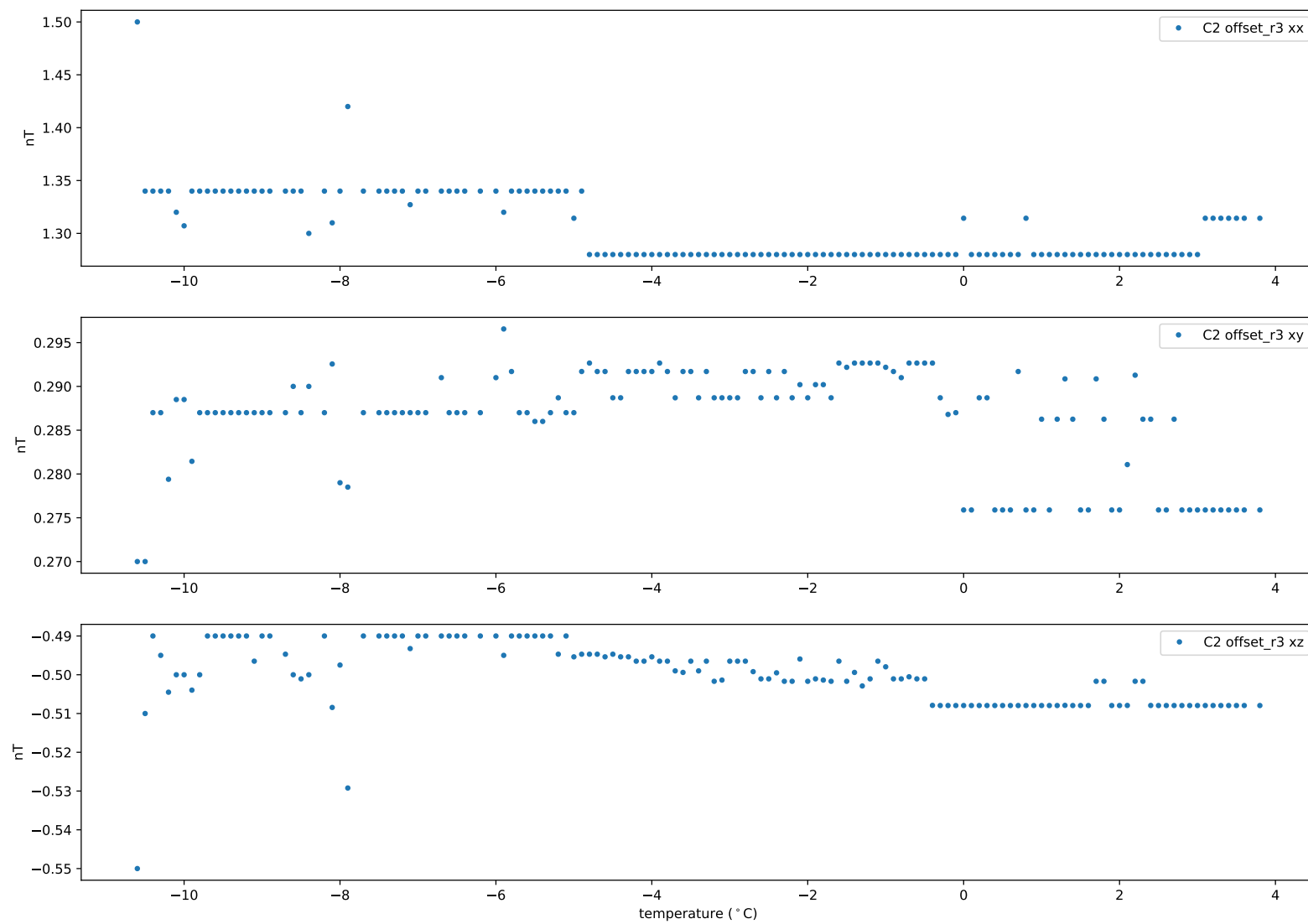


Figure S72: Cluster 2 offset_r3 versus the outboard sensor temperature

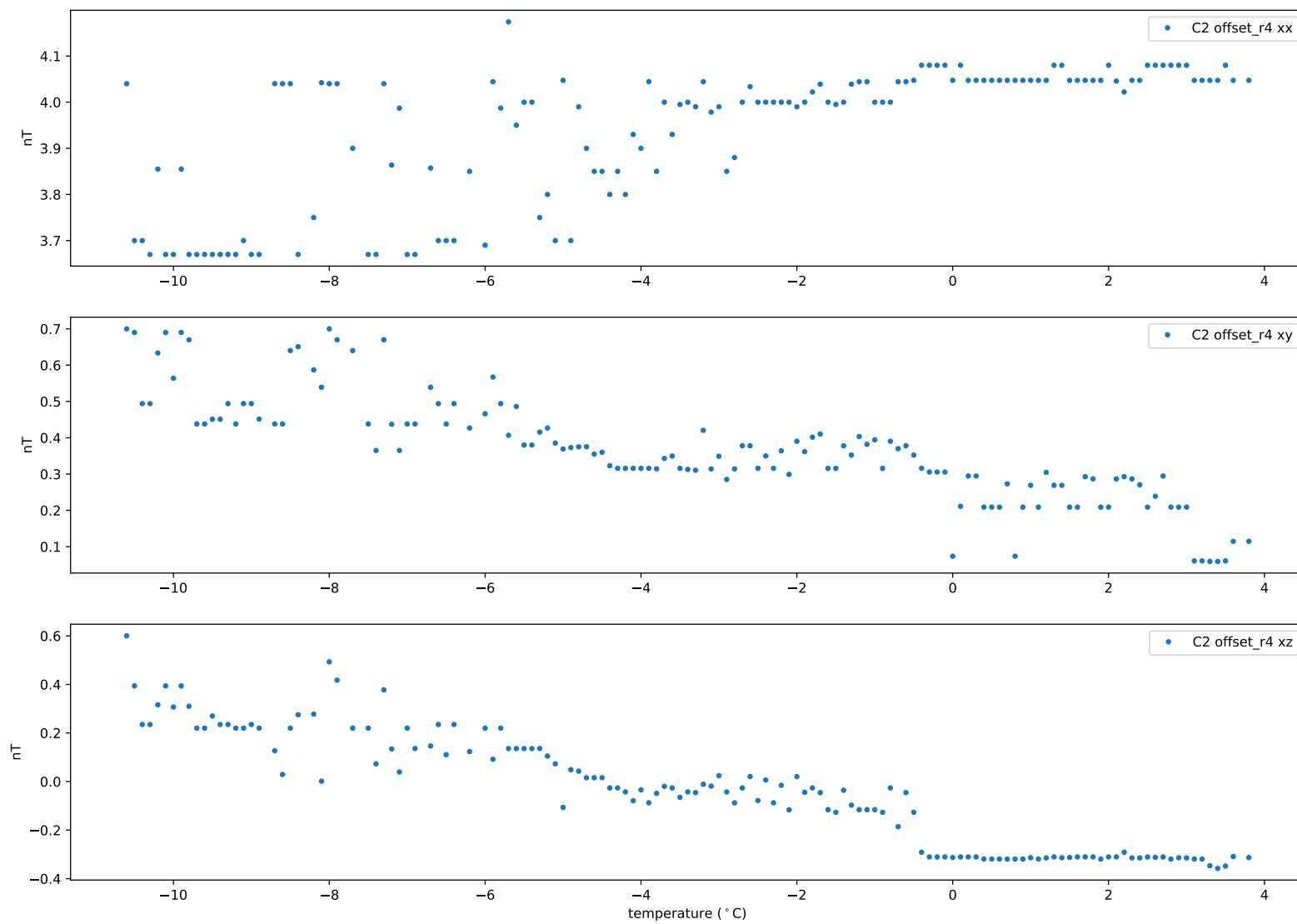


Figure S73: Cluster 2 offset_r4 versus the outboard sensor temperature

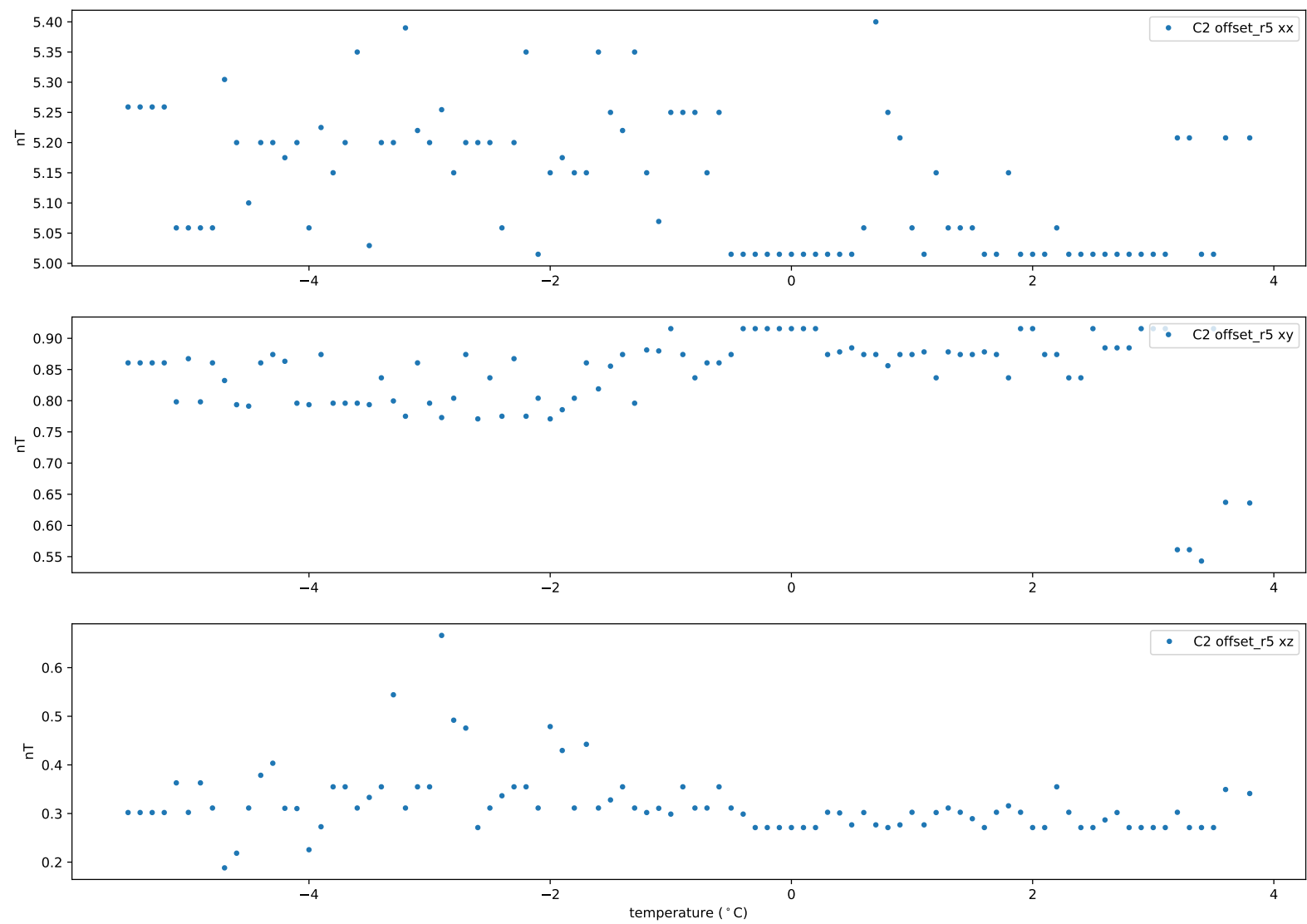


Figure S74: Cluster 2 offset_r5 versus the outboard sensor temperature

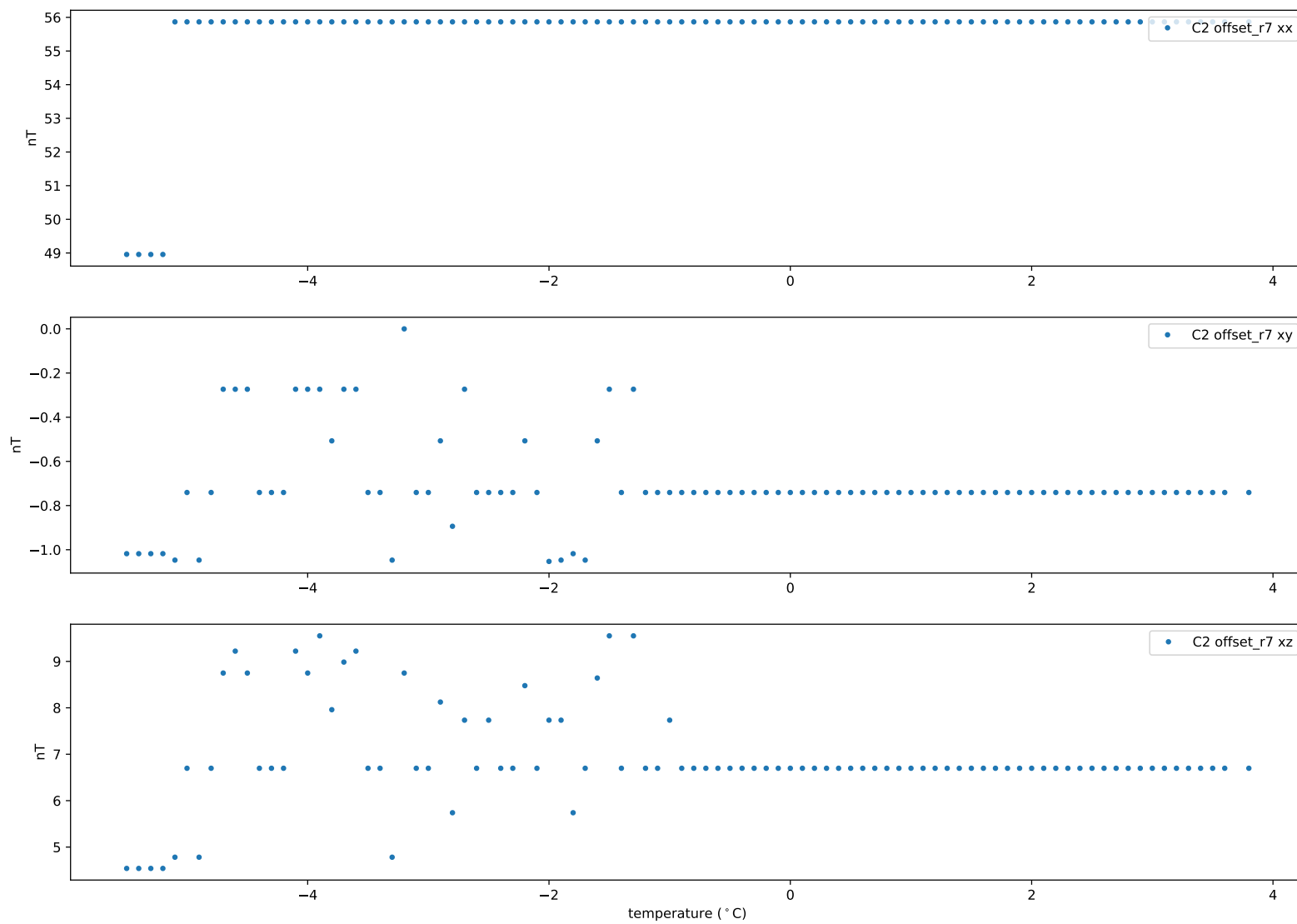


Figure S76: Cluster 2 offset_r7 versus the outboard sensor temperature

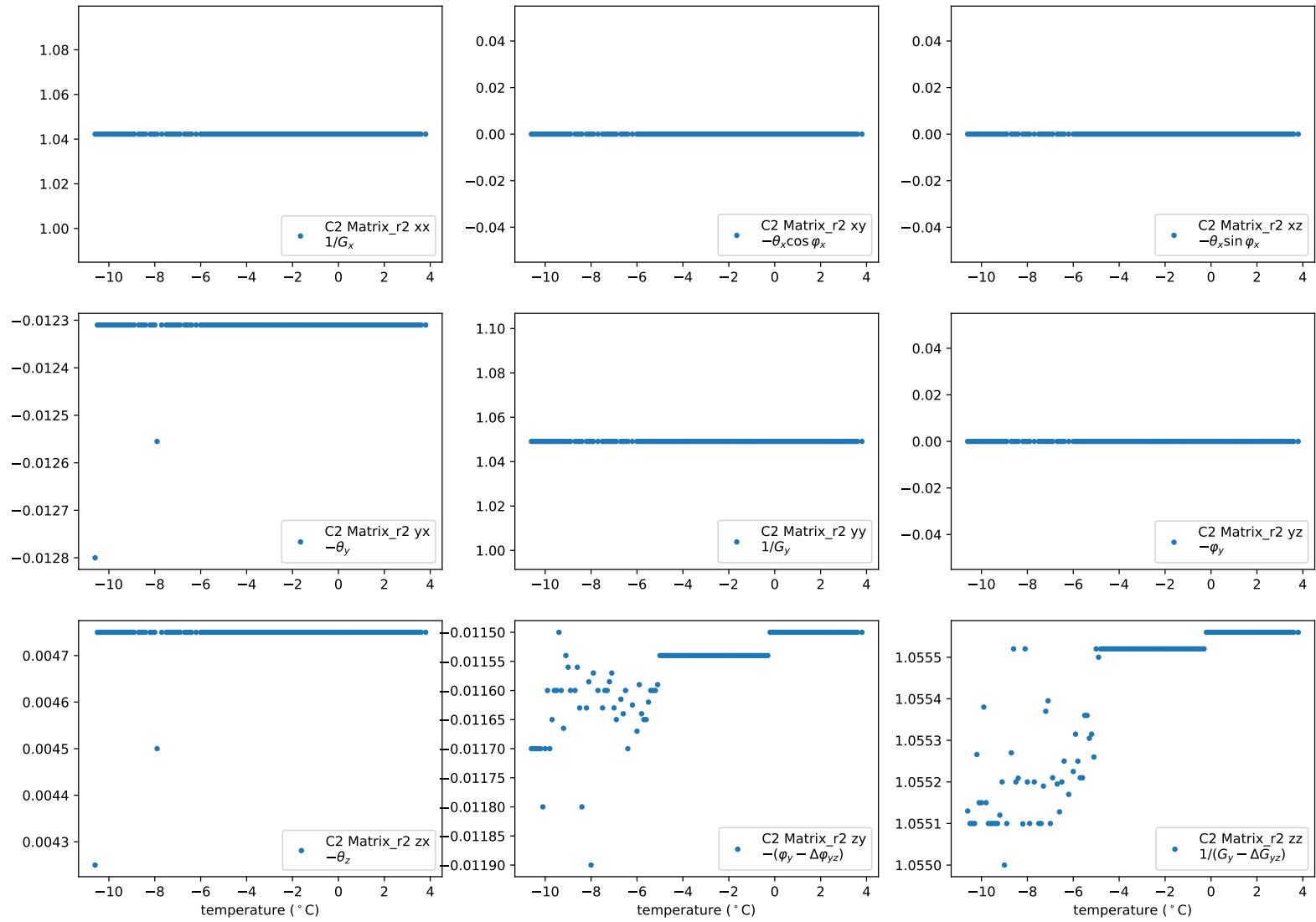


Figure S77: Cluster 2 Matrix_r2 versus the outboard sensor temperature

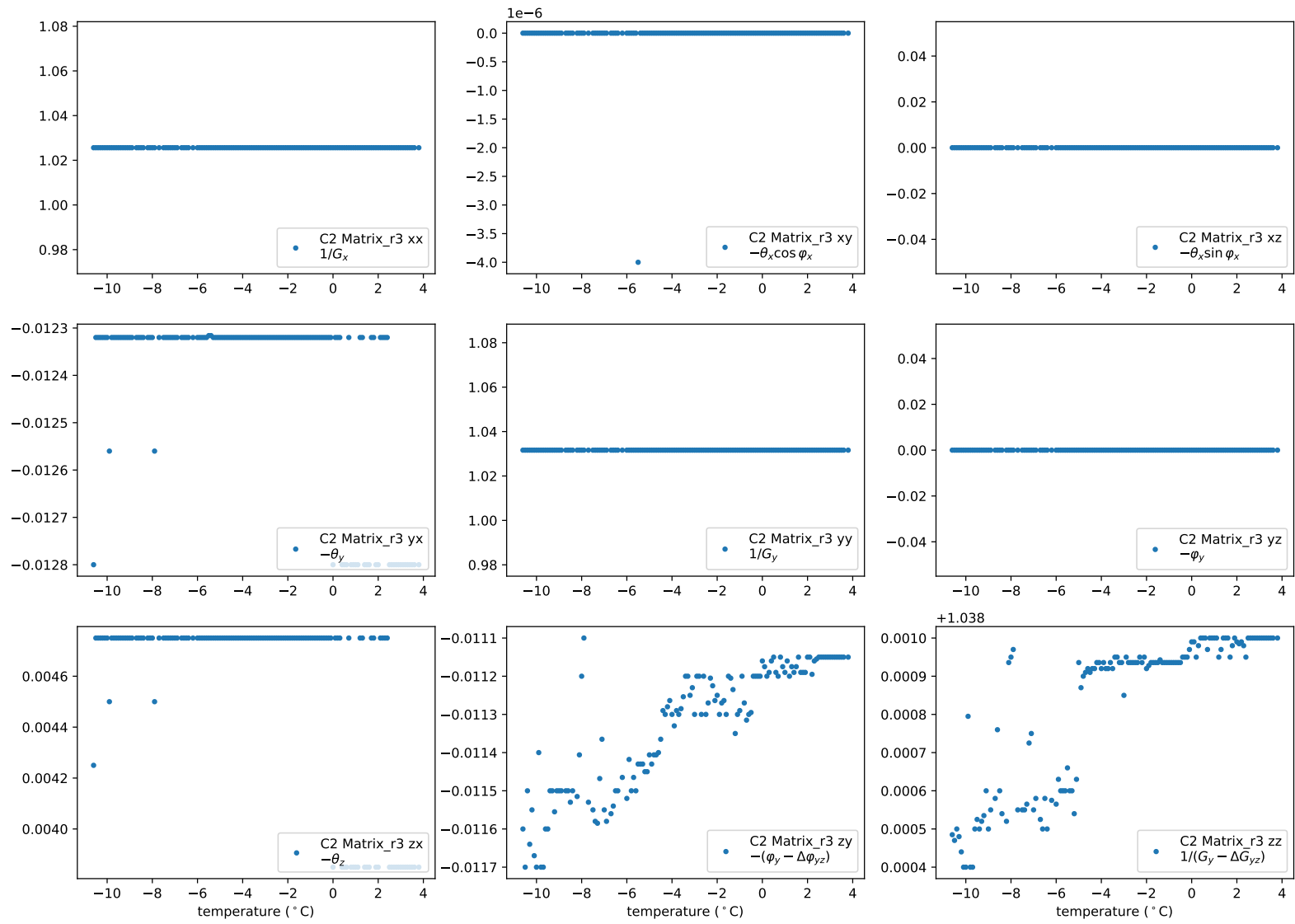


Figure S78: Cluster 2 Matrix_r3 versus the outboard sensor temperature

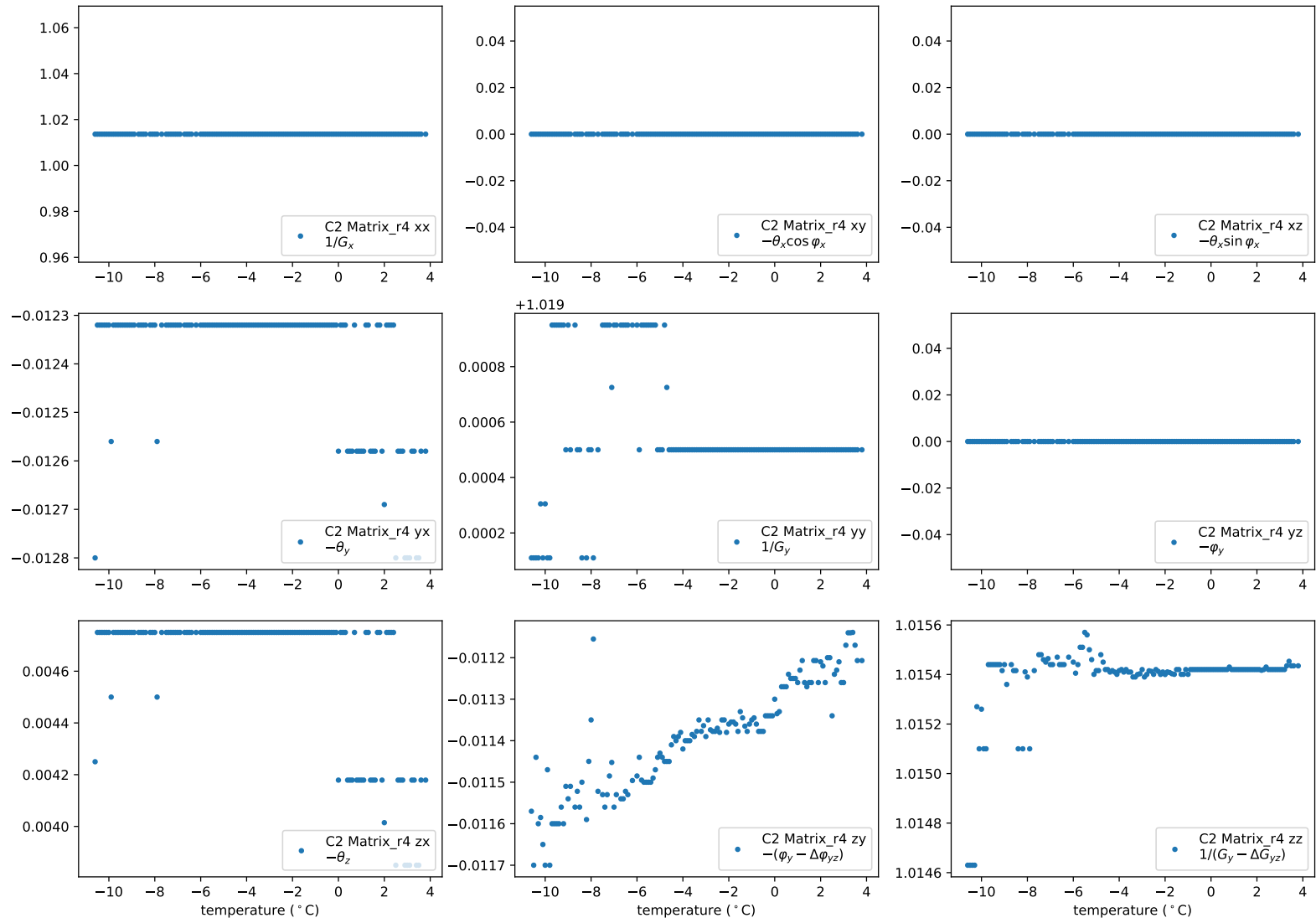


Figure S79: Cluster 2 Matrix_r4 versus the outboard sensor temperature

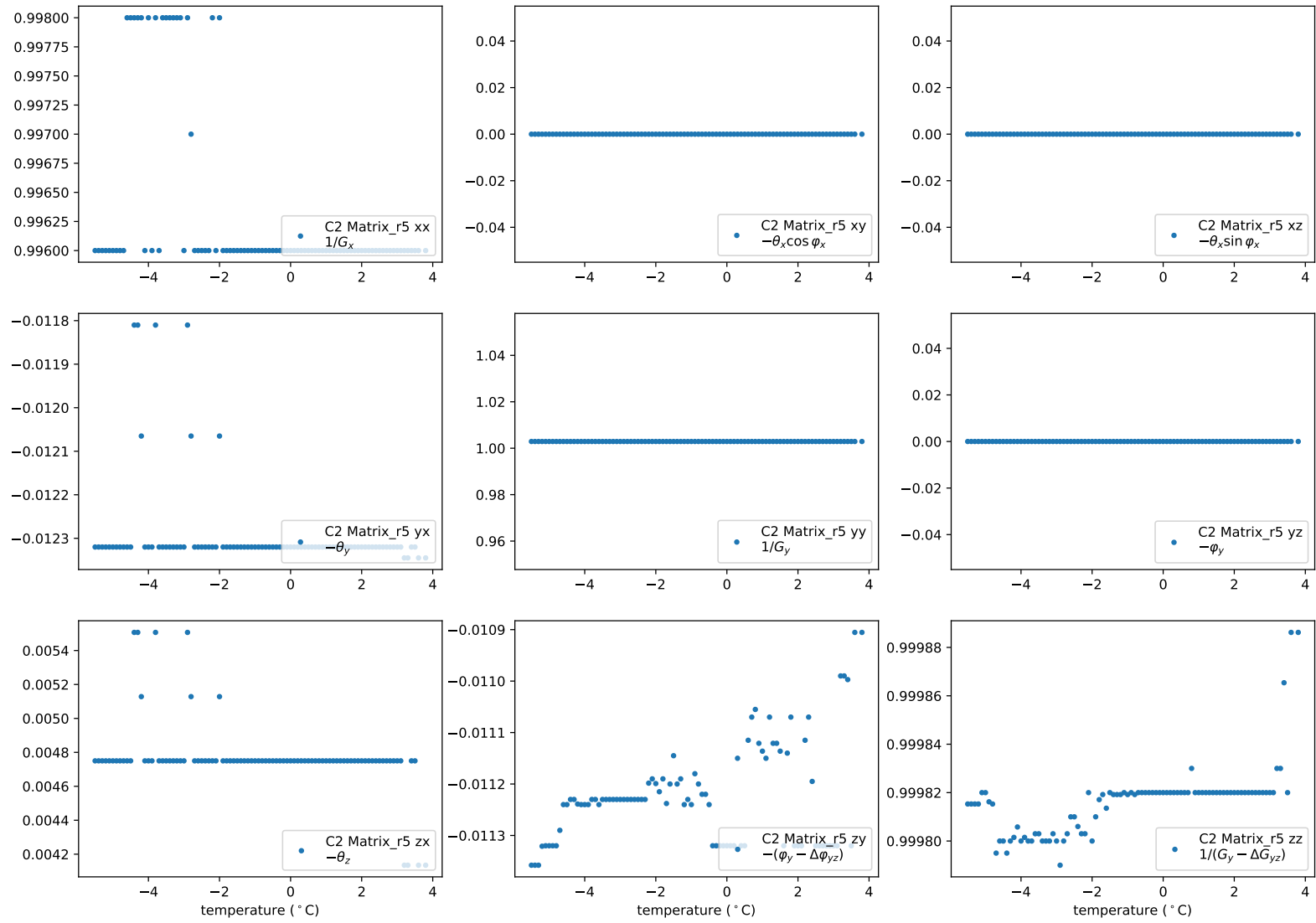


Figure S80: Cluster 2 Matrix_r5 versus the outboard sensor temperature

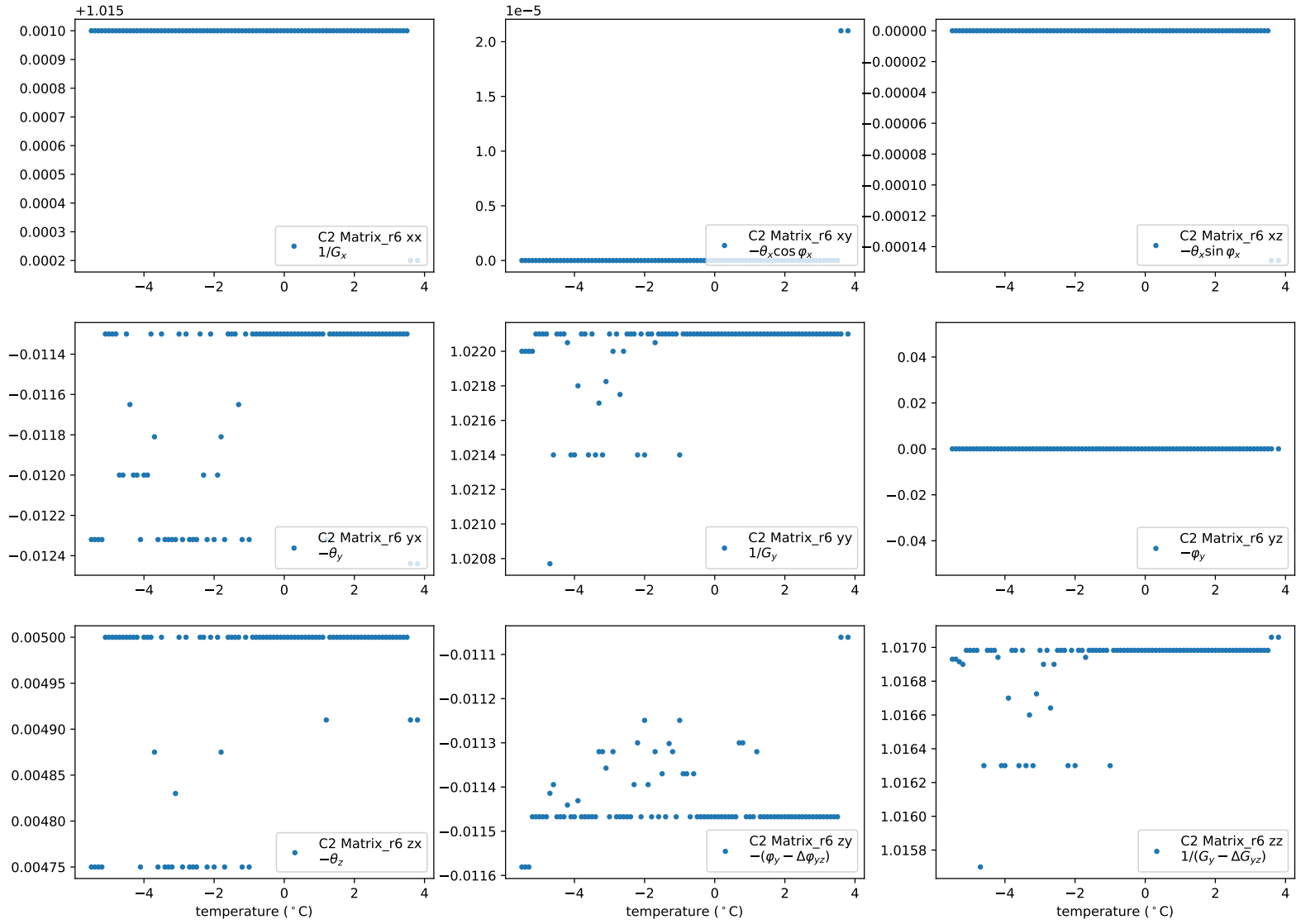


Figure S81: Cluster 2 Matrix_r6 versus the outboard sensor temperature

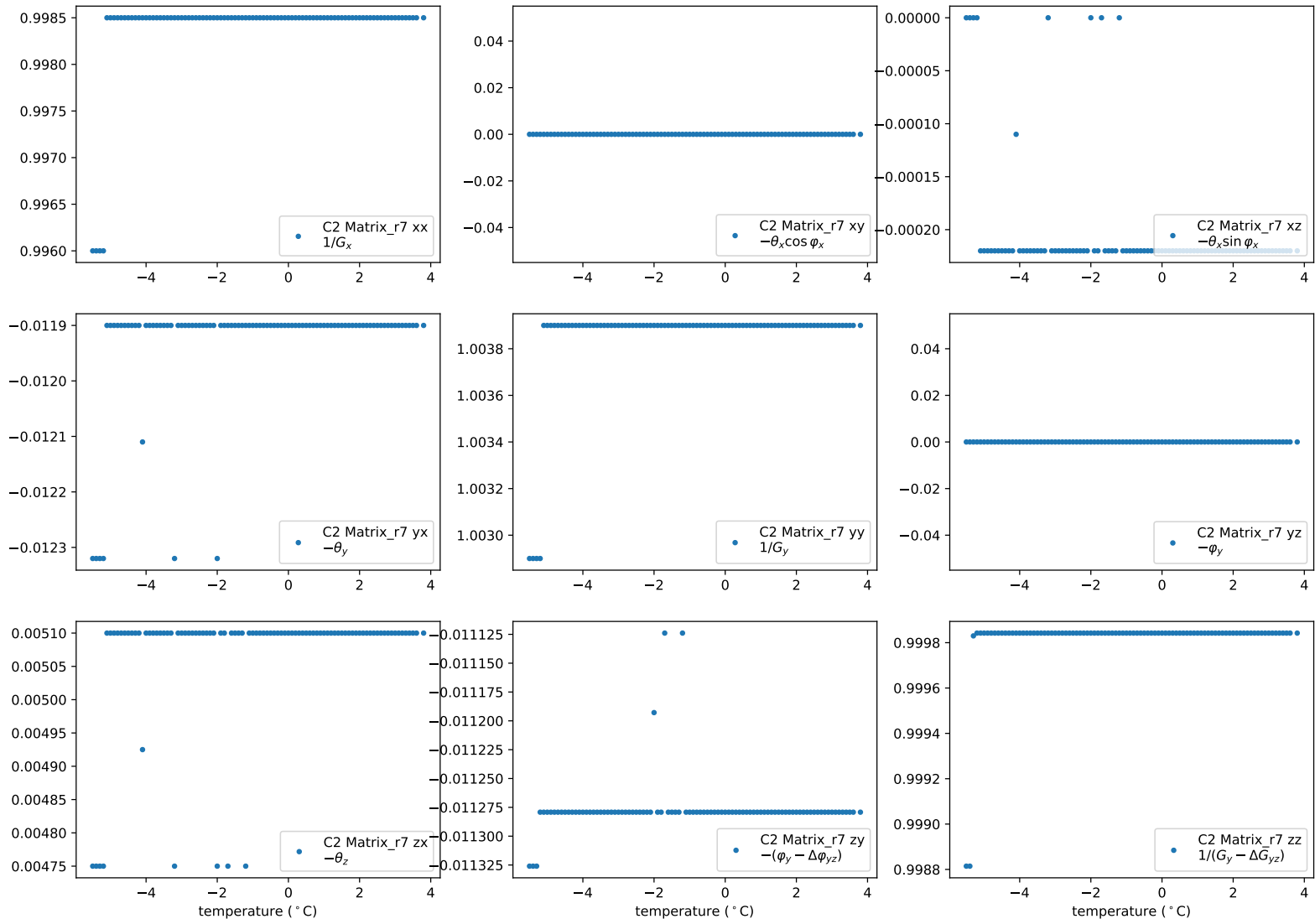


Figure S82: Cluster 2 Matrix_r7 versus the outboard sensor temperature

3 Cluster 3 calibration parameters

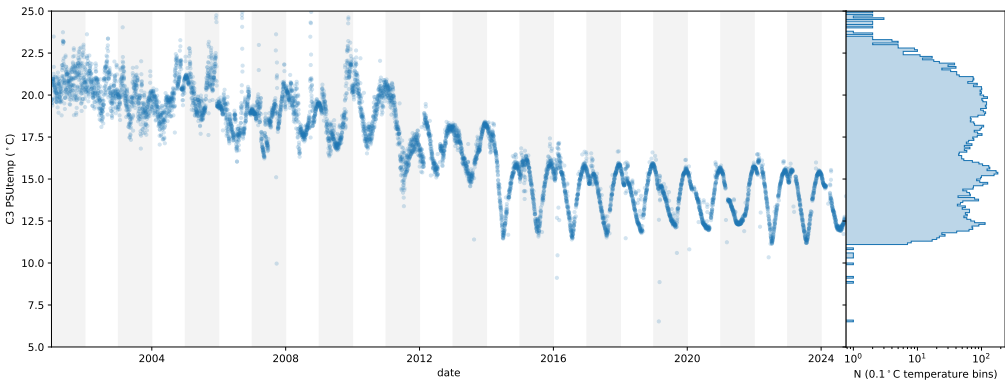


Figure S83: Cluster 3 electronics box temperature

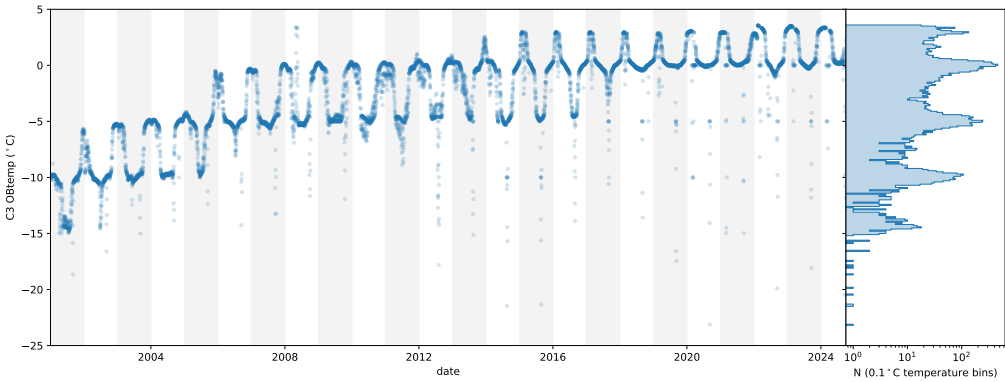


Figure S84: Cluster 3 outboard sensor temperature

3.1 Daily calibration parameters long term variation

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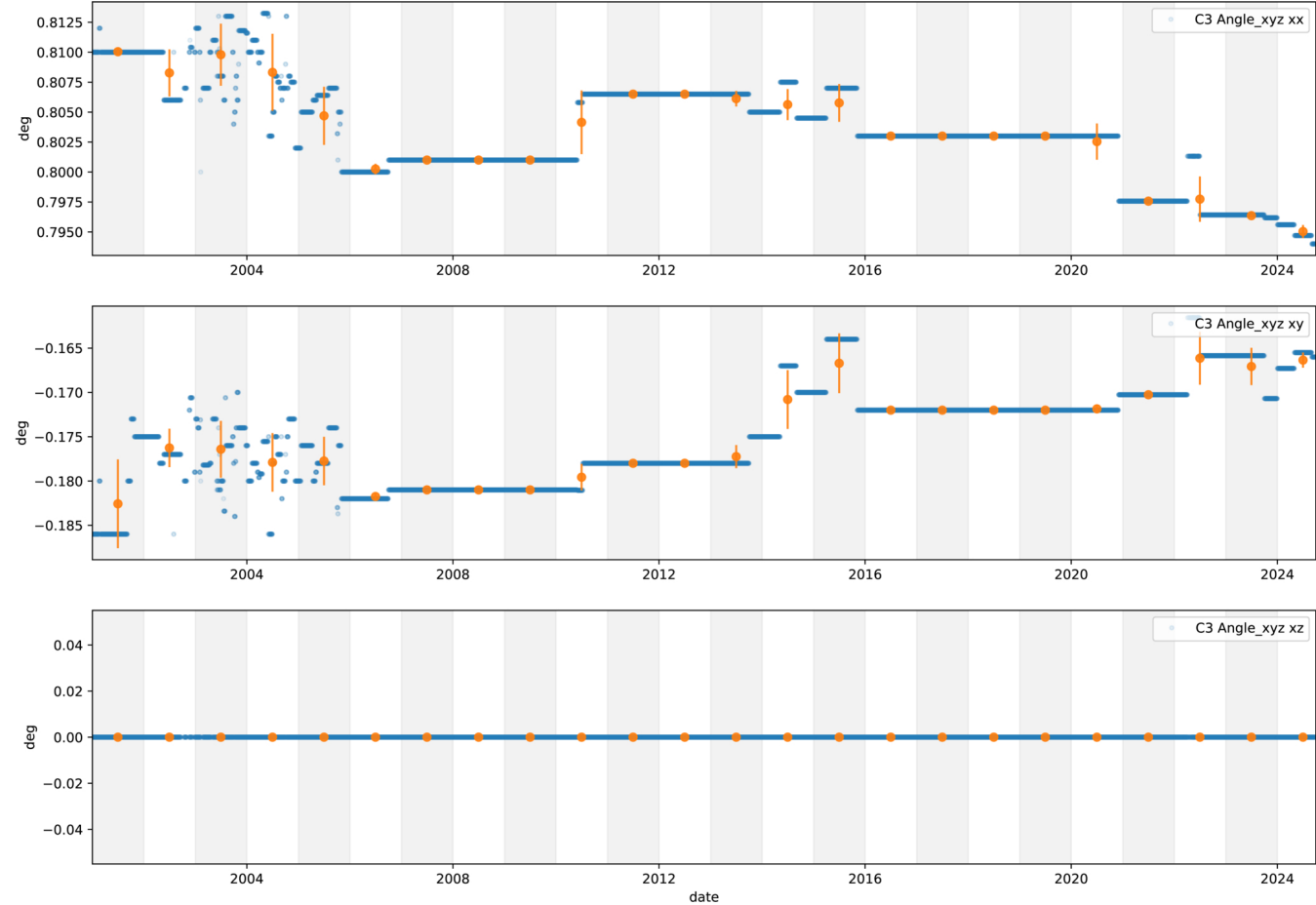


Figure S85: Cluster 3 Angle_xyz long term variation

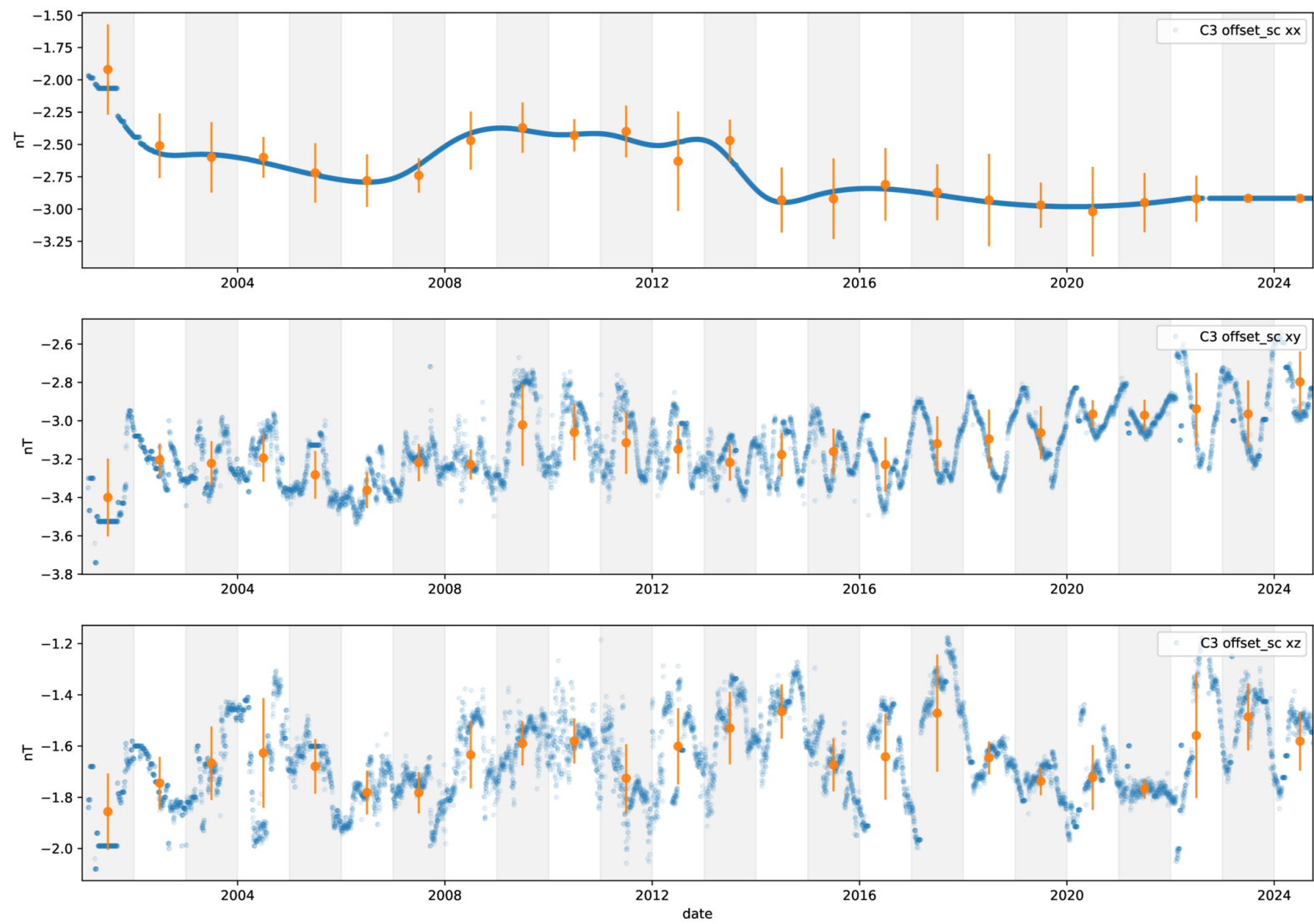


Figure S86: Cluster 3 offset_sc long term variation

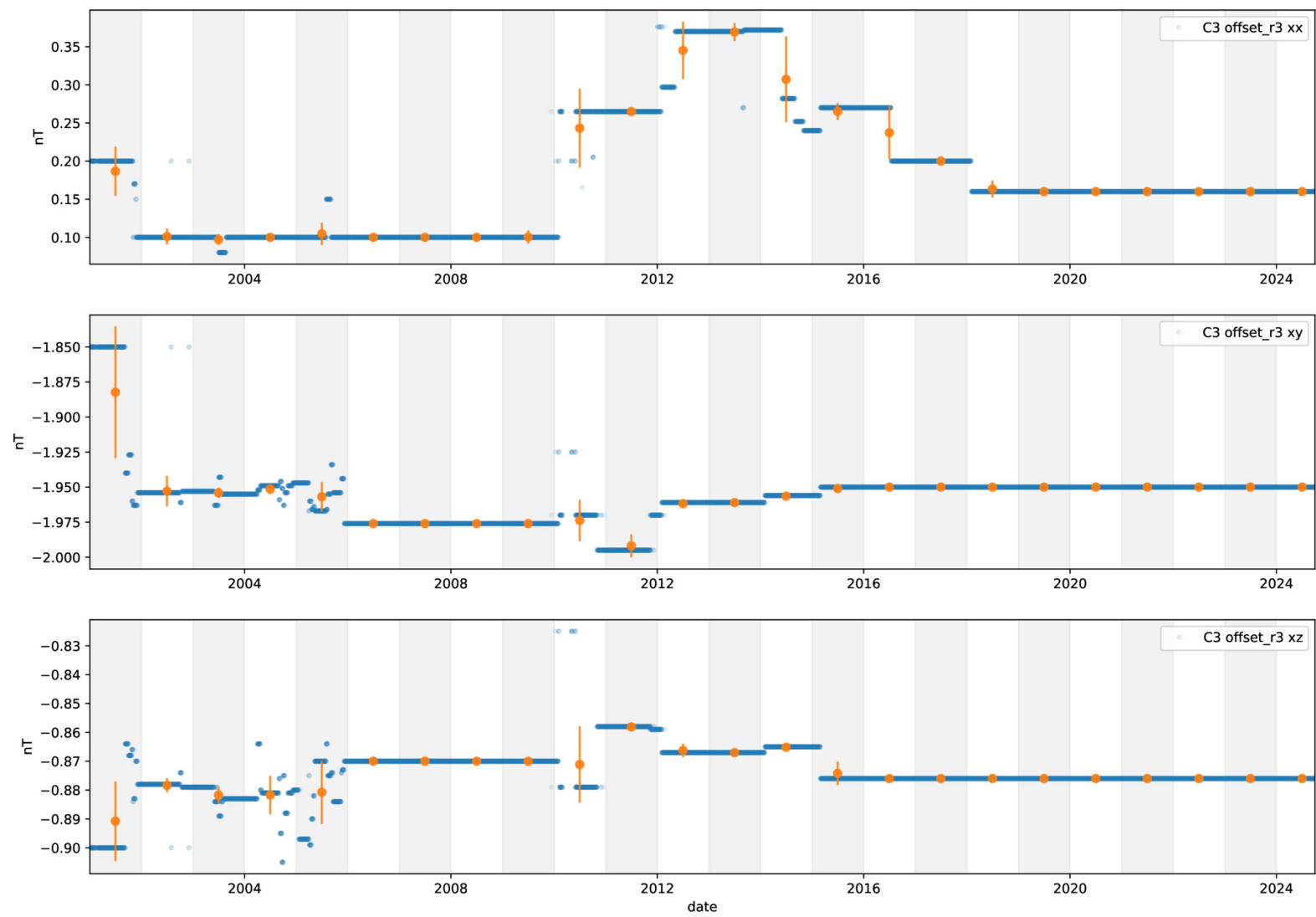


Figure S87: Cluster 3 offset_r3 long term variation

I6

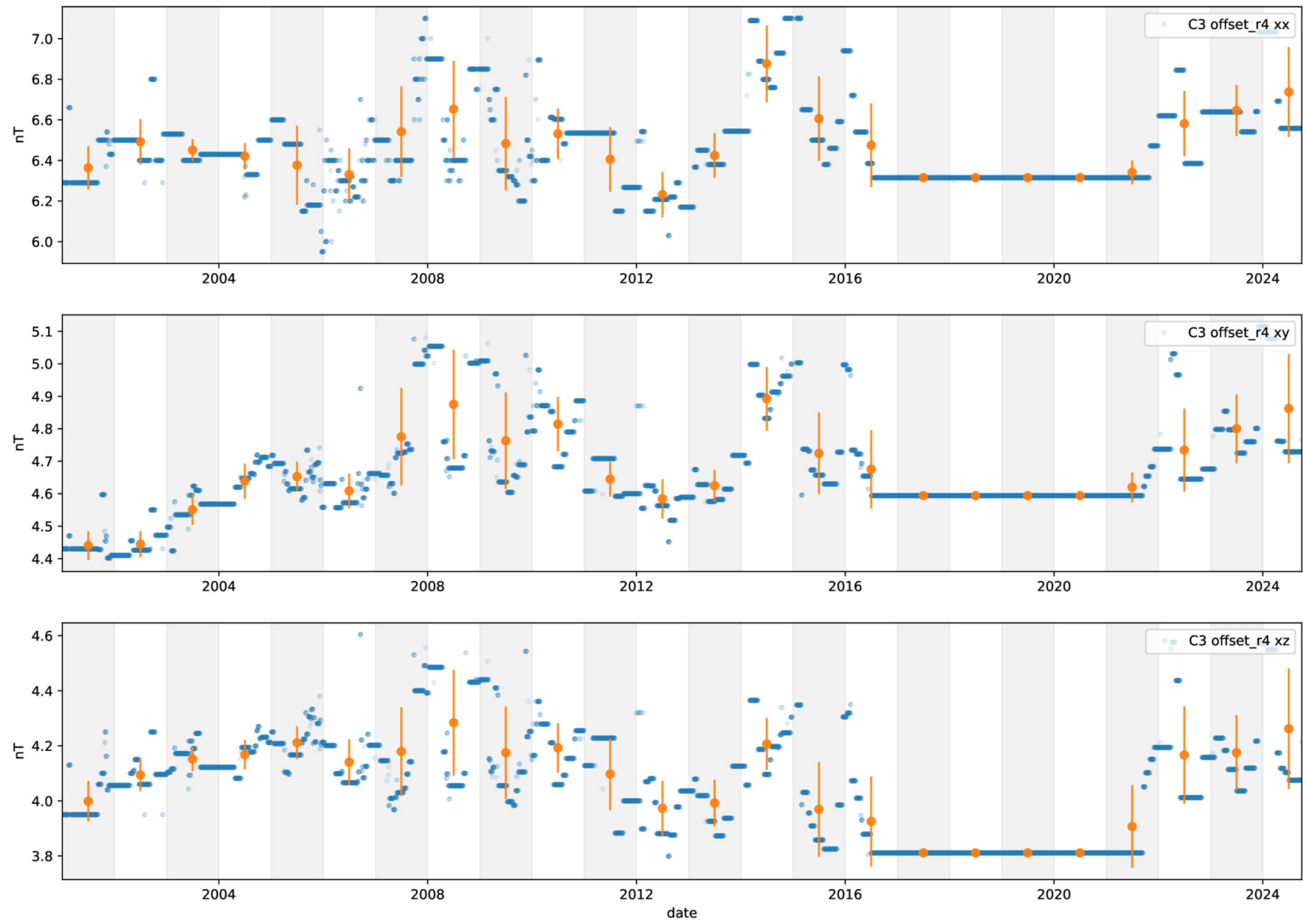


Figure S88: Cluster 3 offset_r4 long term variation

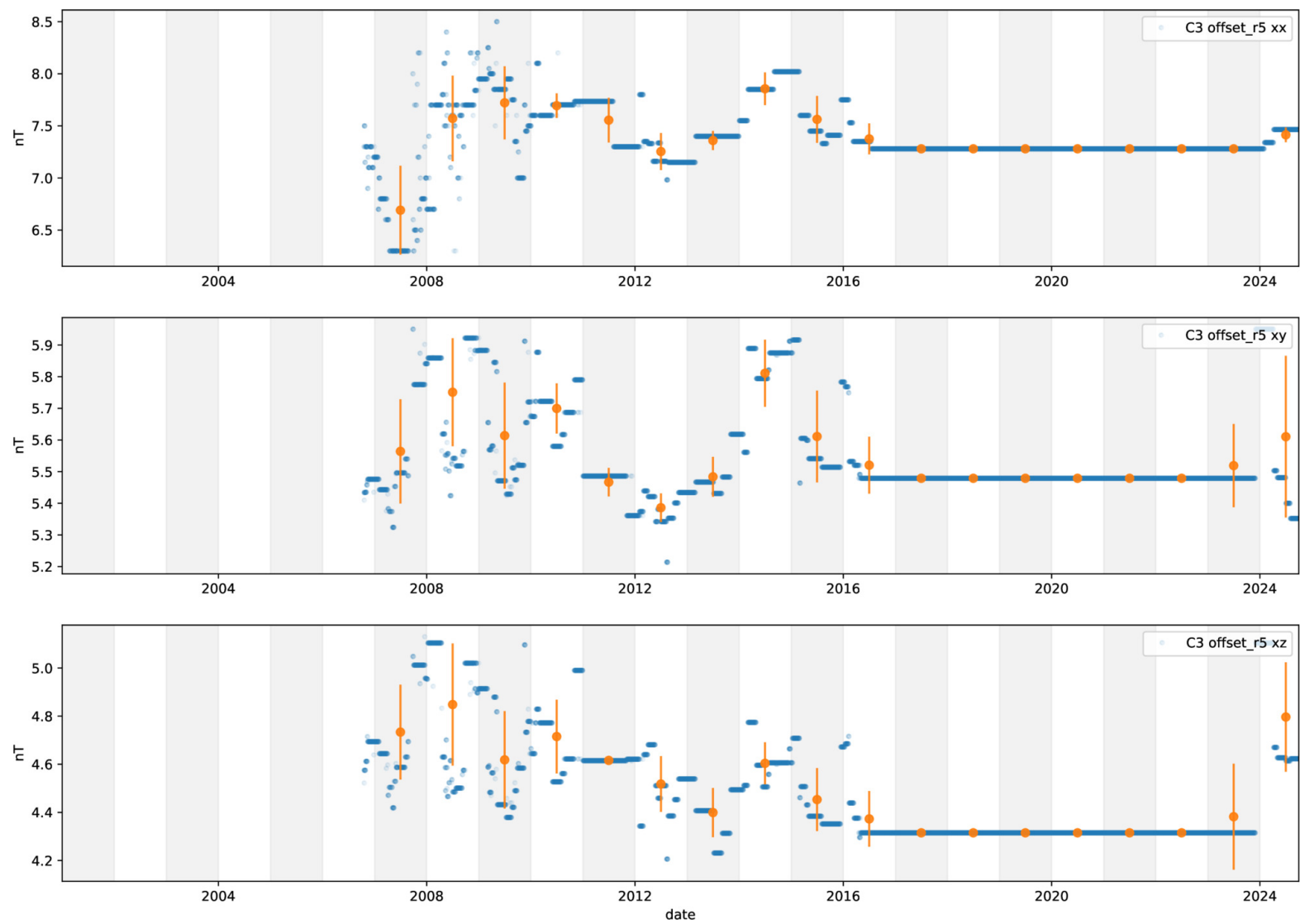


Figure S89: Cluster 3 offset_r5 long term variation

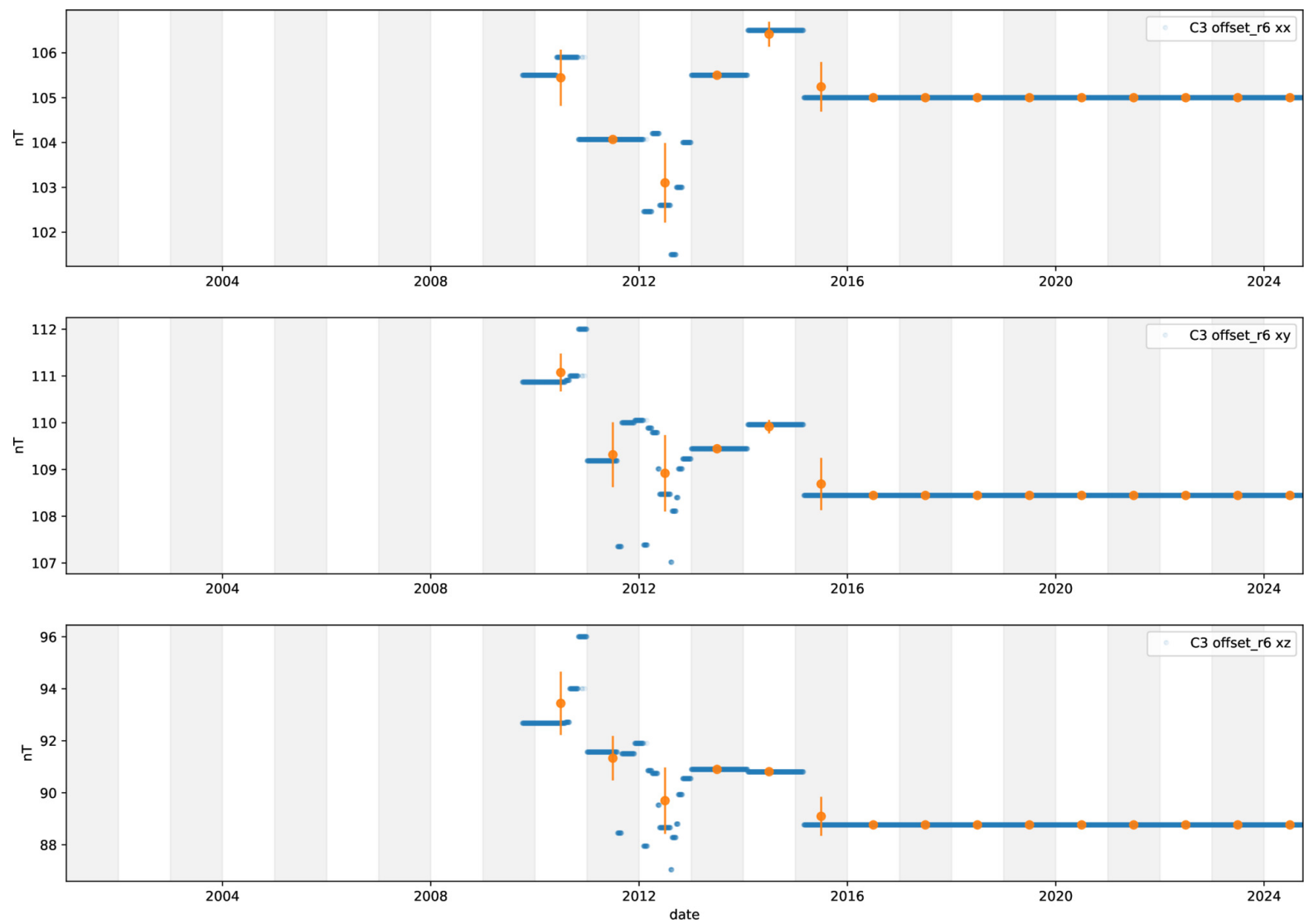


Figure S90: Cluster 3 offset_r6 long term variation

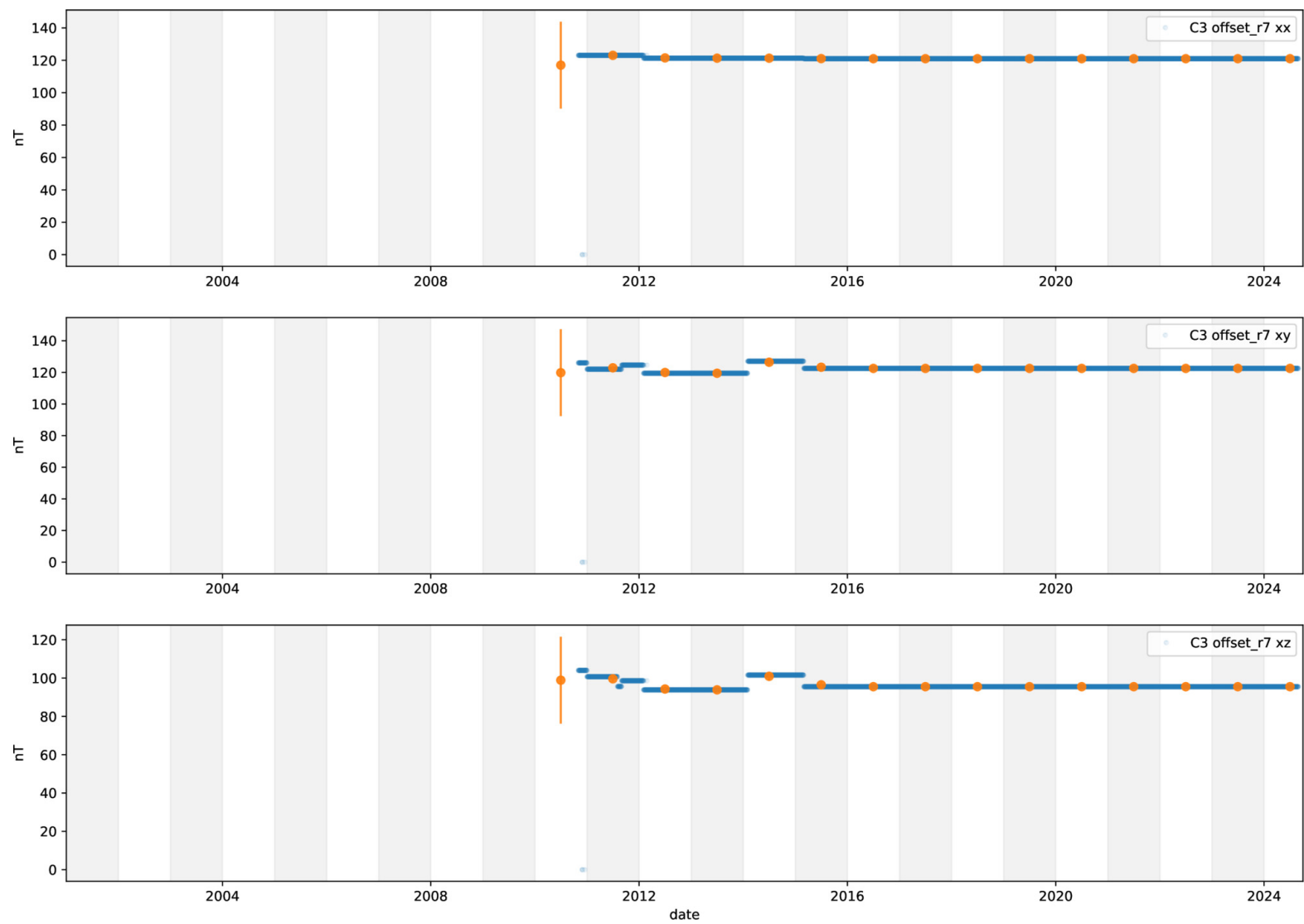


Figure S91: Cluster 3 offset_r7 long term variation

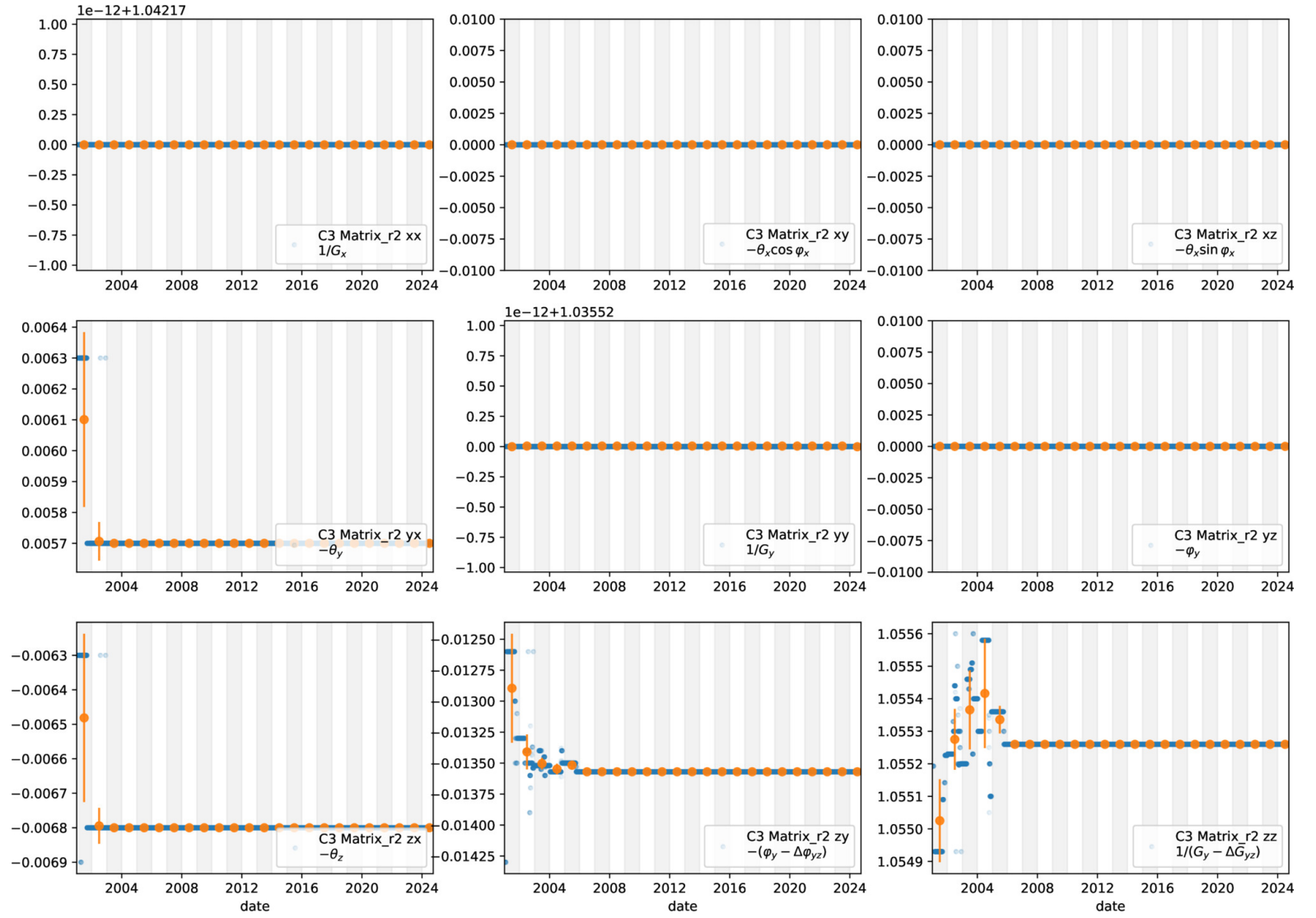


Figure S92: Cluster 3 Matrix_r2 long term variation

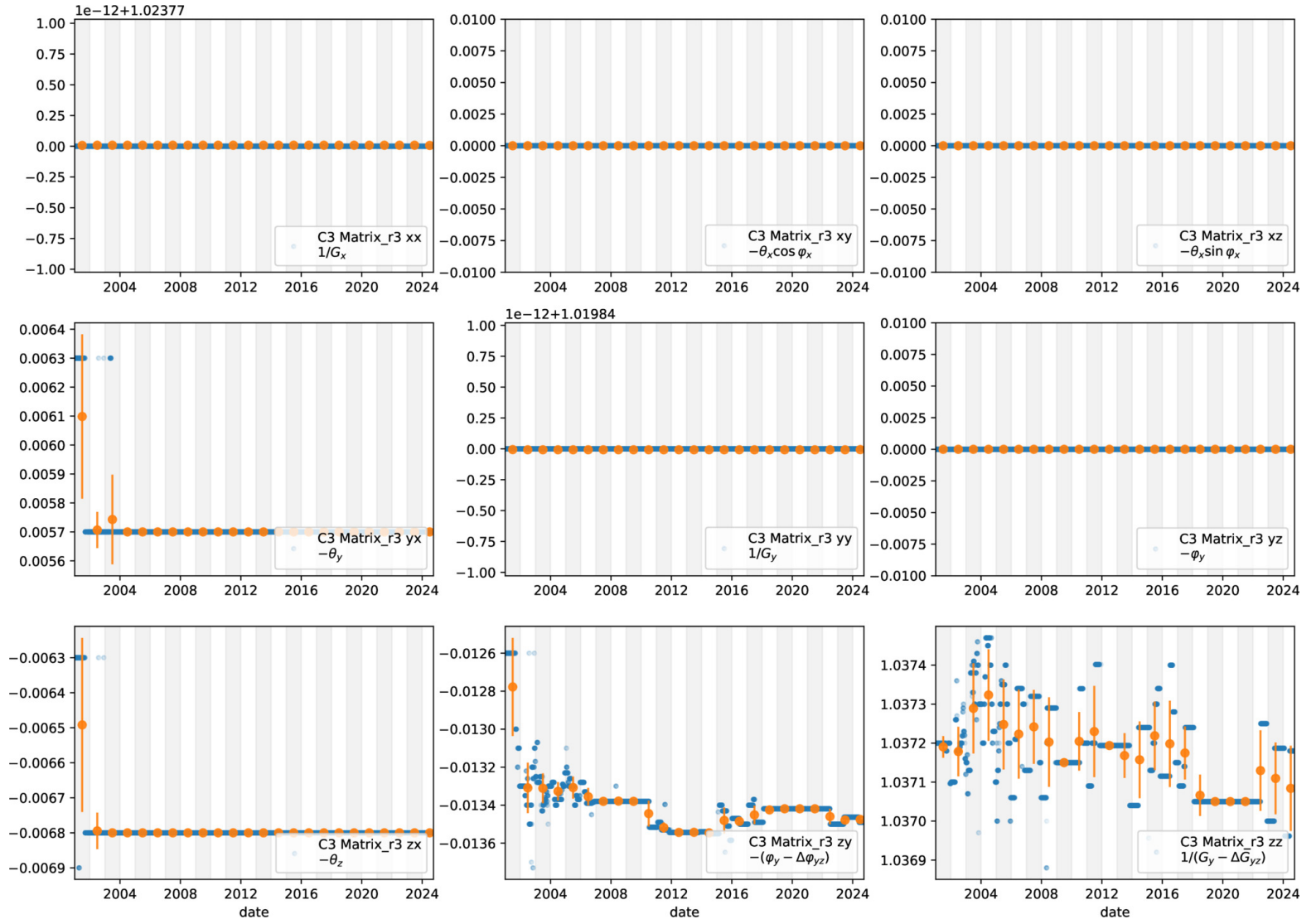


Figure S93: Cluster 3 Matrix_r3 long term variation

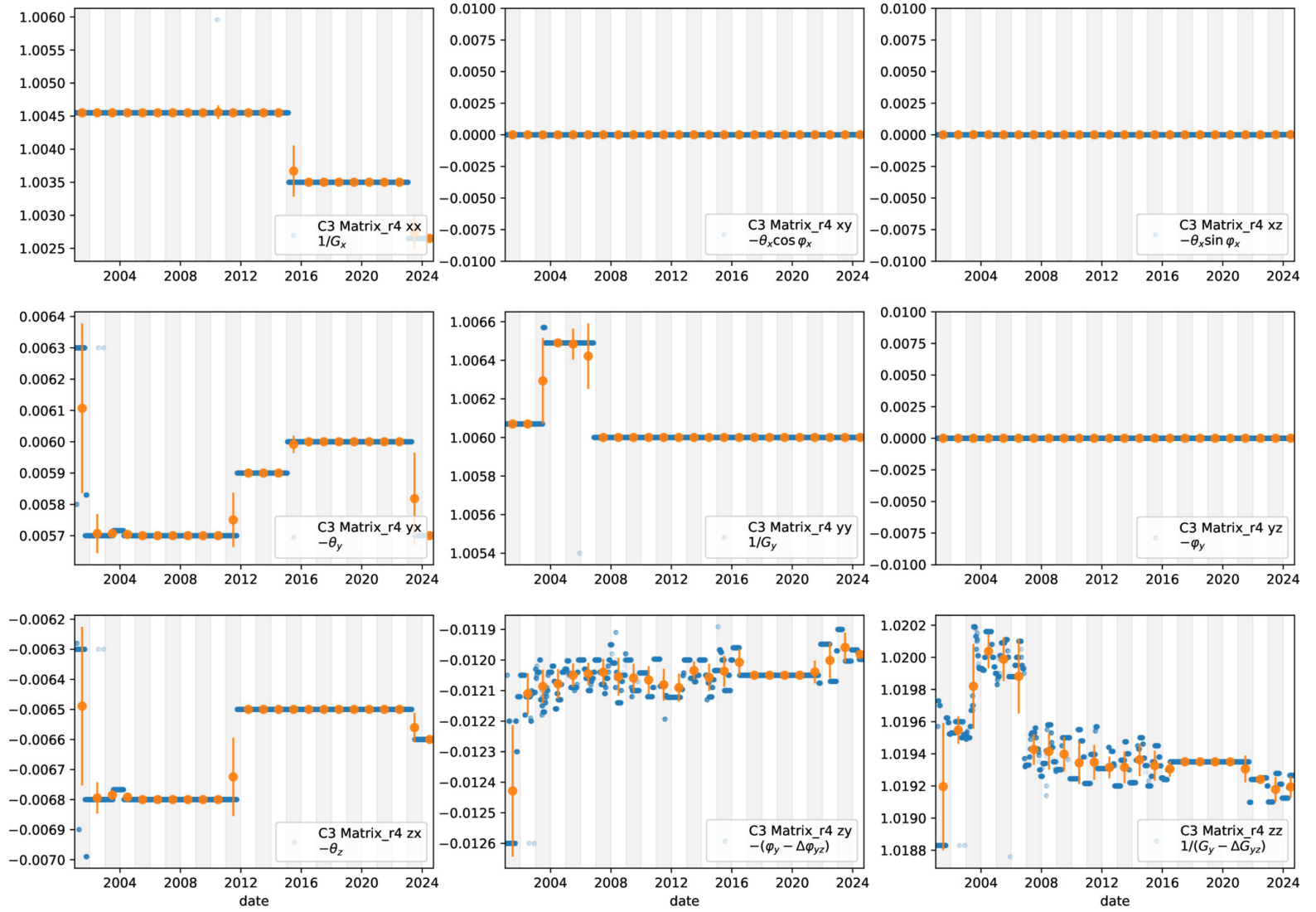


Figure S94: Cluster 3 Matrix_r4 long term variation

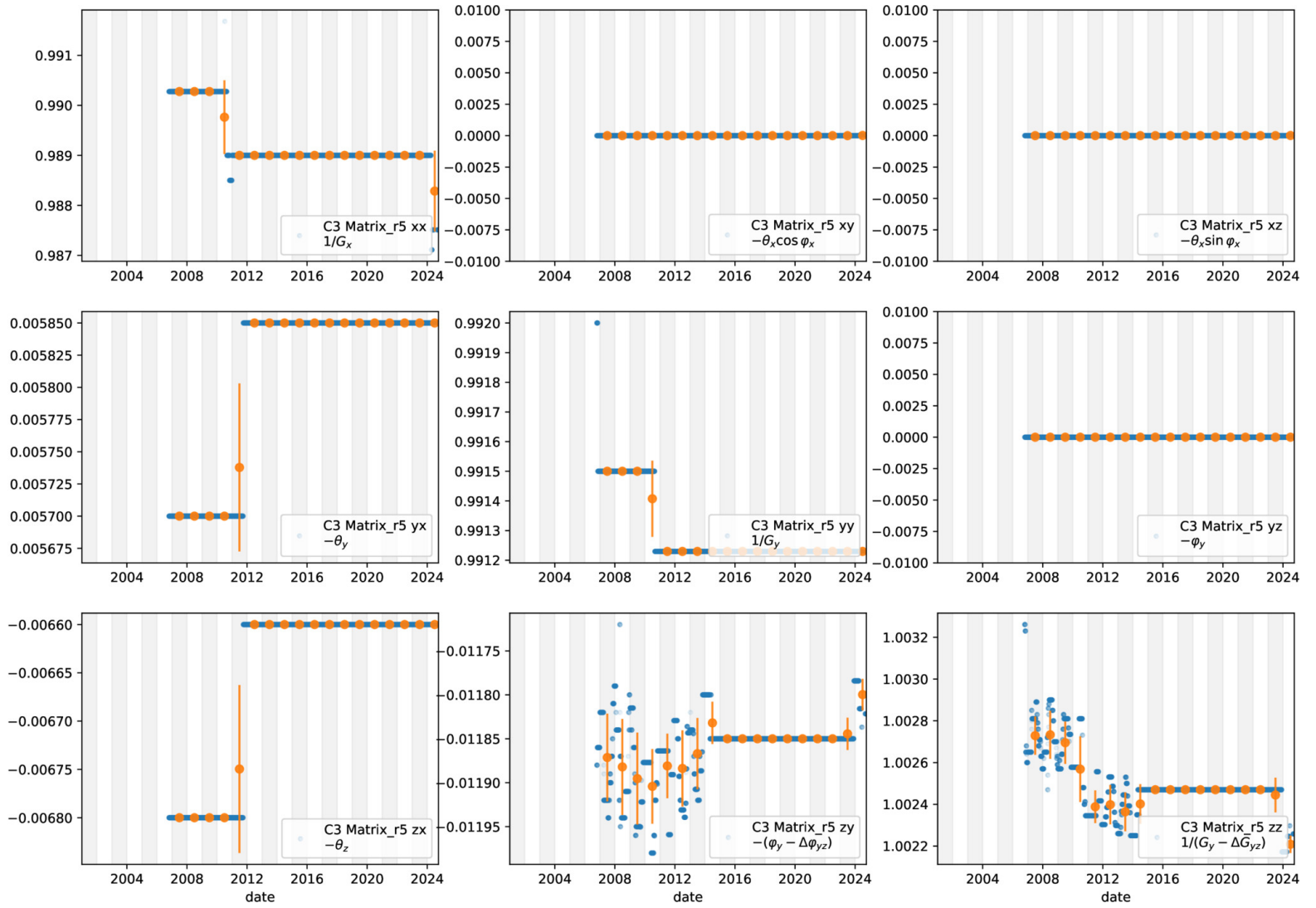


Figure S95: Cluster 3 Matrix_r5 long term variation

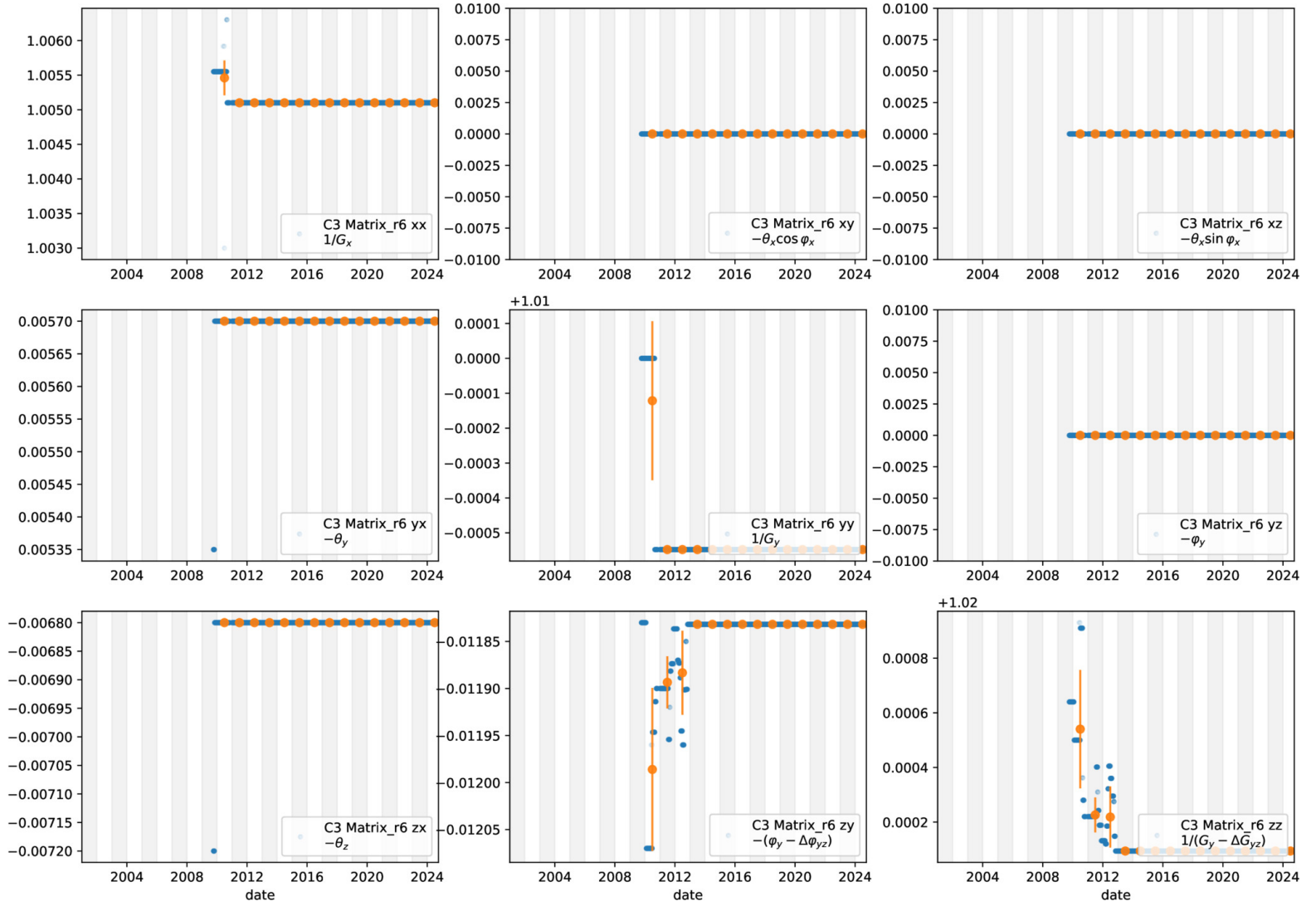


Figure S96: Cluster 3 Matrix_r6 long term variation

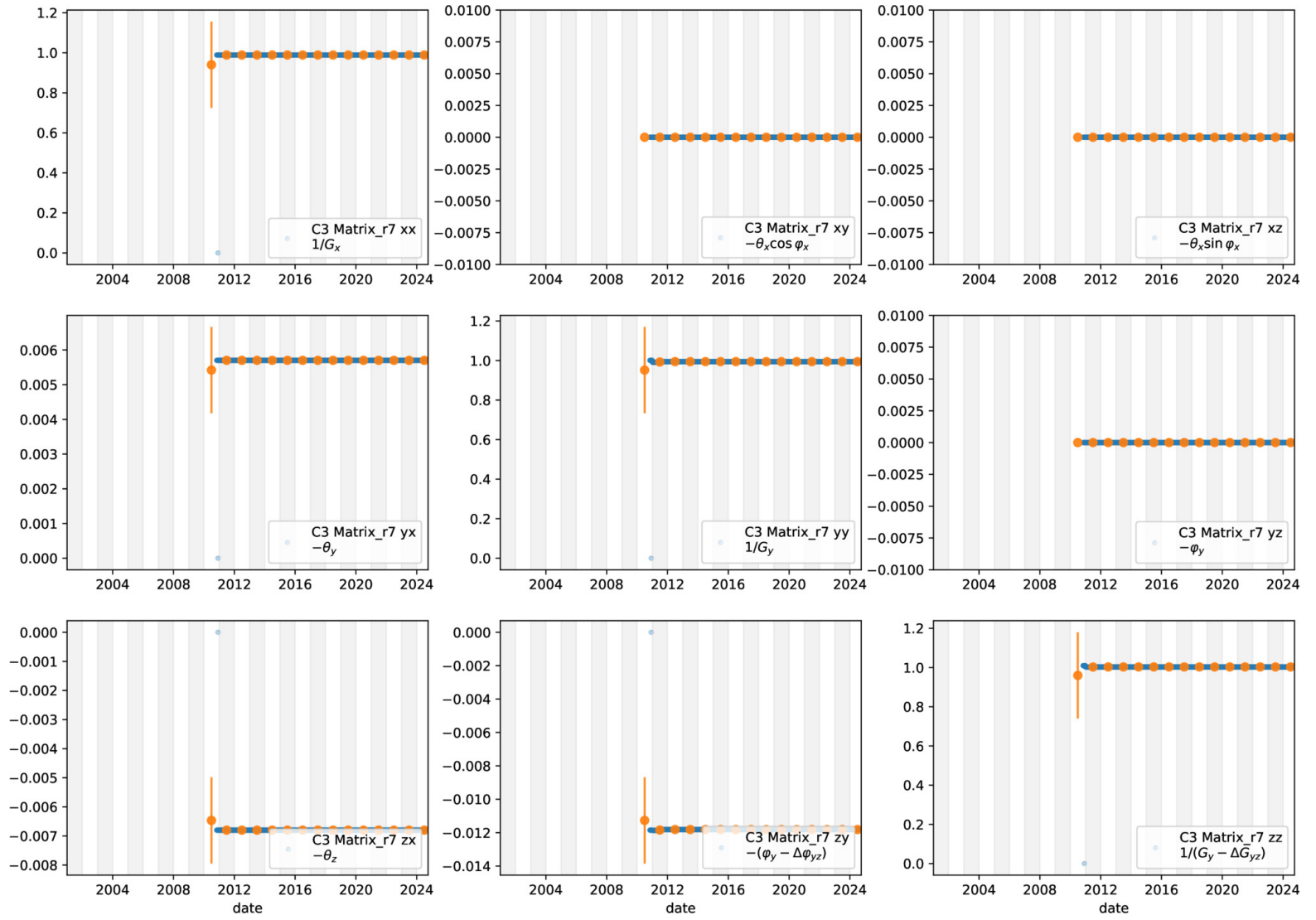


Figure S97: Cluster 3 Matrix_r7 long term variation

3.2 Daily calibration parameters versus the electronics box temperature

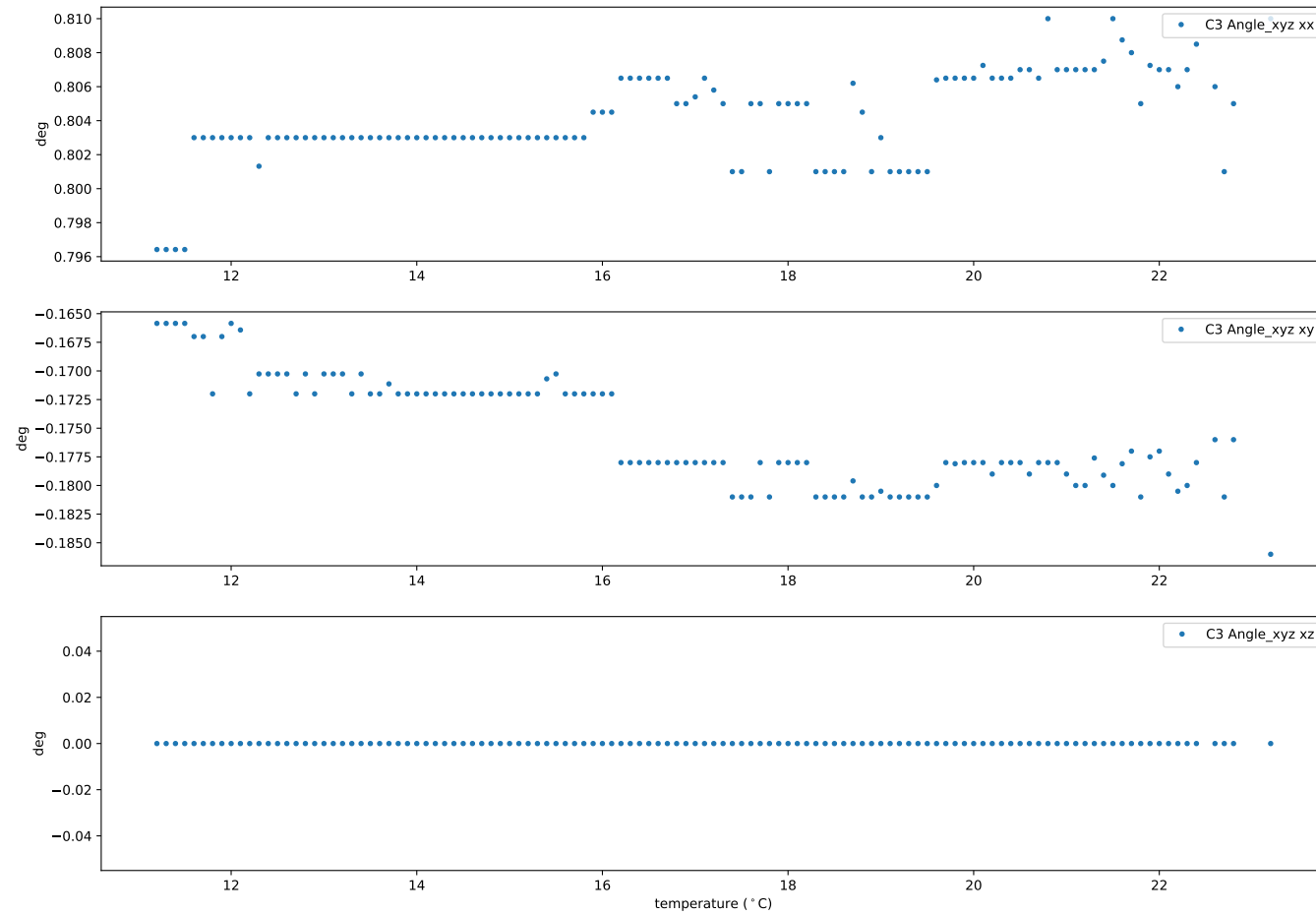


Figure S98: Cluster 3 Angle_xyz versus the electronics box temperature

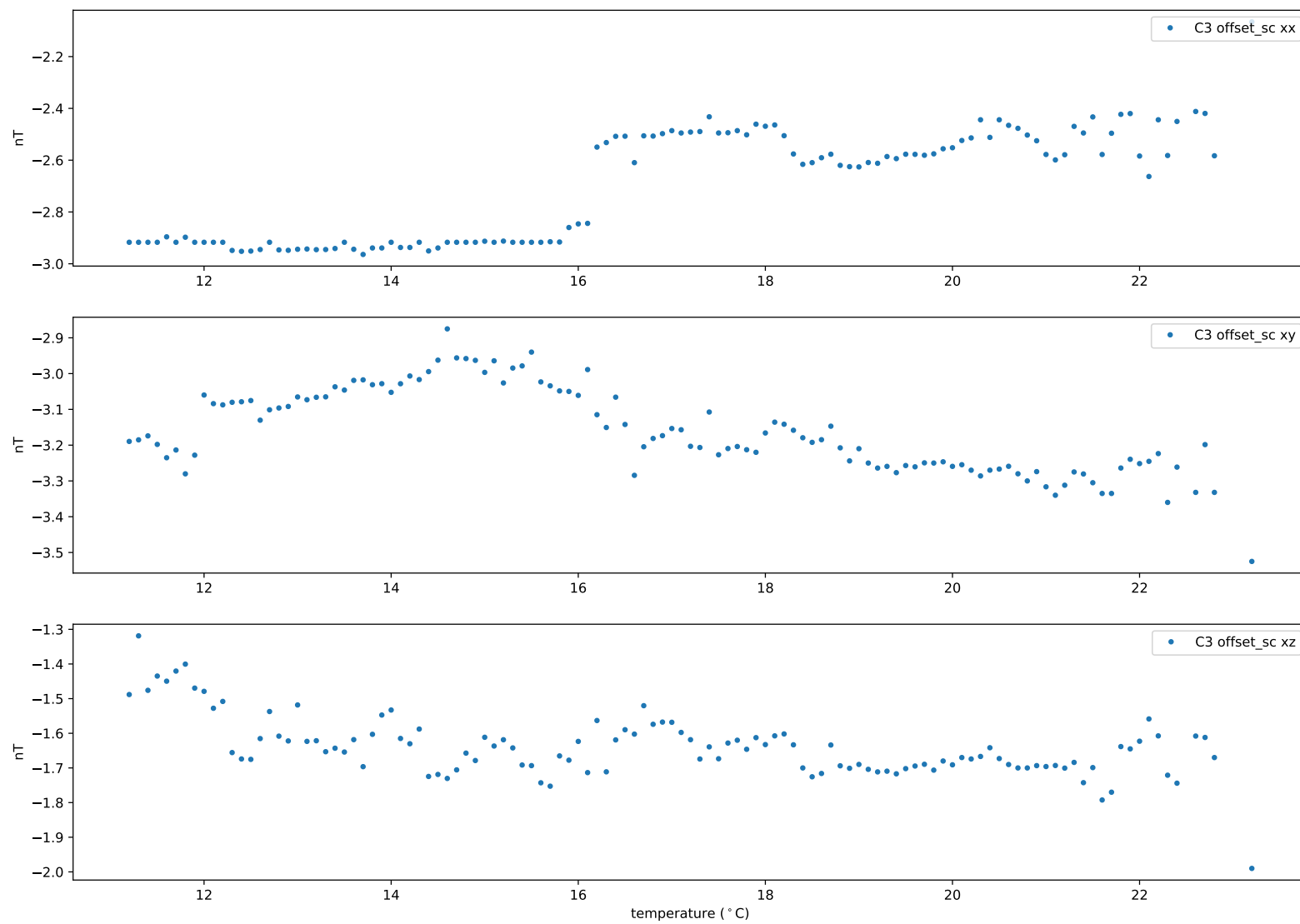


Figure S99: Cluster 3 offset_sc versus the electronics box temperature

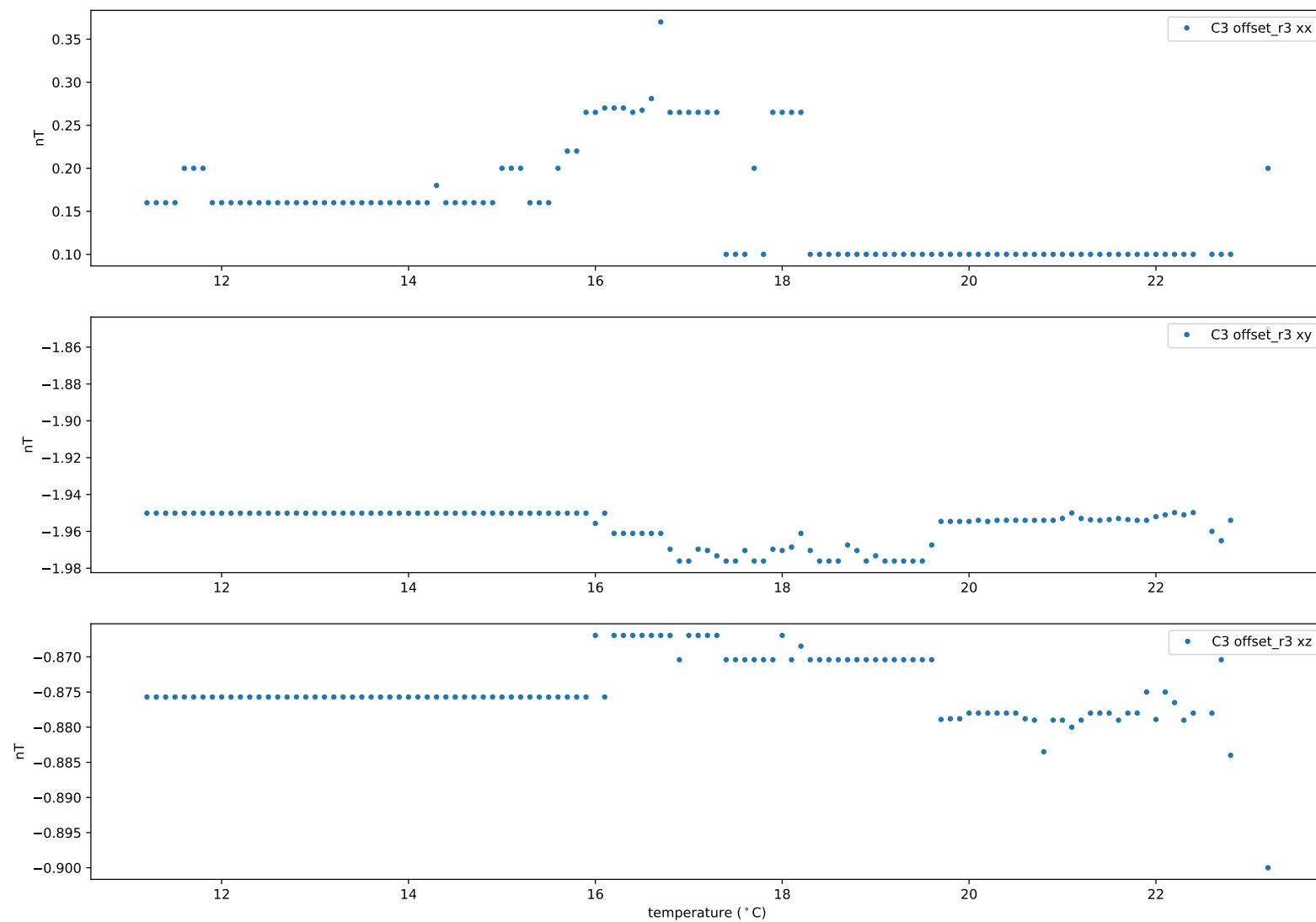


Figure S100: Cluster 3 offset_r3 versus the electronics box temperature

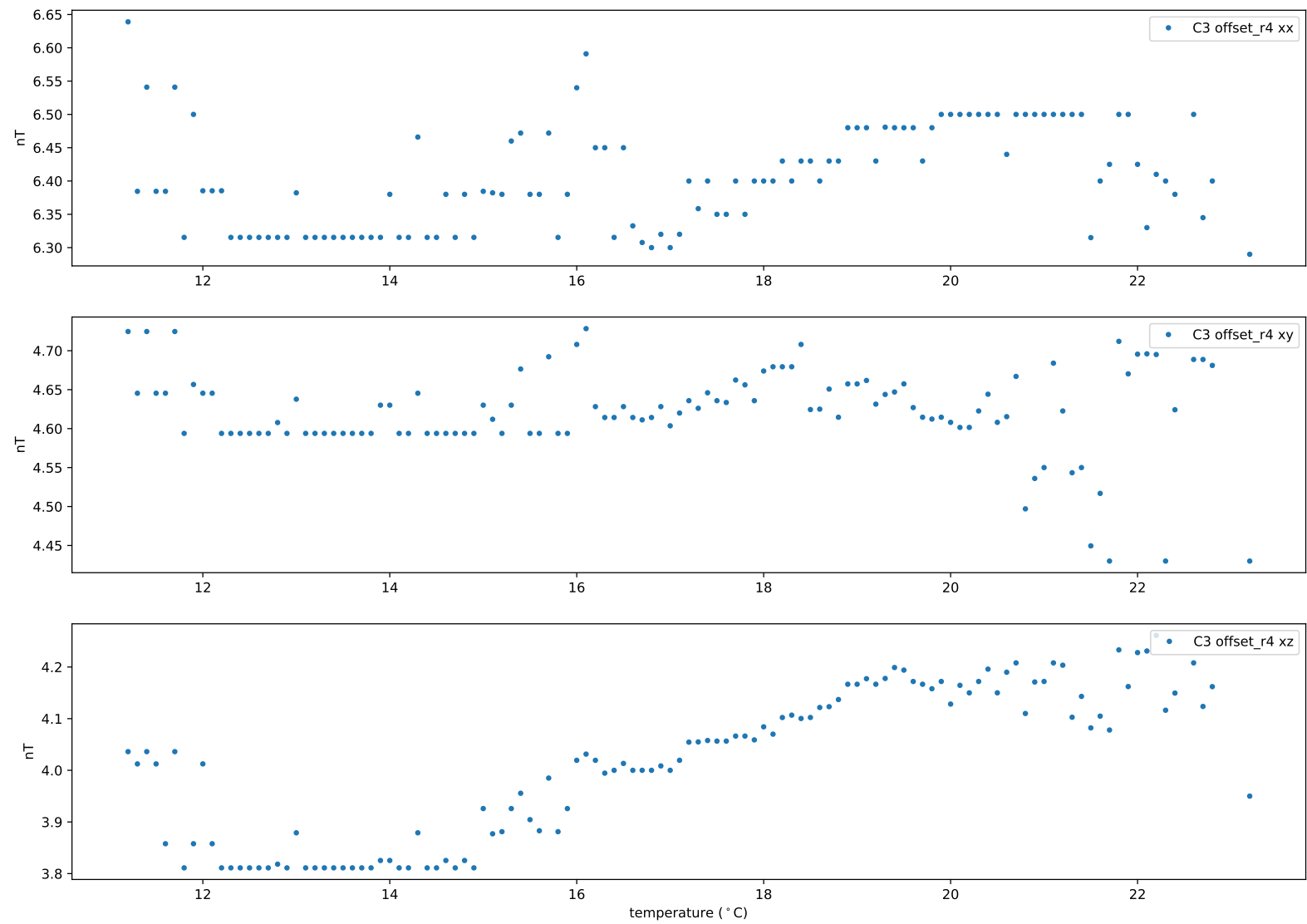


Figure S101: Cluster 3 offset_r4 versus the electronics box temperature

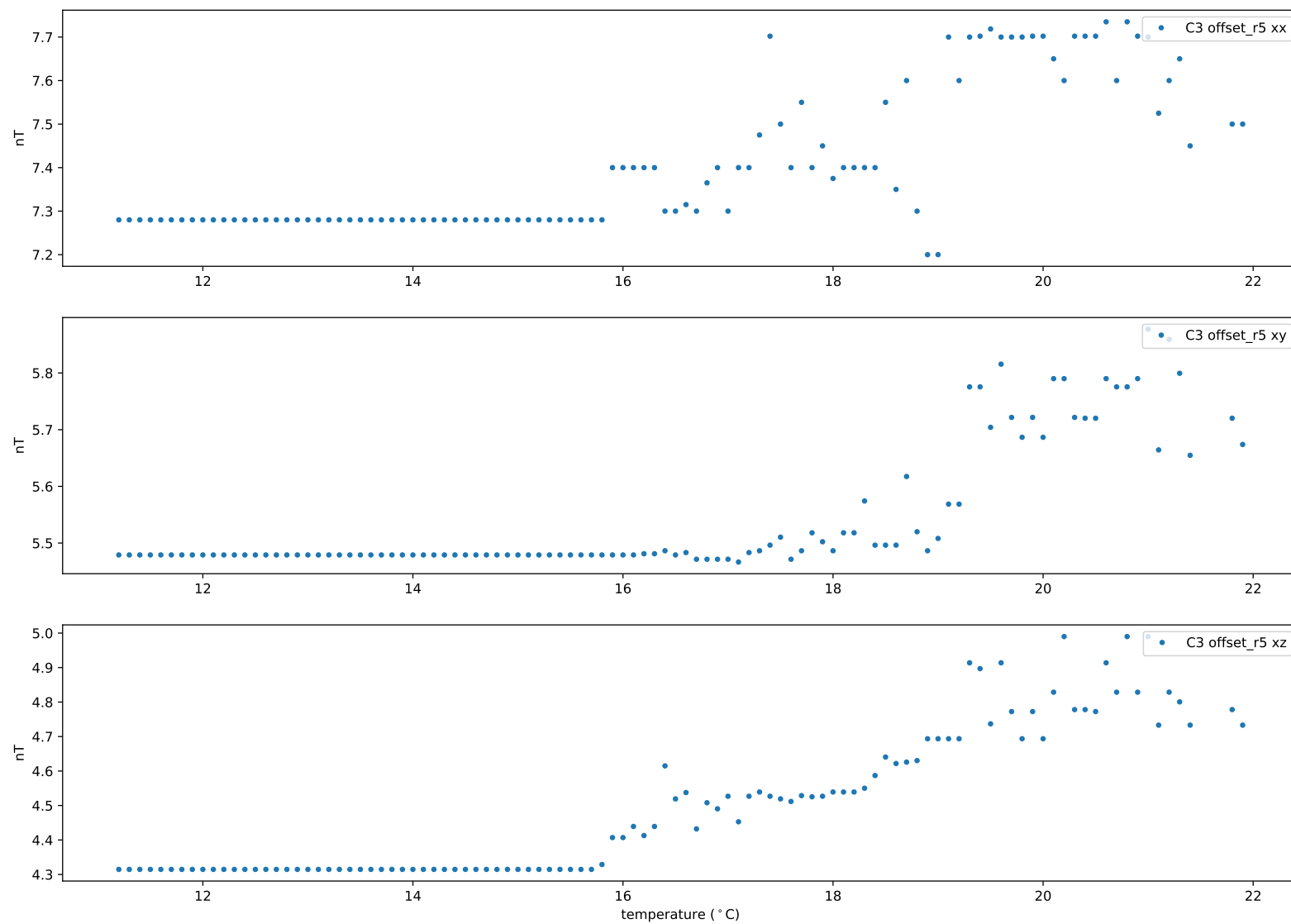


Figure S102: Cluster 3 offset_r5 versus the electronics box temperature

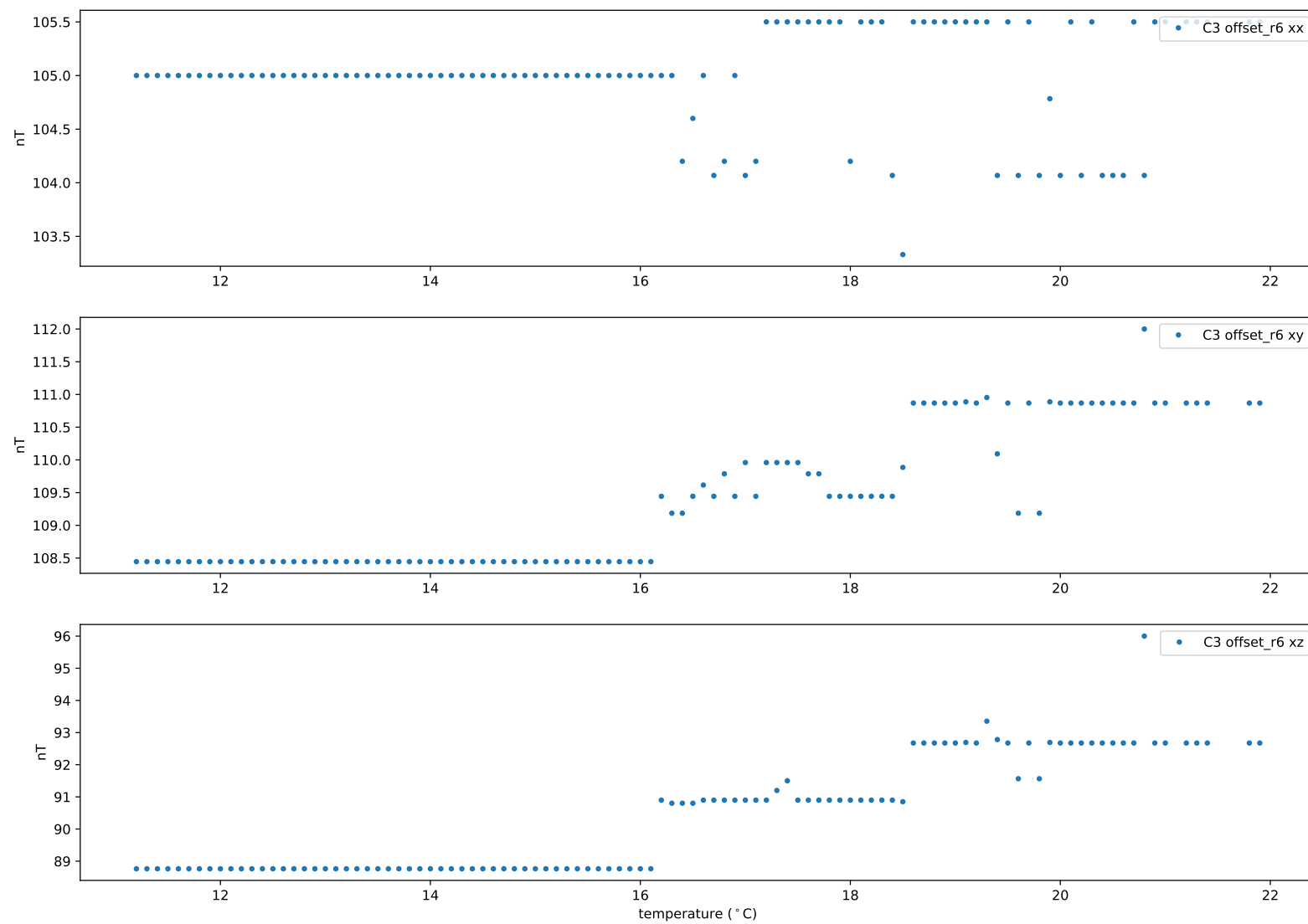


Figure S103: Cluster 3 offset_r6 versus the electronics box temperature

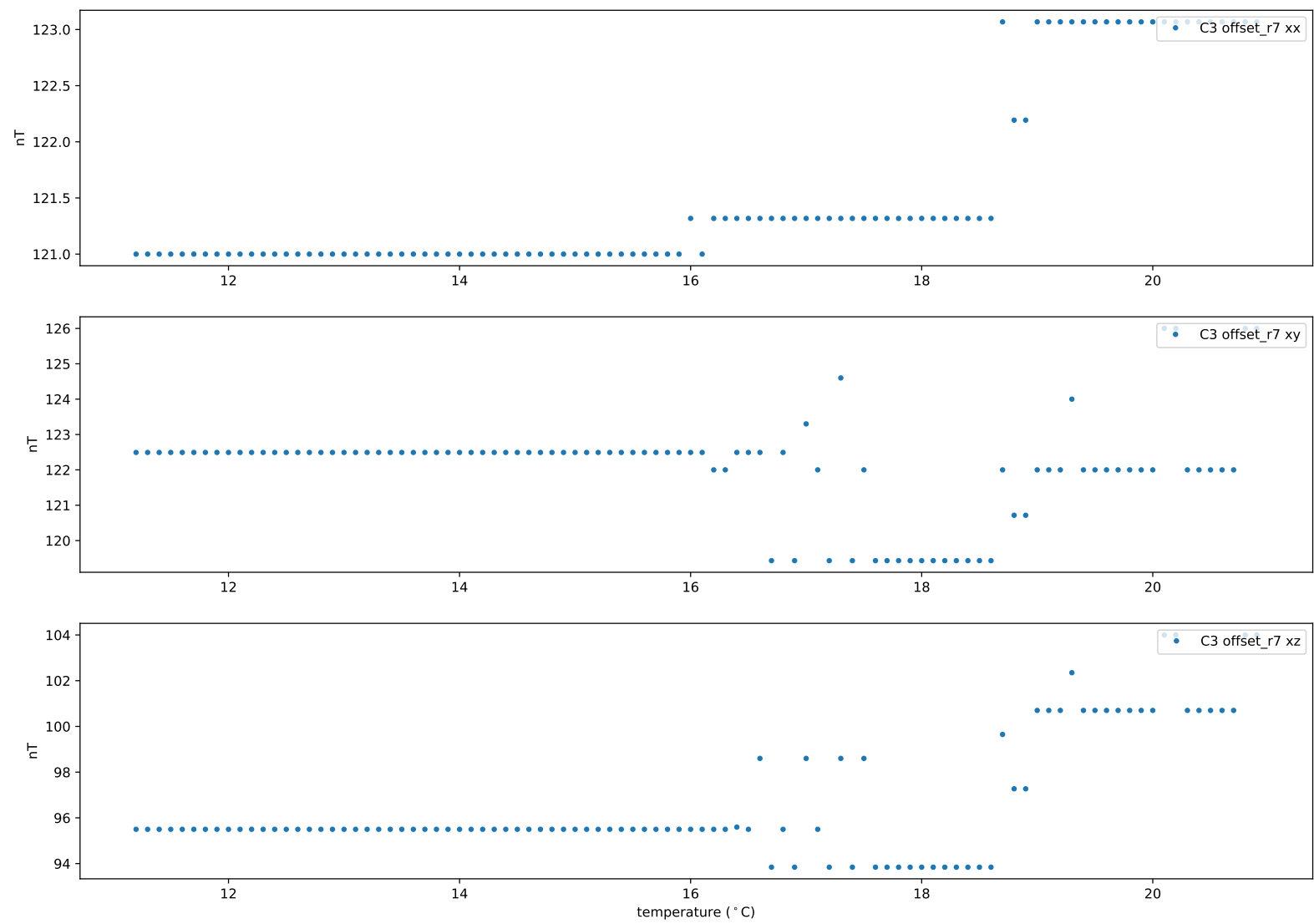


Figure S104: Cluster 3 offset_r7 versus the electronics box temperature

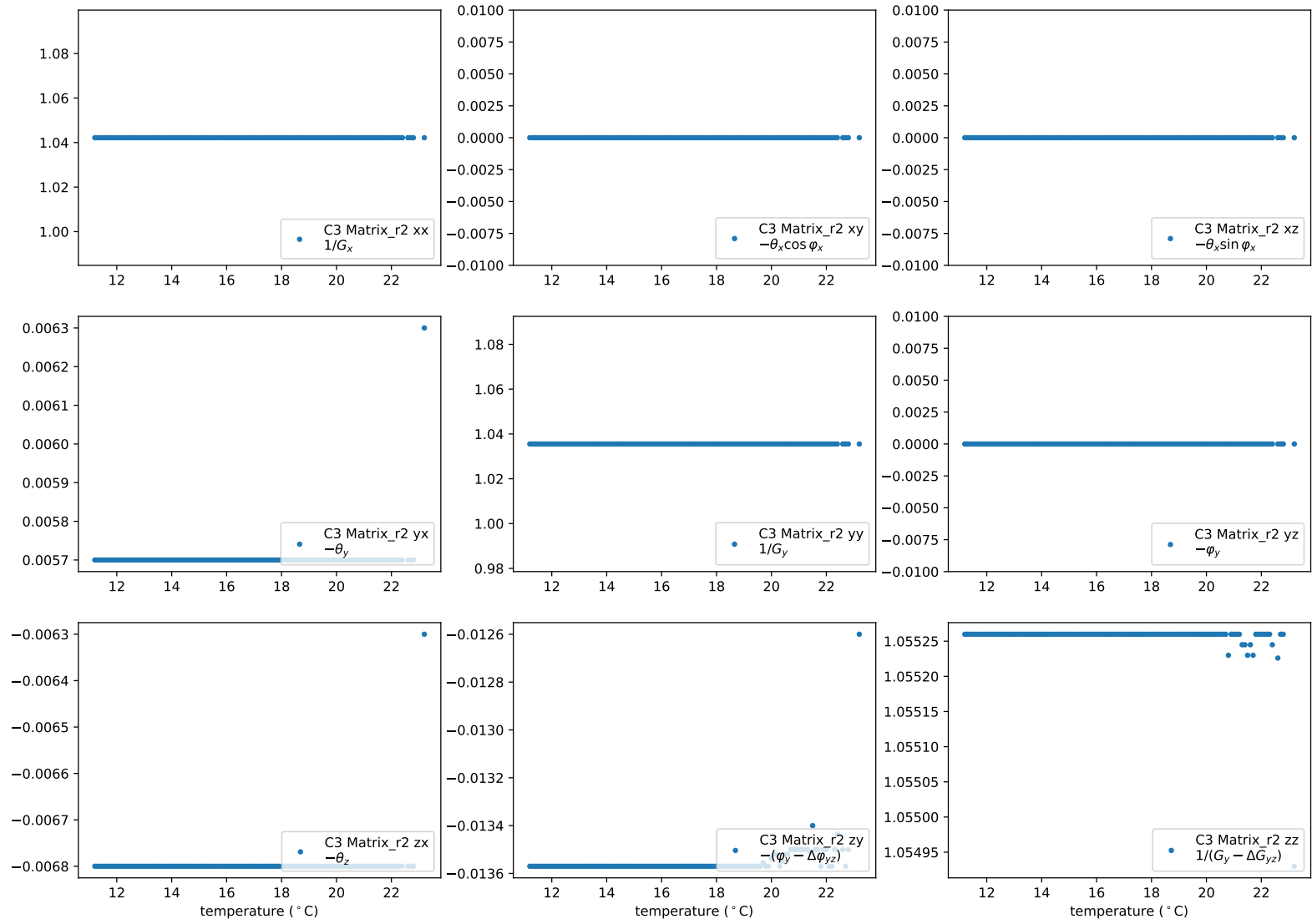


Figure S105: Cluster 3 Matrix_r2 versus the electronics box temperature

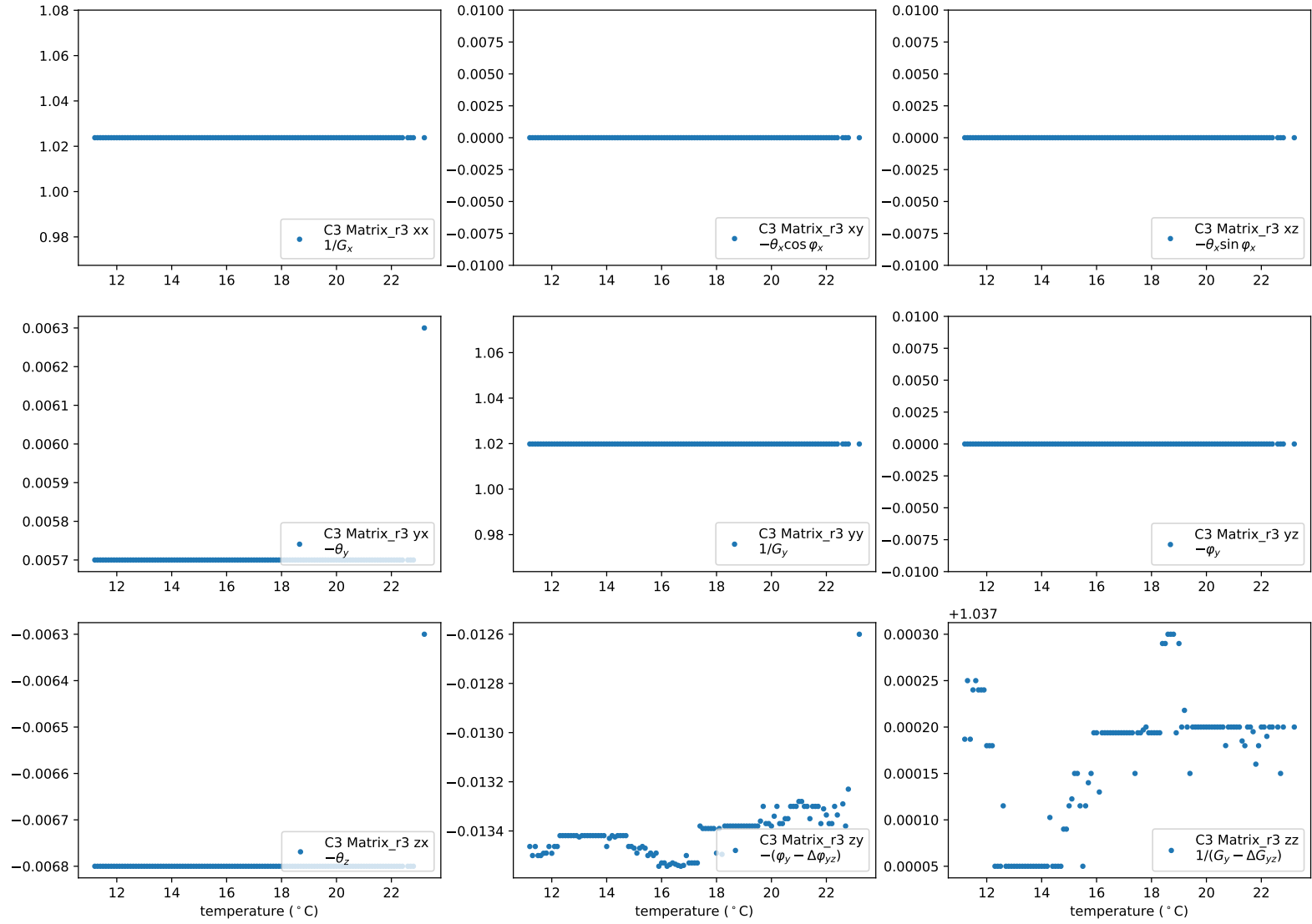


Figure S106: Cluster 3 Matrix_r3 versus the electronics box temperature

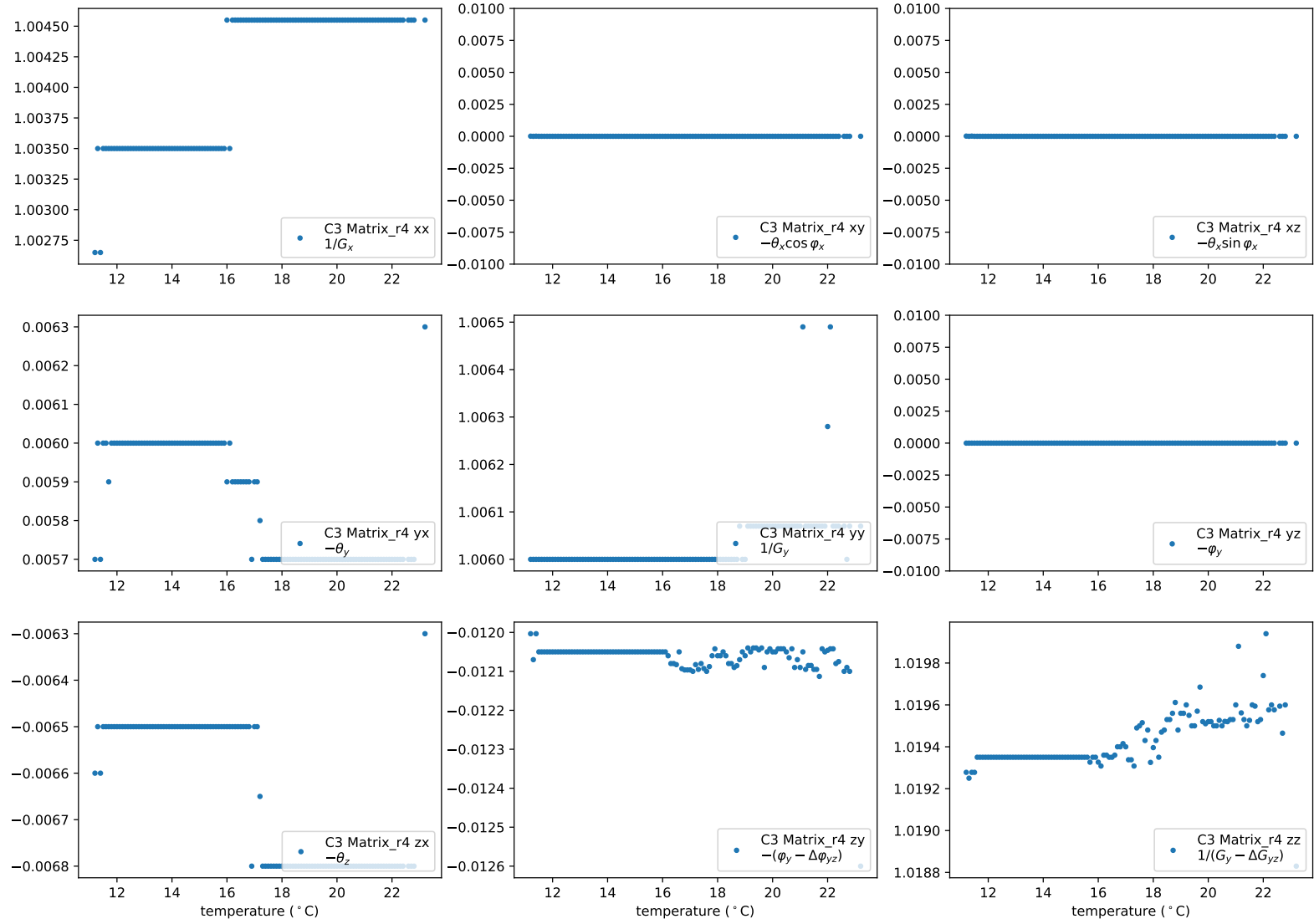


Figure S107: Cluster 3 Matrix_r4 versus the electronics box temperature

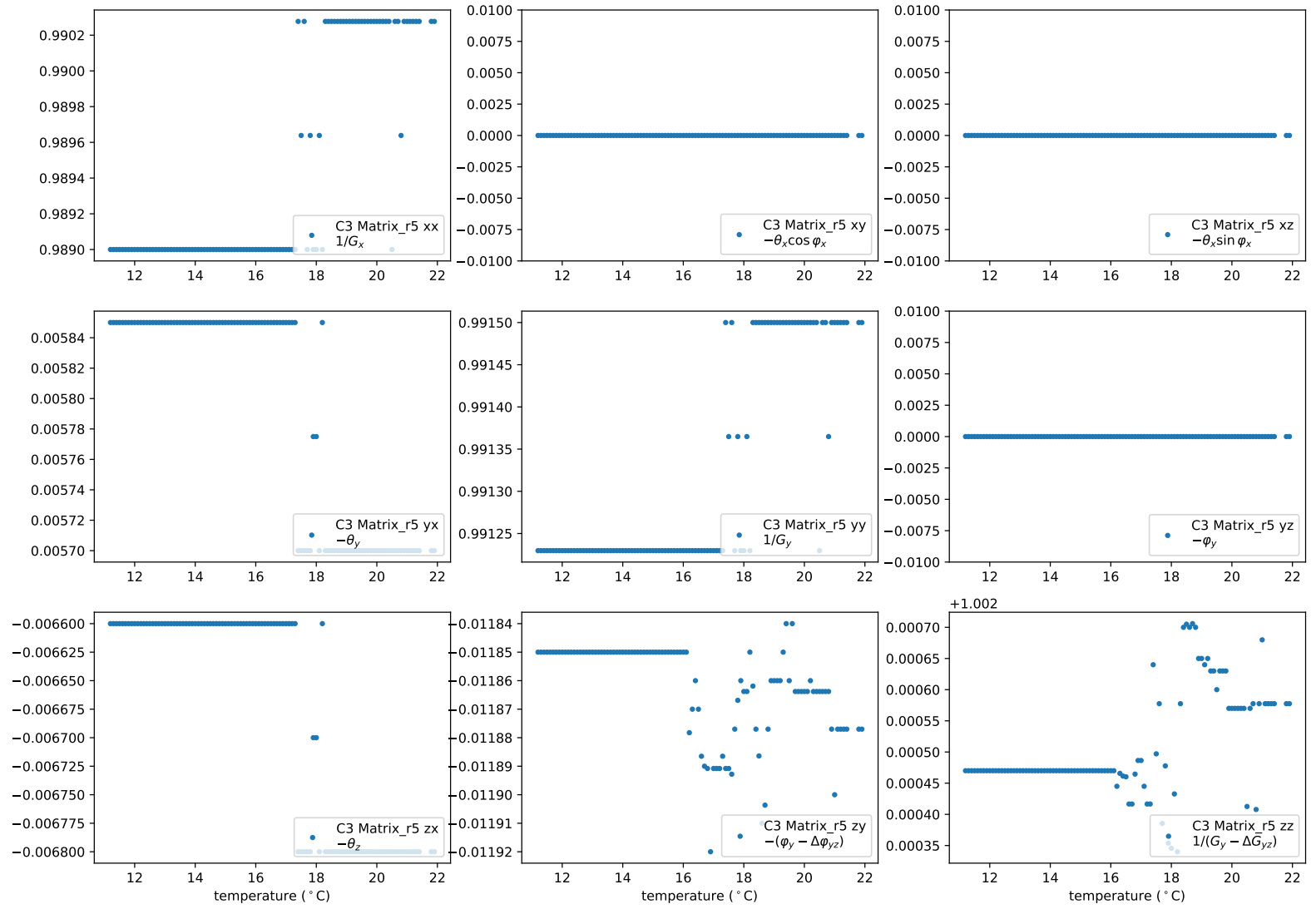


Figure S108: Cluster 3 Matrix_r5 versus the electronics box temperature

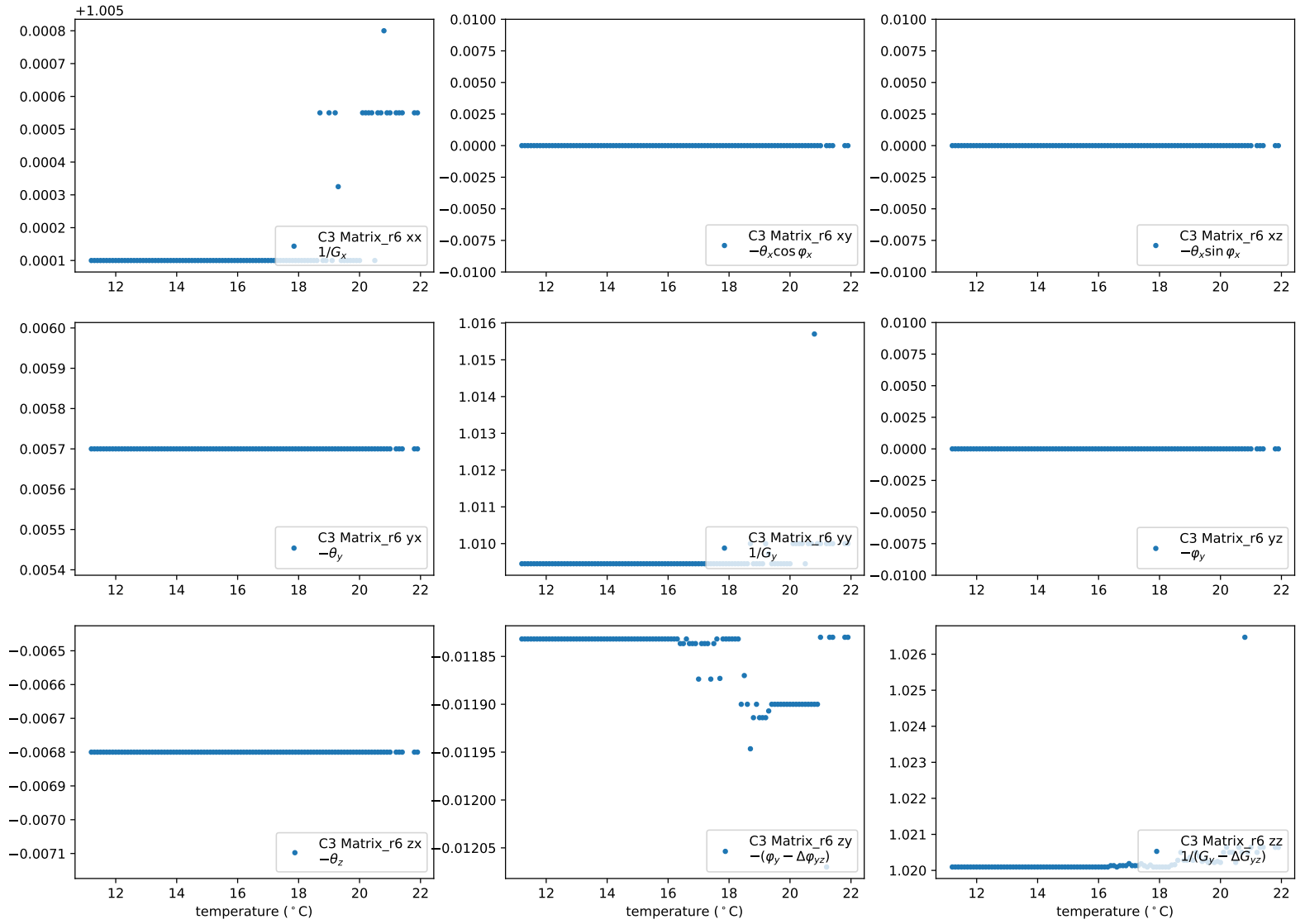


Figure S109: Cluster 3 Matrix_r6 versus the electronics box temperature

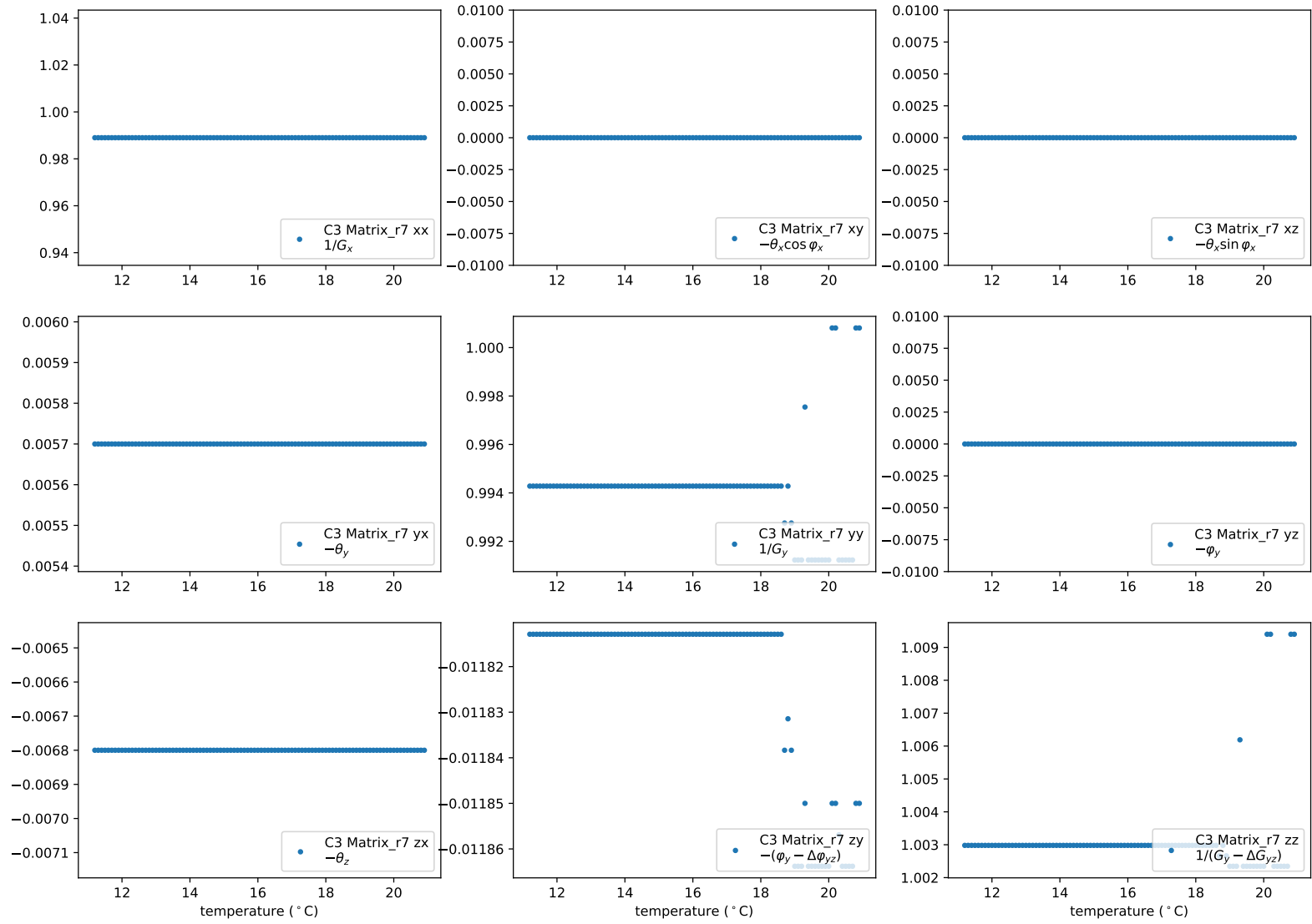


Figure S110: Cluster 3 Matrix_r7 versus the electronics box temperature

3.3 Daily calibration parameters versus the outboard sensor temperature

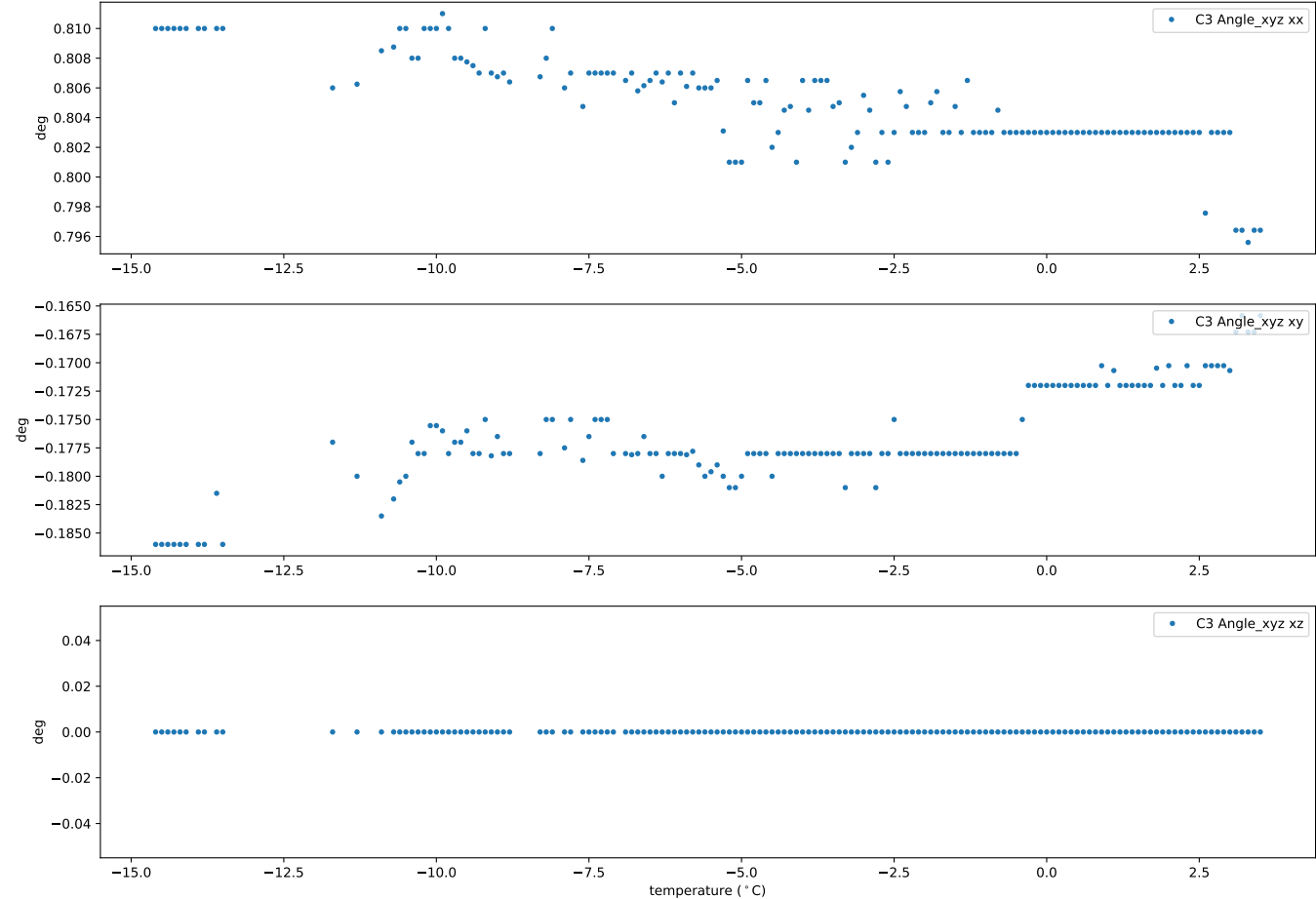


Figure S111: Cluster 3 Angle_xyz versus the outboard sensor temperature

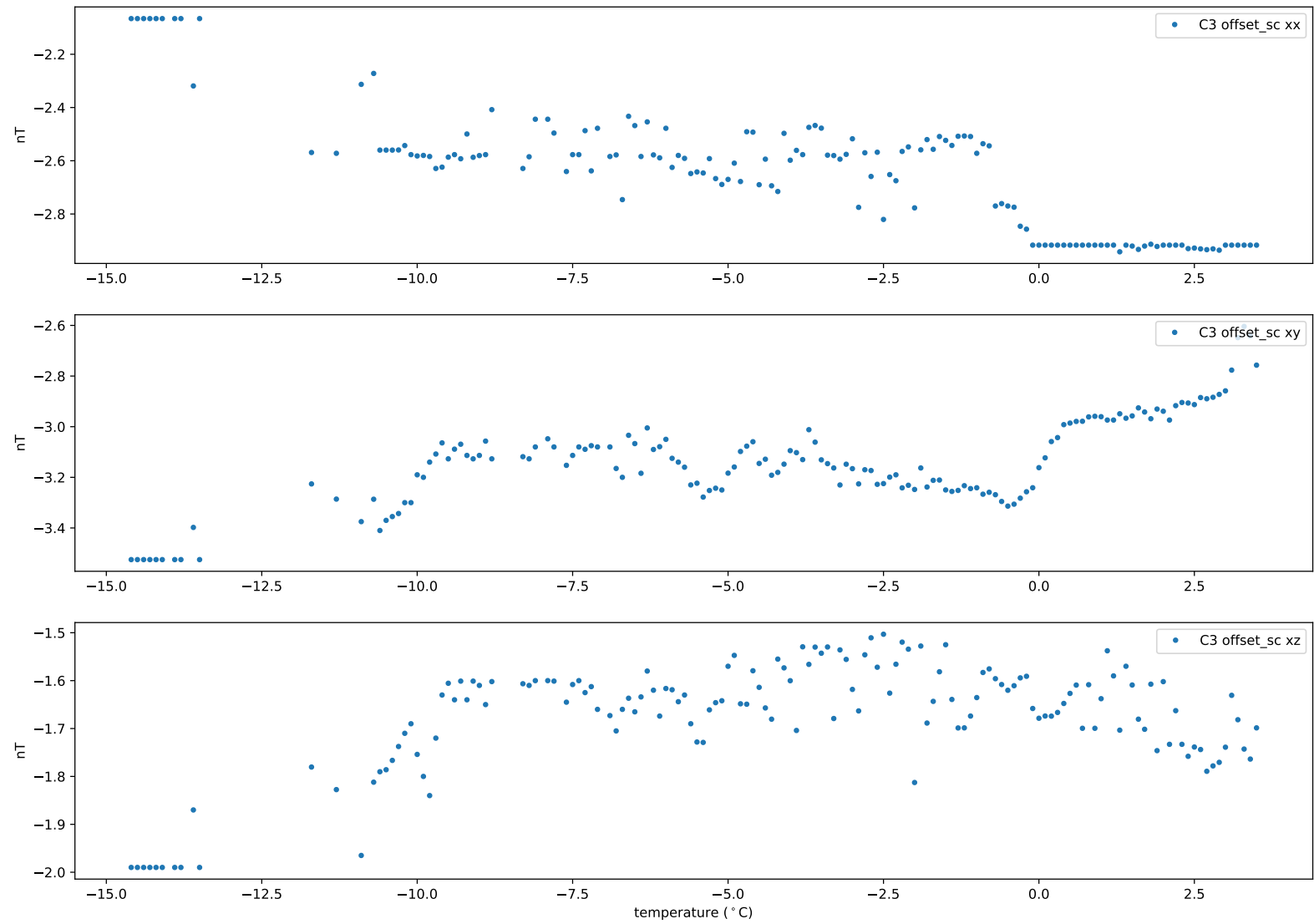


Figure S112: Cluster 3 offset_sc versus the outboard sensor temperature

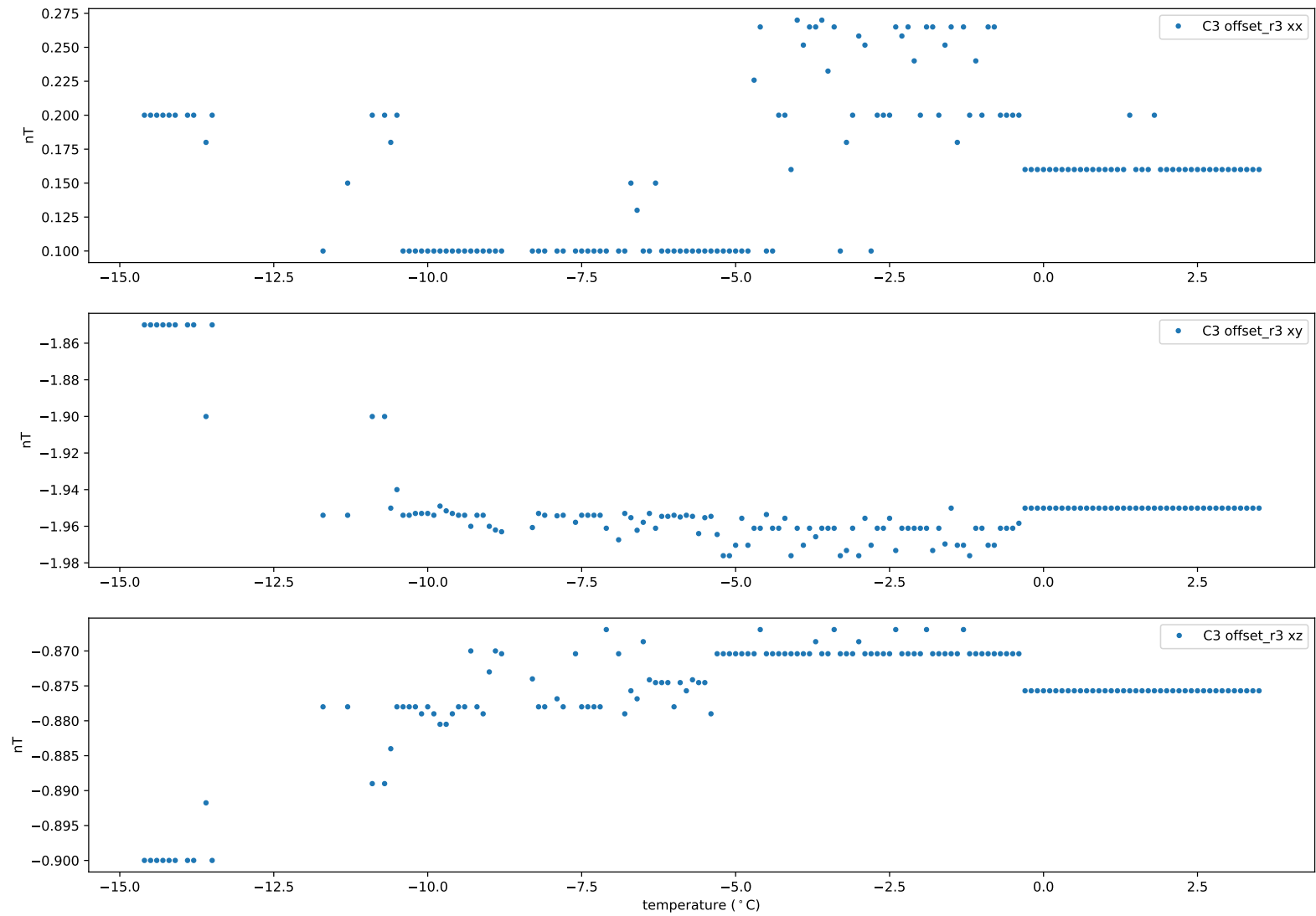


Figure S113: Cluster 3 offset_r3 versus the outboard sensor temperature

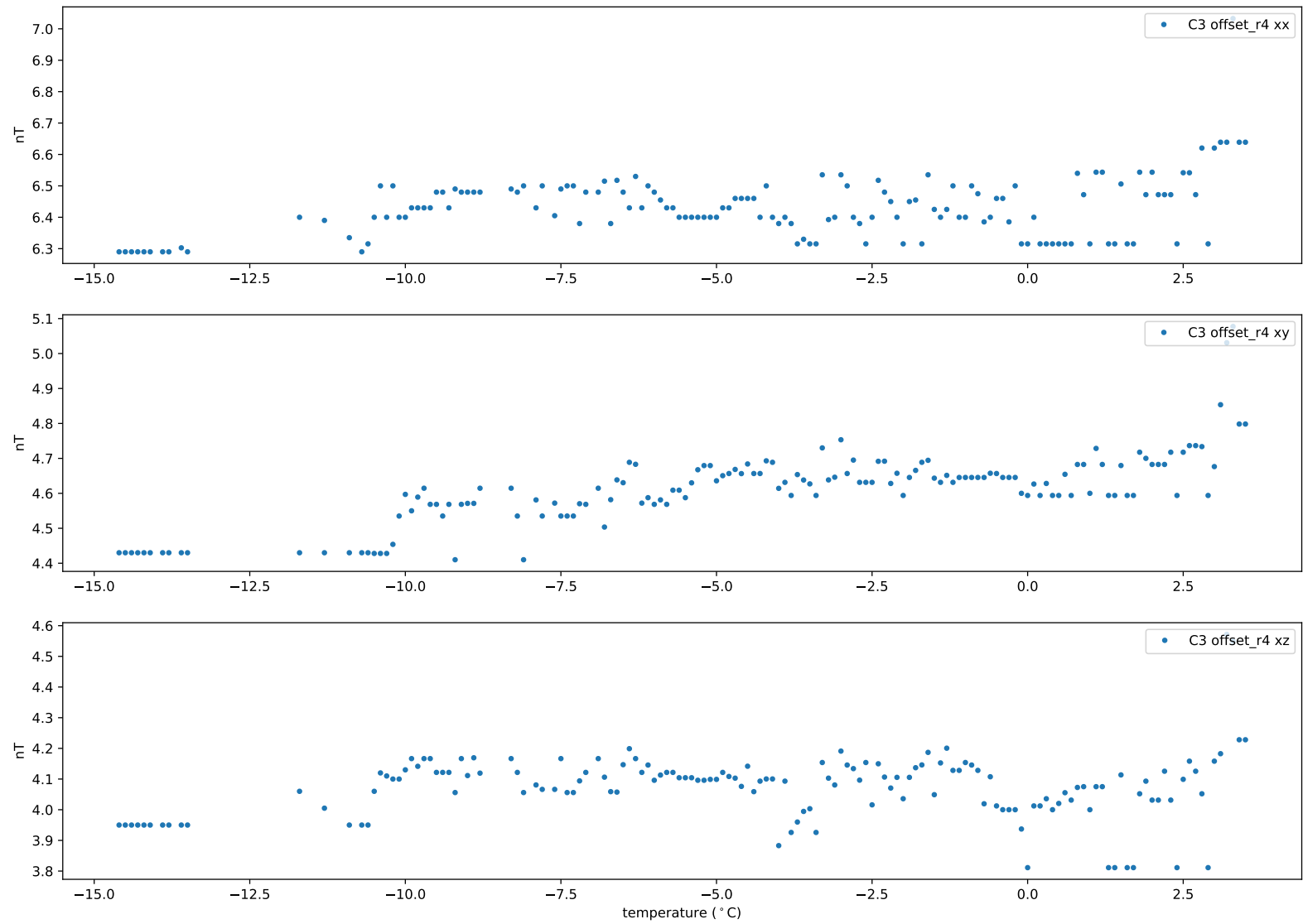


Figure S114: Cluster 3 offset_r4 versus the outboard sensor temperature

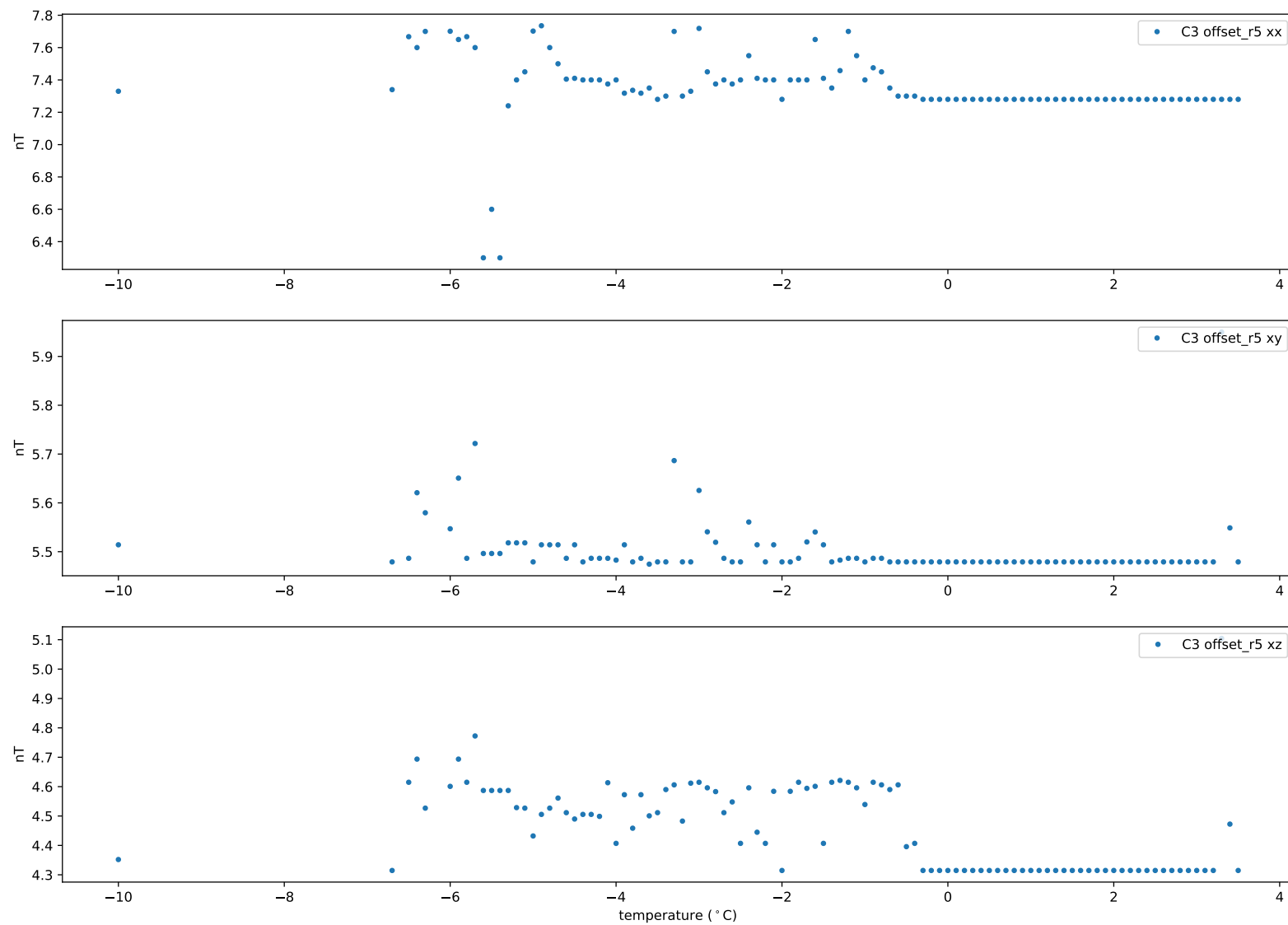


Figure S115: Cluster 3 offset_r5 versus the outboard sensor temperature

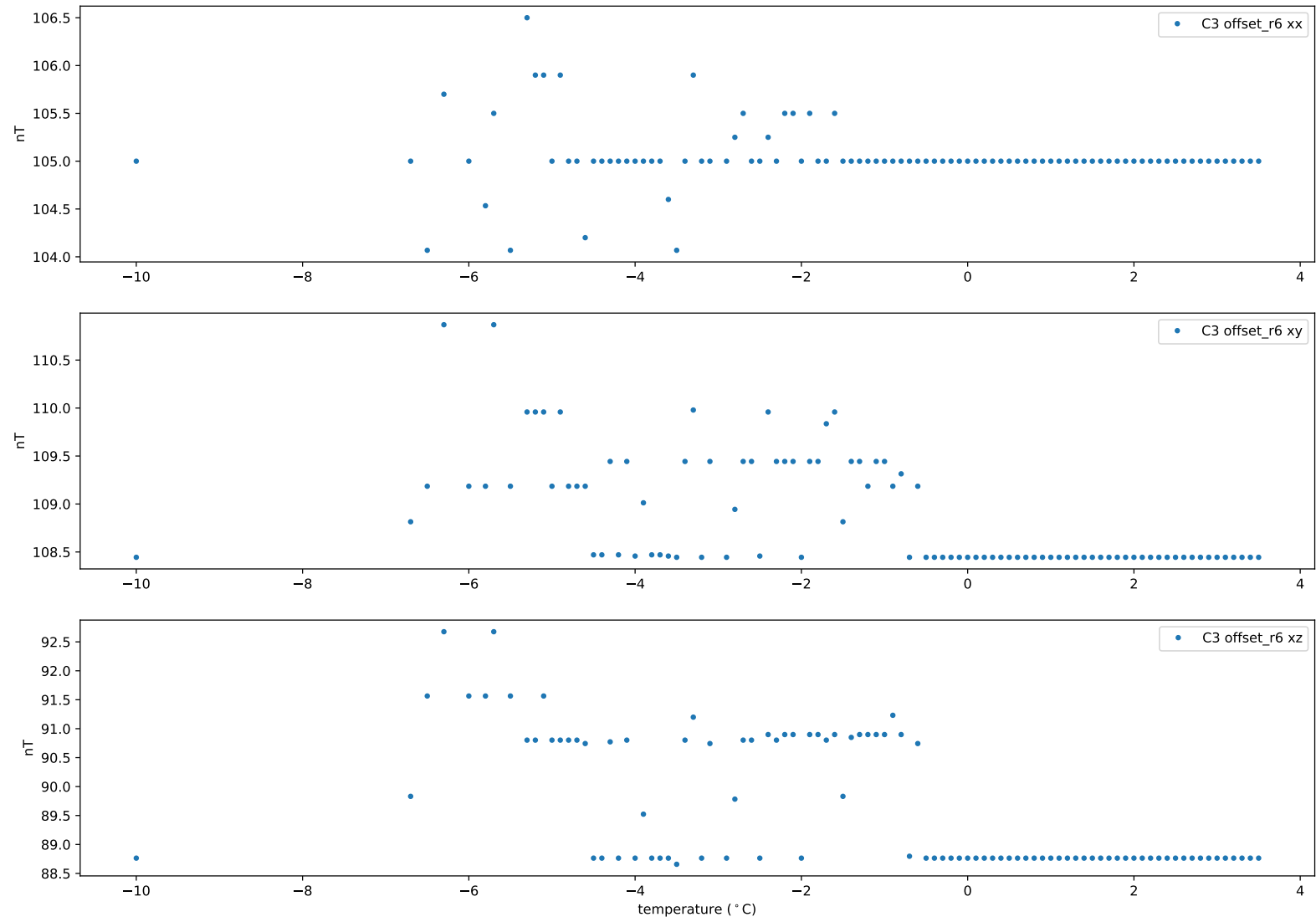


Figure S116: Cluster 3 offset_r6 versus the outboard sensor temperature

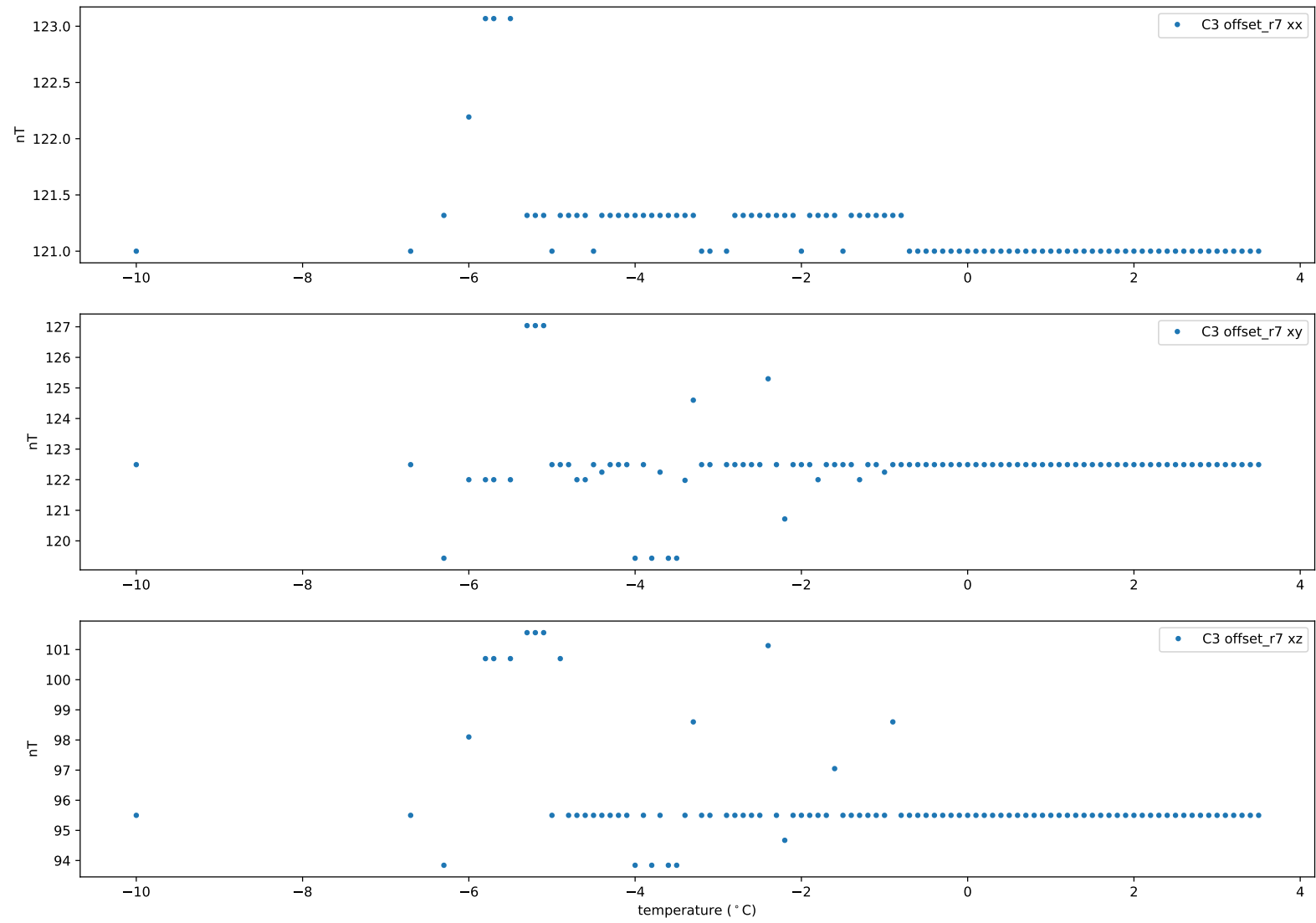


Figure S117: Cluster 3 offset_r7 versus the outboard sensor temperature

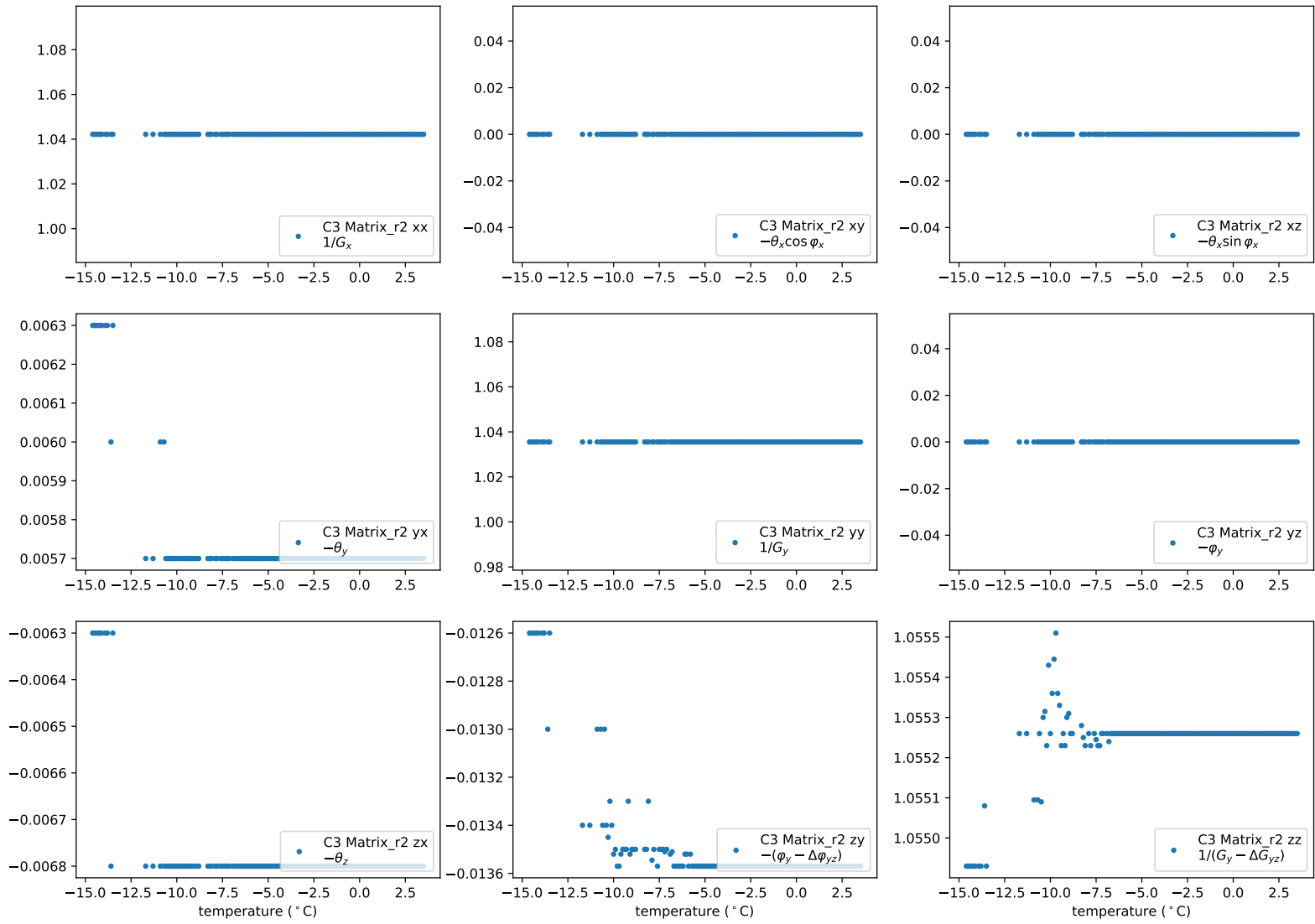


Figure S118: Cluster 3 Matrix_r2 versus the outboard sensor temperature

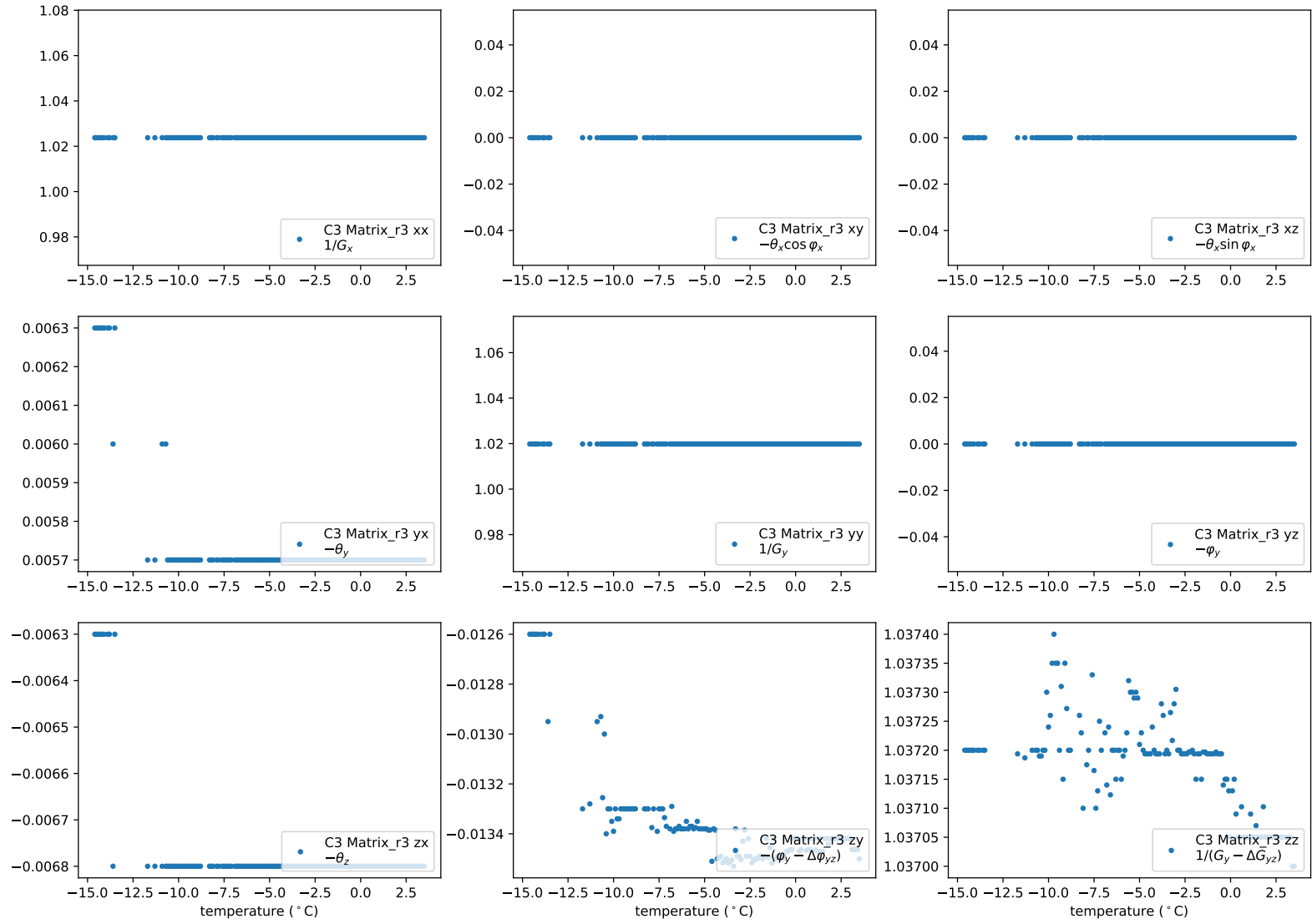


Figure S119: Cluster 3 Matrix_r3 versus the outboard sensor temperature

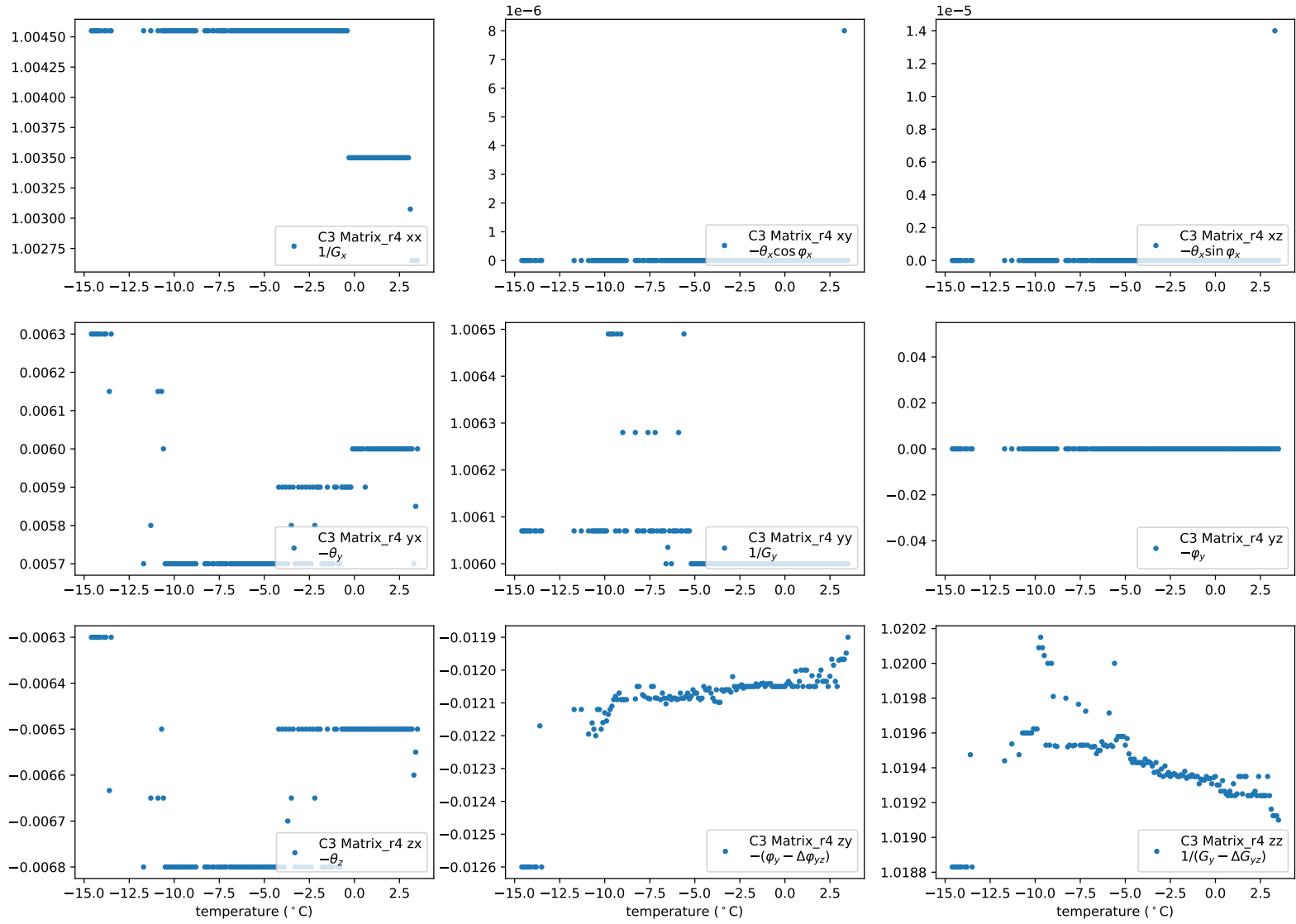


Figure S120: Cluster 3 Matrix_r4 versus the outboard sensor temperature

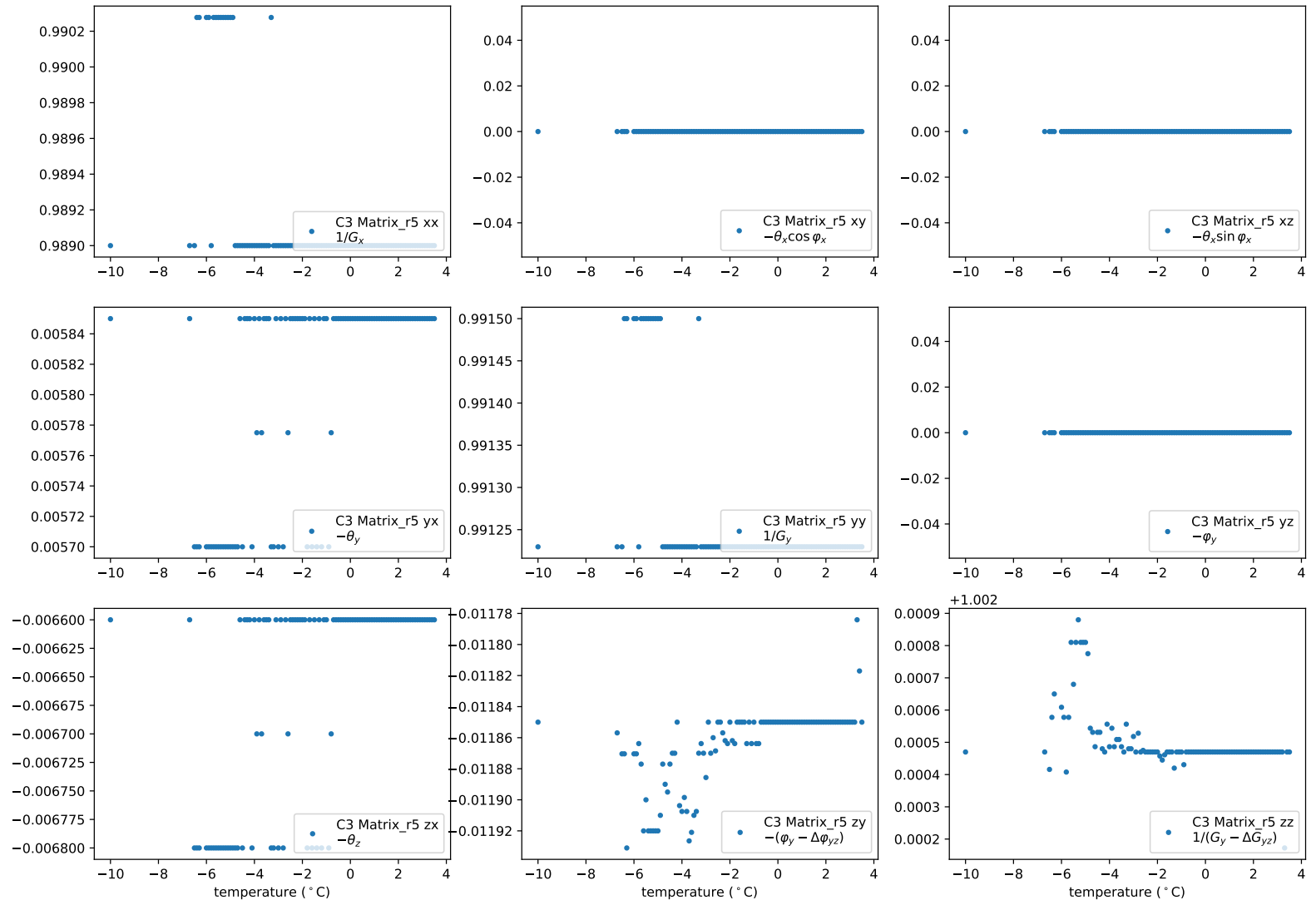


Figure S121: Cluster 3 Matrix_r5 versus the outboard sensor temperature

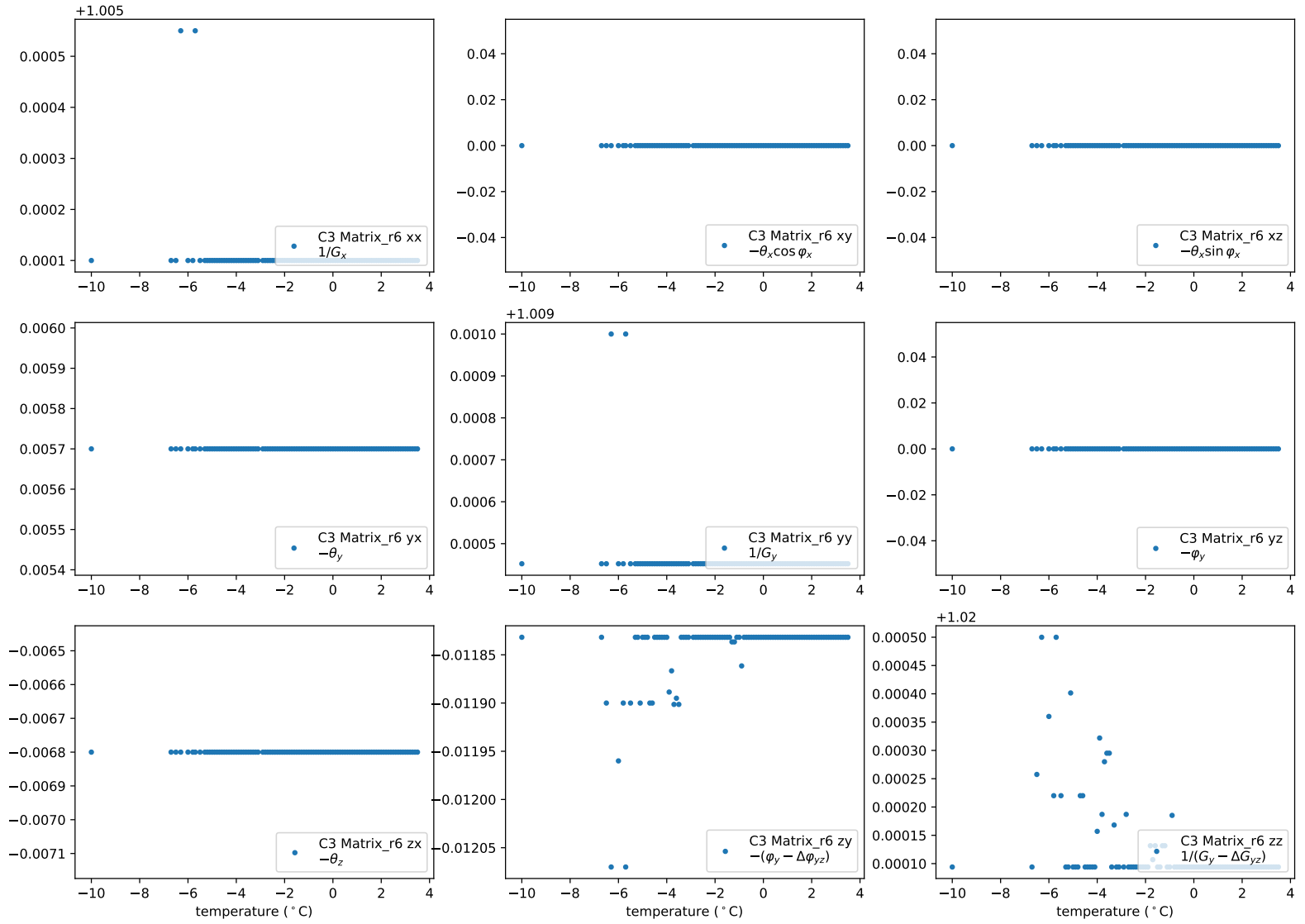


Figure S122: Cluster 3 Matrix_r6 versus the outboard sensor temperature

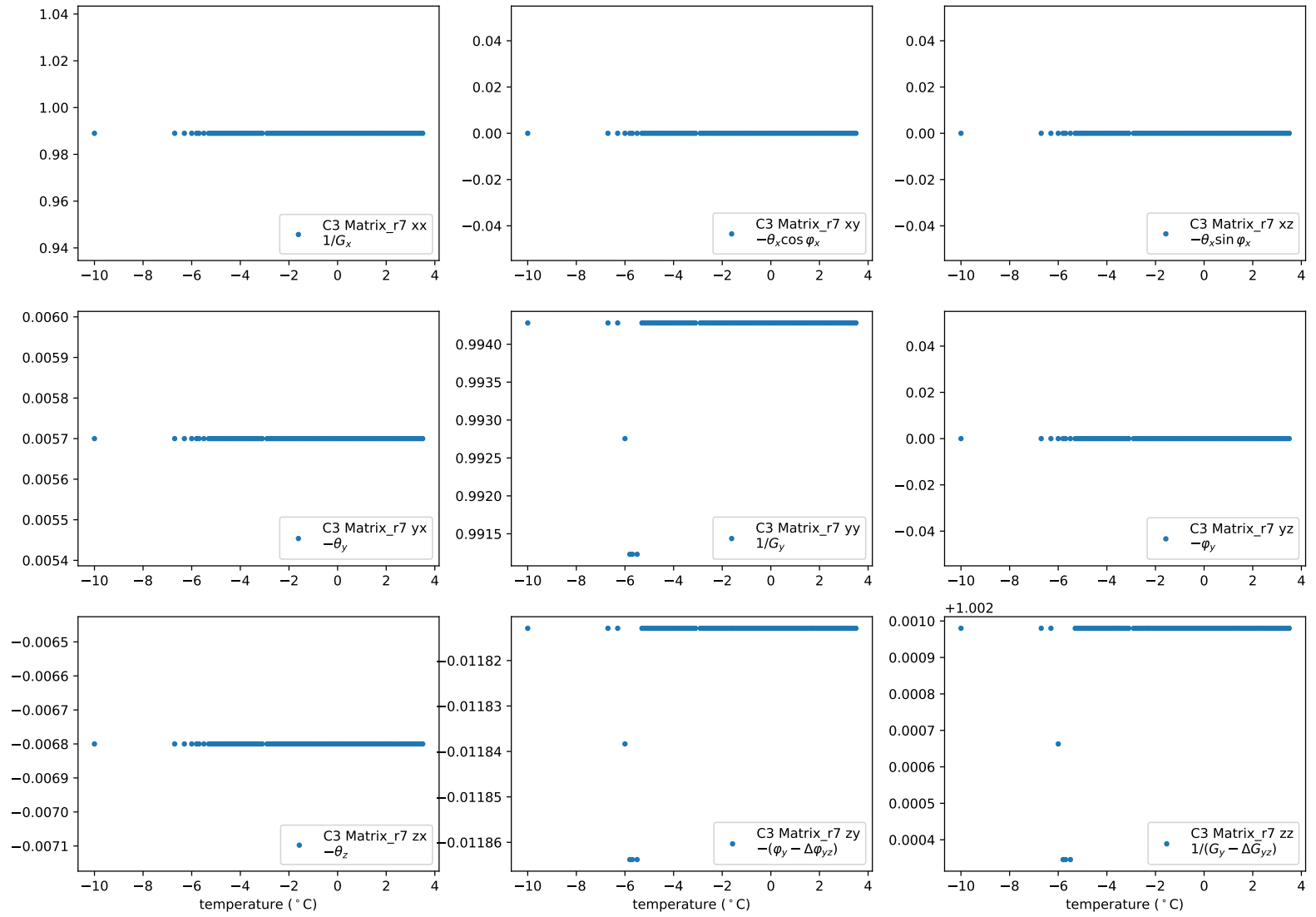


Figure S123: Cluster 3 Matrix_r7 versus the outboard sensor temperature

4 Cluster 4 calibration parameters

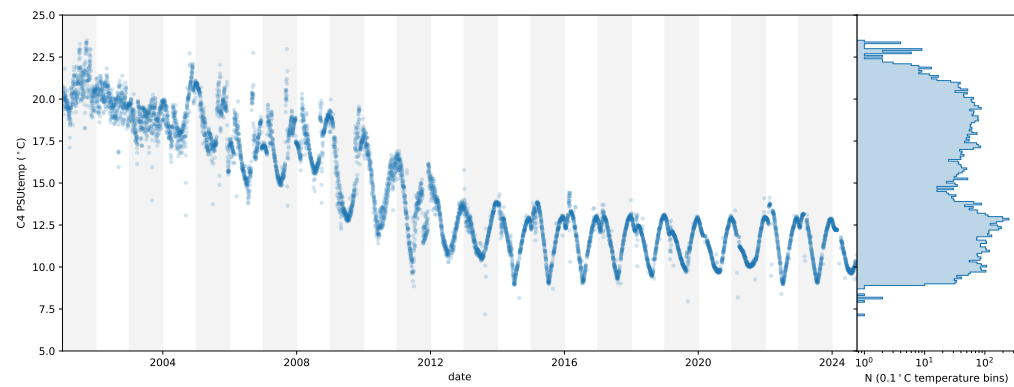


Figure S124: Cluster 4 electronics box temperature

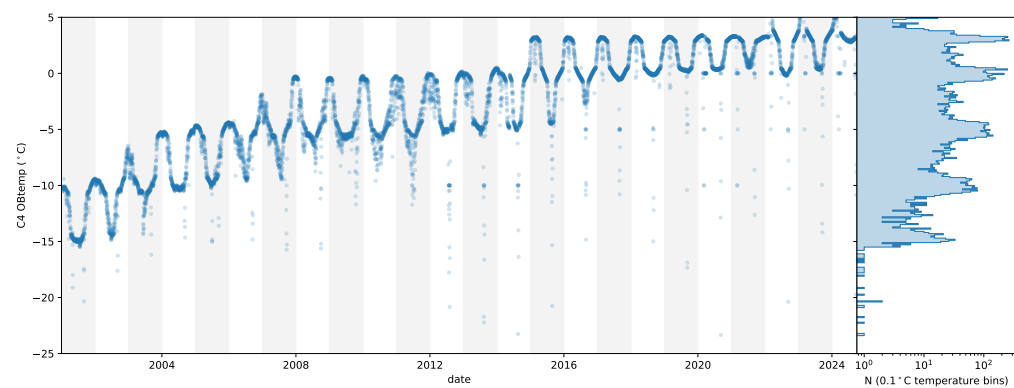


Figure S125: Cluster 4 outboard sensor temperature

4.1 Daily calibration parameters long term variation

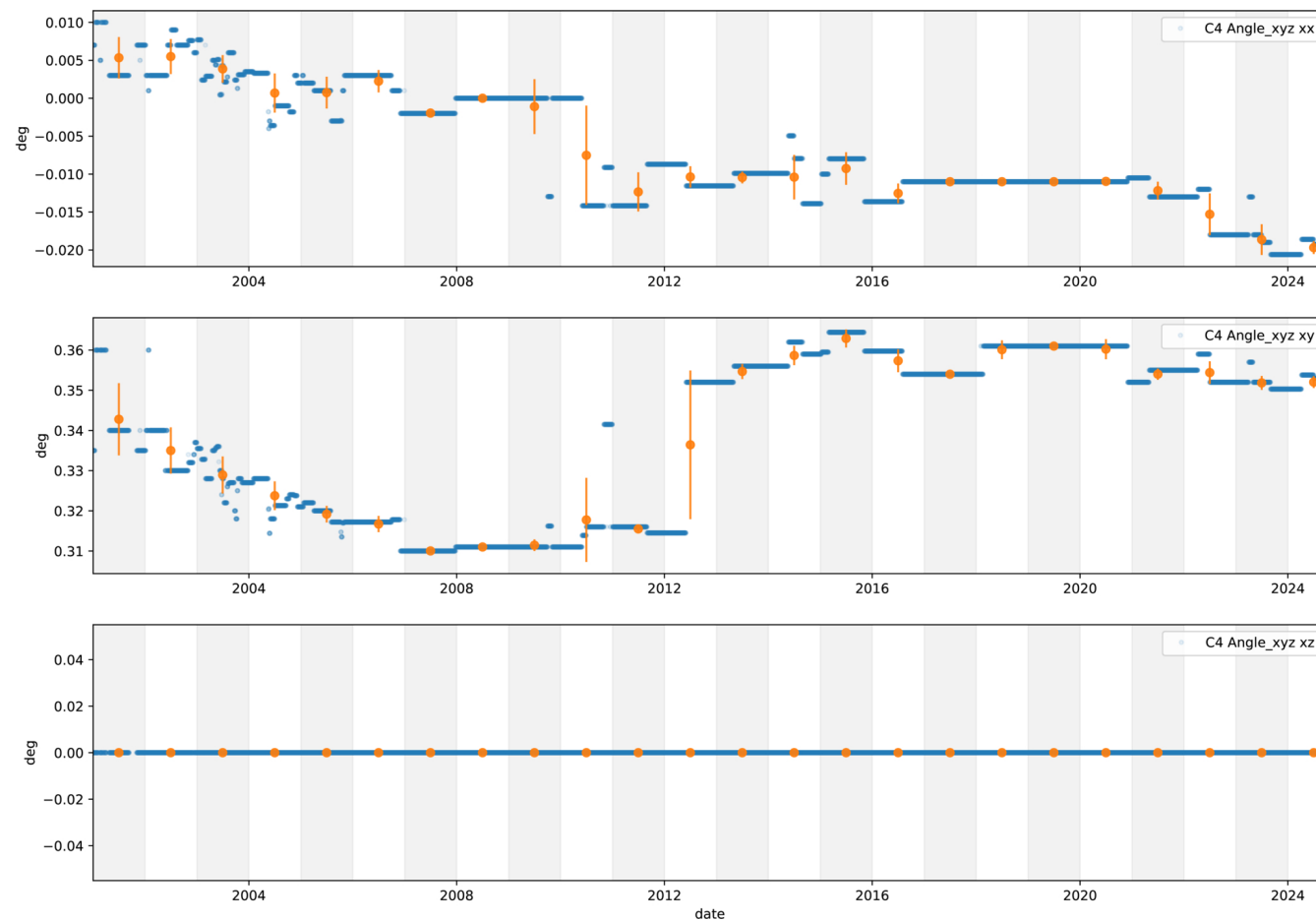


Figure S126: Cluster 4 Angle_xyz long term variation

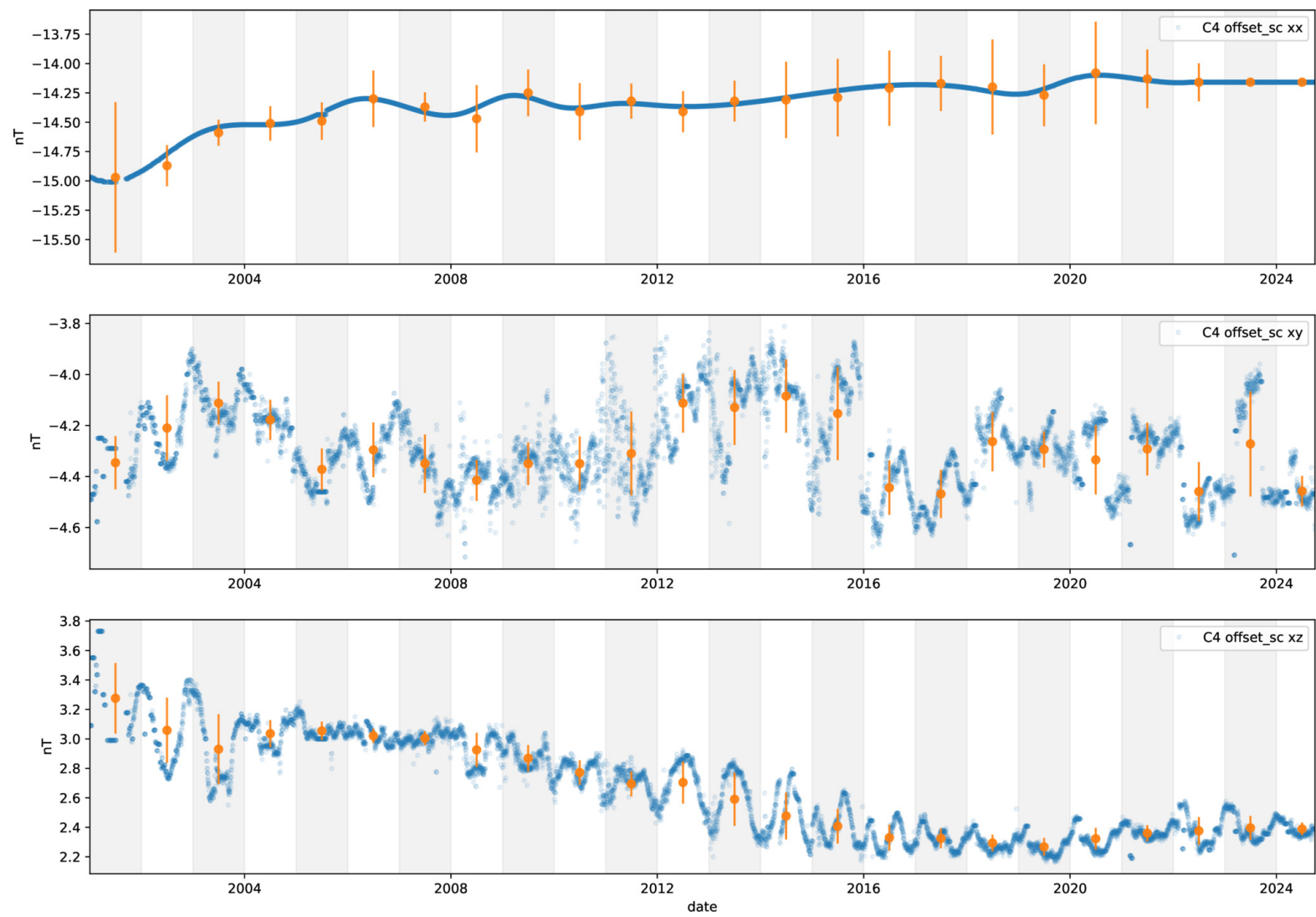


Figure S127: Cluster 4 offset_sc long term variation

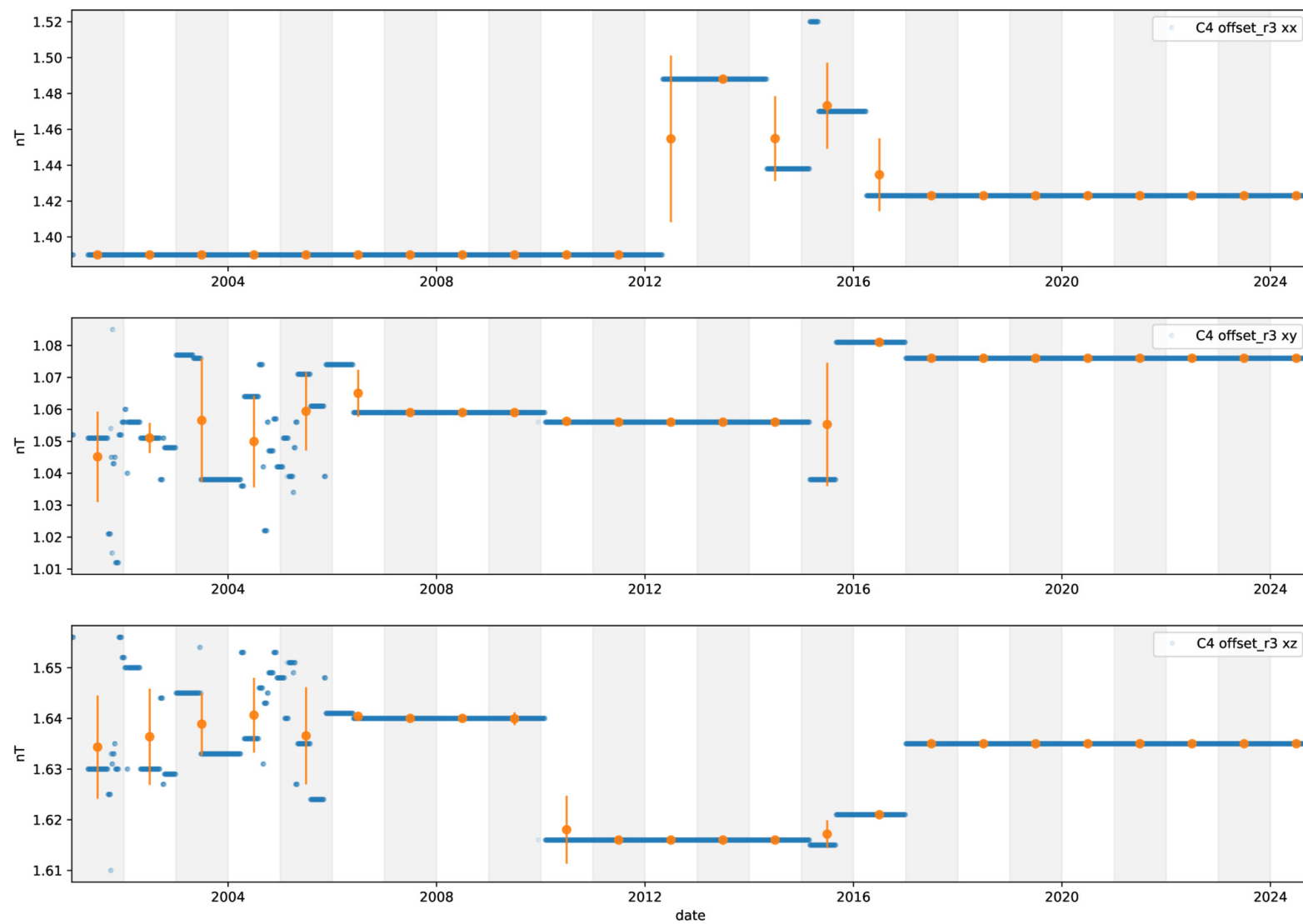


Figure S128: Cluster 4 offset_r3 long term variation

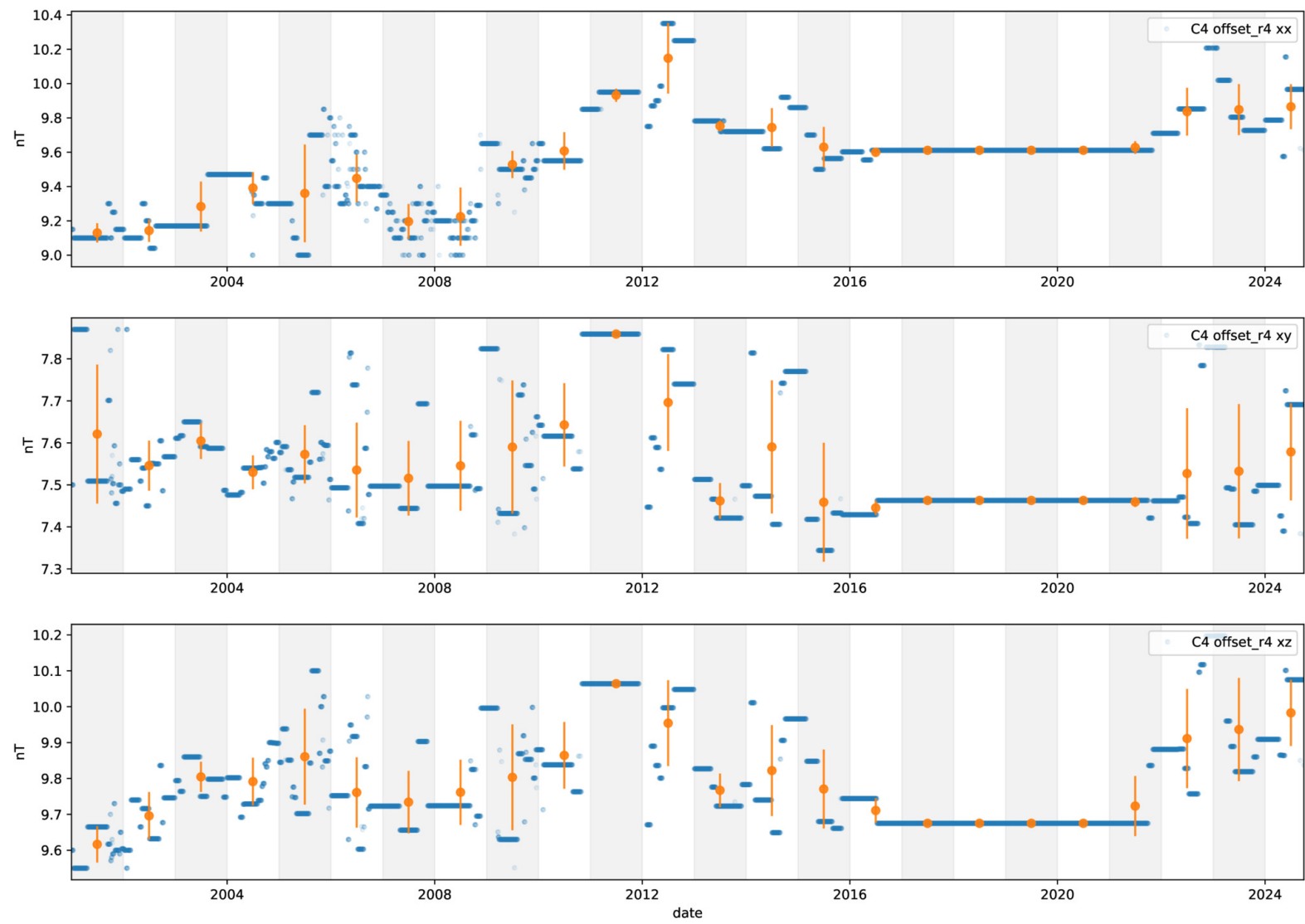


Figure S129: Cluster 4 offset_r4 long term variation

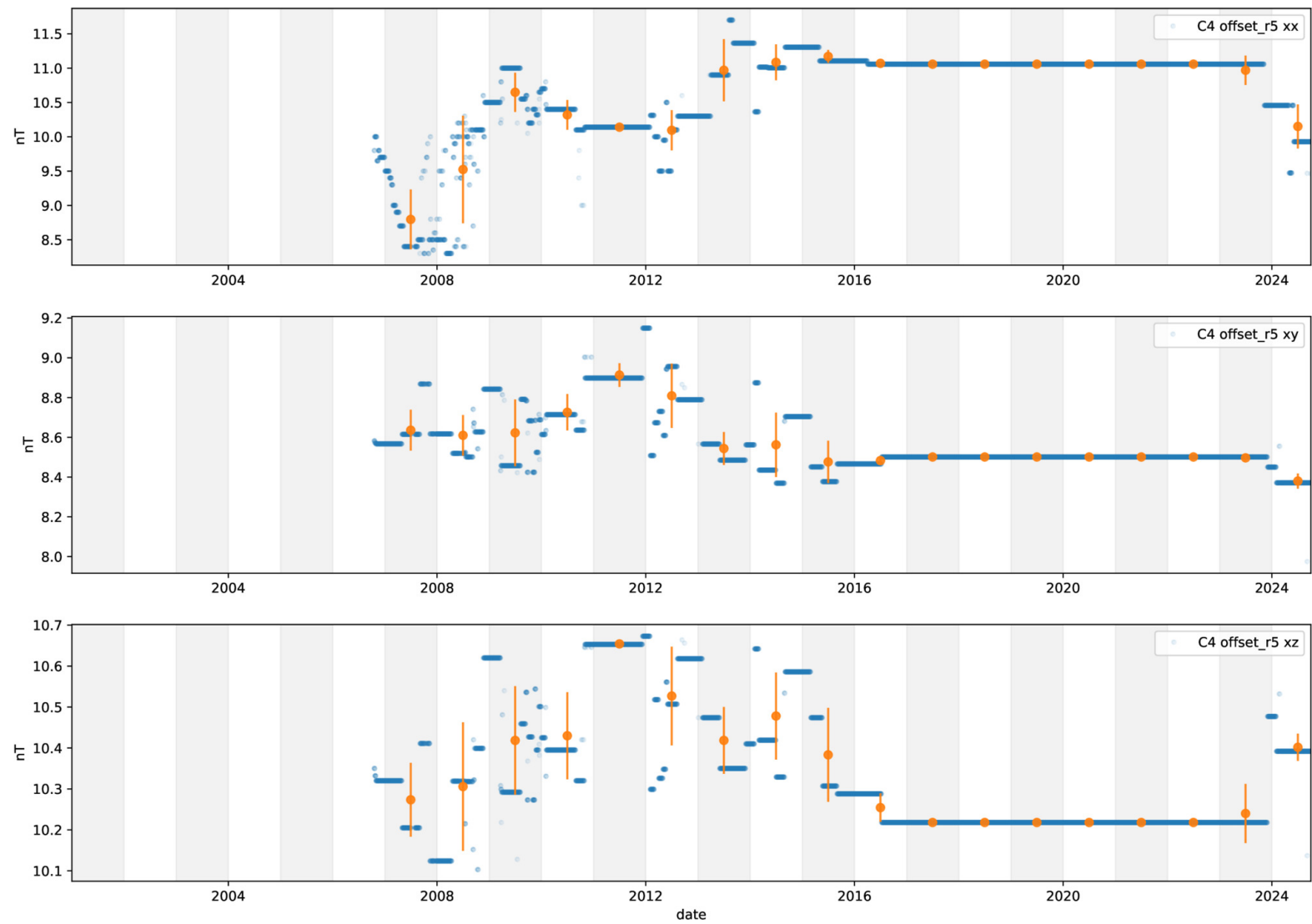


Figure S130: Cluster 4 offset_r5 long term variation

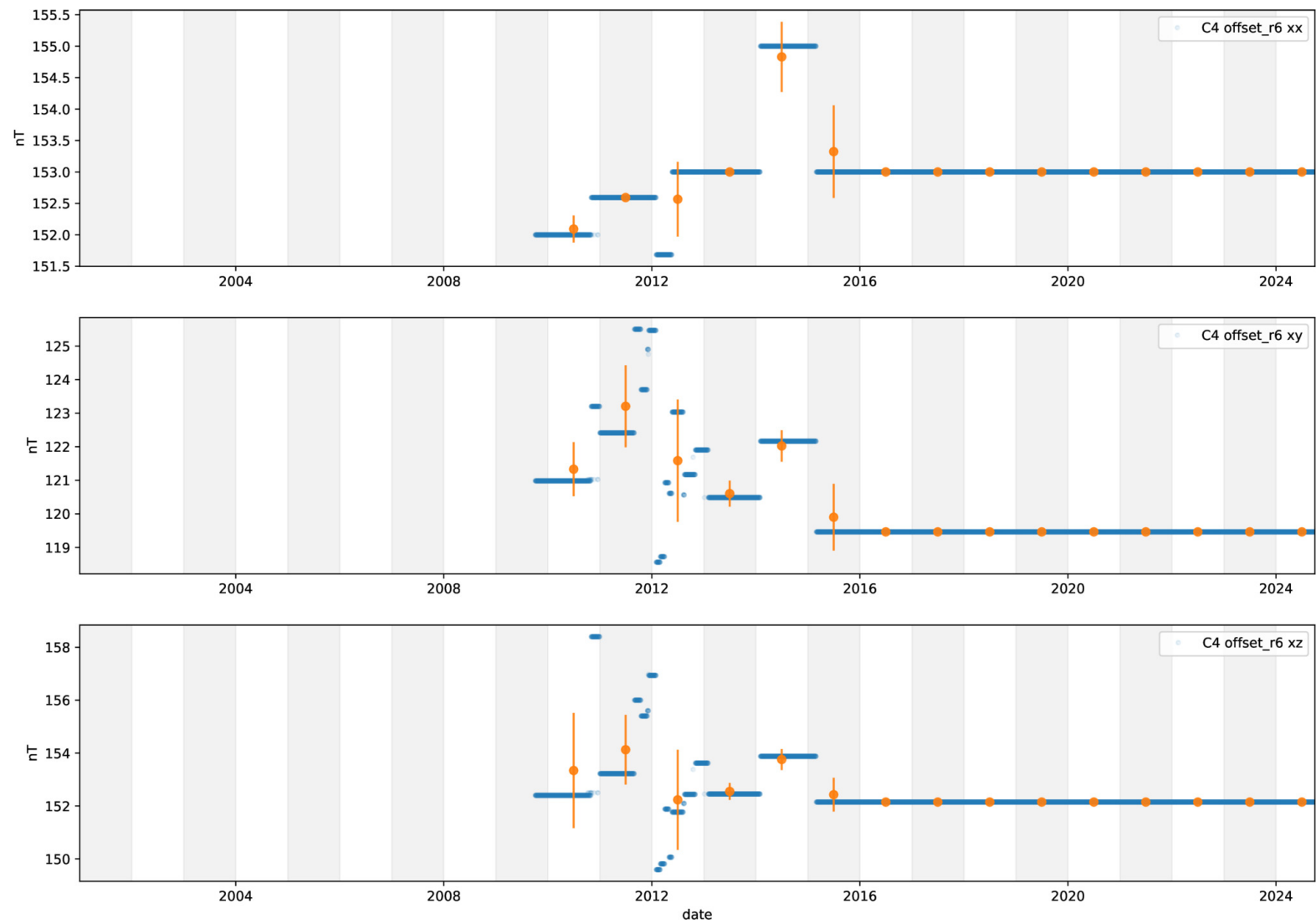


Figure S131: Cluster 4 offset_r6 long term variation

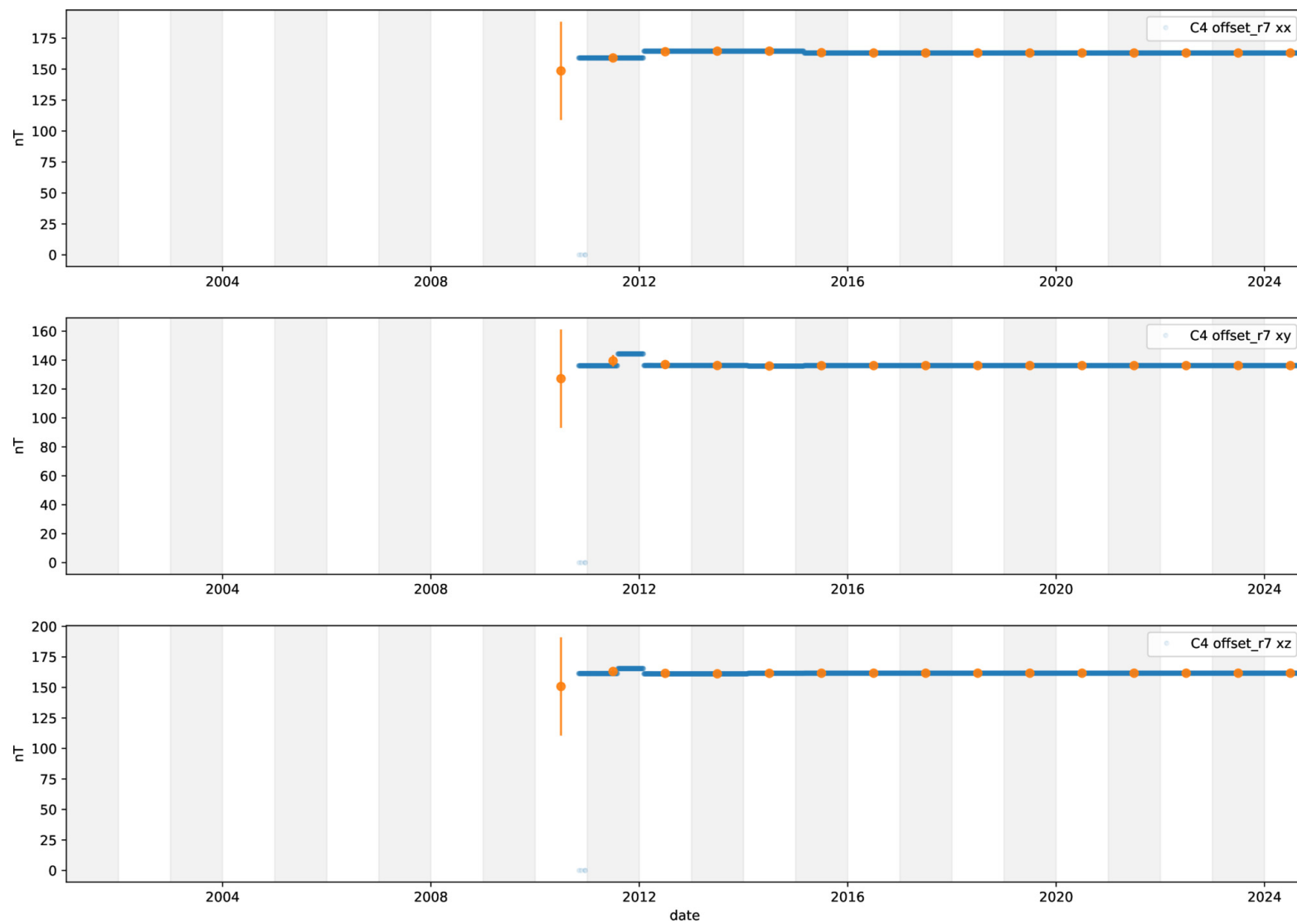


Figure S132: Cluster 4 offset_r7 long term variation

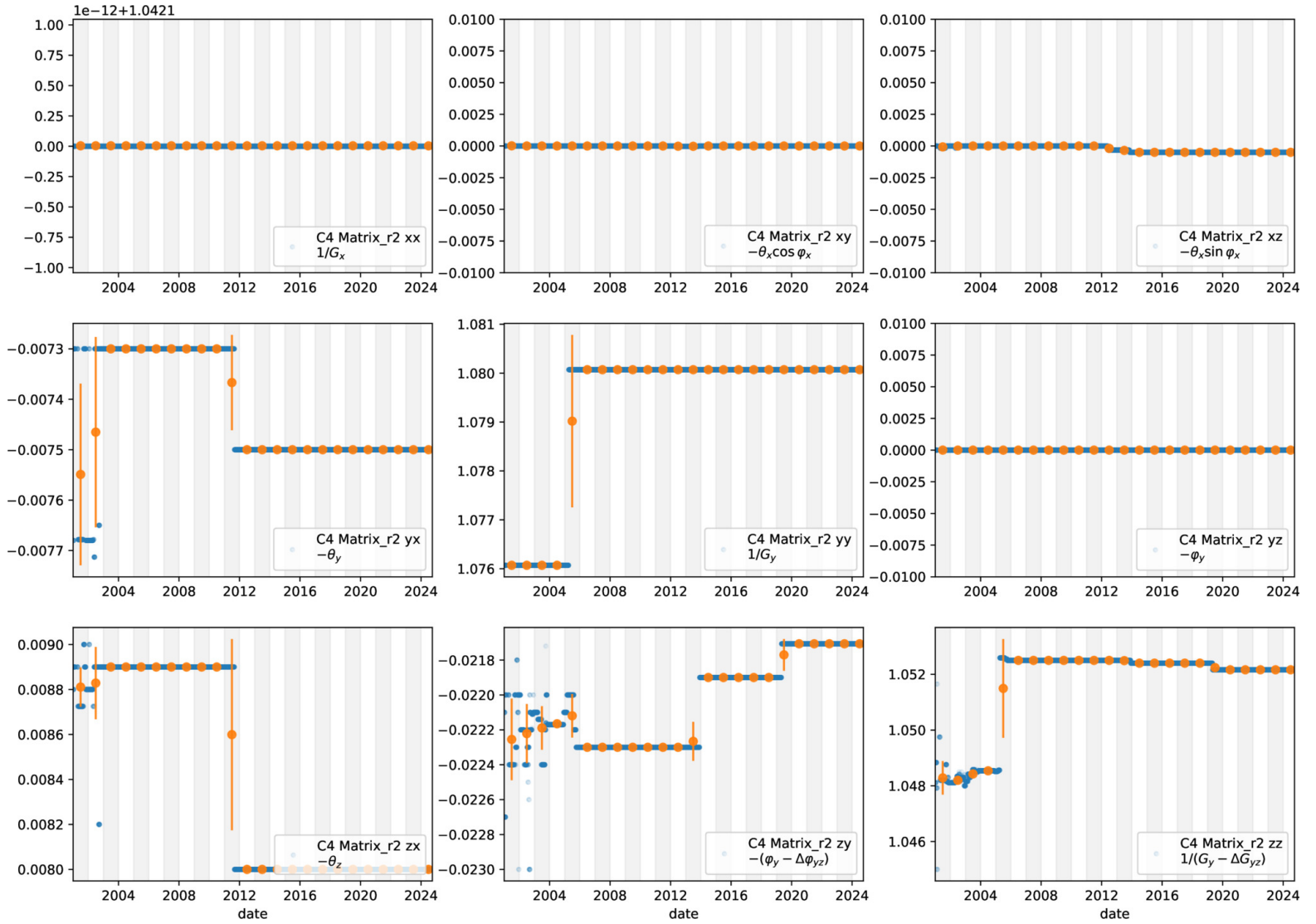


Figure S133: Cluster 4 Matrix_r2 long term variation

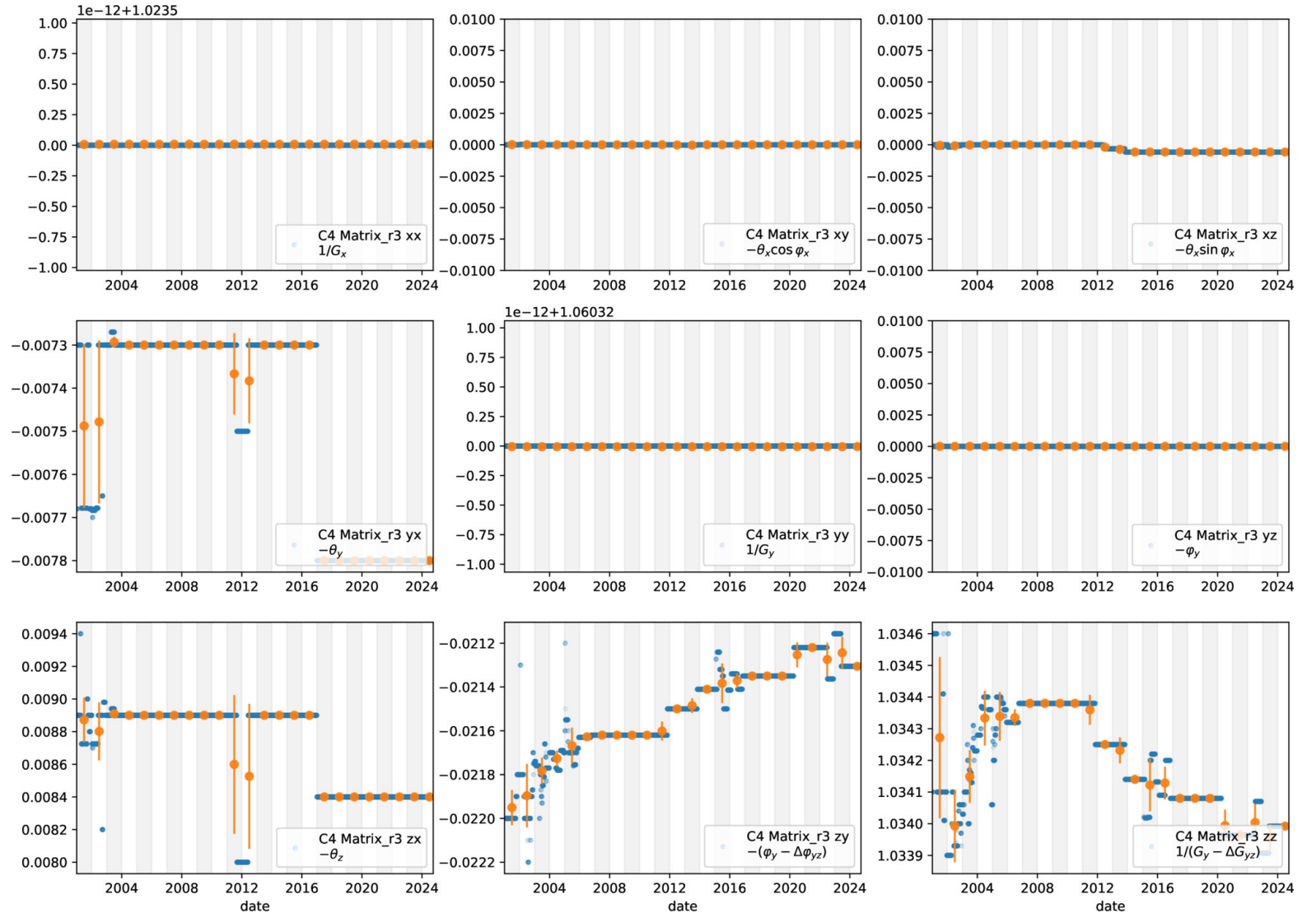


Figure S134: Cluster 4 Matrix_r3 long term variation

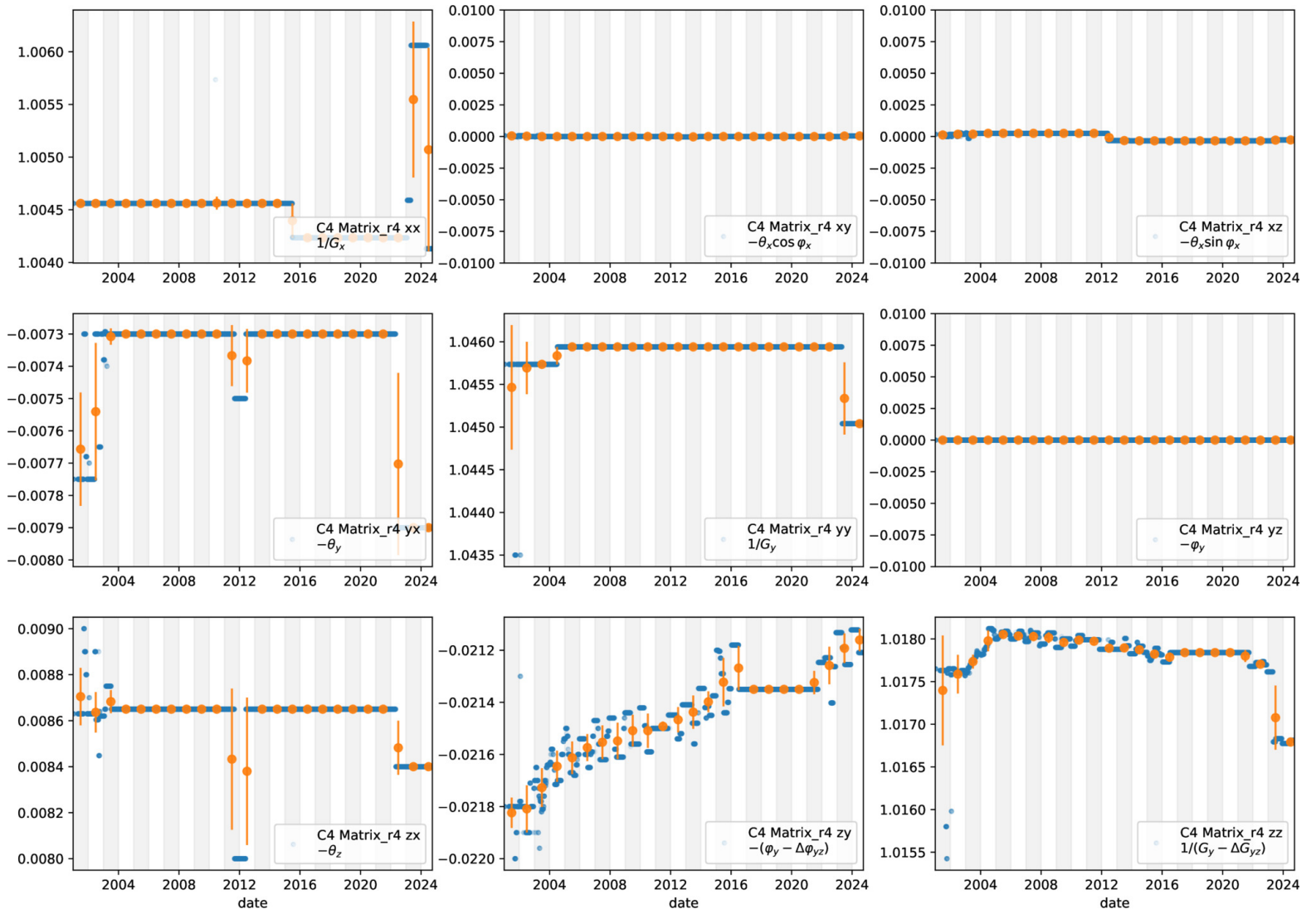


Figure S135: Cluster 4 Matrix_r4 long term variation

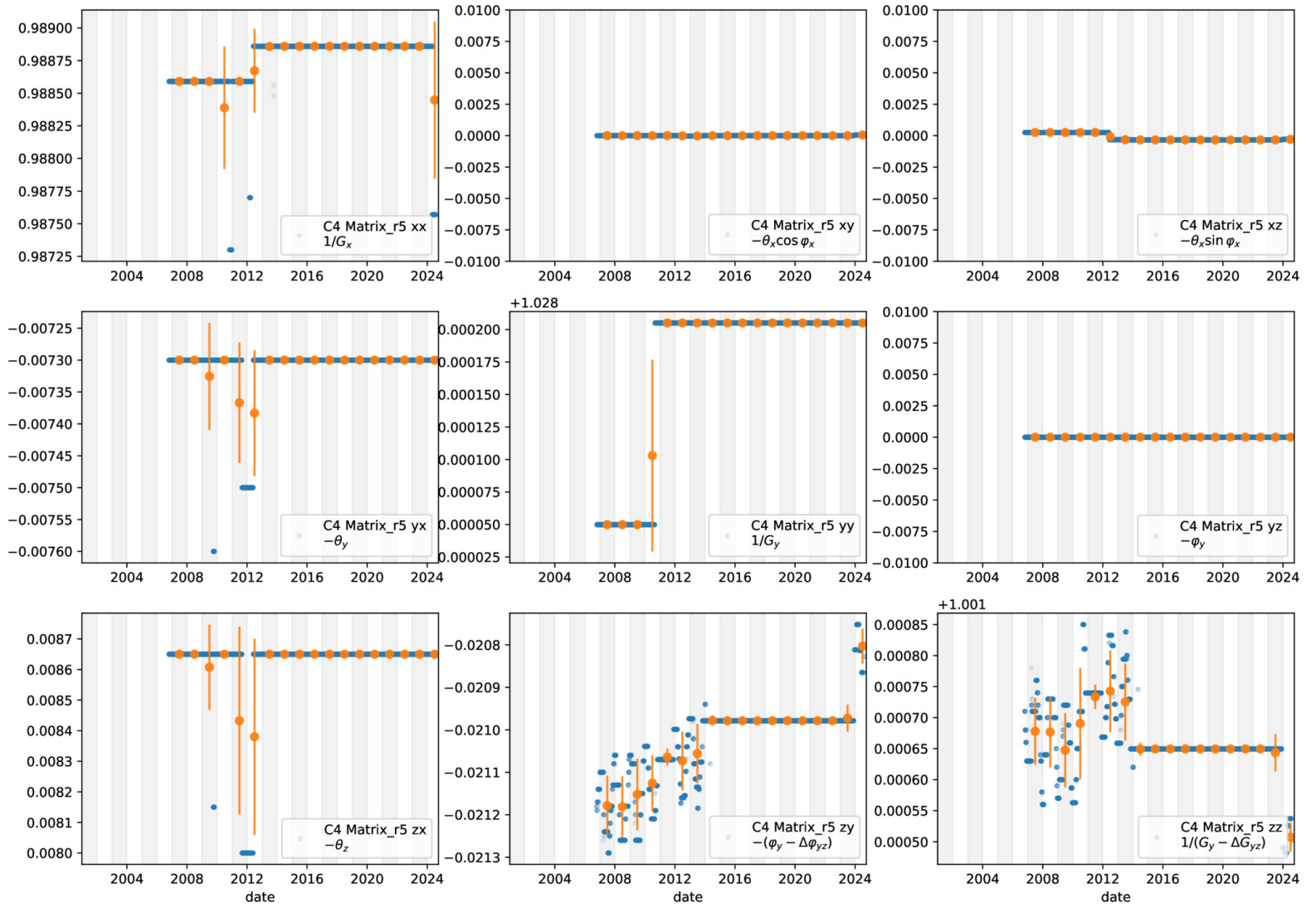


Figure S136: Cluster 4 Matrix_r5 long term variation

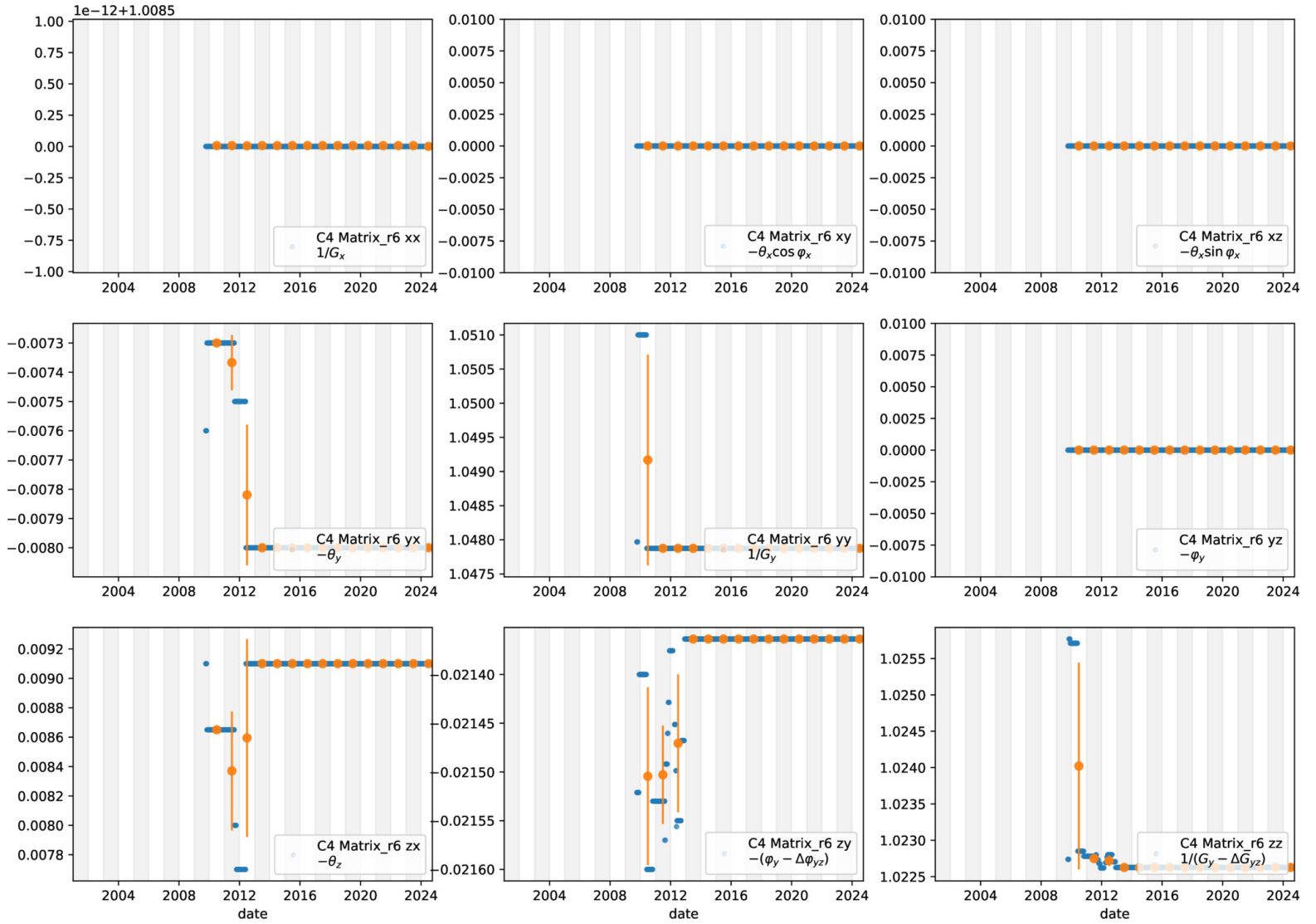


Figure S137: Cluster 4 Matrix_r6 long term variation

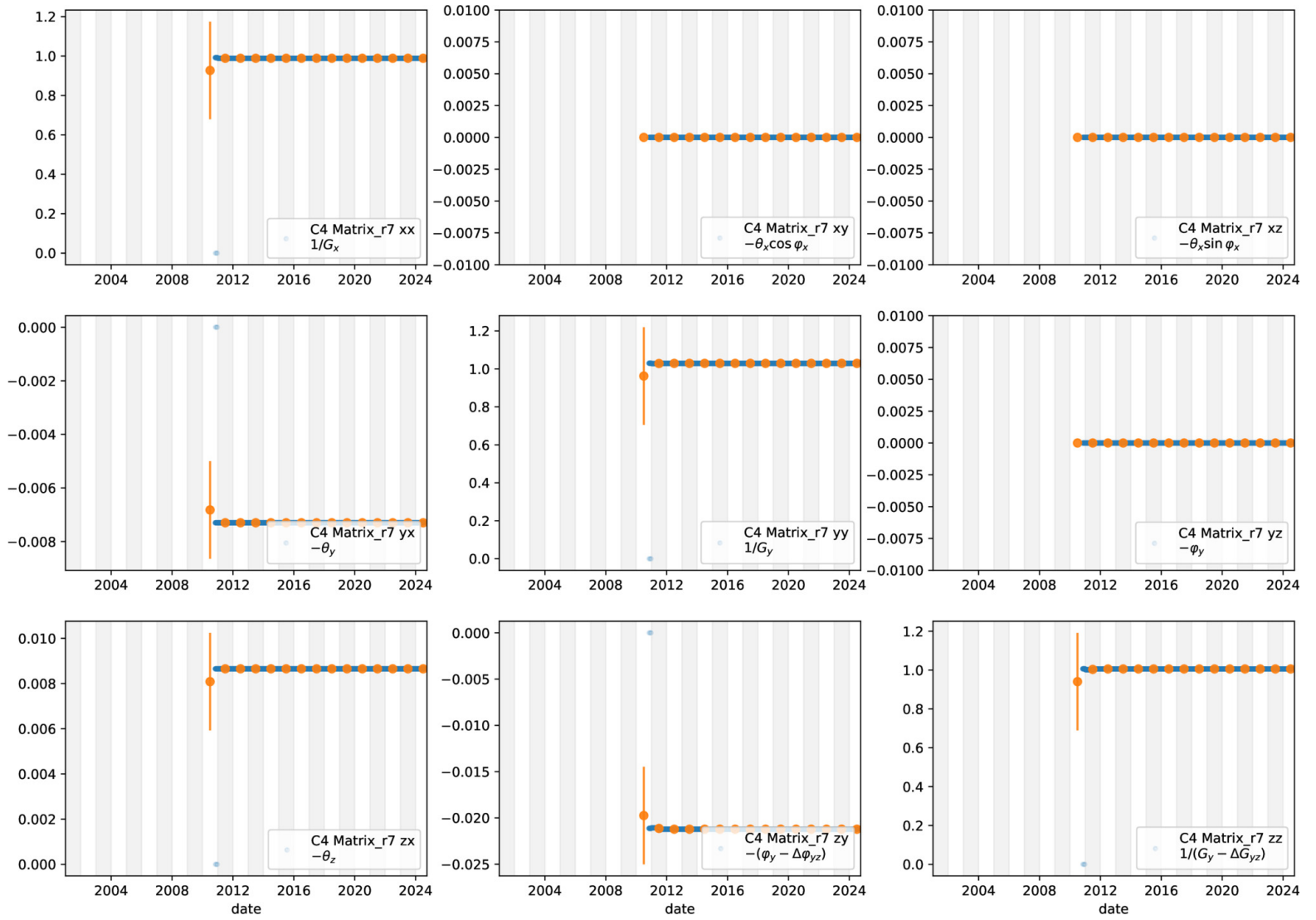


Figure S138: Cluster 4 Matrix_r7 long term variation

4.2 Daily calibration parameters versus the electronics box temperature

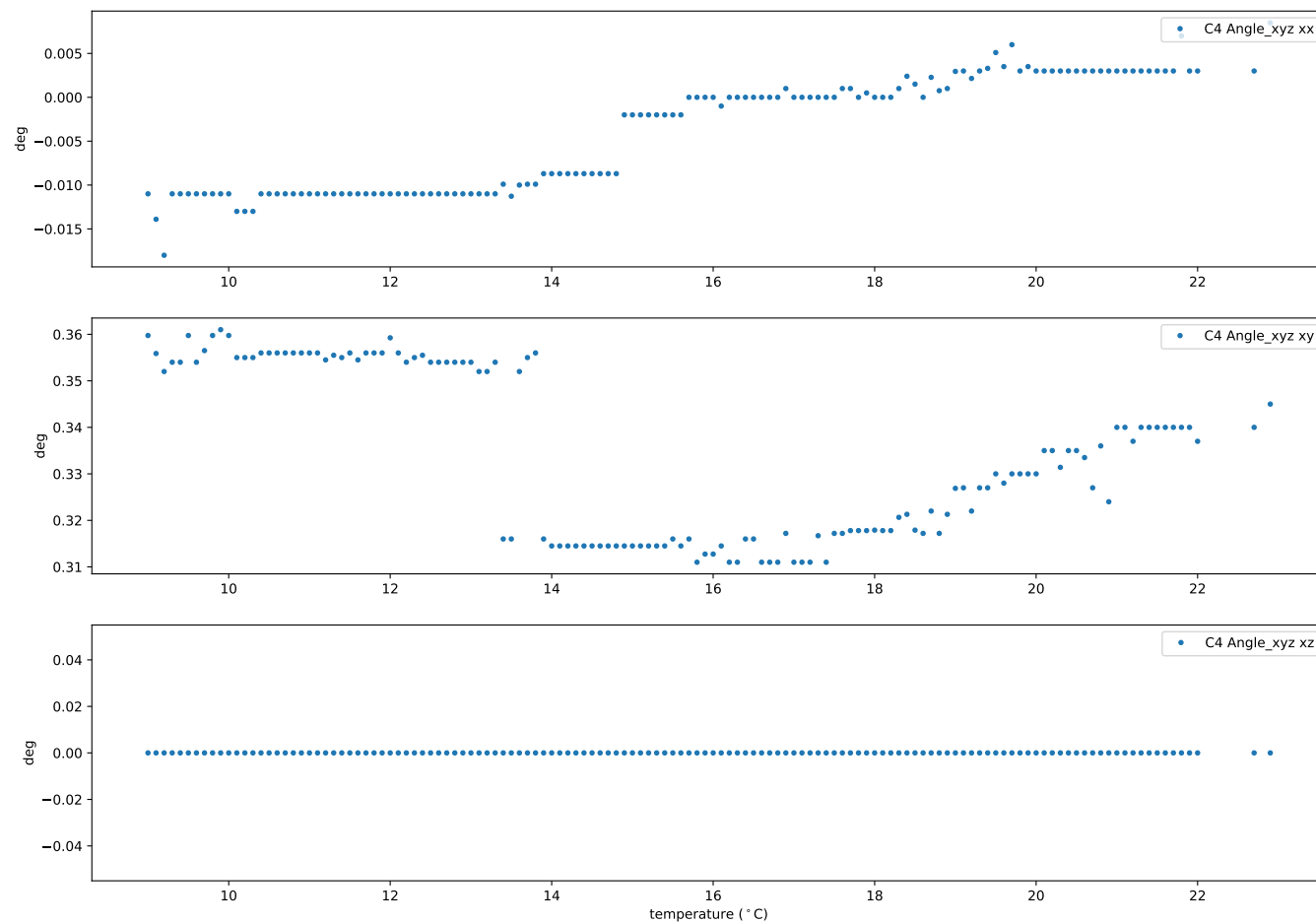


Figure S139: Cluster 4 Angle_xyz versus the electronics box temperature

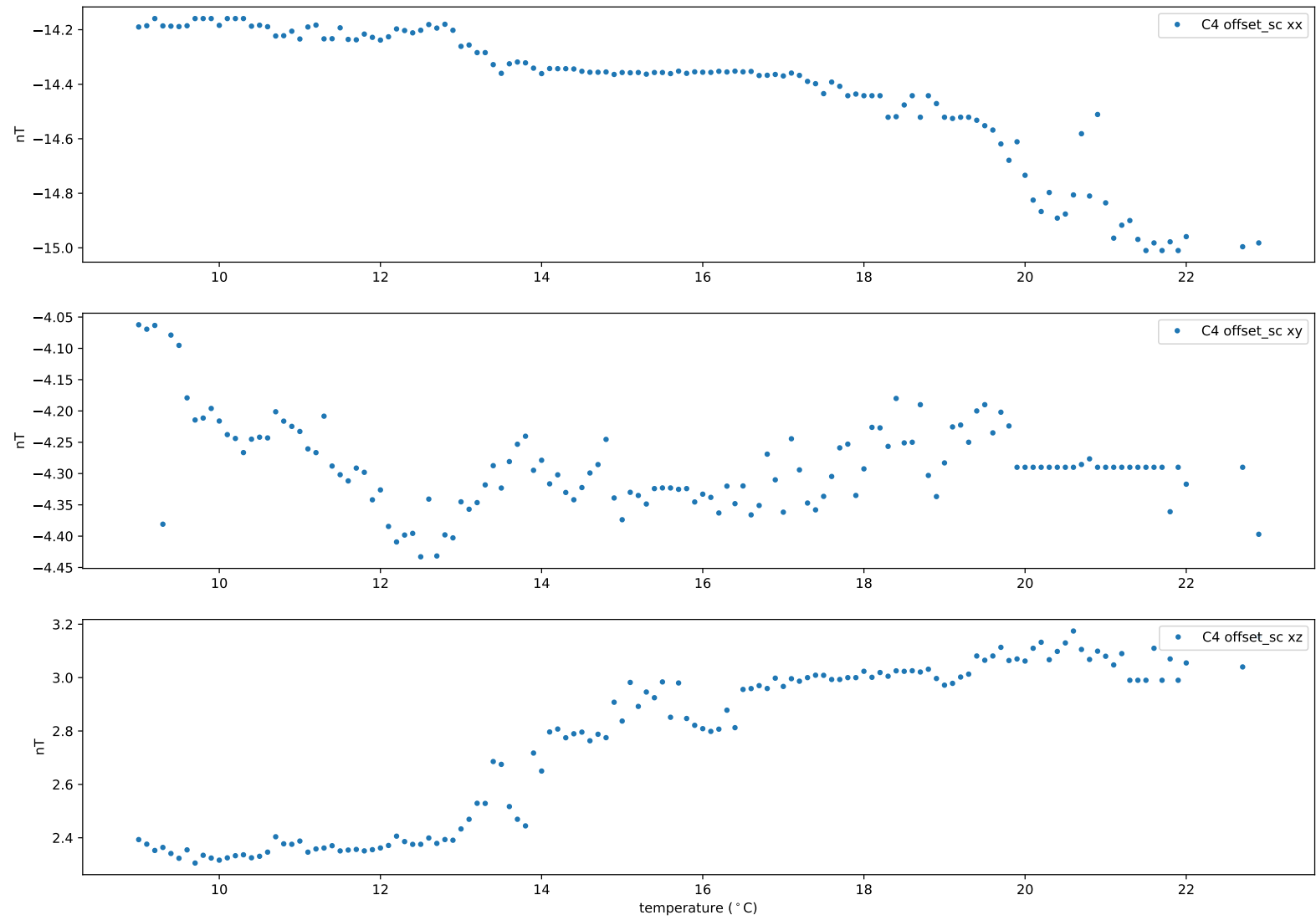


Figure S140: Cluster 4 offset_sc versus the electronics box temperature

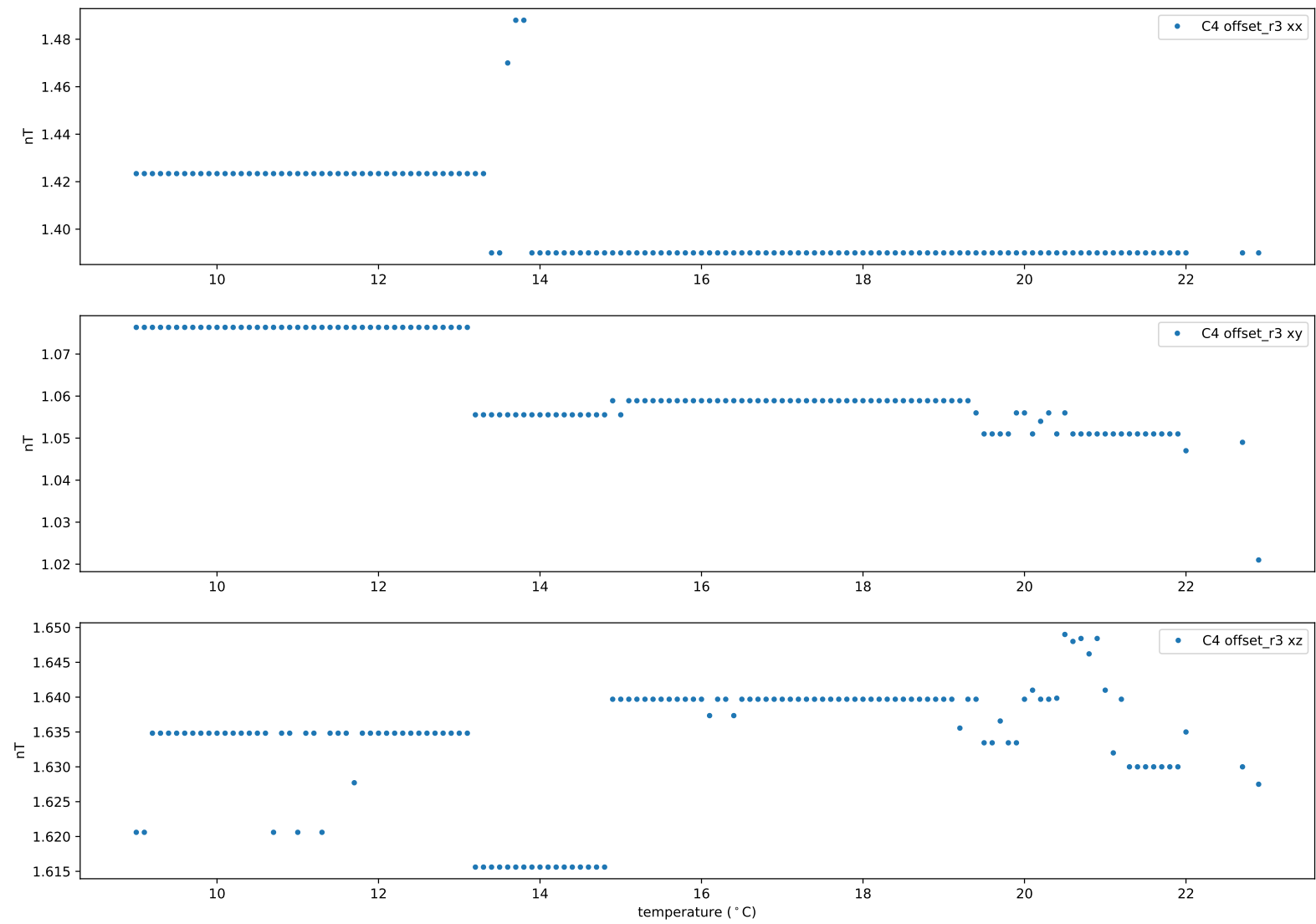


Figure S141: Cluster 4 offset_r3 versus the electronics box temperature

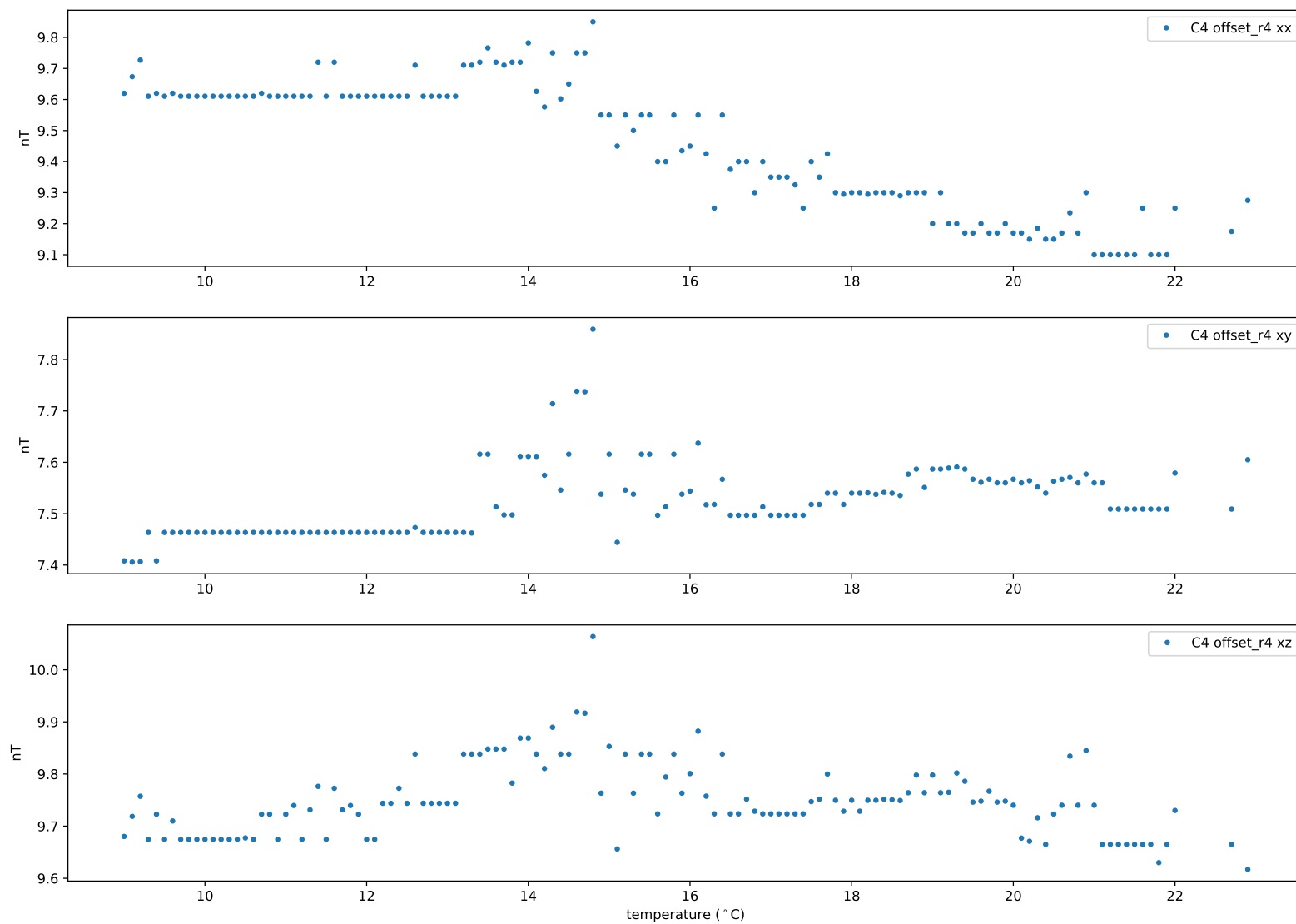


Figure S142: Cluster 4 offset_r4 versus the electronics box temperature

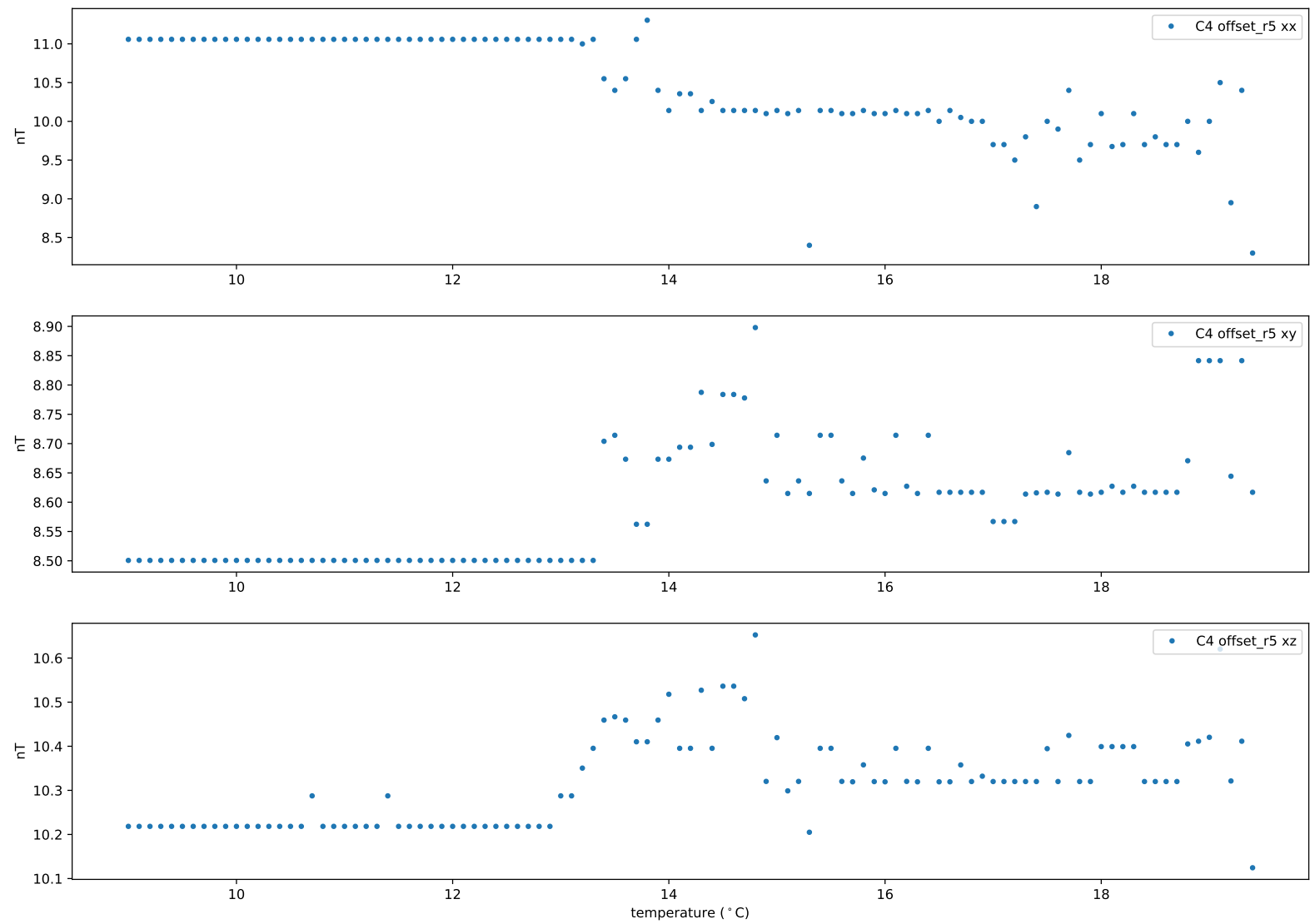


Figure S143: Cluster 4 offset_r5 versus the electronics box temperature

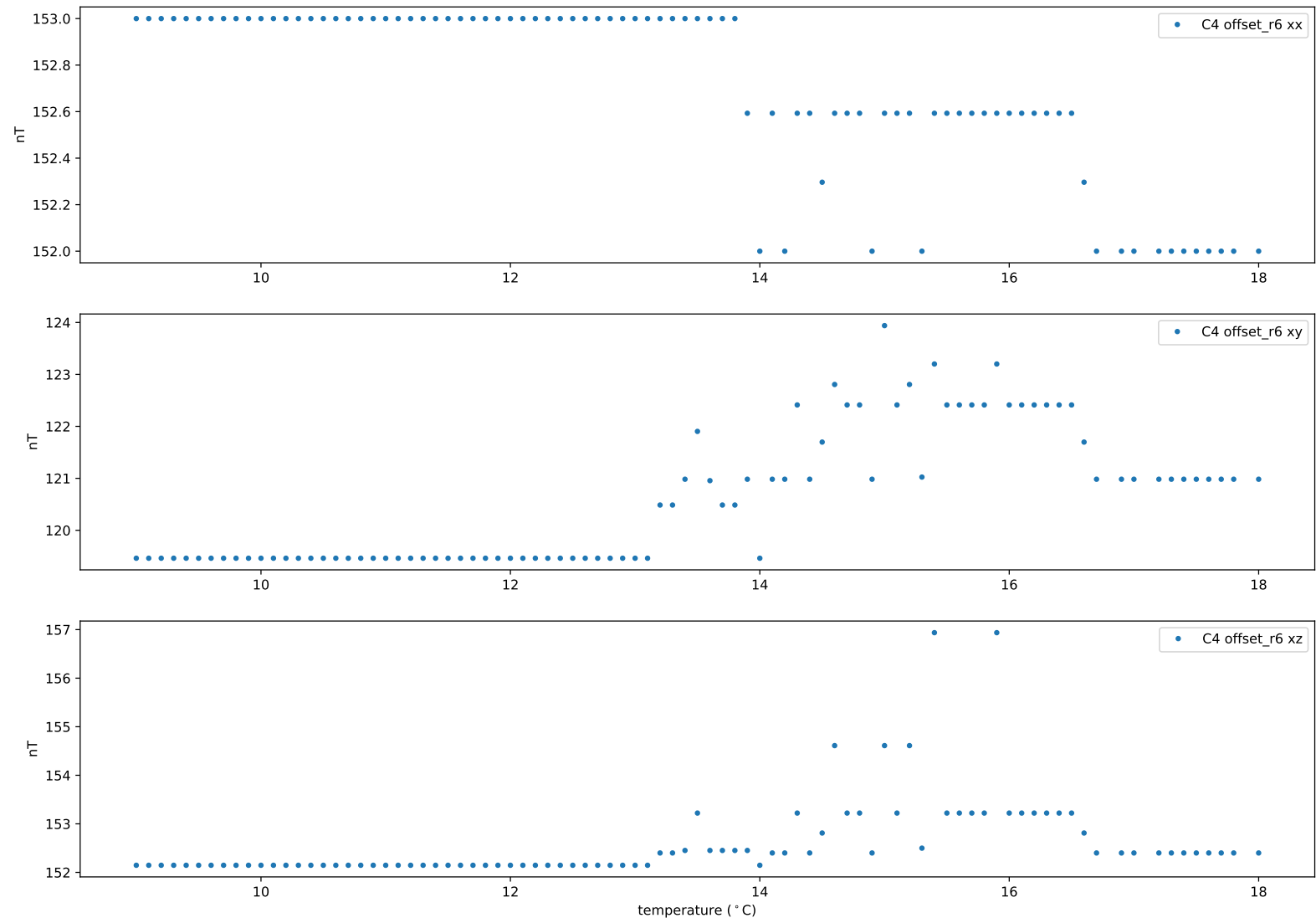


Figure S144: Cluster 4 offset_r6 versus the electronics box temperature

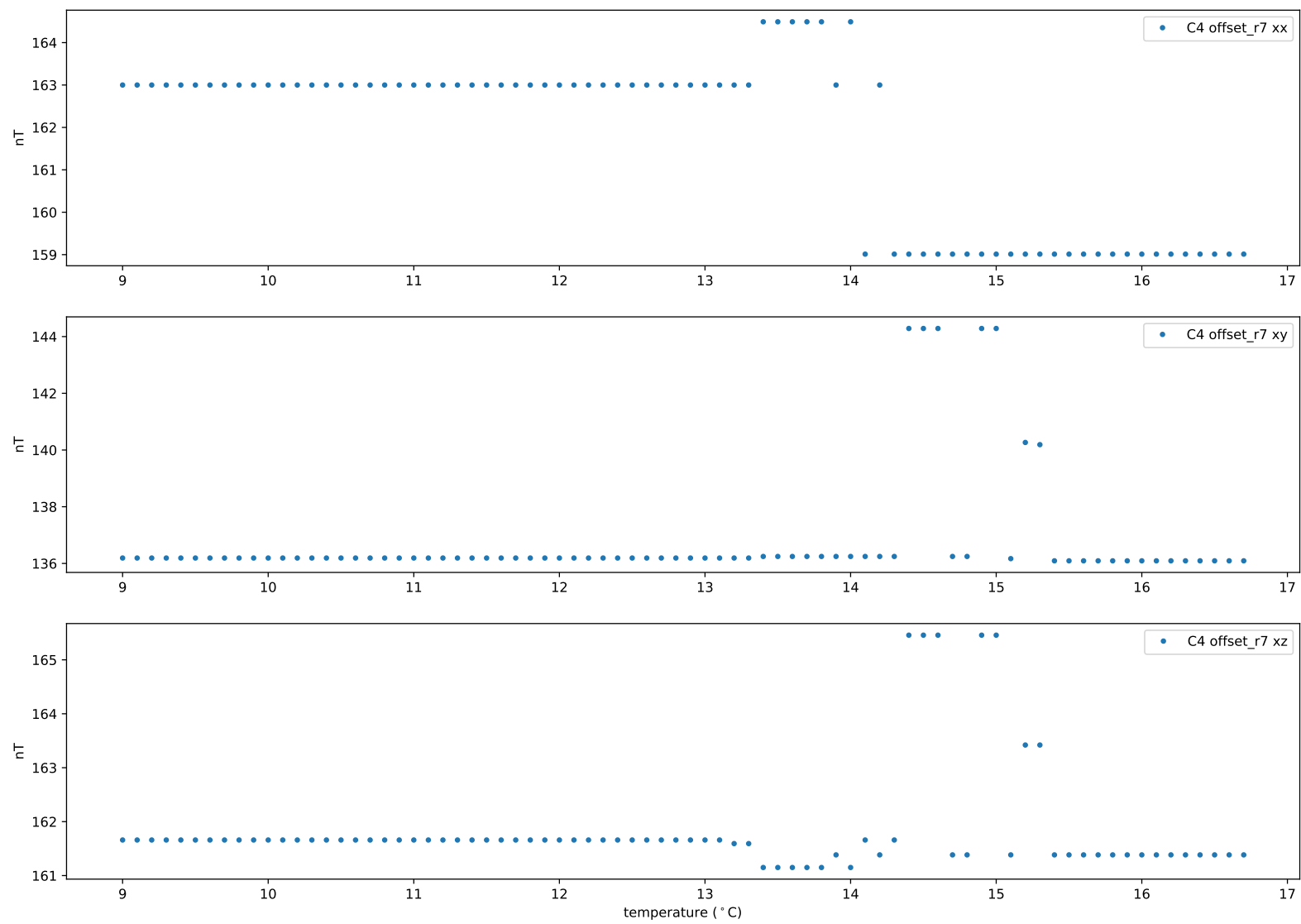


Figure S145: Cluster 4 offset_r7 versus the electronics box temperature

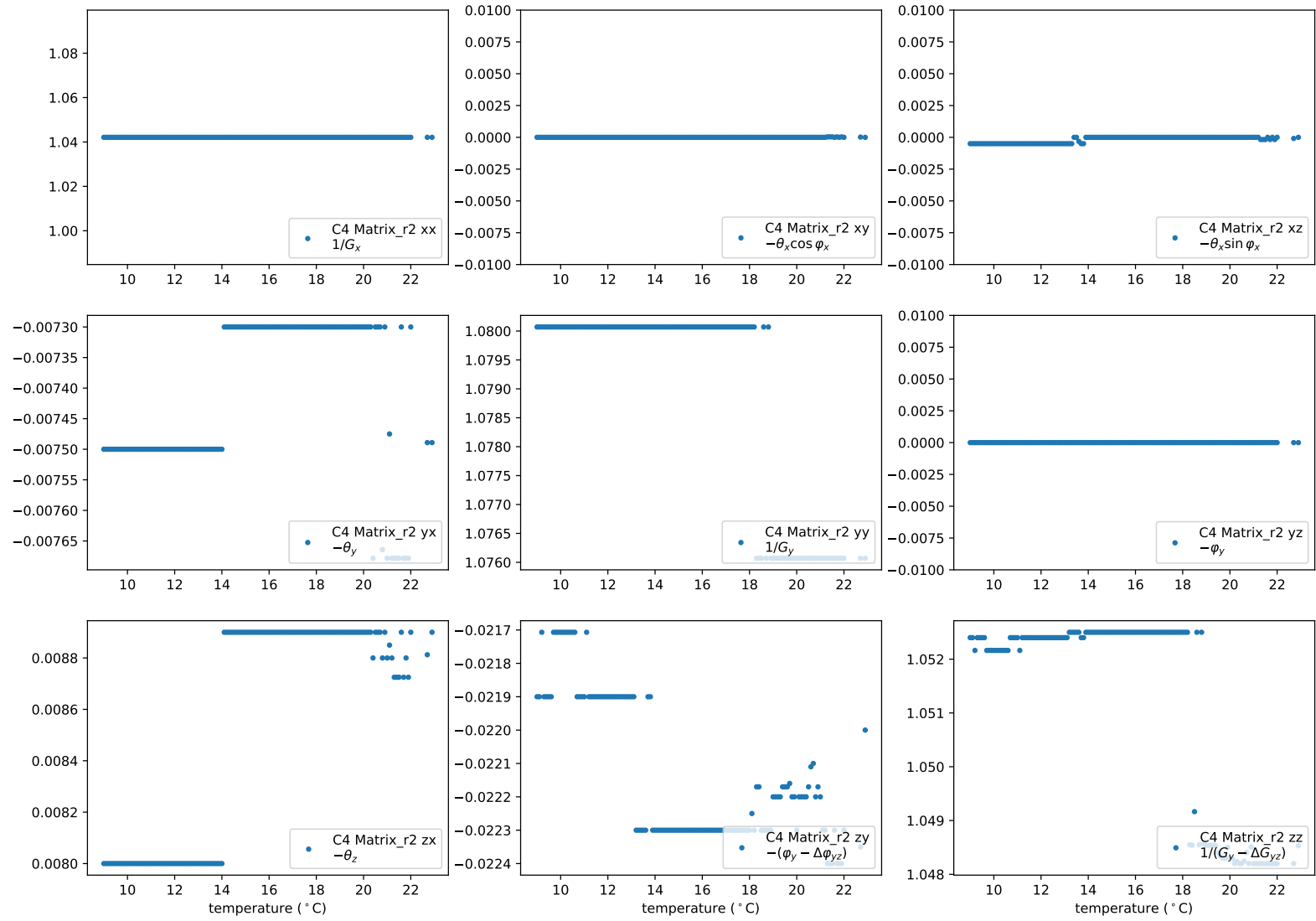


Figure S146: Cluster 4 Matrix_r2 versus the electronics box temperature

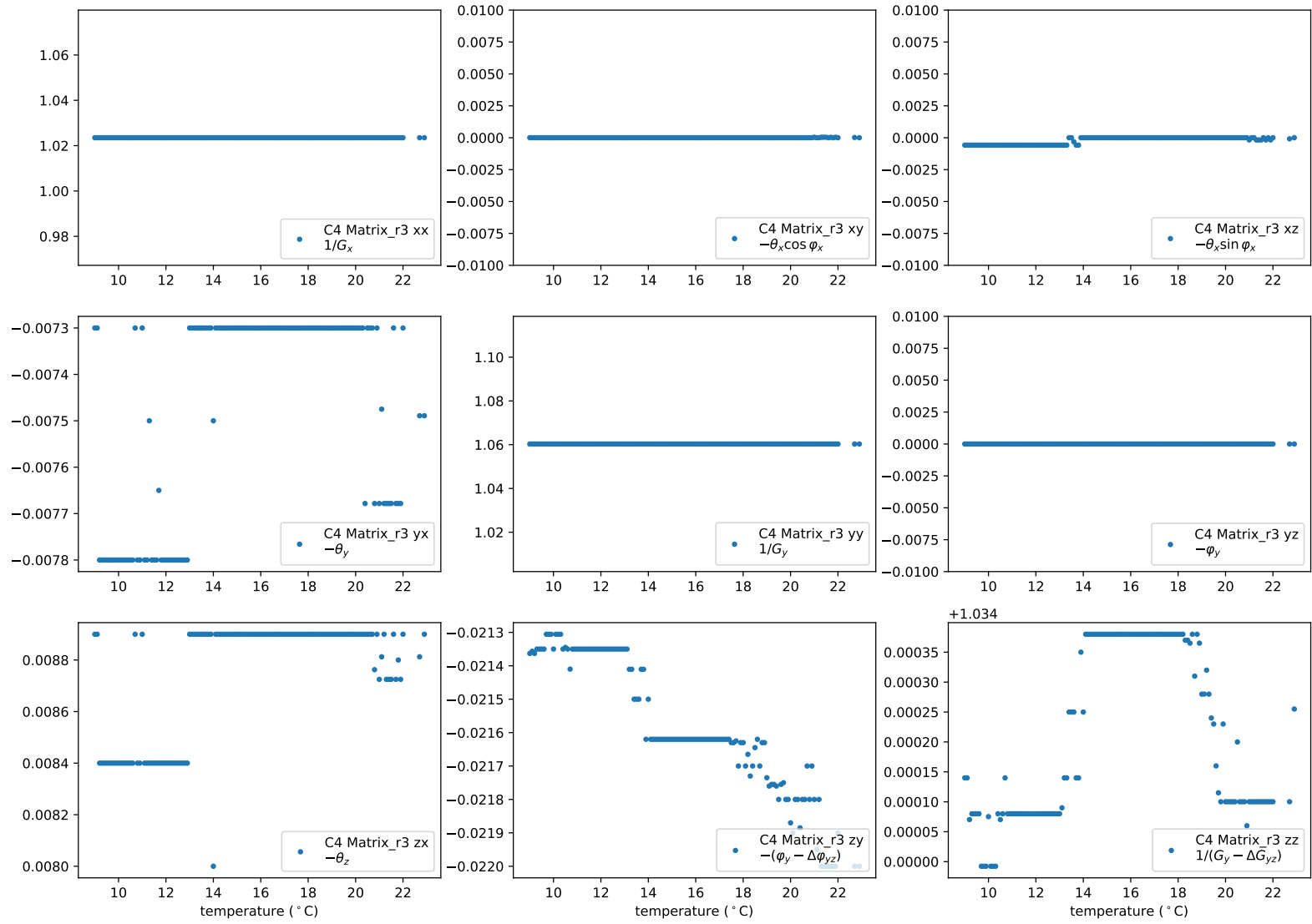


Figure S147: Cluster 4 Matrix_r3 versus the electronics box temperature

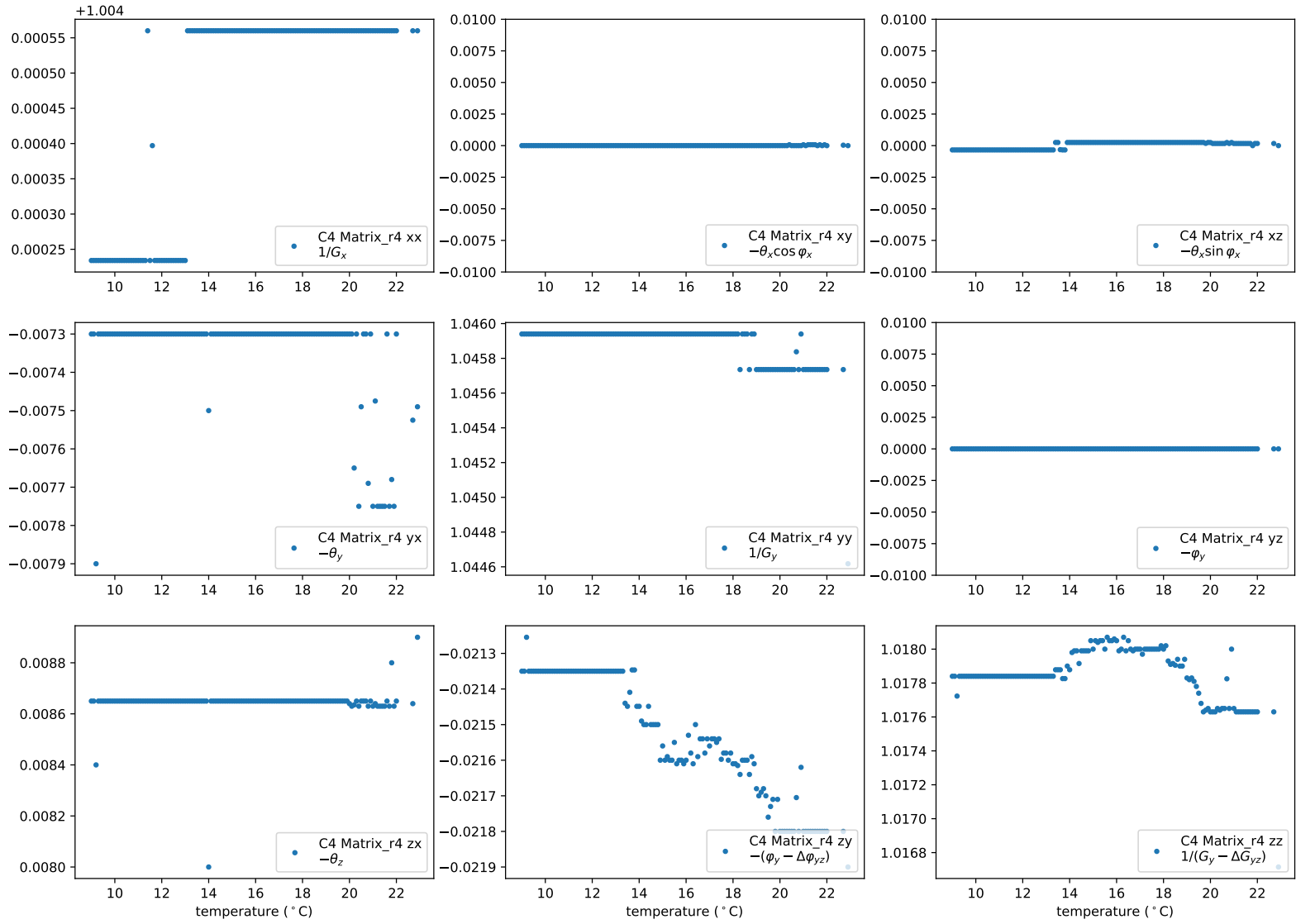


Figure S148: Cluster 4 Matrix_r4 versus the electronics box temperature

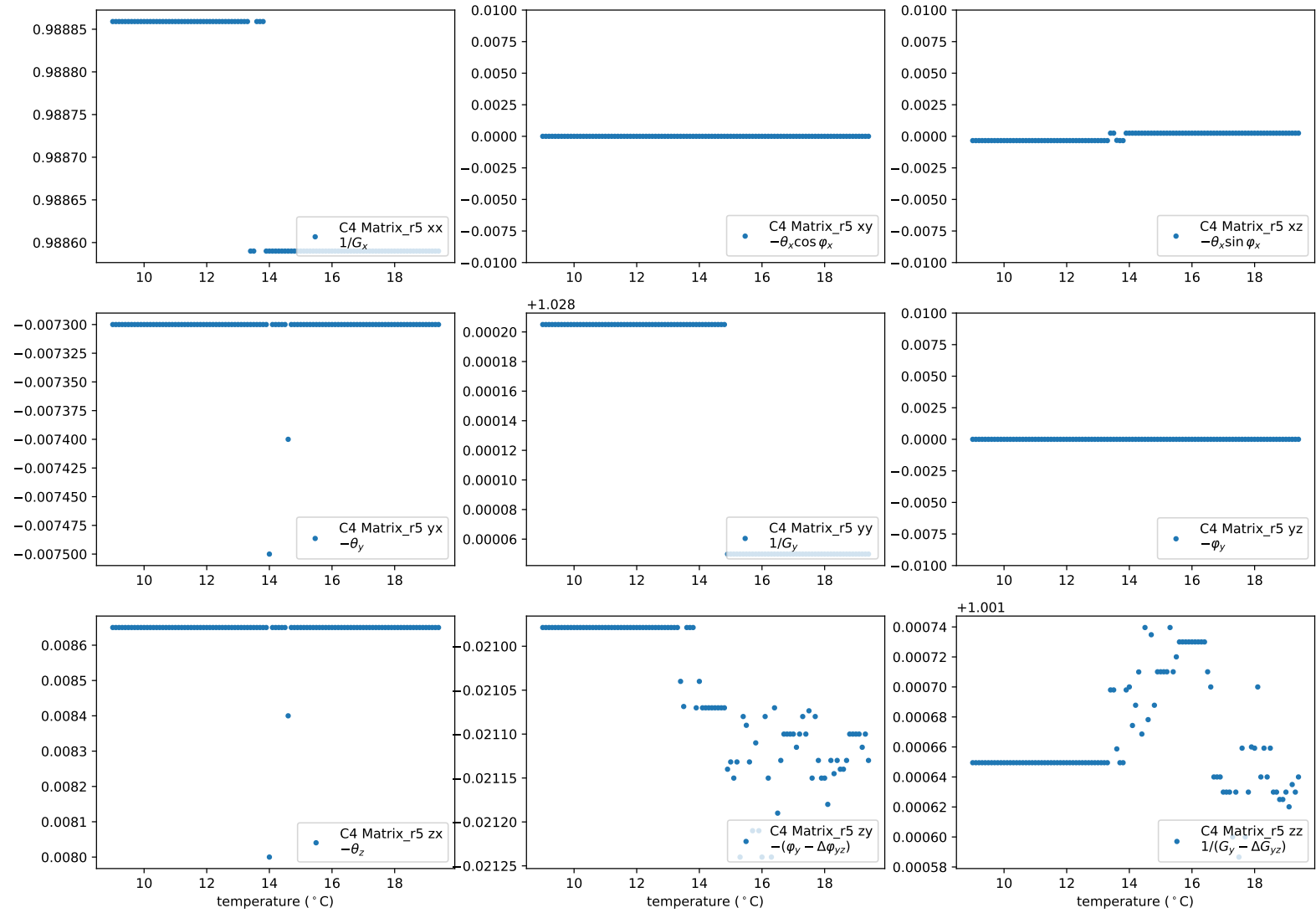


Figure S149: Cluster 4 Matrix_r5 versus the electronics box temperature

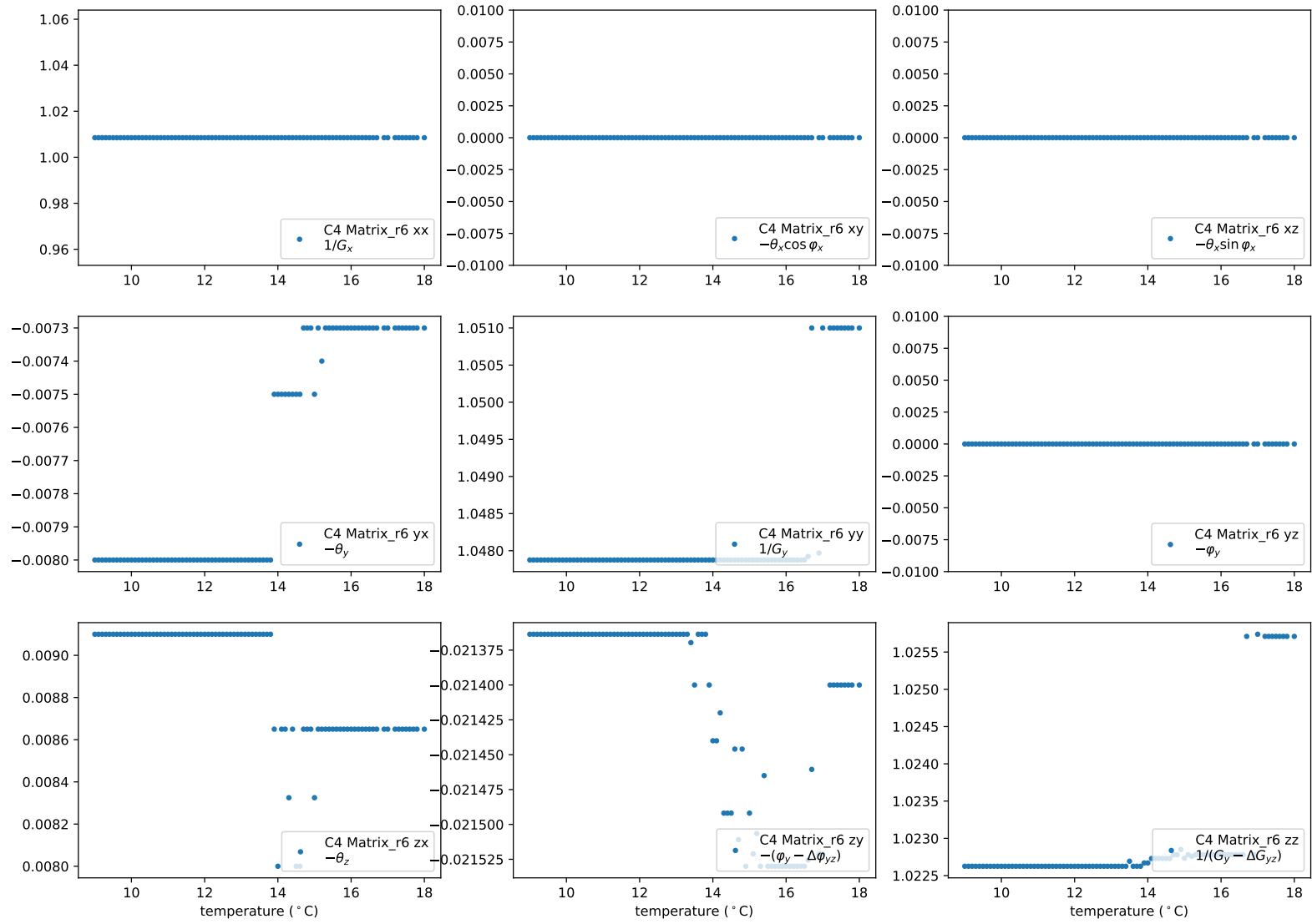


Figure S150: Cluster 4 Matrix_r6 versus the electronics box temperature

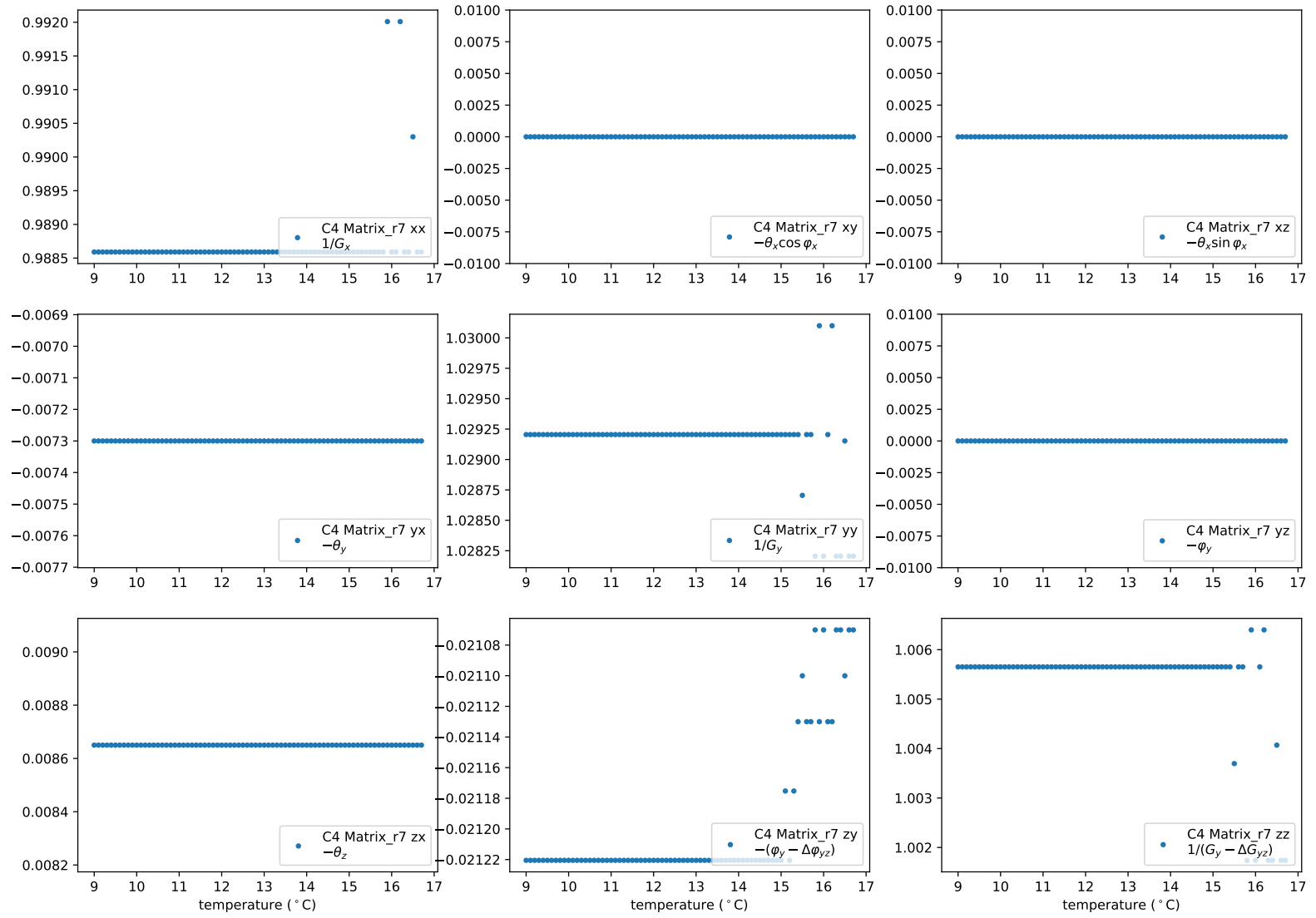


Figure S151: Cluster 4 Matrix_r7 versus the electronics box temperature

4.3 Daily calibration parameters versus the outboard sensor temperature

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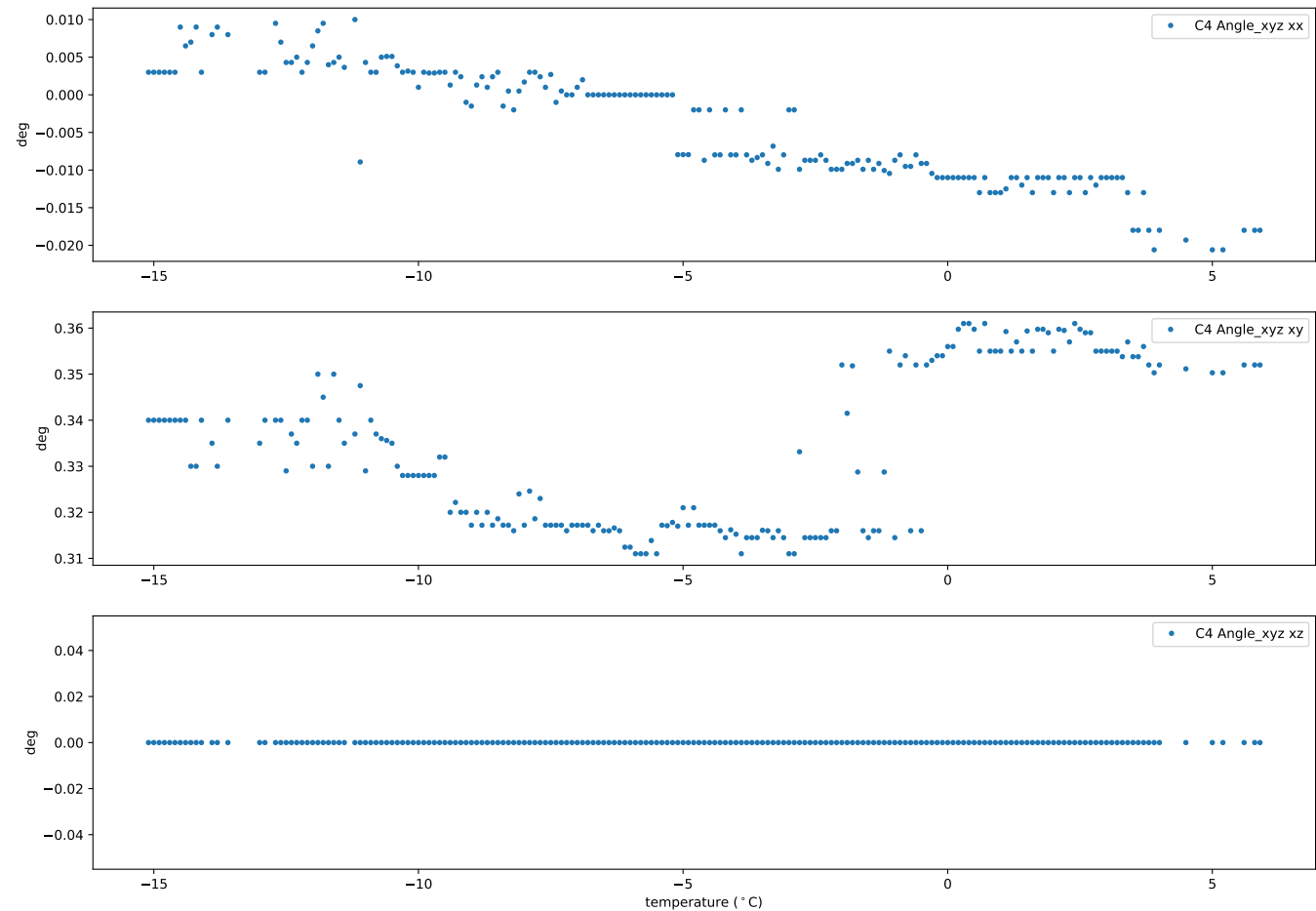


Figure S152: Cluster 4 Angle_xyz versus the outboard sensor temperature

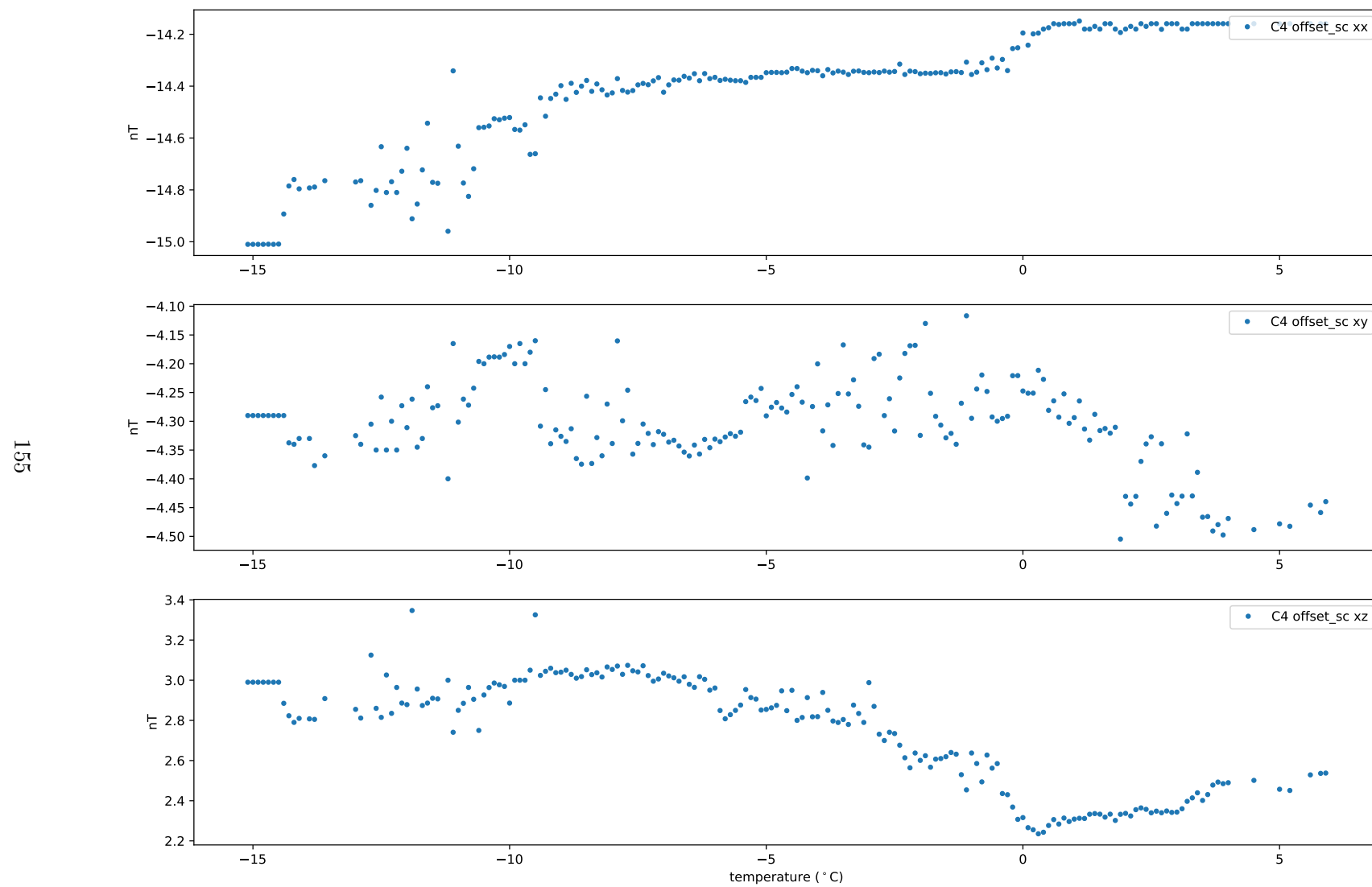


Figure S153: Cluster 4 offset_sc versus the outboard sensor temperature

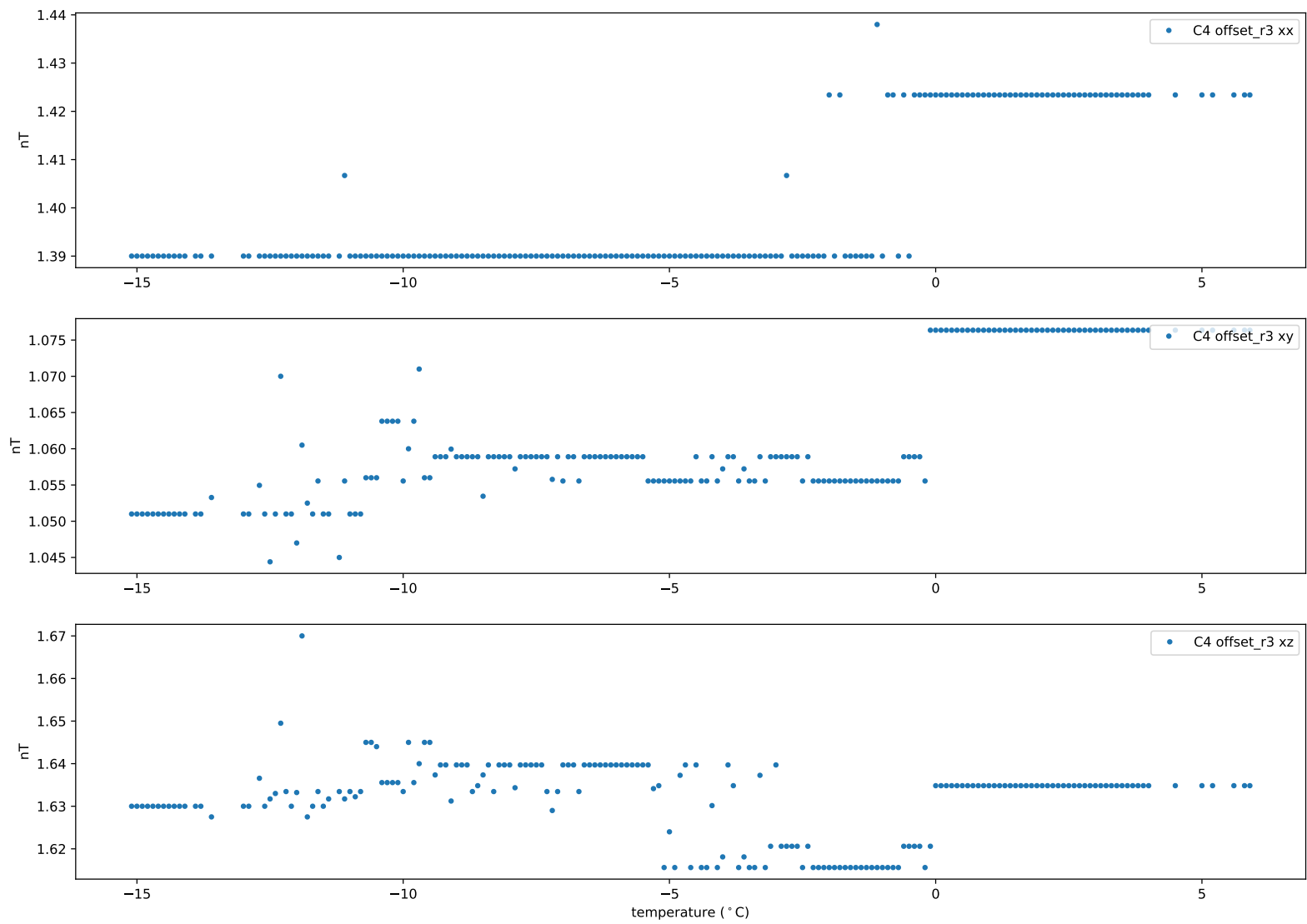


Figure S154: Cluster 4 offset_r3 versus the outboard sensor temperature

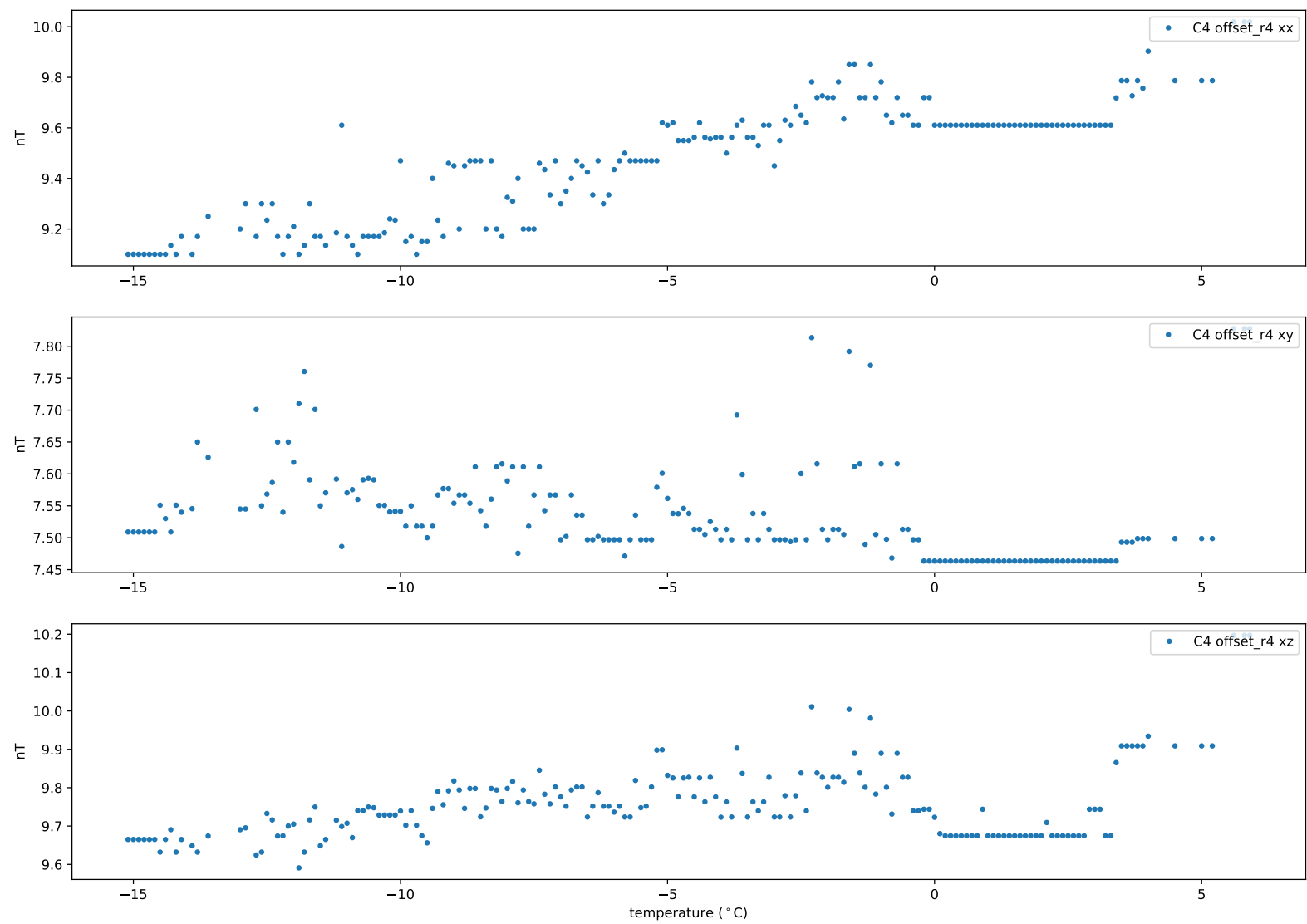


Figure S155: Cluster 4 offset_r4 versus the outboard sensor temperature

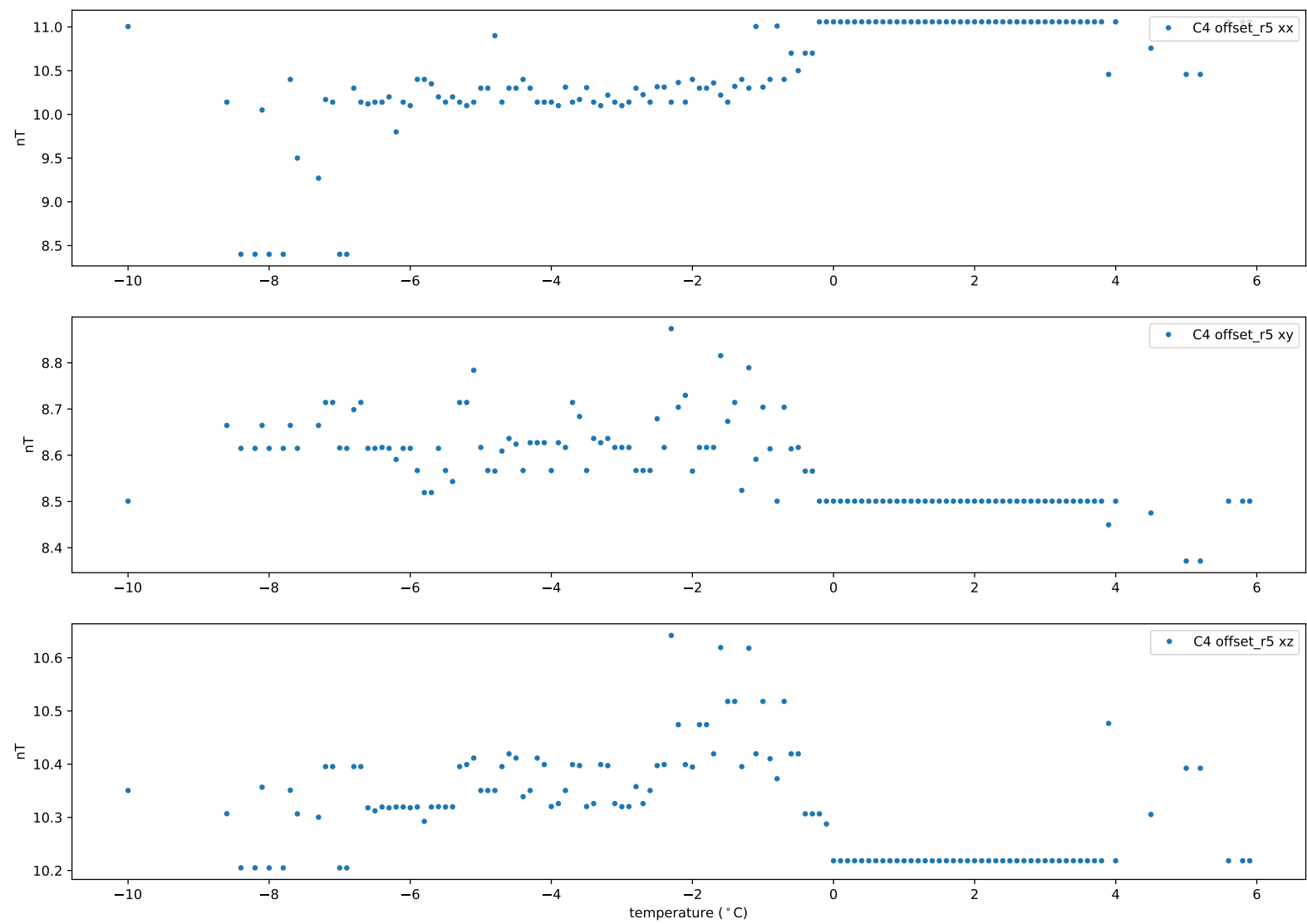


Figure S156: Cluster 4 offset_r5 versus the outboard sensor temperature

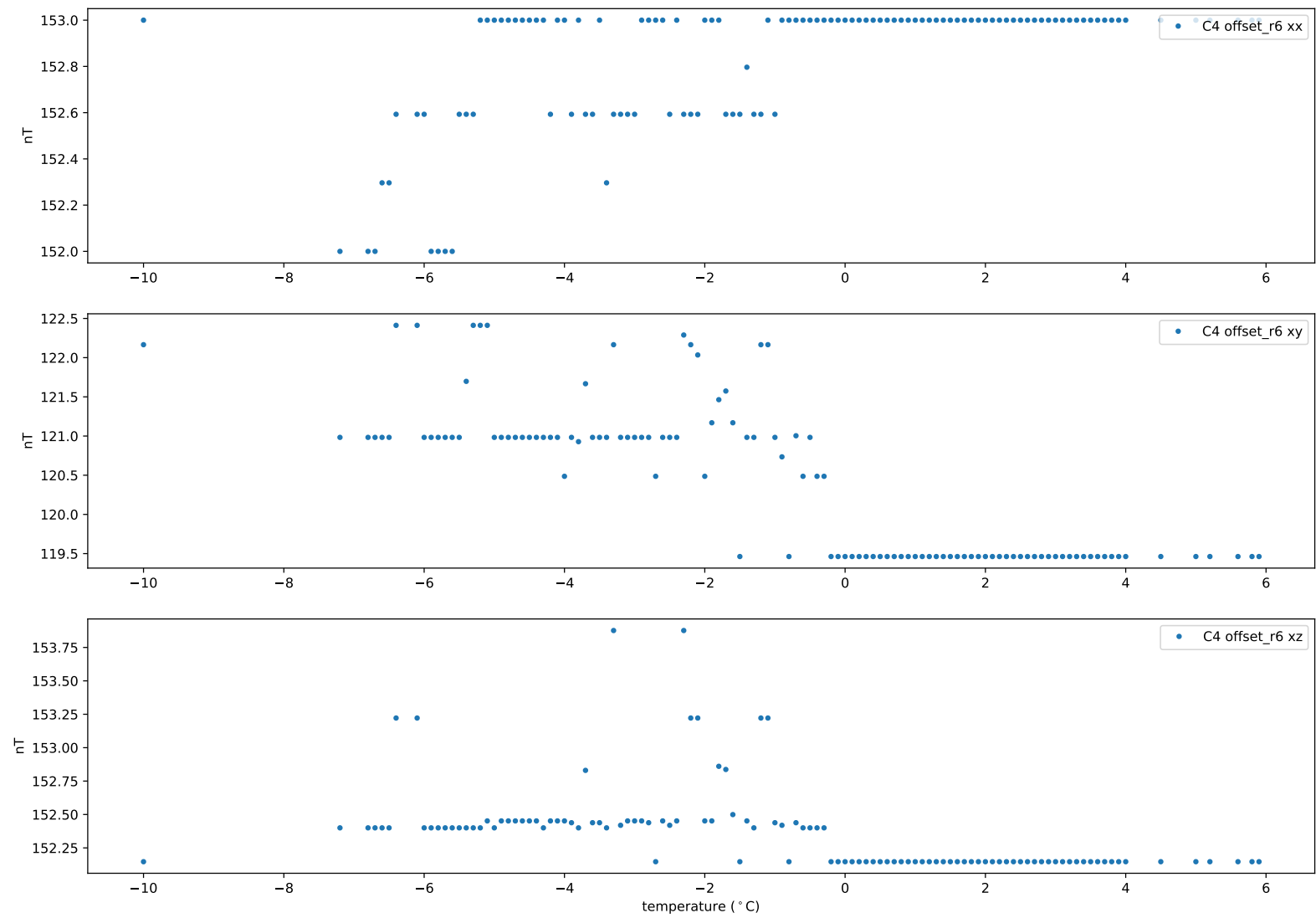


Figure S157: Cluster 4 offset_r6 versus the outboard sensor temperature

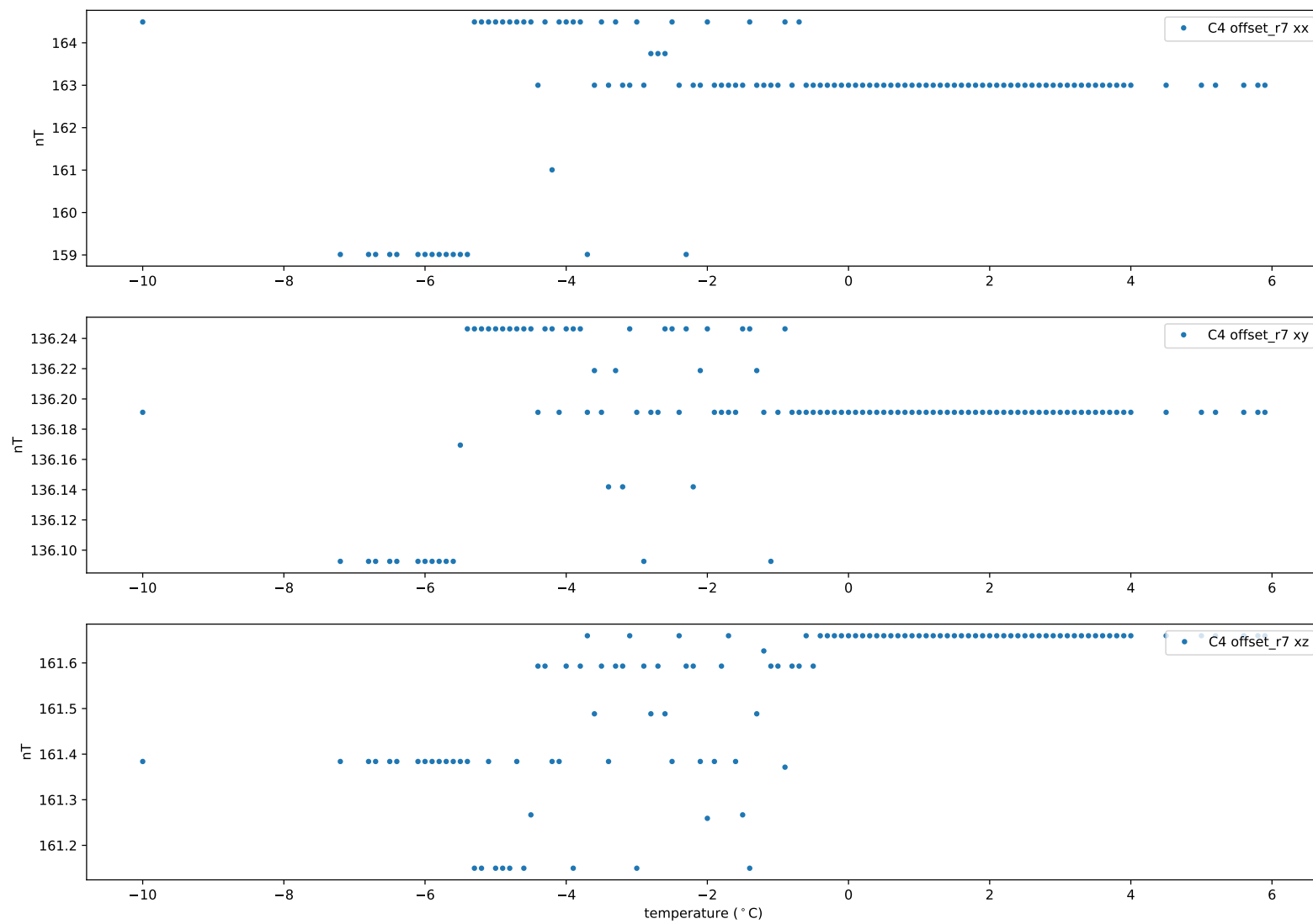


Figure S158: Cluster 4 offset_r7 versus the outboard sensor temperature

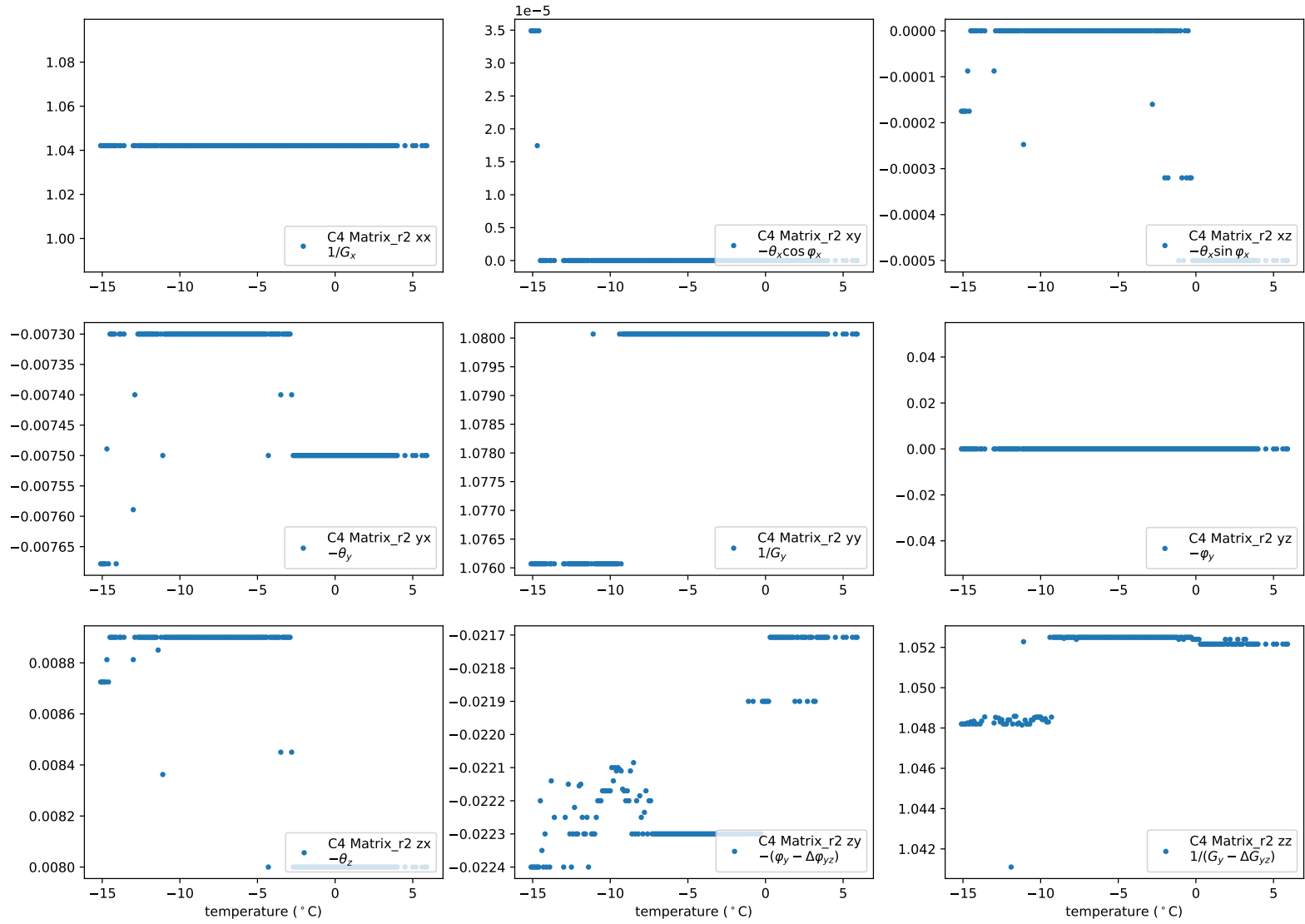


Figure S159: Cluster 4 Matrix_r2 versus the outboard sensor temperature

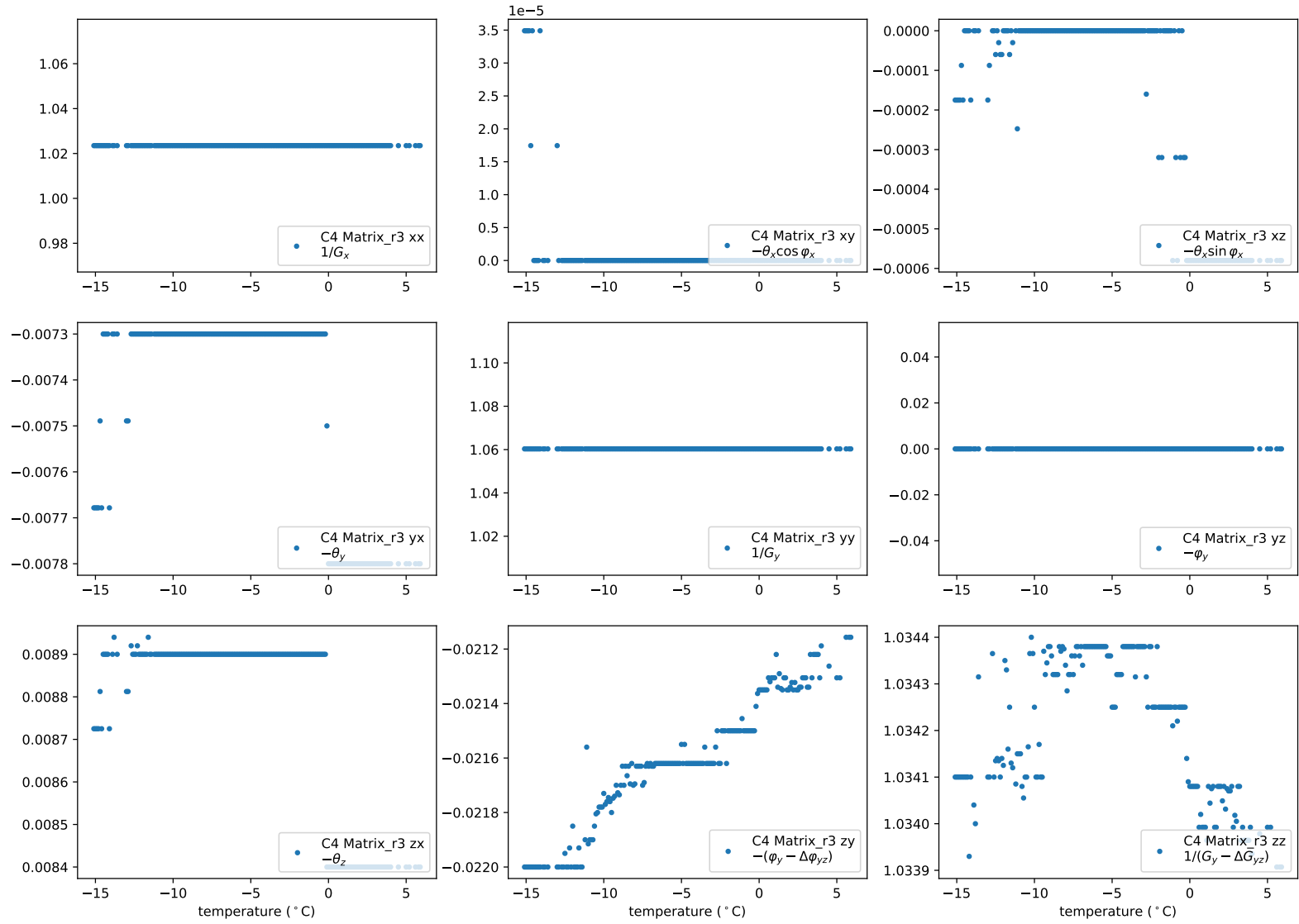


Figure S160: Cluster 4 Matrix_r3 versus the outboard sensor temperature

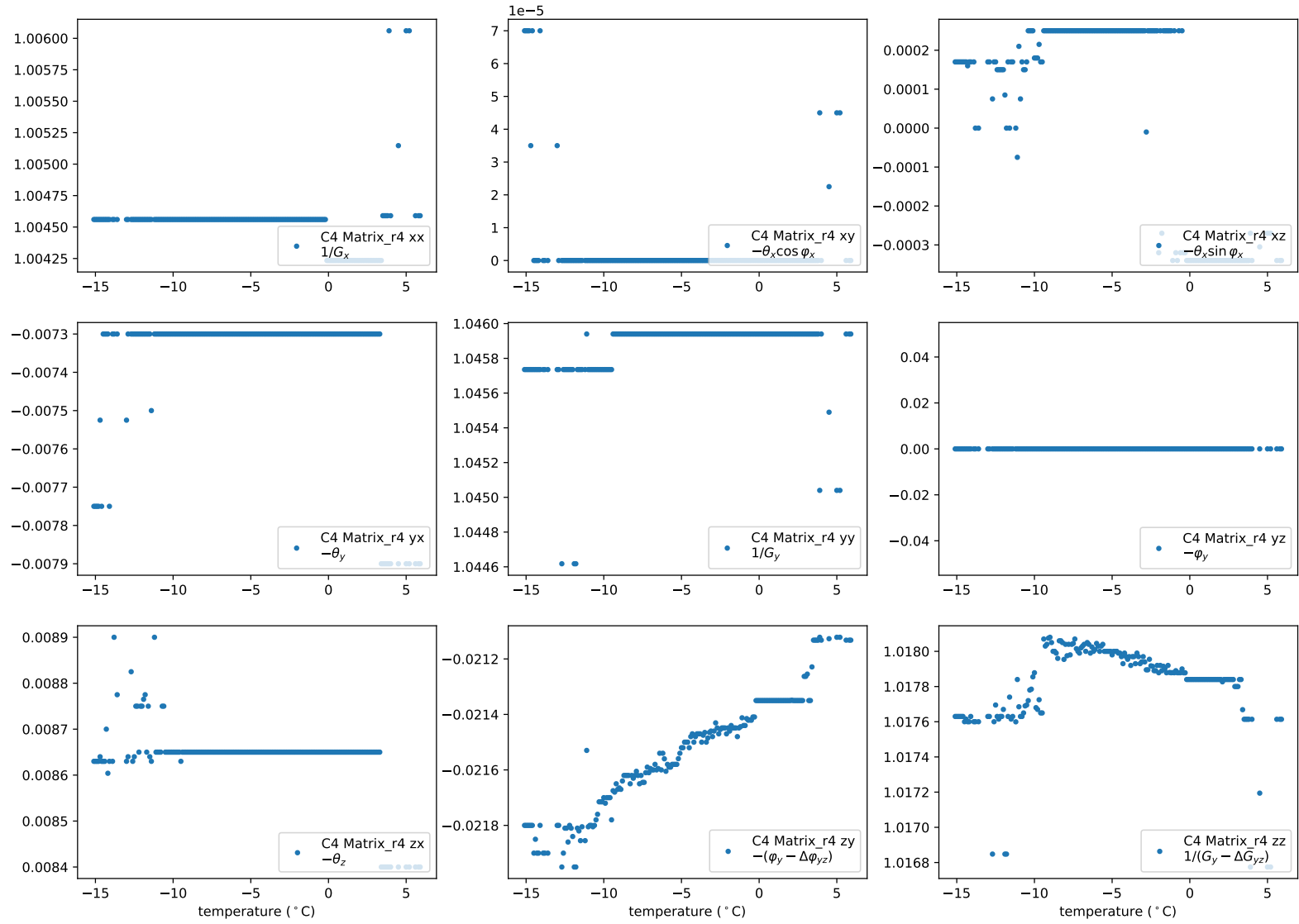


Figure S161: Cluster 4 Matrix_r4 versus the outboard sensor temperature

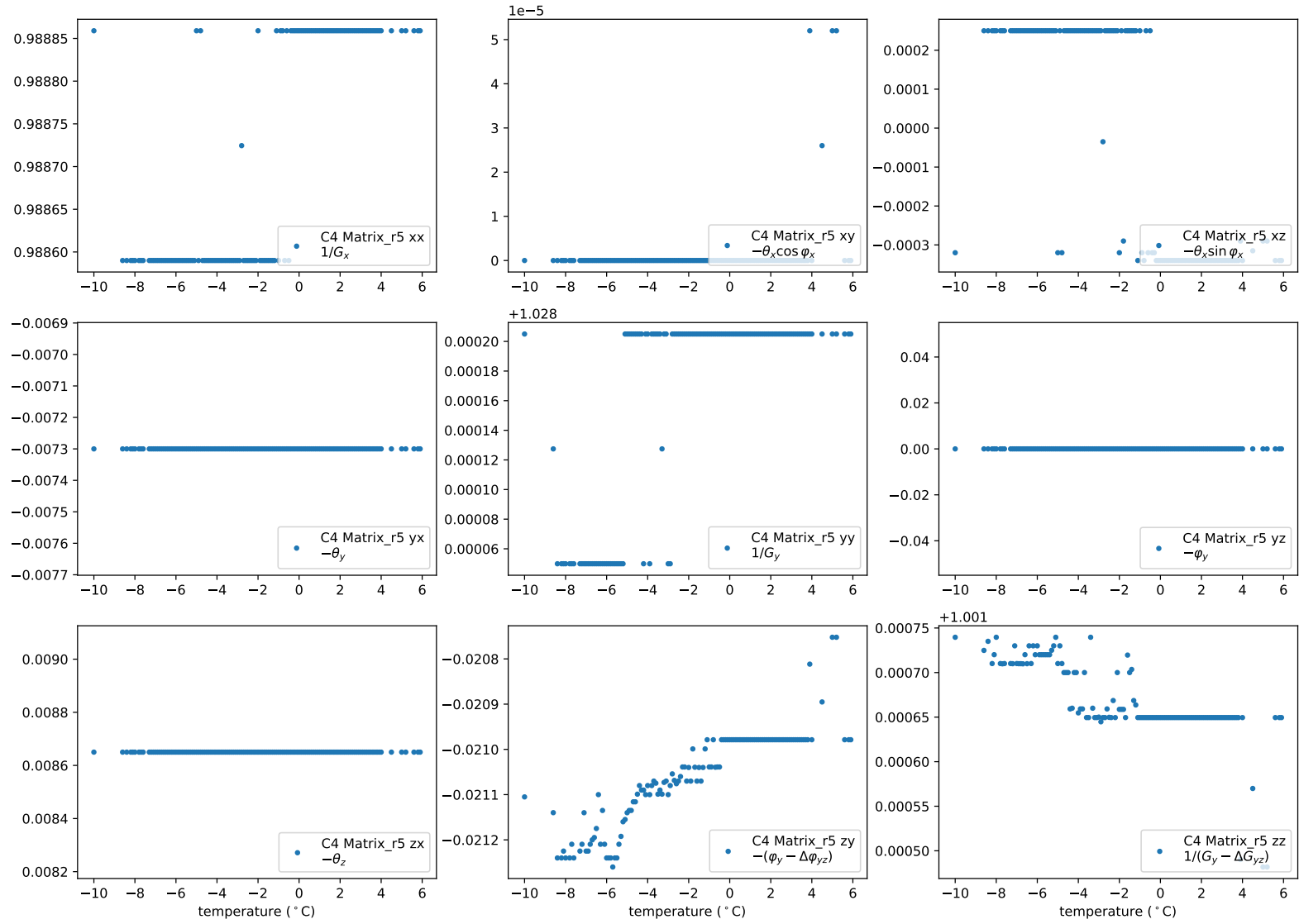


Figure S162: Cluster 4 Matrix_r5 versus the outboard sensor temperature

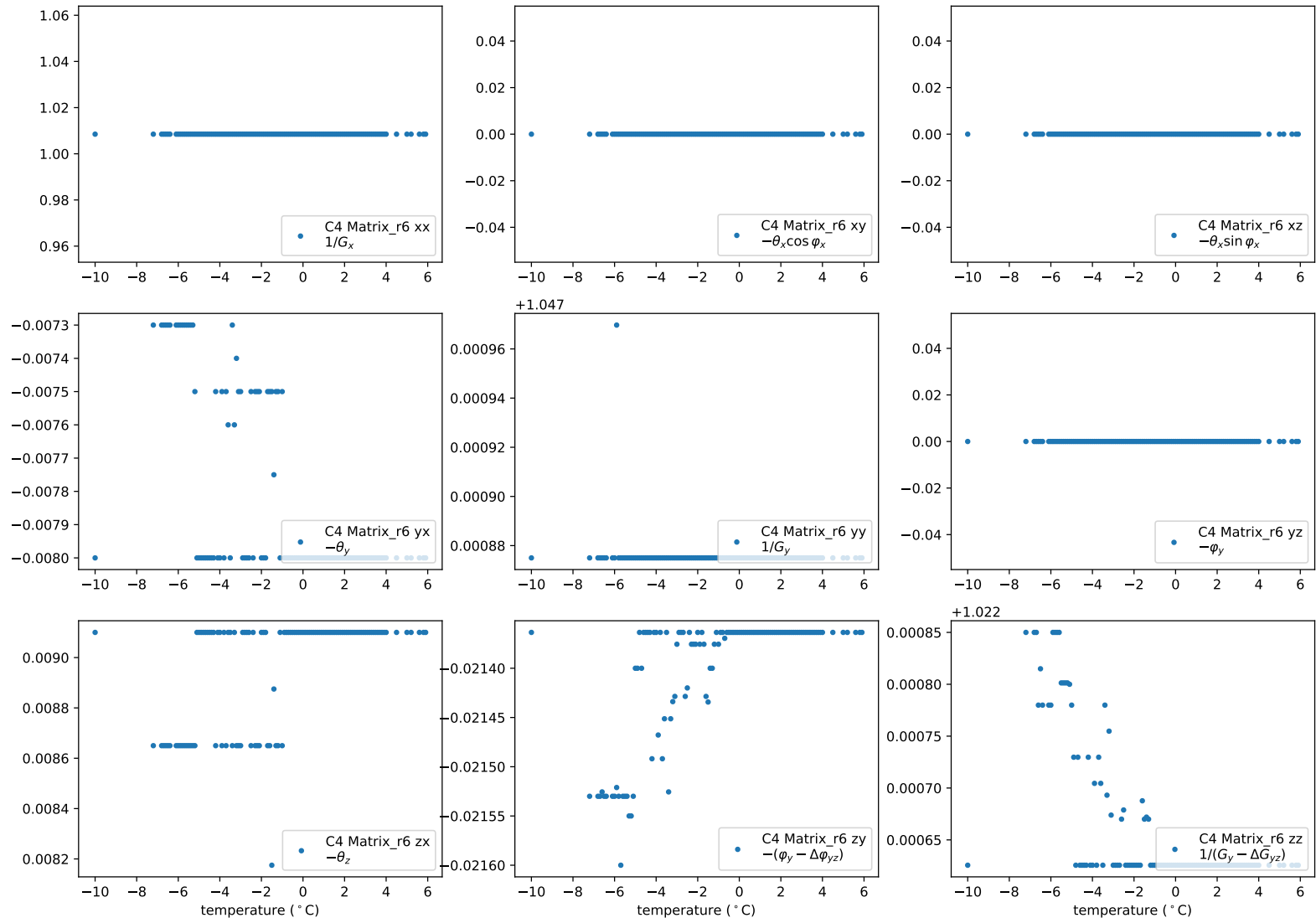


Figure S163: Cluster 4 Matrix_r6 versus the outboard sensor temperature

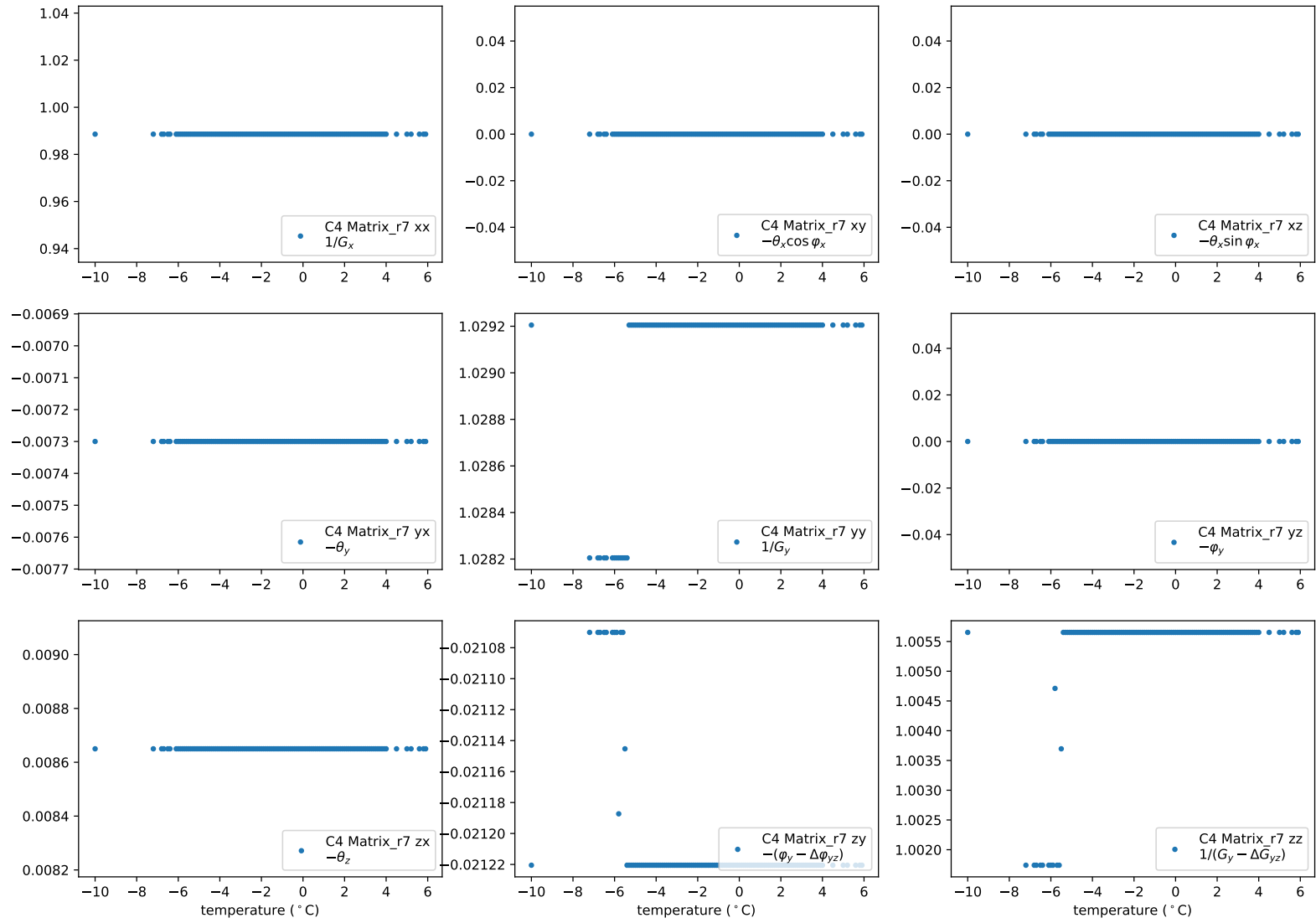


Figure S164: Cluster 4 Matrix_r7 versus the outboard sensor temperature

5 Calibration impact on the magnetic field data accuracy

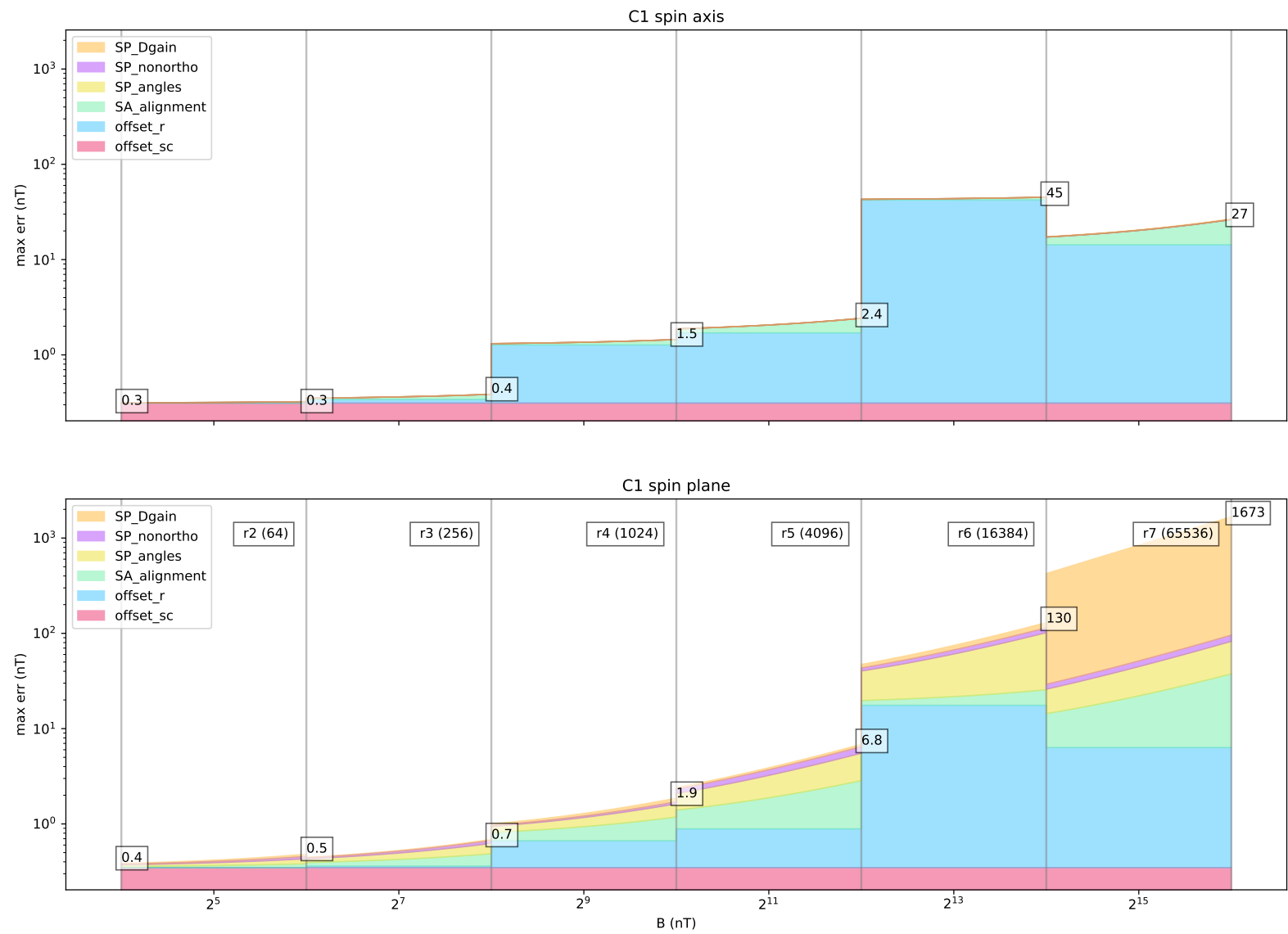


Figure S165: Estimation of the maximum error due to calibration for Cluster 1

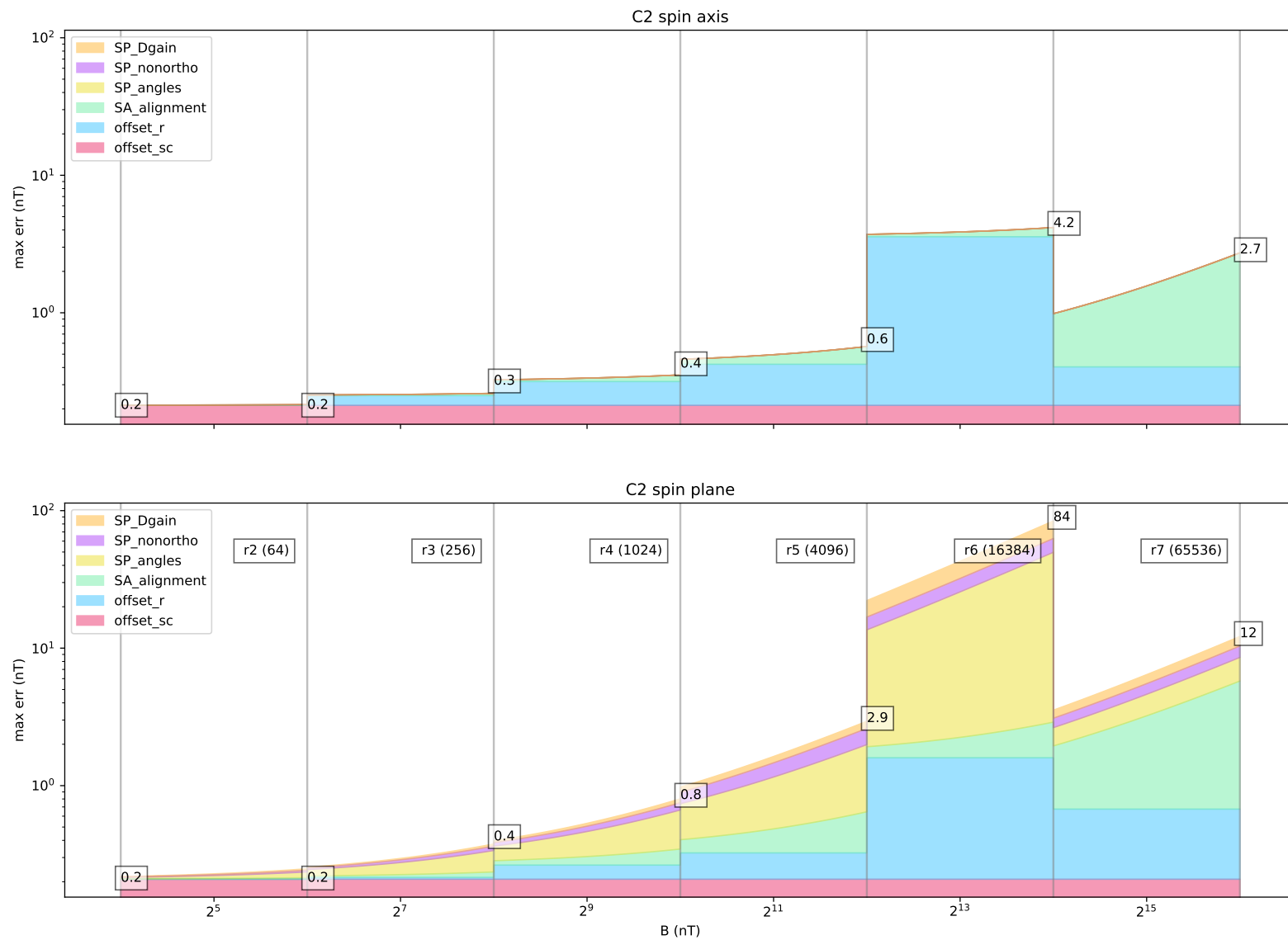


Figure S166: Estimation of the maximum error due to calibration for Cluster 2

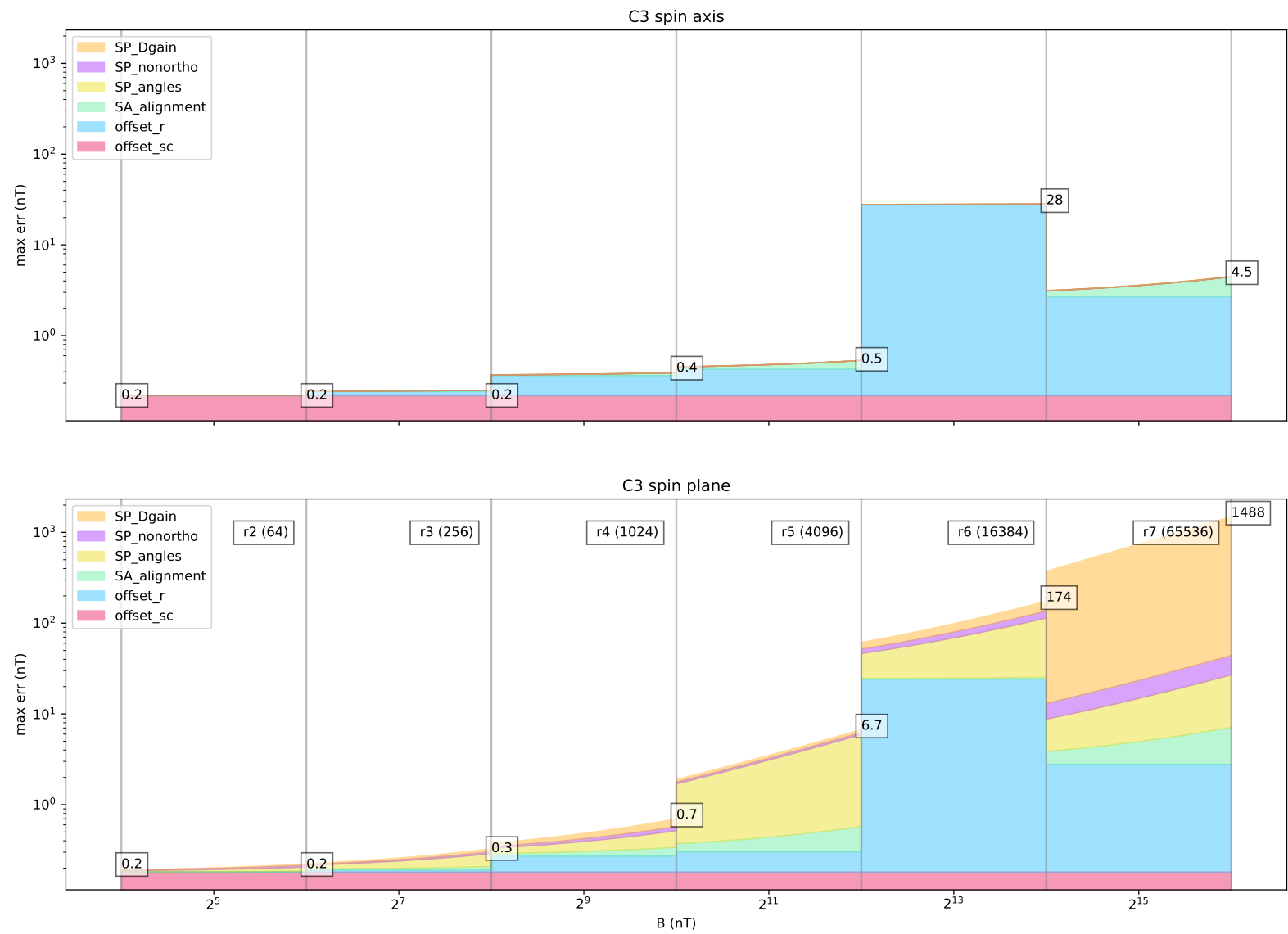


Figure S167: Estimation of the maximum error due to calibration for Cluster 3

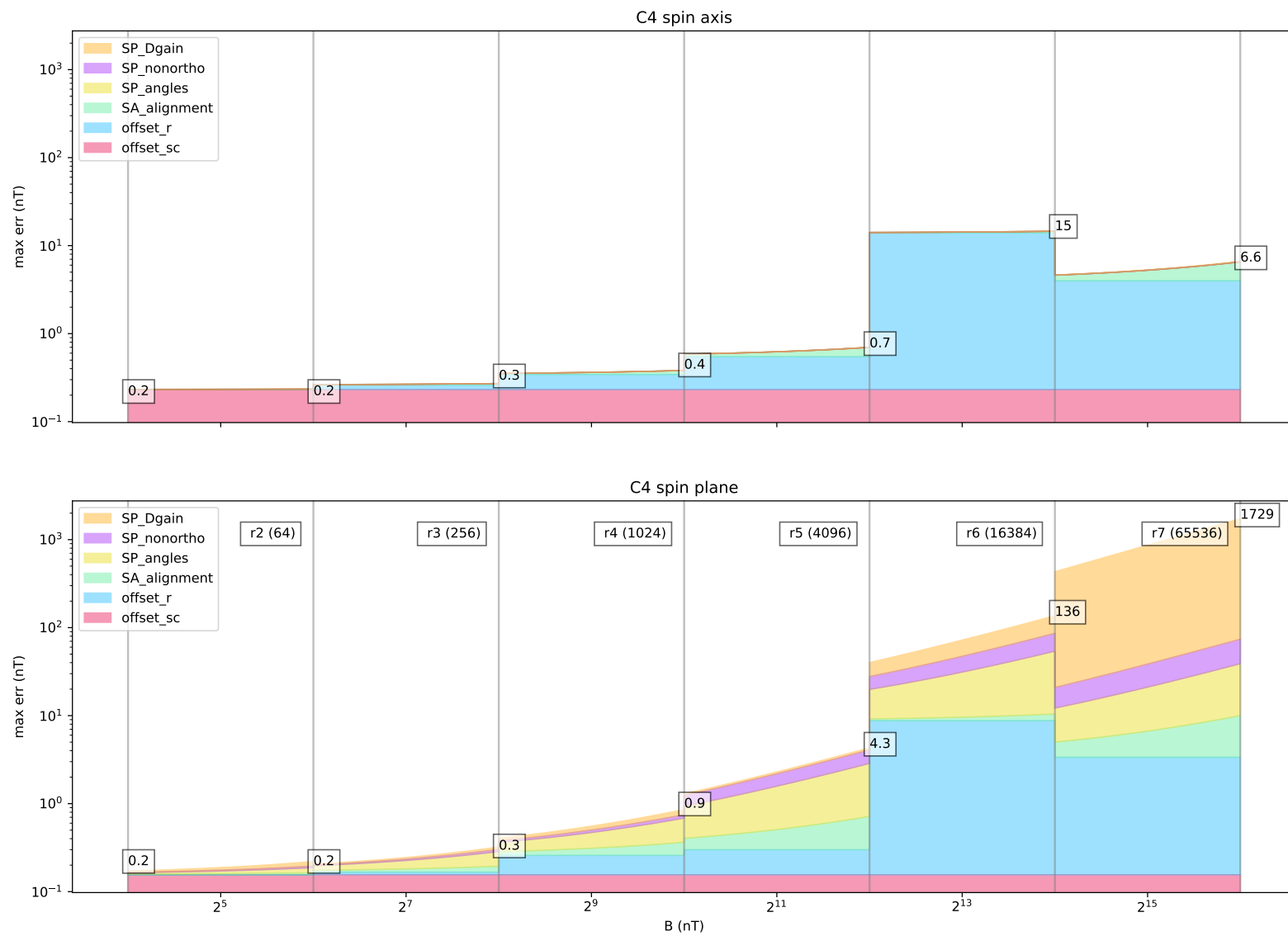


Figure S168: Estimation of the maximum error due to calibration for Cluster 4