Baker Creek Driving Data Preparation Methodology

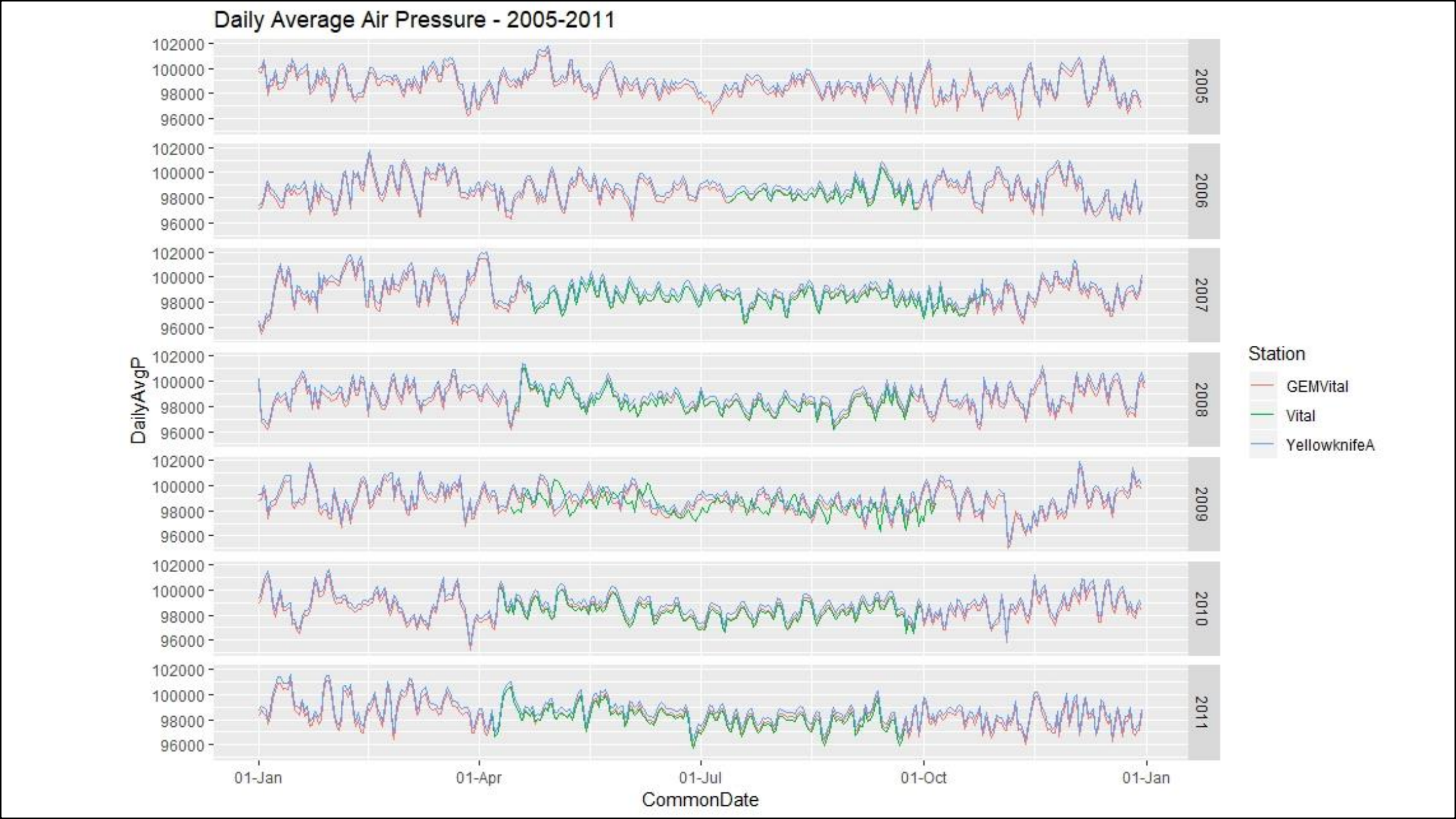
By Haley Brauner

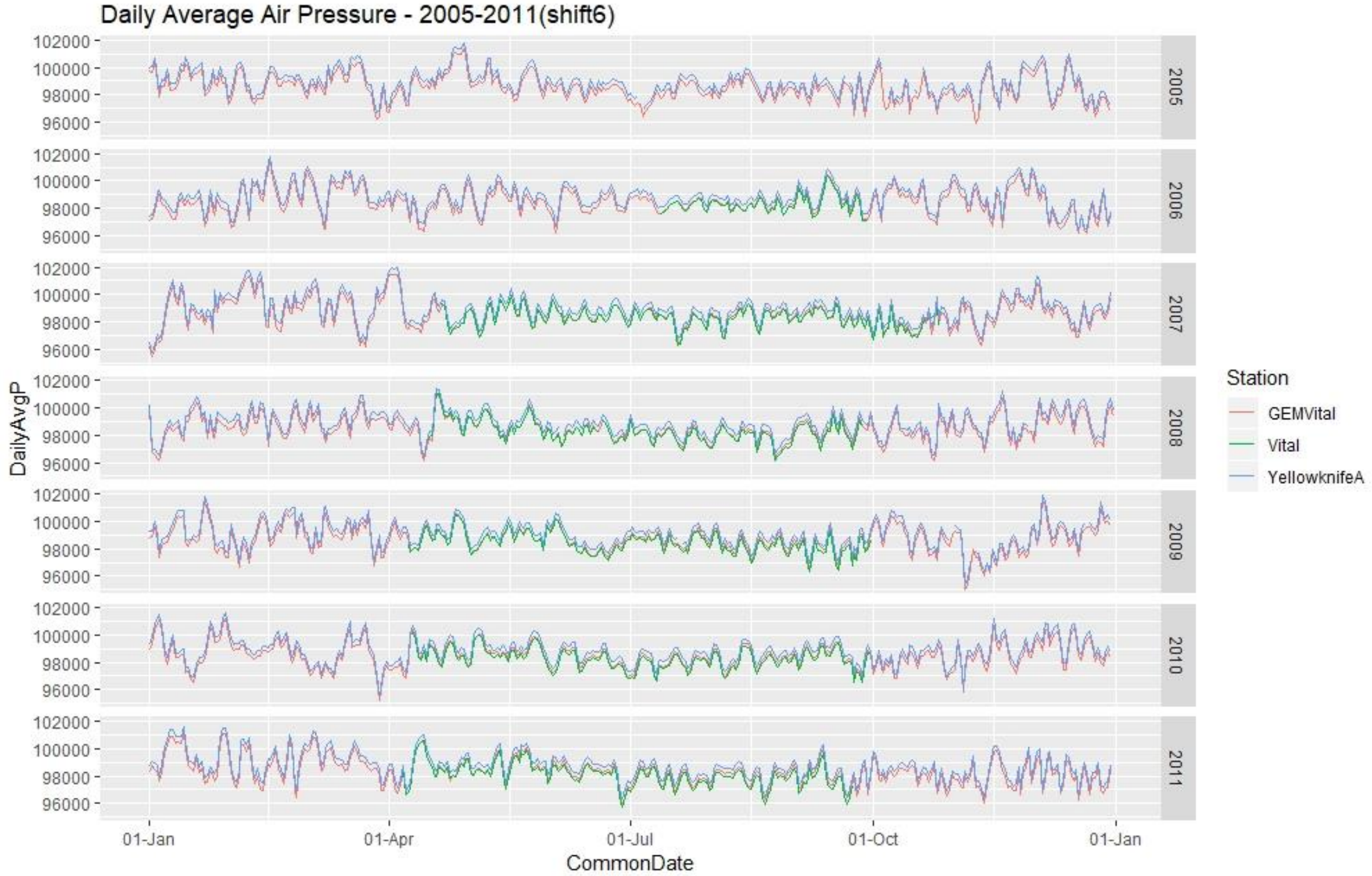
Air Pressure

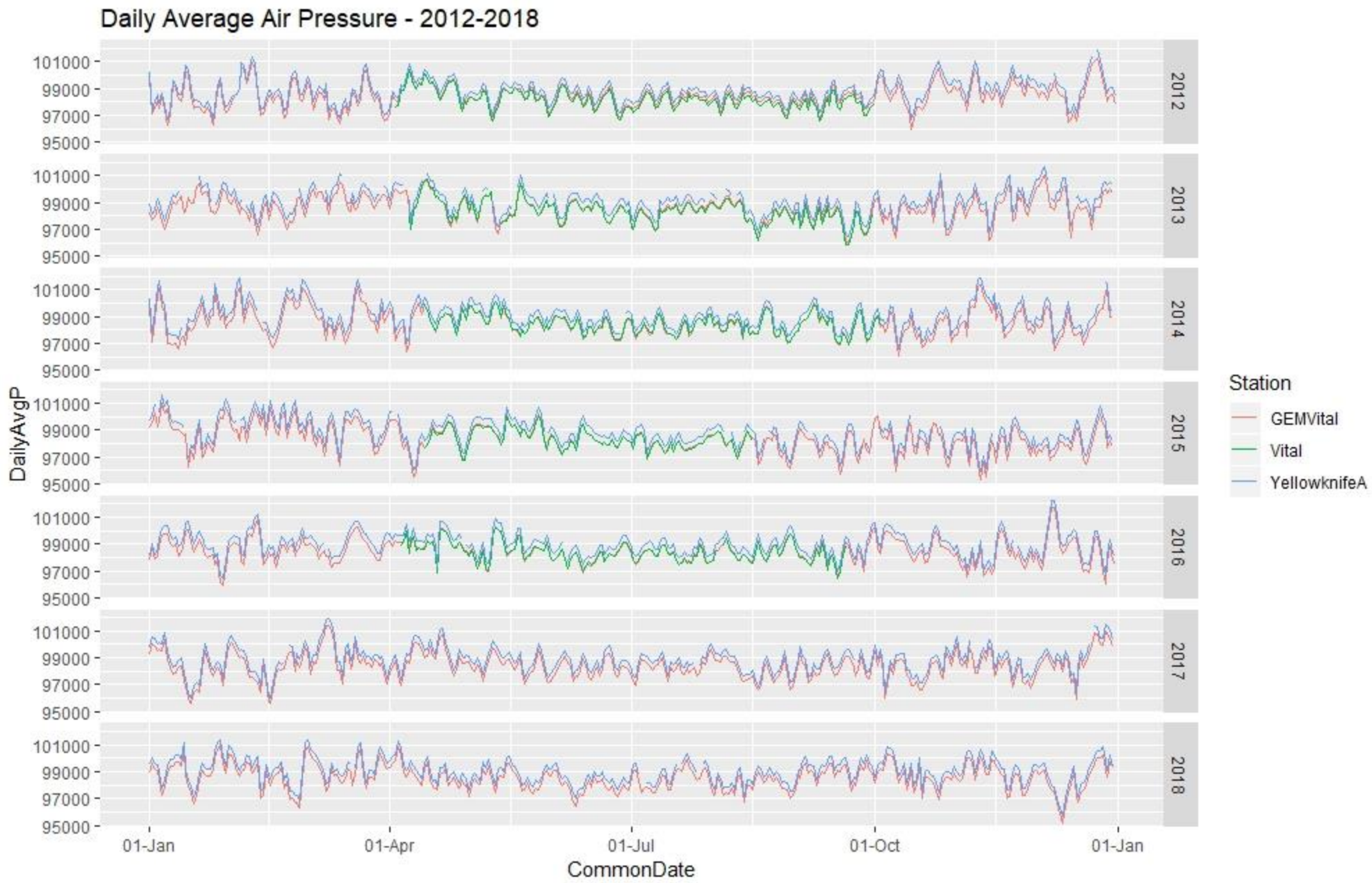
- Compared Vital, Yellowkinfe A, and GEM @ Vital datasets
- *Yellowknife is consistently greater than the other 2 locations*
- *Vital and GEM @ Vital match almost perfectly except that in 2009, Vital is shifted forward by 6 days (shifting back 6 days matches almost perfectly*

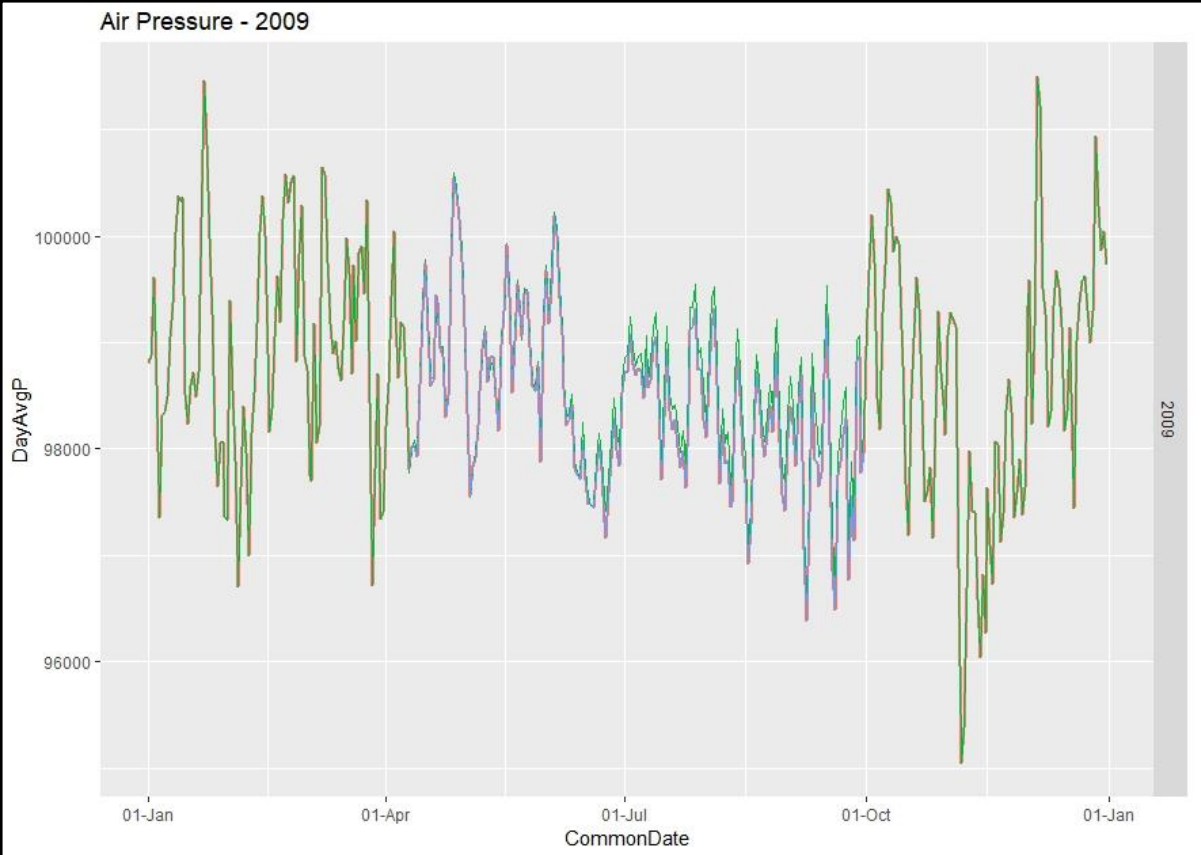
- Combining methodology:
- Used Vital data primarily, with the 2009 observations shifted back in time by 6 days
- Gap-filled with GEM @ Vital data

- The following 2 slides show a comparison of the original and shifted data, followed by the 2012-2018 data and the a close-up of just 2009 (shifted)

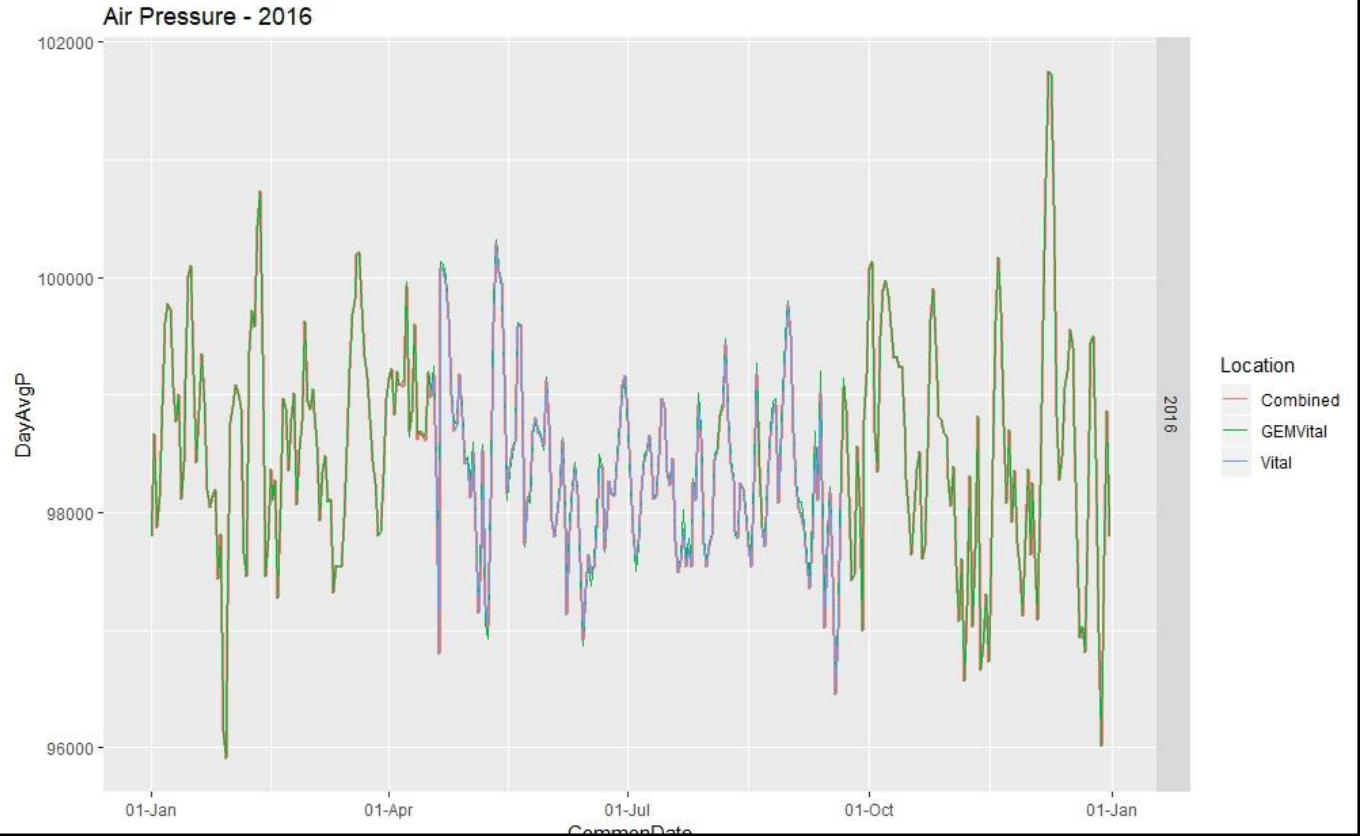

Daily Average Air Pressure - 2005-2011
DailyAvgP
102000
100000
98000
96000
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Vital
YellowknifeA


Daily Average Air Pressure - 2005-2011(shift6)
DailyAvgP
102000
100000
98000
96000
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Vital
YellowknifeA


Daily Average Air Pressure - 2012-2018
DailyAvgP
101000
99000
97000
95000
2012
2013
2014
2015
2016
2017
2018
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Vital
YellowknifeA


Air Pressure - 2009
100000
98000
96000
DayAvgP
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
2009

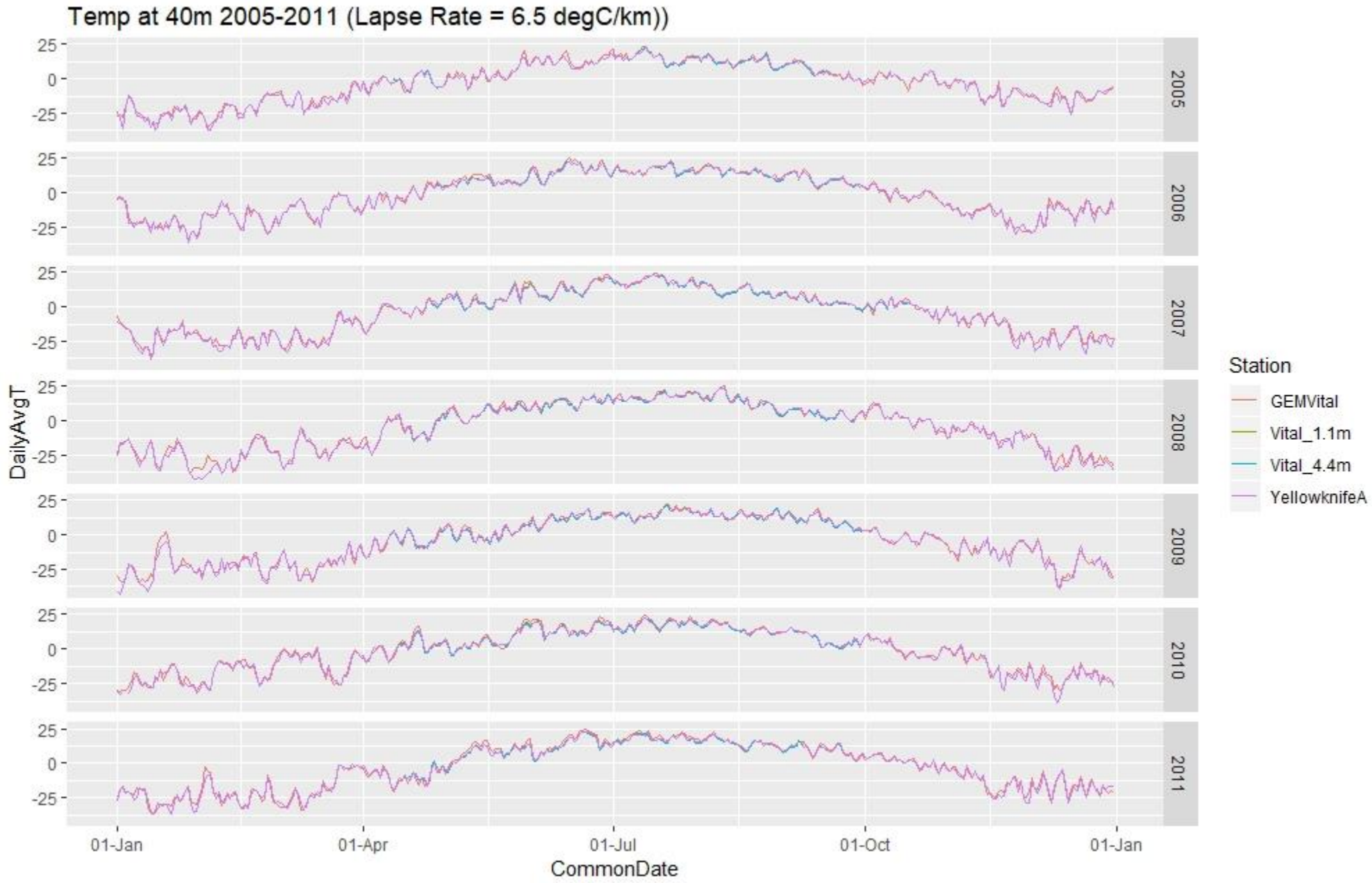

Location
Combined
GEMVital
Vital

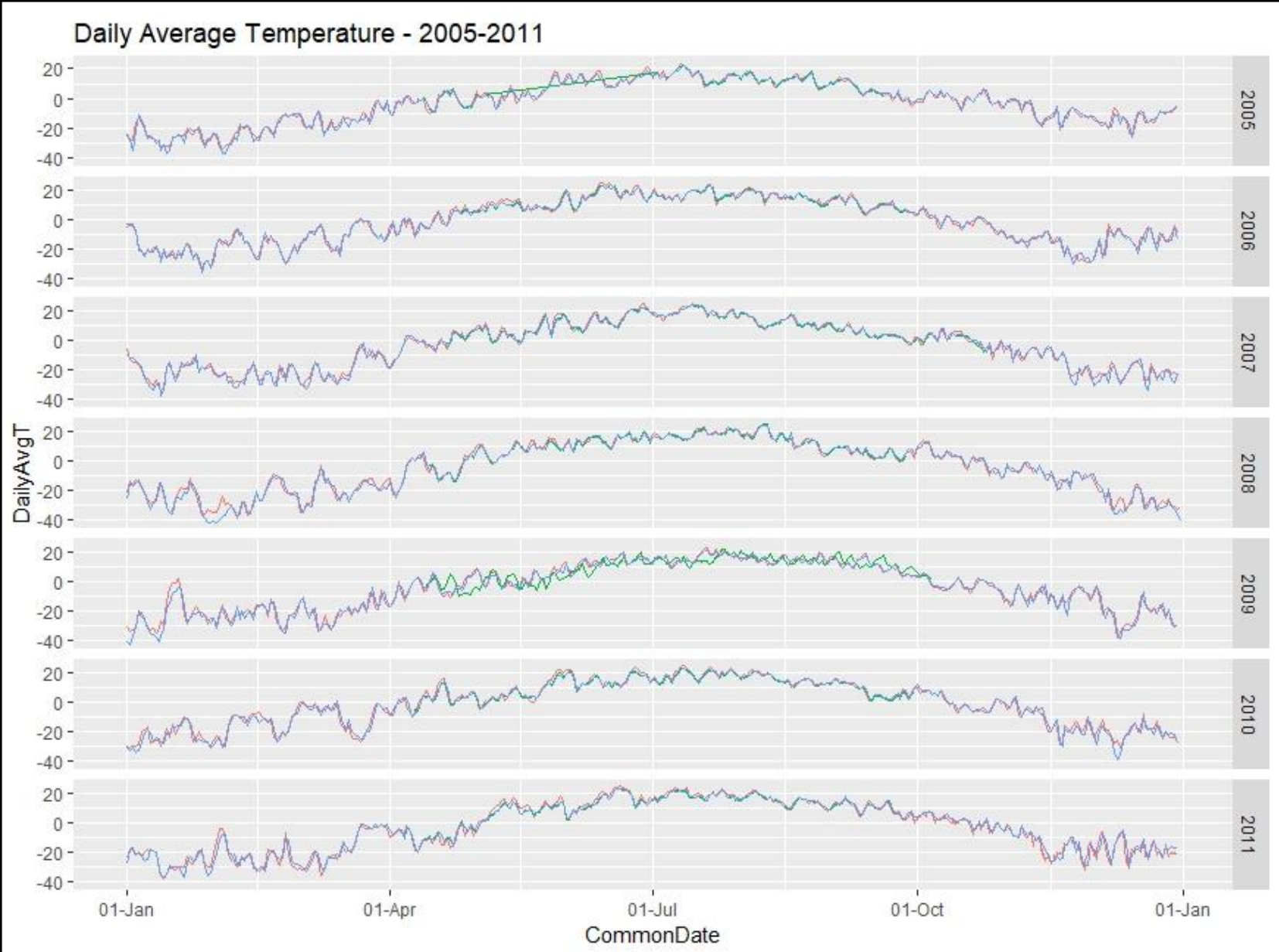

Air Pressure - 2016
102000
100000
98000
96000
DayAvgP
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
2016
Location
Combined
GEMVital
Vital

Air Temperature

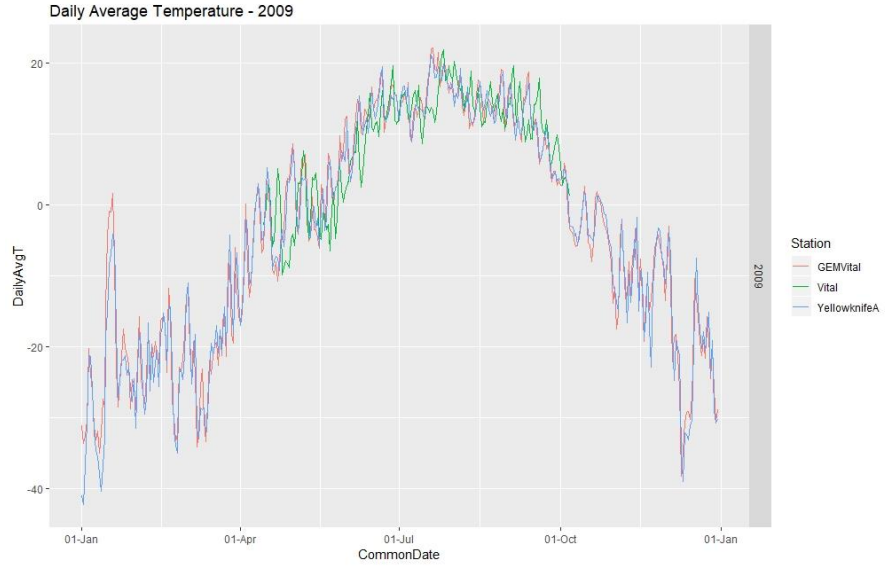
- Combining methodology:
- A dry adiabatic lapse rate of 6.5°C/km was used to scale the Vital observations at 2.8 m (incorrectly labelled as 1.1m) and 4.4m, and Yellowknife A (2 m) up to 40 m
- The shift in 2009 Vital data was also present and was shifted back by 6 days to match
- Vital at 4.4 m was used as the primary dataset, then gap-filled with Vital at 2.8 m, followed by Yellowknife then GEM data

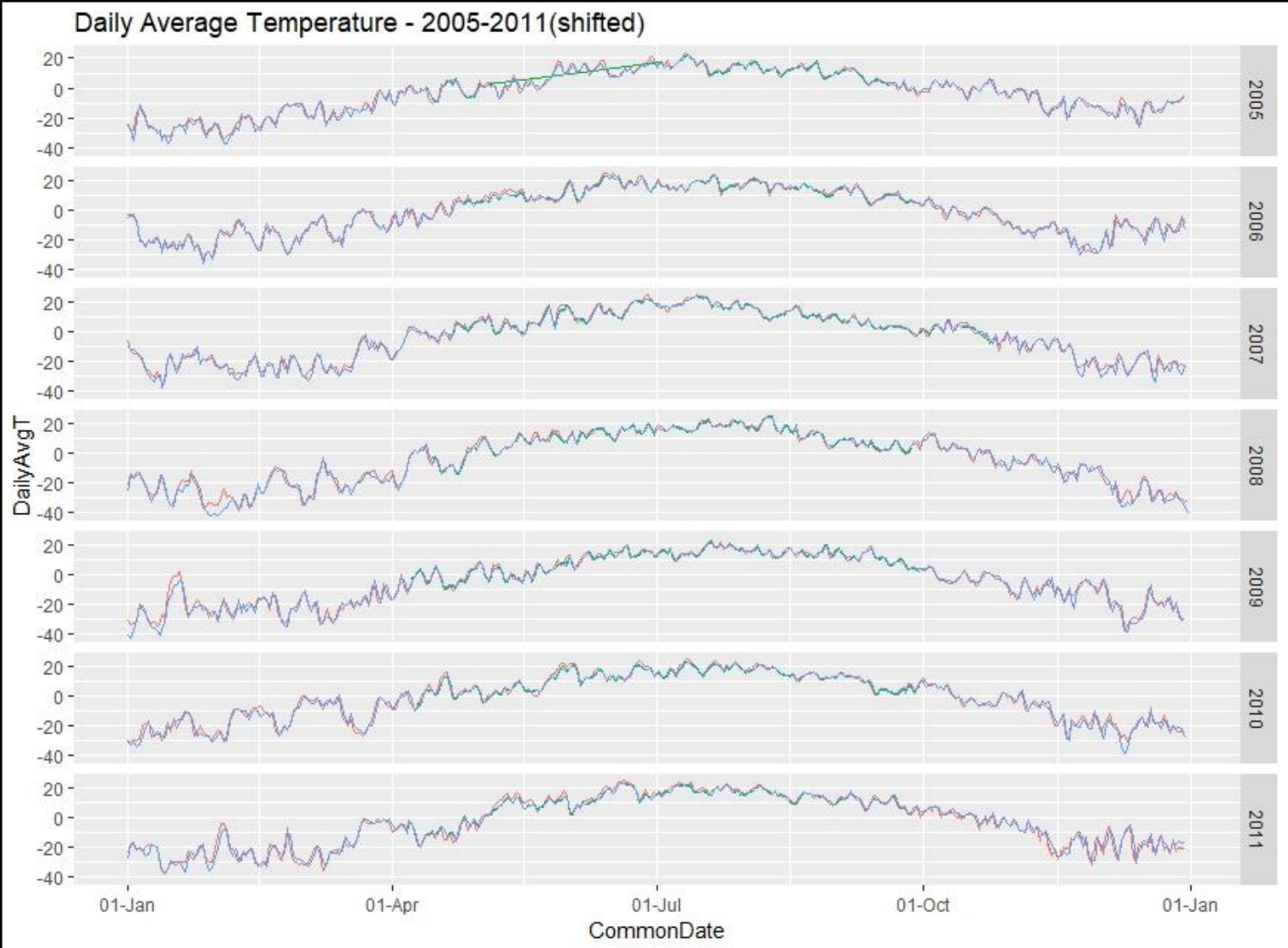
- The following slides show a comparison of the datasets for 2005-2011, including before and after the shift in Vital data


Temp at 40m 2005-2011 (Lapse Rate = 6.5 degC/km))
DailyAvgT
25
0
-25
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Vital_1.1m
Vital_4.4m
YellowknifeA

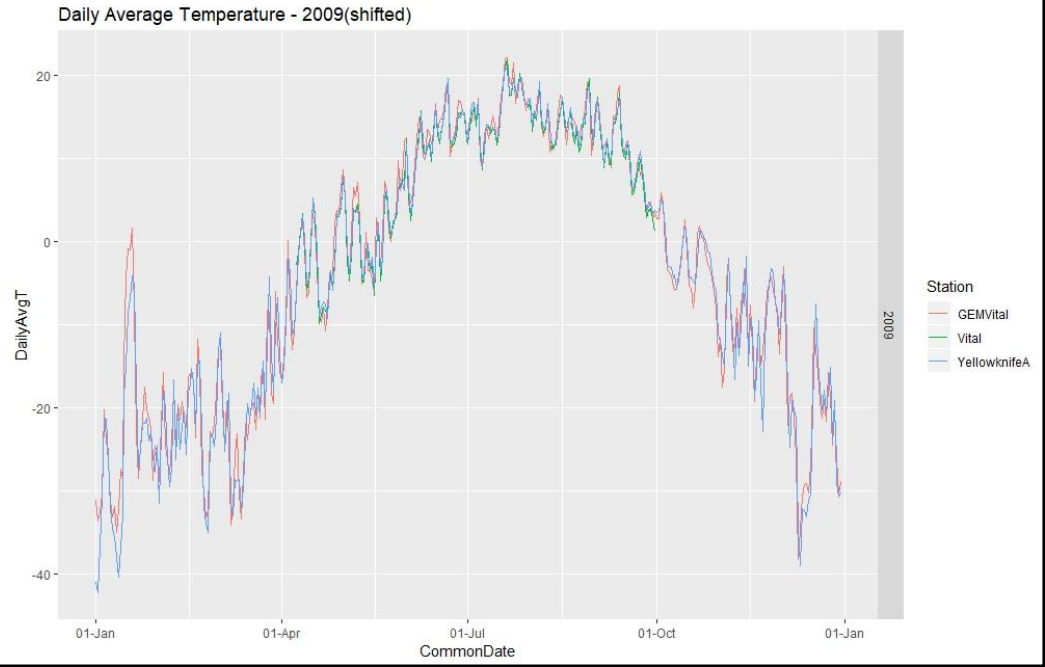

Daily Average Temperature - 2005-2011
DailyAvgT
20
0
-20
-40
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate


Station
GEMVital
Vital
YellowknifeA


Daily Average Temperature - 2009
DailyAvgT
20
0
-20
-40
2009
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Vital
YellowknifeA

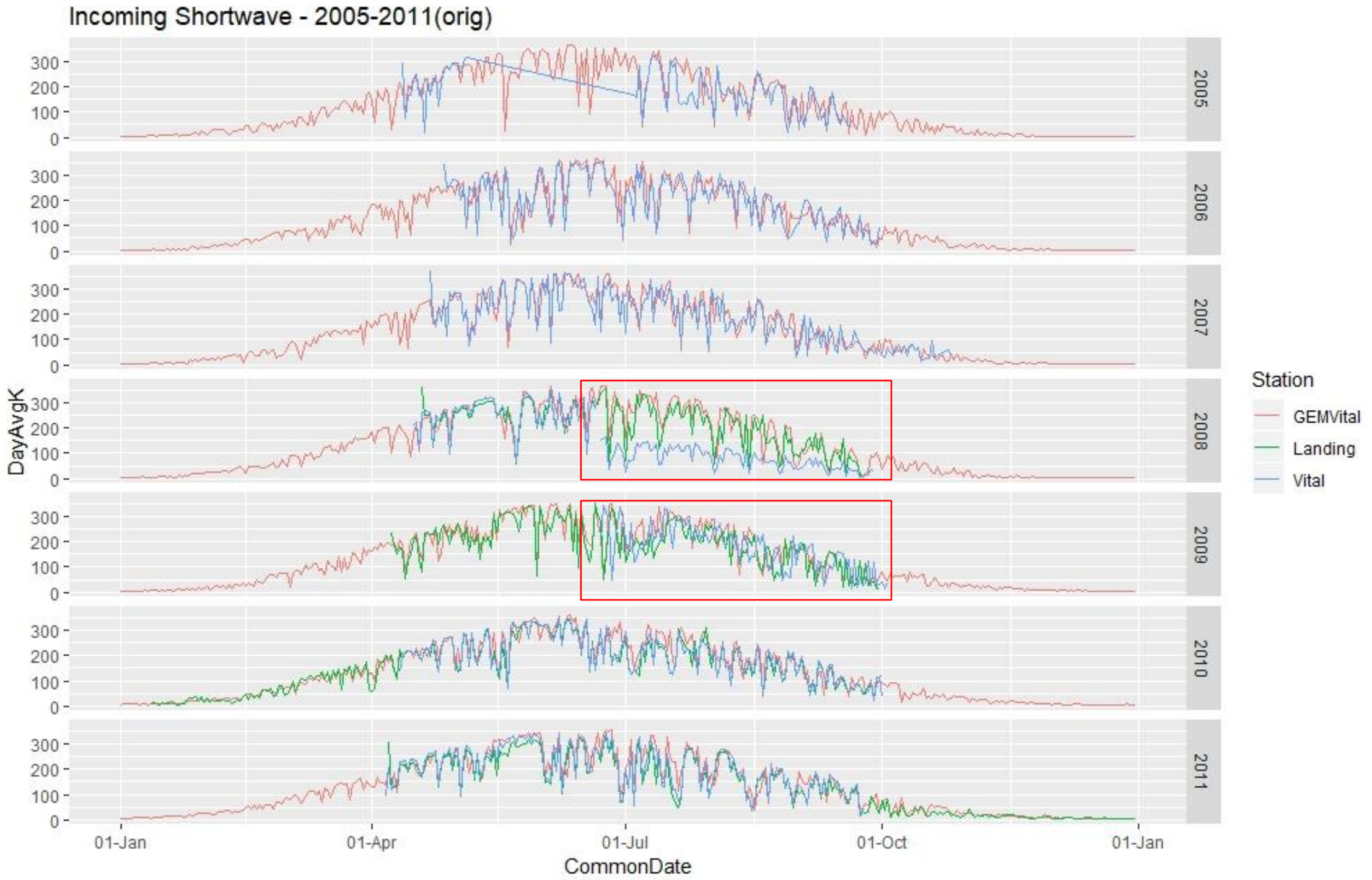

Daily Average Temperature - 2005-2011(shifted)
DailyAvgT
20
0
-20
-40
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate

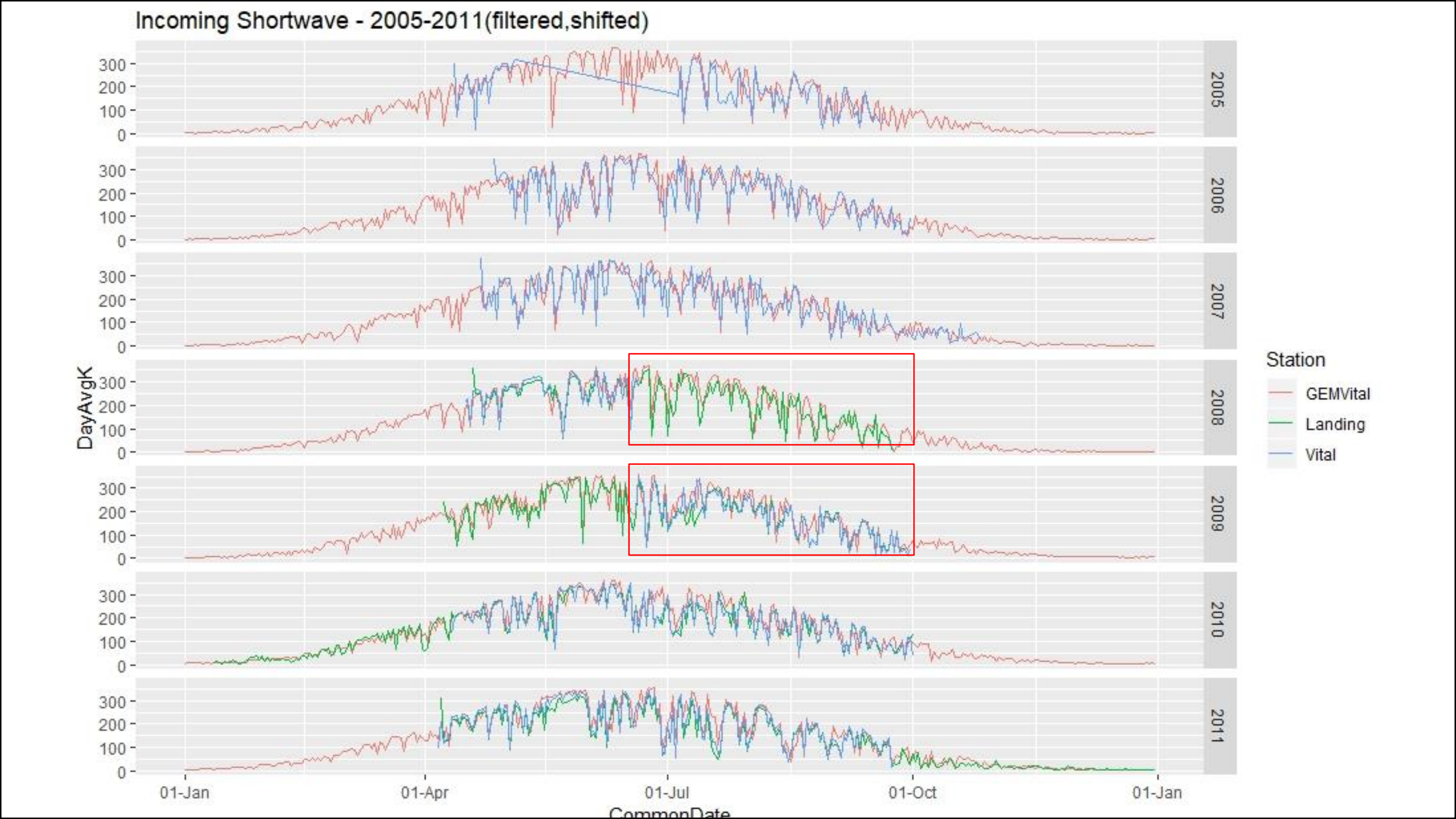

Station
GEMVital
Vital
YellowknifeA

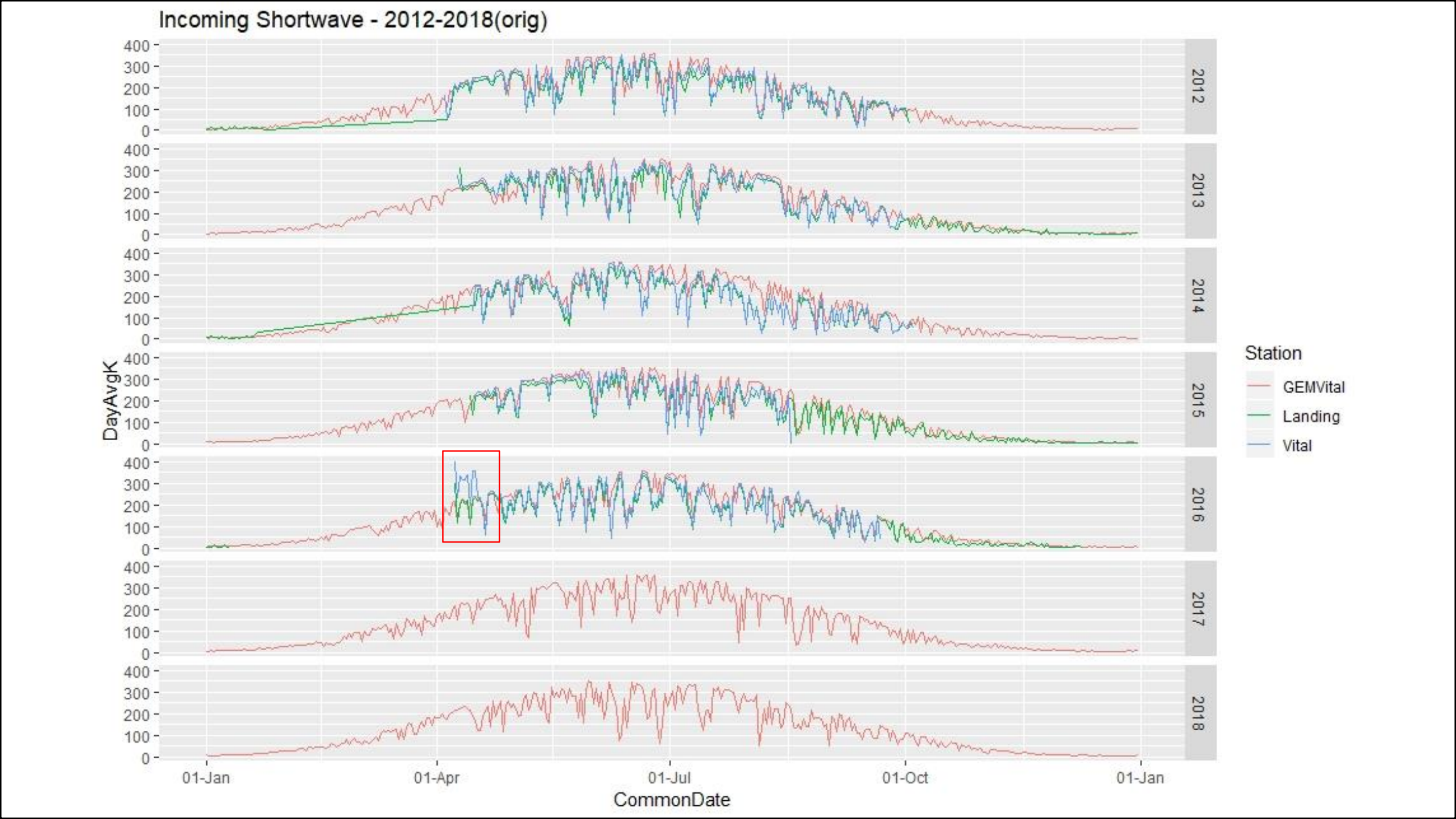

Daily Average Temperature - 2009(shifted)
DailyAvgT
20
0
-20
-40
2009
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Vital
YellowknifeA

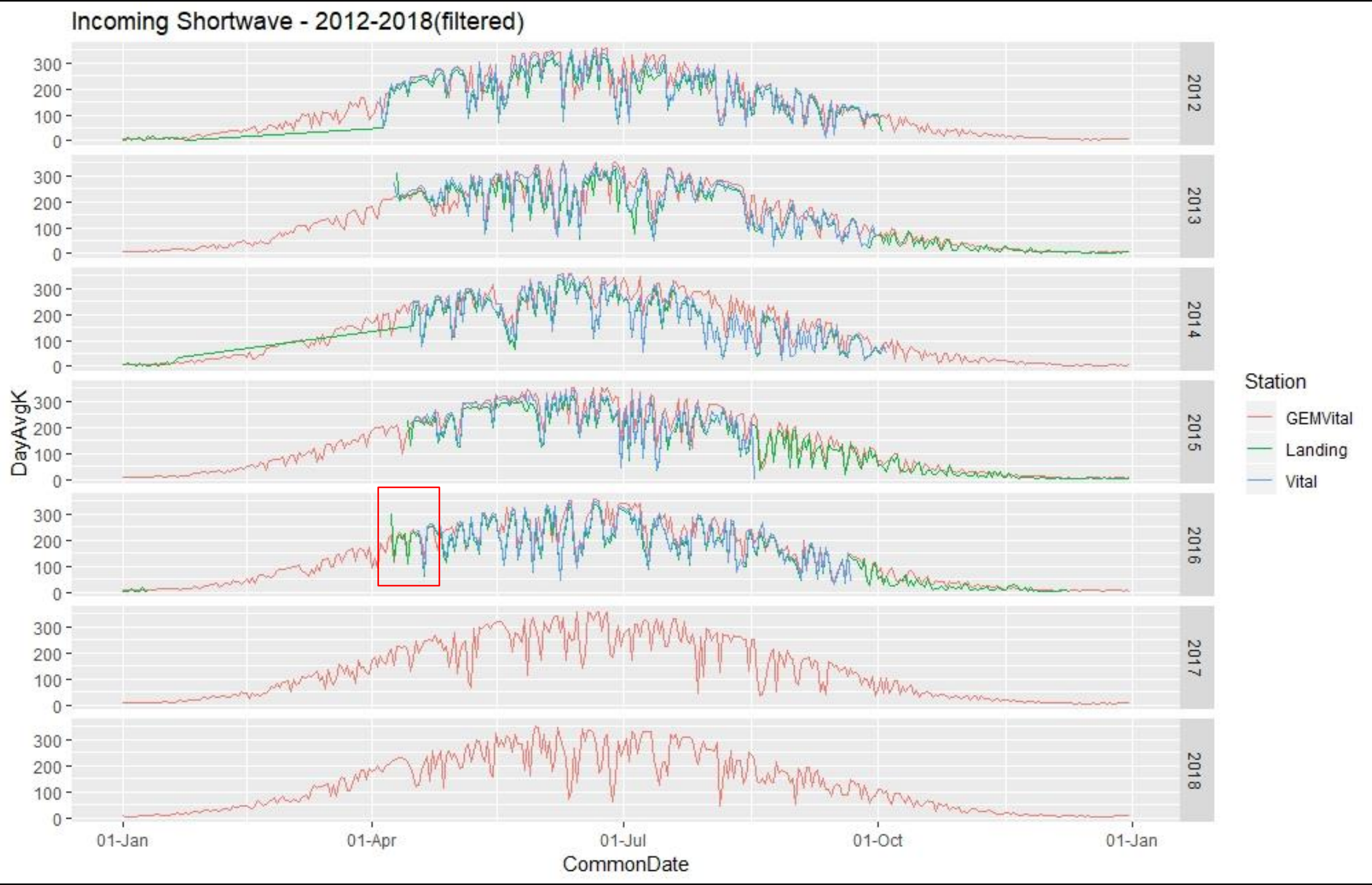
Incoming Shortwave Radiation

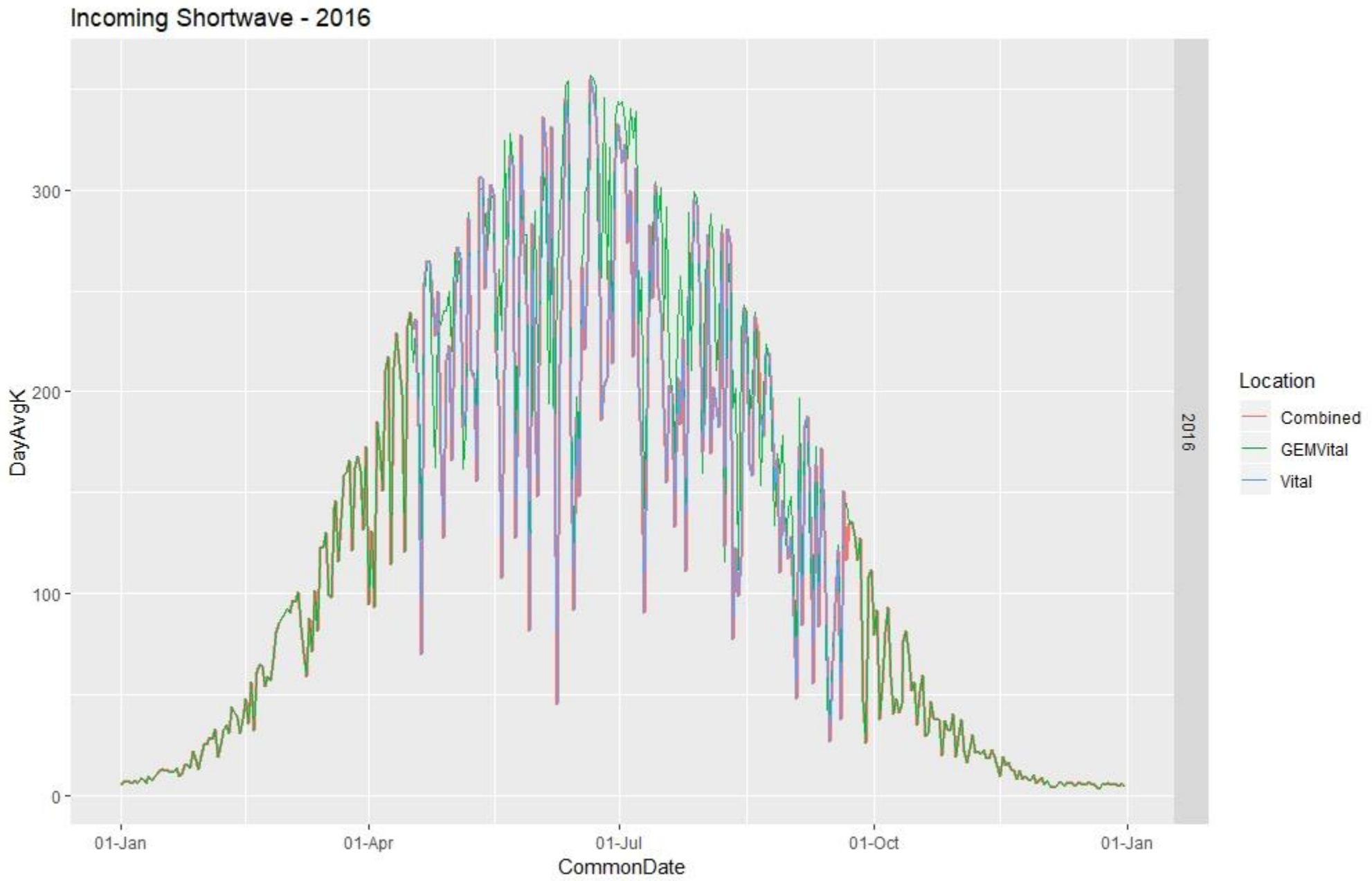
- When comparing the data, noticed a magnitude shift upward in the Vital data starting around June 21, 2008
- Noticed that in 2009, the Vital data seems to be shifted forward by 3 days (not 6 like the other variables)
- In 2016, daily average values look to be too high at the Vital station
- Combining methodology
  - Vital was used as the primary, but omitted 2008 from June 20 to the end of the year, 2016 prior to April 17, and shifted 2009 back by 3 days
  - Gap-filled with Landing data
  - Gap-filled remaining with GEM @ Vital was used to gap-fill
  - Negative values were later converted to zero in Excel prior to being used in the model


Incoming Shortwave - 2005-2011(orig)
DayAvgK
300
200
100
0
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Landing
Vital


Incoming Shortwave - 2005-2011(filtered,shifted)
DayAvgK
300
200
100
0
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Landing
Vital


Incoming Shortwave - 2012-2018(orig)
DayAvgK
400
300
200
100
0
2012
2013
2014
2015
2016
2017
2018
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Landing
Vital

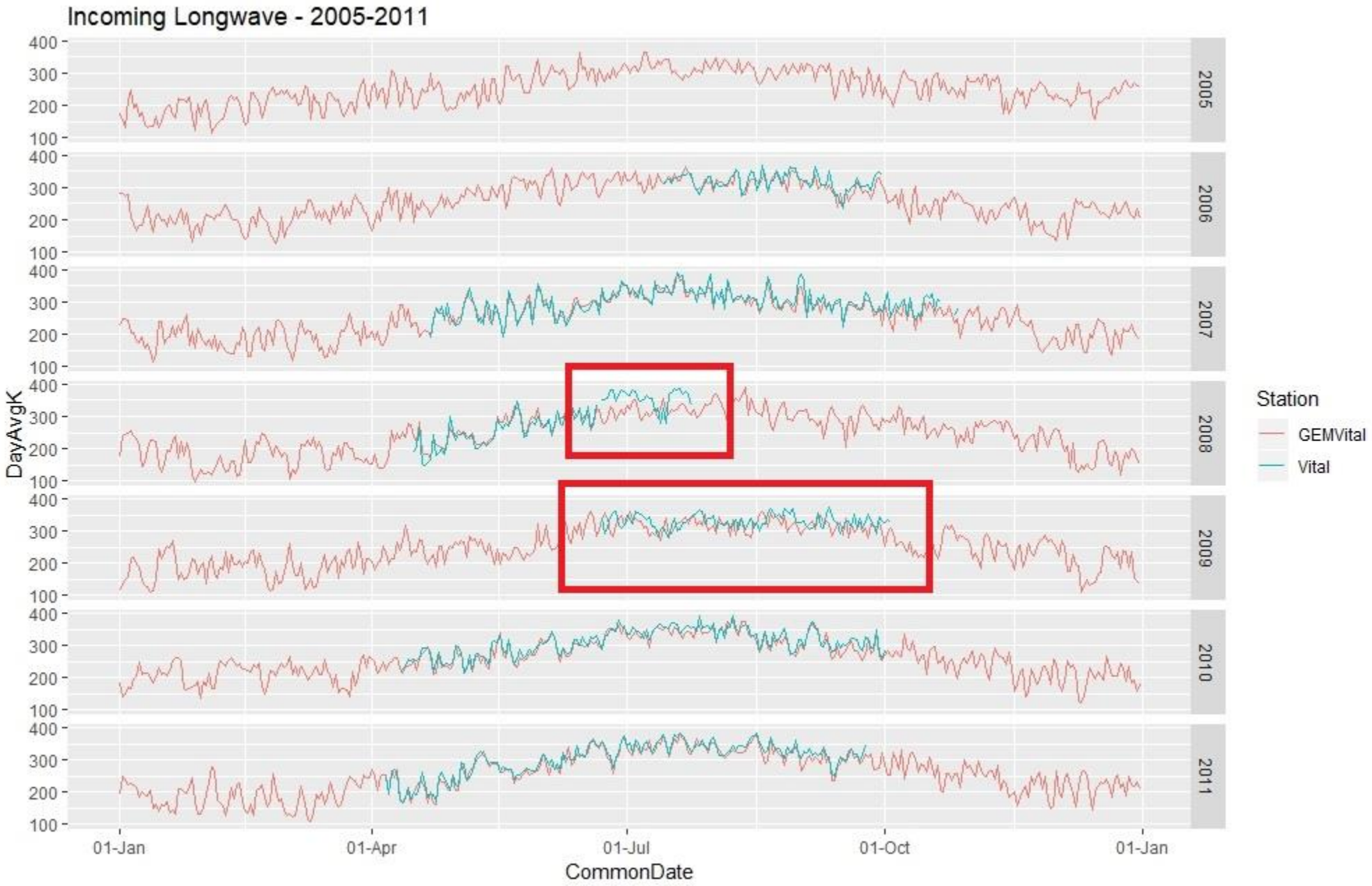

Incoming Shortwave - 2012-2018(filtered)
DayAvgK
300
200
100
0
2012
2013
2014
2015
2016
2017
2018
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Landing
Vital

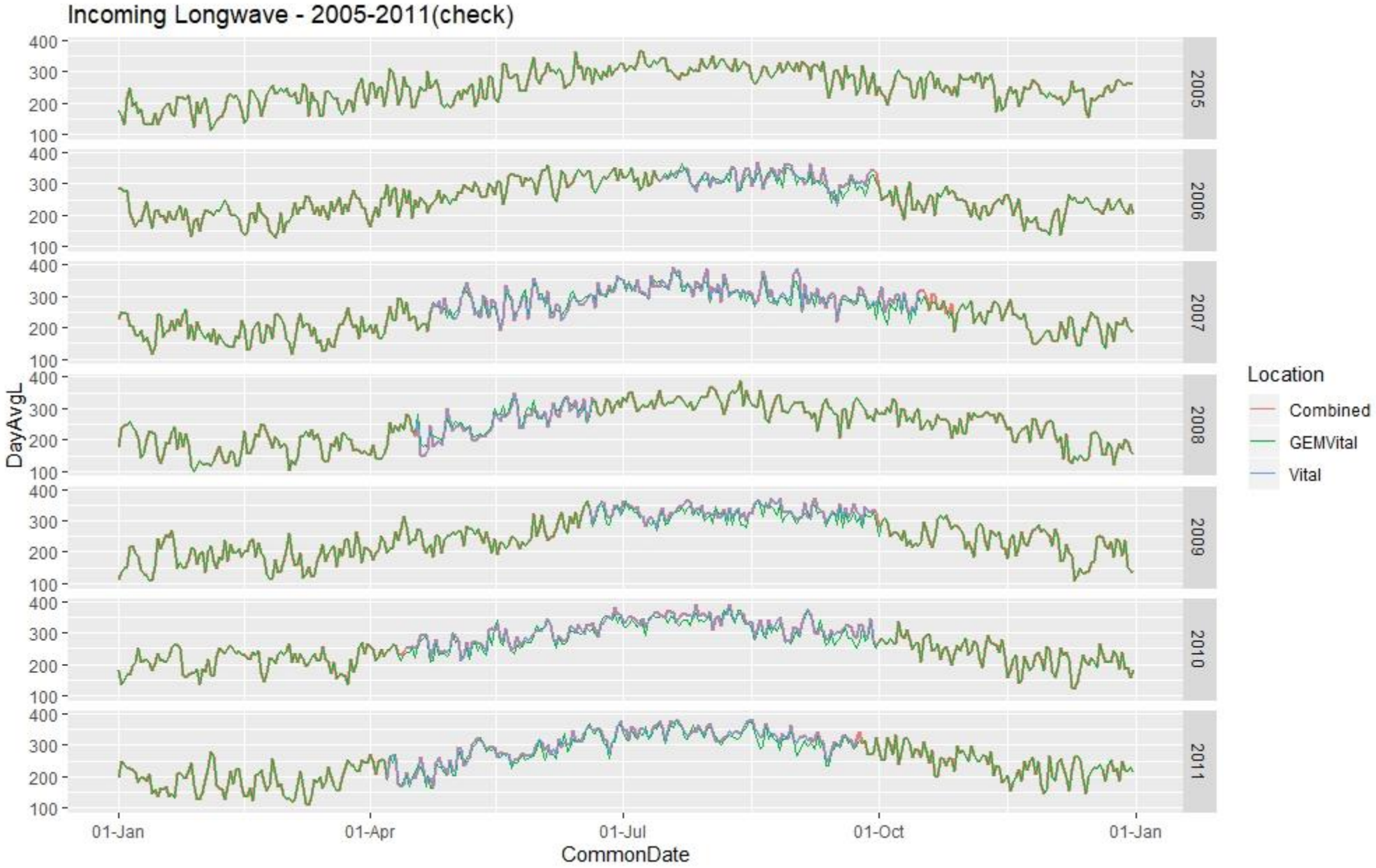

Incoming Shortwave - 2016
DayAvgK
300
200
100
0
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
2016
Location
Combined
GEMVital
Vital

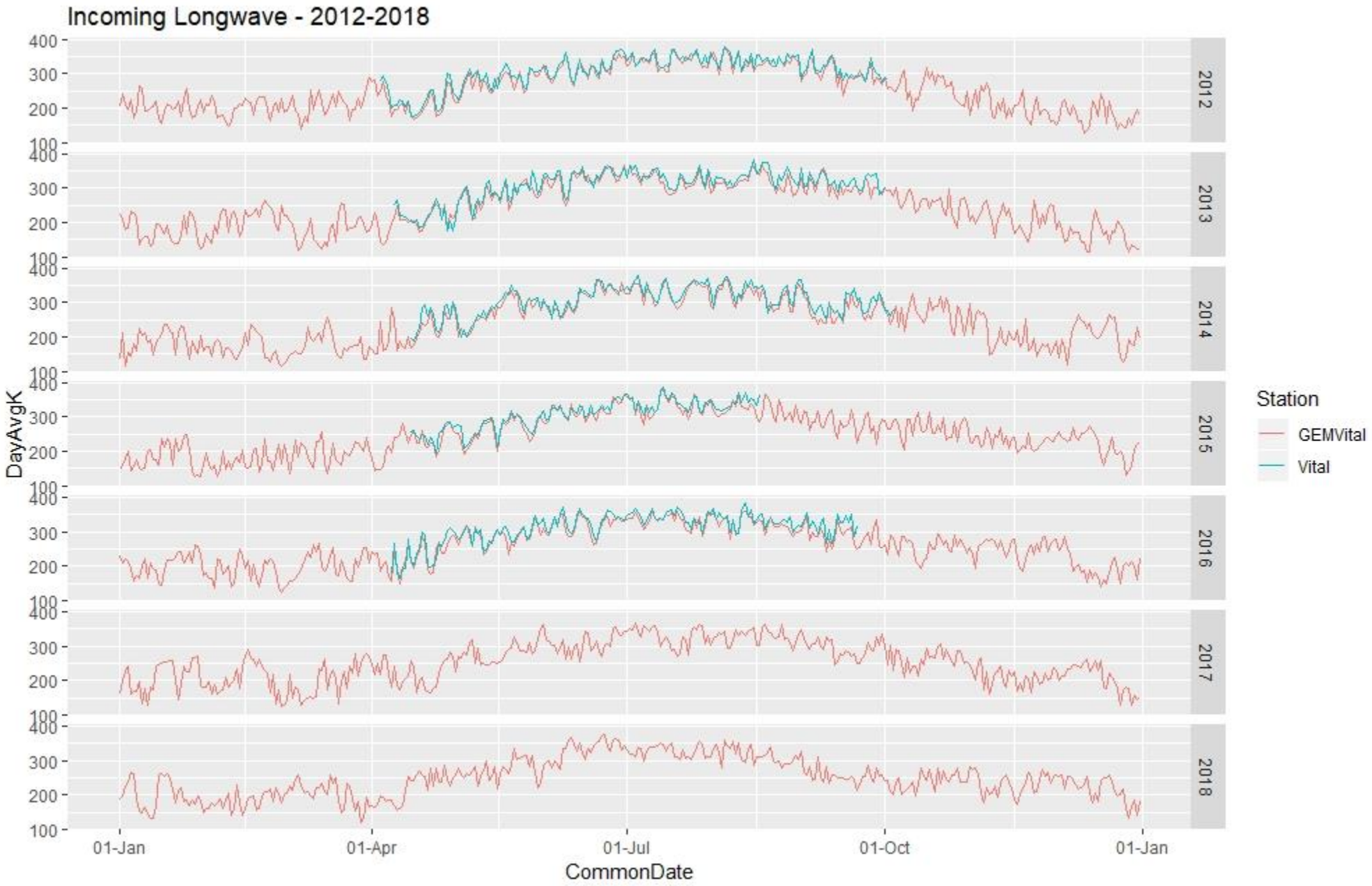
Incoming Longwave Radiation

- Compared GEM and Vital data
- *In 2005, there were minimal Vital observations*
- *In 2008, the June and July data was shifted upward, and a fair number of large negative values in July*
- *The 2009 Vital data appeared to be shifted forward by 3 days*

- Combining Methodology:
- Used Vital as primary data but filtered out June 20, 2008 onward and shifted 2009 back by 3 days
- Gap-filled with GEM data

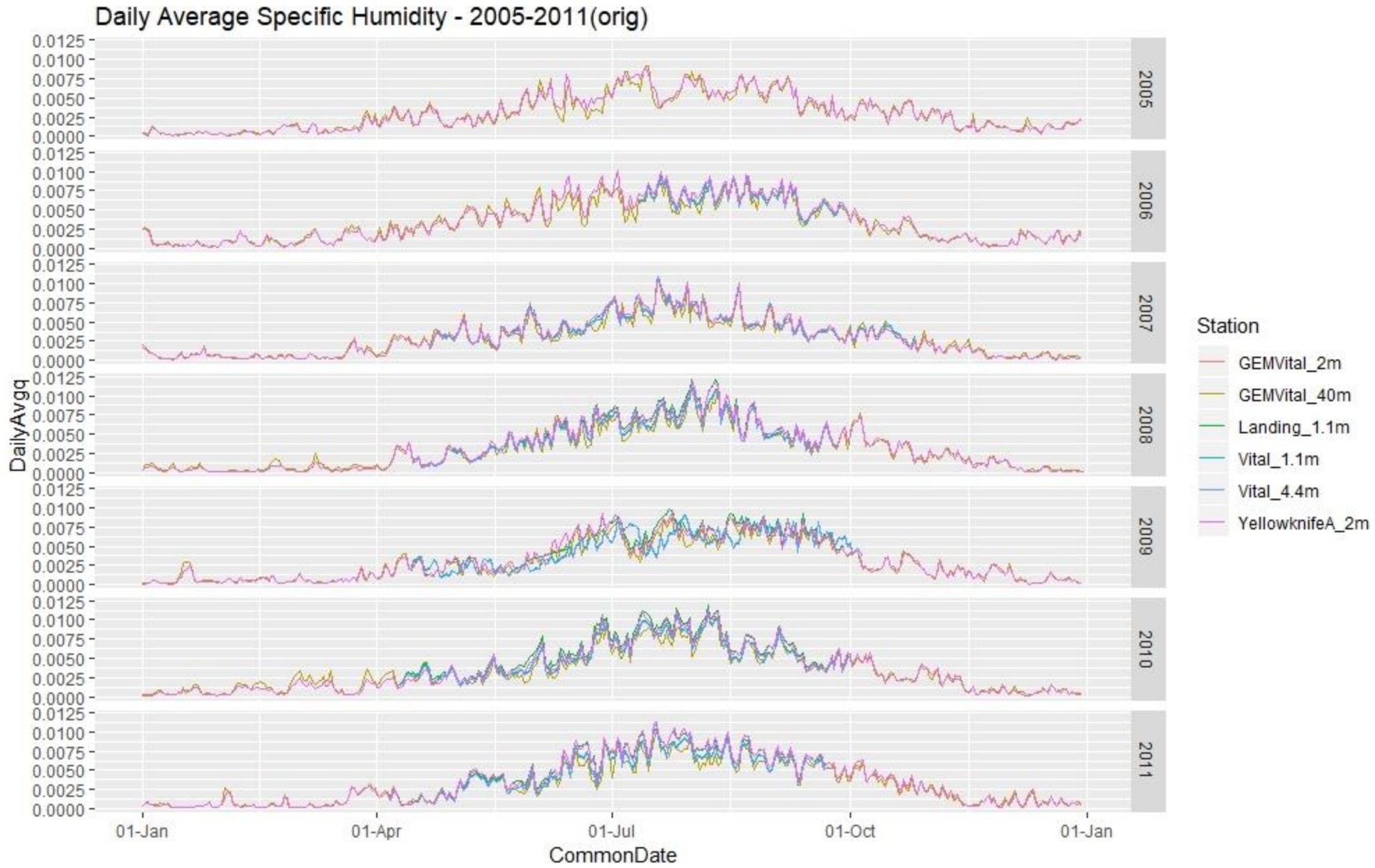

Incoming Longwave - 2005-2011
DayAvgK
400
300
200
100
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Vital

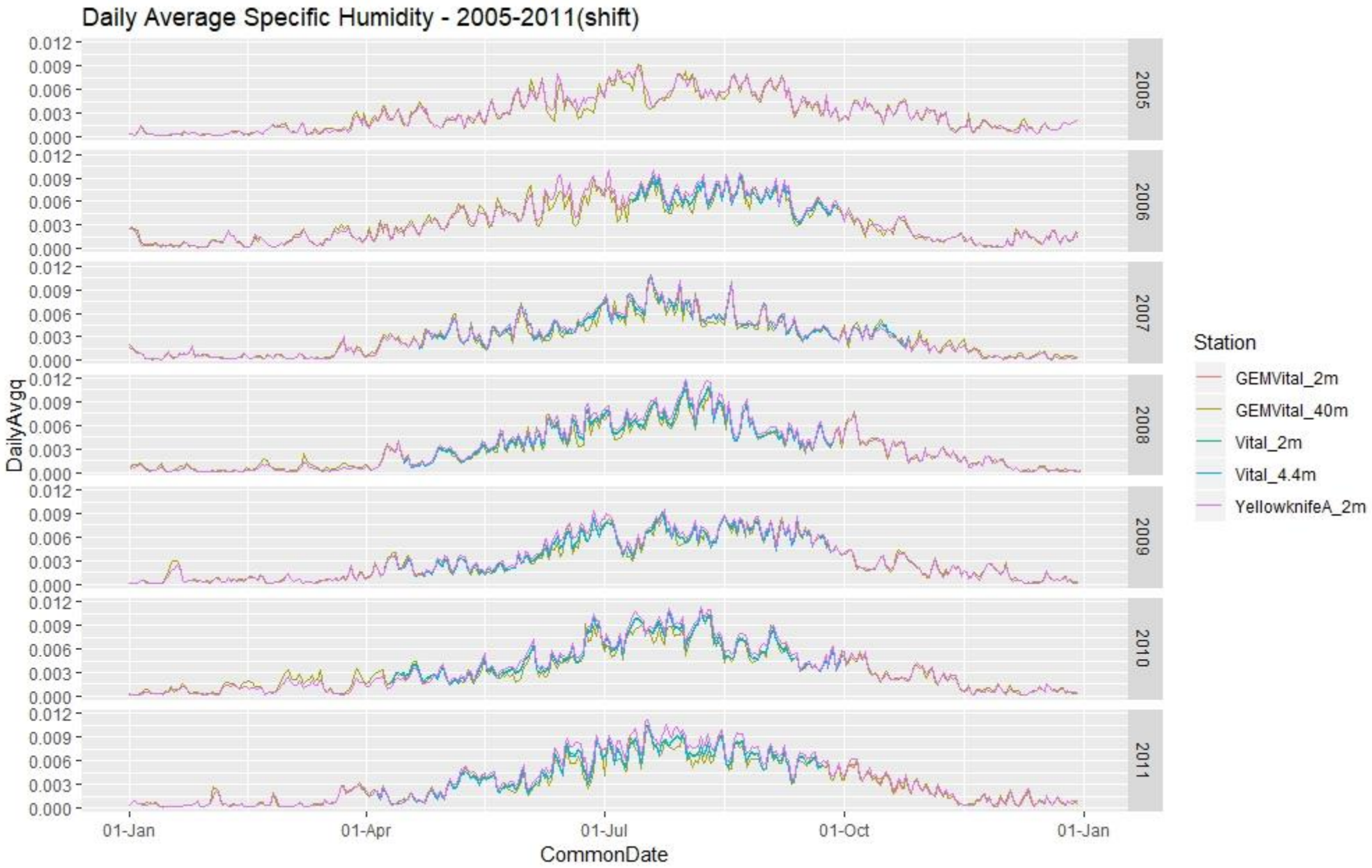

Incoming Longwave - 2005-2011(check)
DayAvgL
400
300
200
100
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Location
Combined
GEMVital
Vital

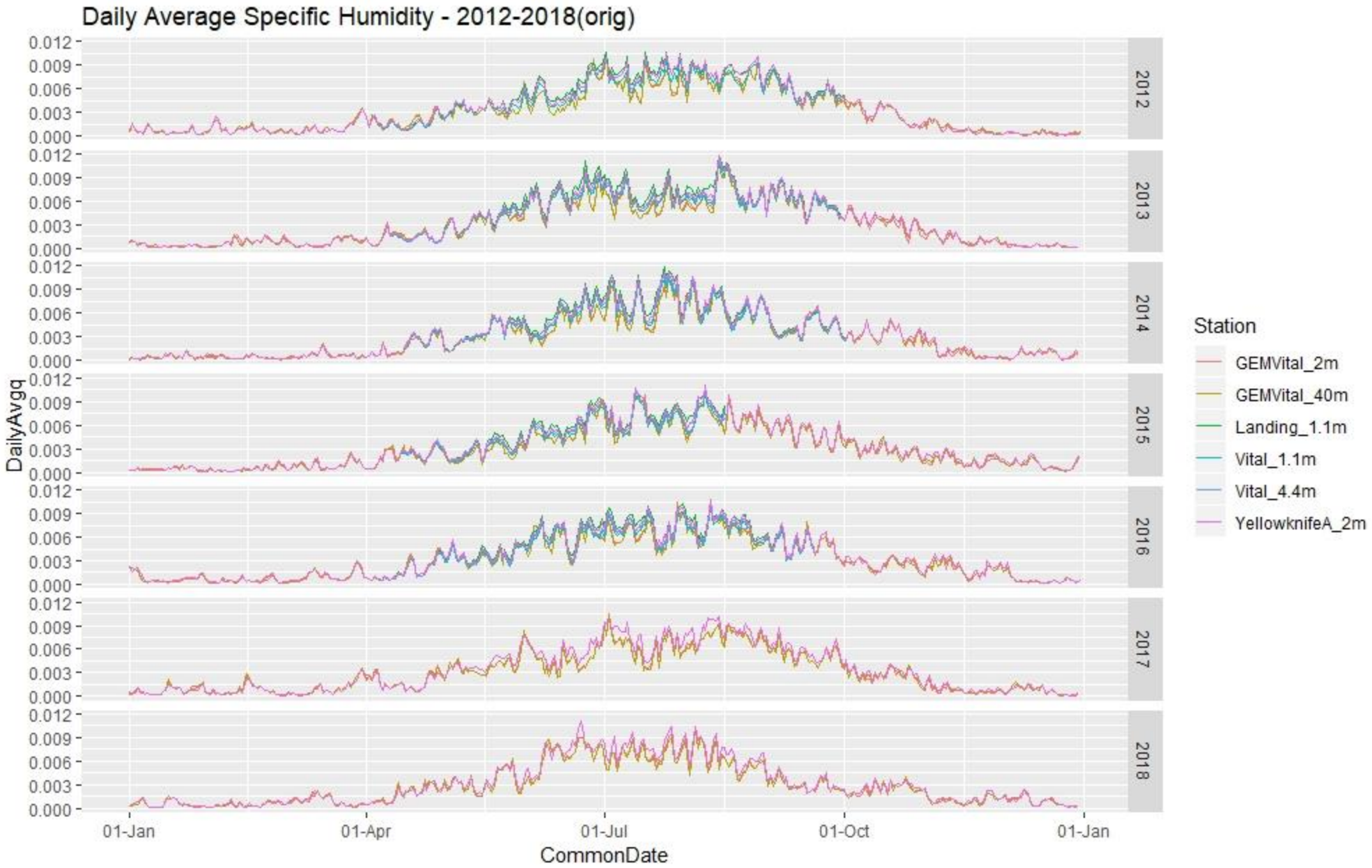

Incoming Longwave - 2012-2018
DayAvgK
400
300
200
100
2012
2013
2014
2015
2016
2017
2018
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital
Vital

Humidity

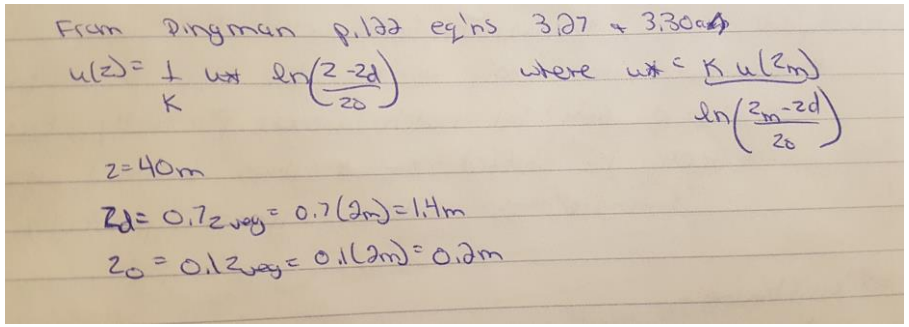
- During the summer months, GEM @ 2m ≅ GEM @ 40 m < Vital (both 2.8 m and 4.4 m), < Yellowknife < Landing
- *Since the Landing tower is at a lake, humidity is expected to be higher*
- In the winter, Yellowknife q is approximately equal to the GEM data
- Tried scaling Vital and Yellowknife summer observations up to 40 m by using the T@40m instead of T near ground; didn't make much of a difference
- Combining Methodology:
- Used the observed values from Vital @ 4.4 m as the primary (knowing that in the summer, the values are likely biased low.
- Gap-filled with GEM (@40m) data


Daily Average Specific Humidity - 2005-2011(orig)
DailyAvgq
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital_2m
GEMVital_40m
Landing_1.1m
Vital_1.1m
Vital_4.4m
YellowknifeA_2m


Daily Average Specific Humidity - 2005-2011(shift)
DailyAvgq
0.012
0.009
0.006
0.003
0.000
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital_2m
GEMVital_40m
Vital_2m
Vital_4.4m
YellowknifeA_2m

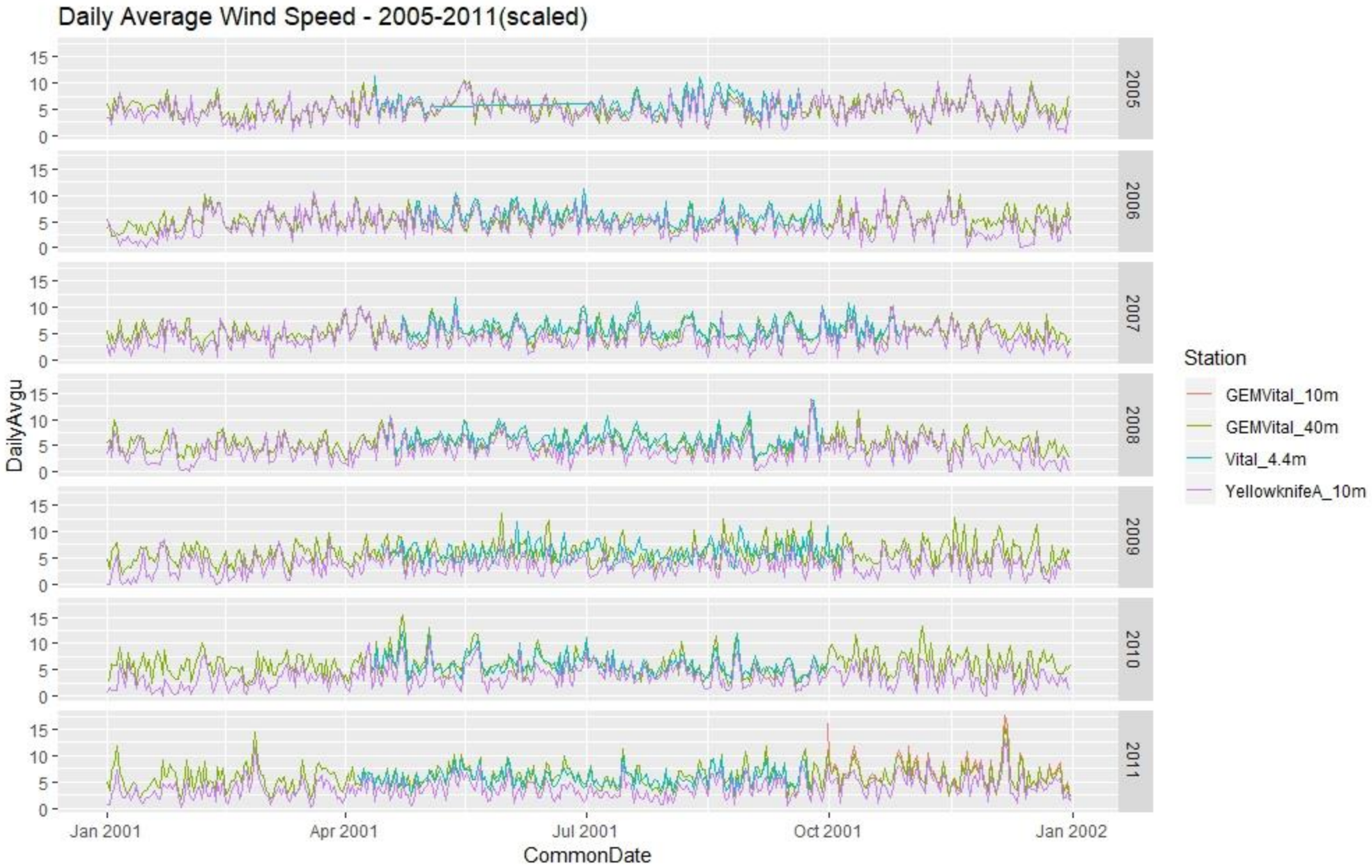

Daily Average Specific Humidity - 2012-2018(orig)
DailyAvgq
0.012
0.009
0.006
0.003
0.000
2012
2013
2014
2015
2016
2017
2018
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital_2m
GEMVital_40m
Landing_1.1m
Vital_1.1m
Vital_4.4m
YellowknifeA_2m

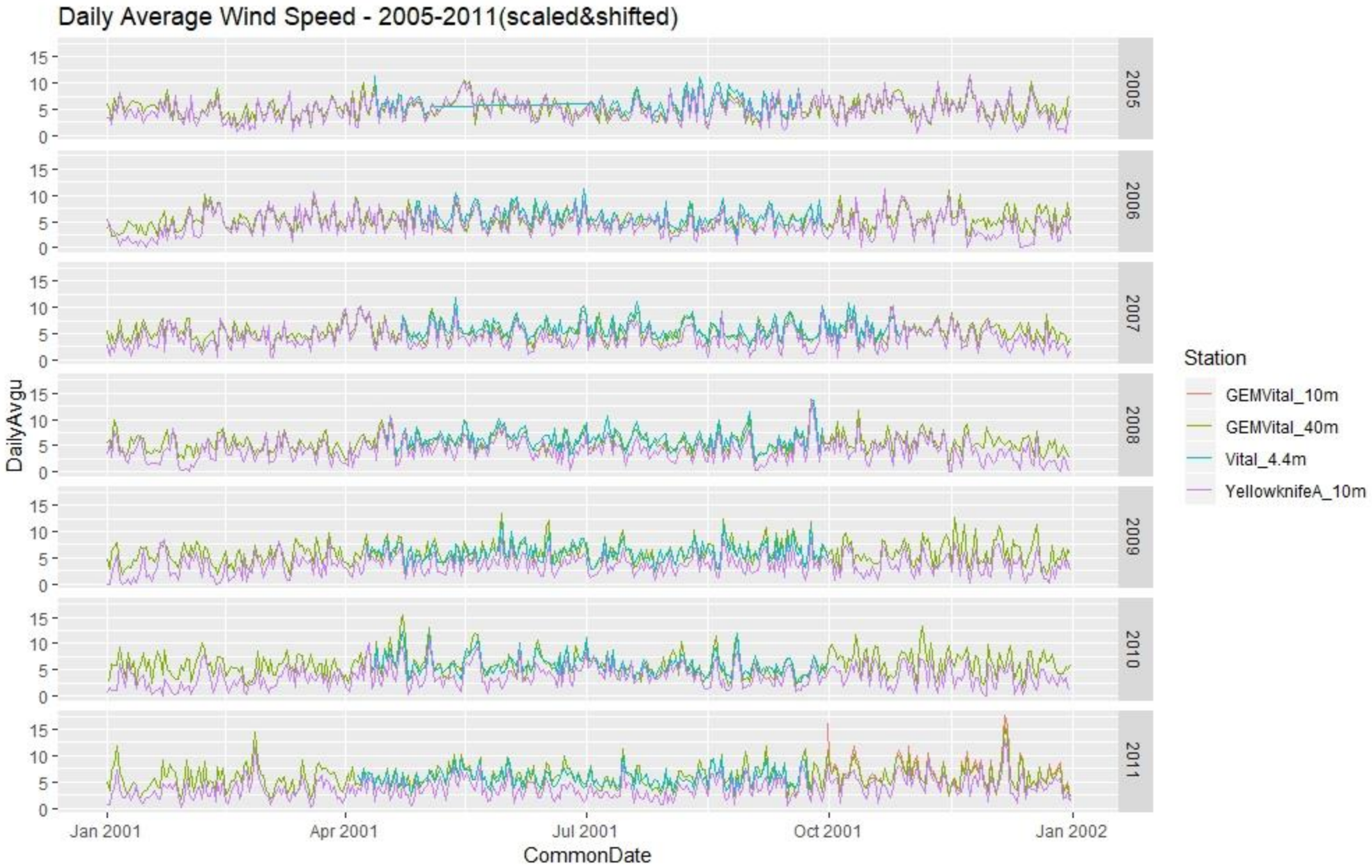
Wind Speed

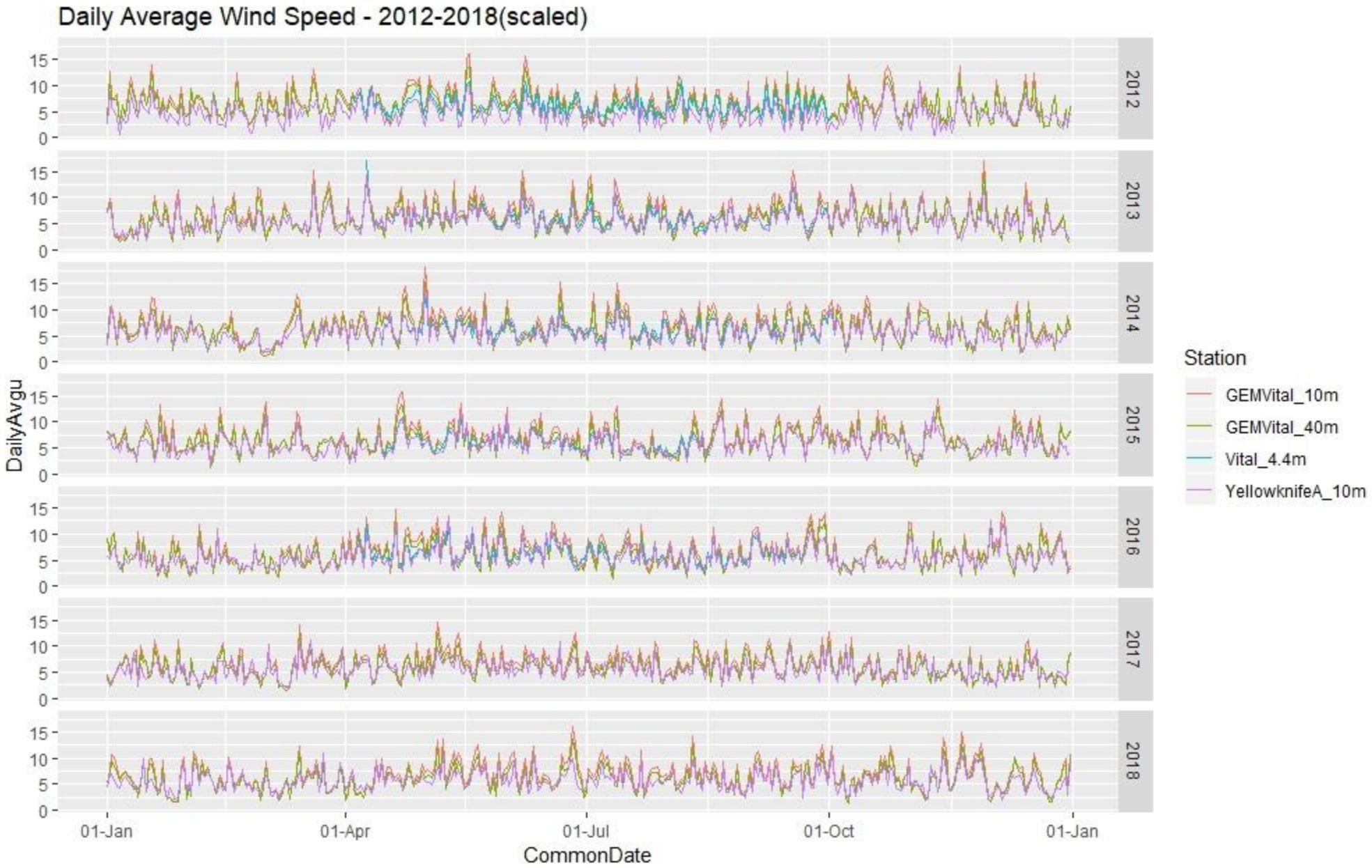


- Scaled wind speed up to 40 m using equations 3.27 and 3.30 a and b
- Observations of Vital match reasonably well with GEM @ 40m, and Yellowknife seems to be lower. Could be due to rain interference or lower sensitivity instrument, but also there were many zero values in the hourly data. Therefore, Yellowknife not used

- Combining Methodology
- Used scaled Vital with 2009 shifted back 6 days as the primary
- Used GEM @ 40 m (Vital) to gap-fill


Daily Average Wind Speed - 2005-2011(scaled)
DailyAvgu
15
10
5
0
2005
2006
2007
2008
2009
2010
2011
Jan 2001
Apr 2001
Jul 2001
Oct 2001
Jan 2002
CommonDate
Station
GEMVital_10m
GEMVital_40m
Vital_4.4m
YellowknifeA_10m

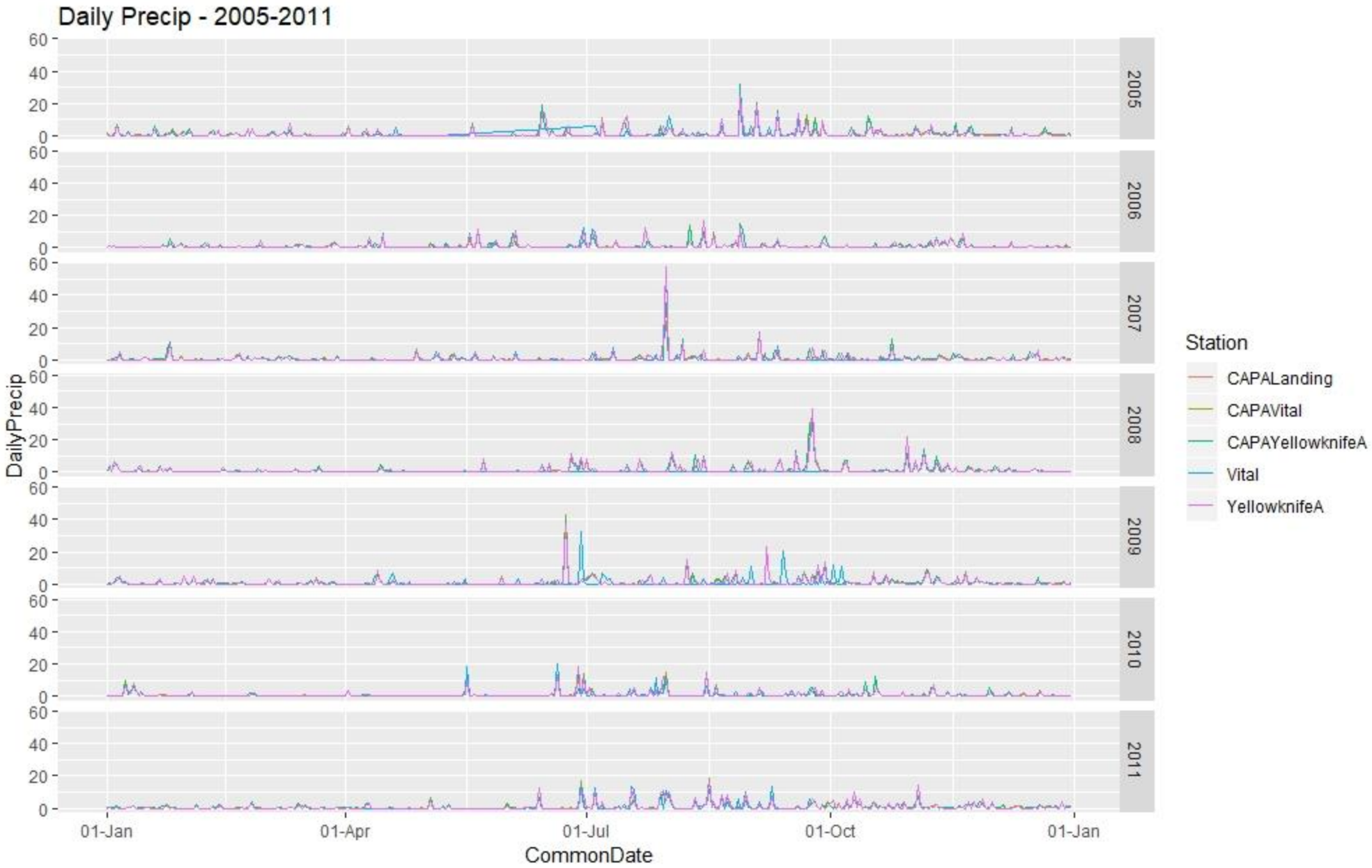

Daily Average Wind Speed - 2005-2011(scaled&shifted)
DailyAvgu
CommonDate
Jan 2001
Apr 2001
Jul 2001
Oct 2001
Jan 2002
2005
2006
2007
2008
2009
2010
2011
Station
GEMVital_10m
GEMVital_40m
Vital_4.4m
YellowknifeA_10m

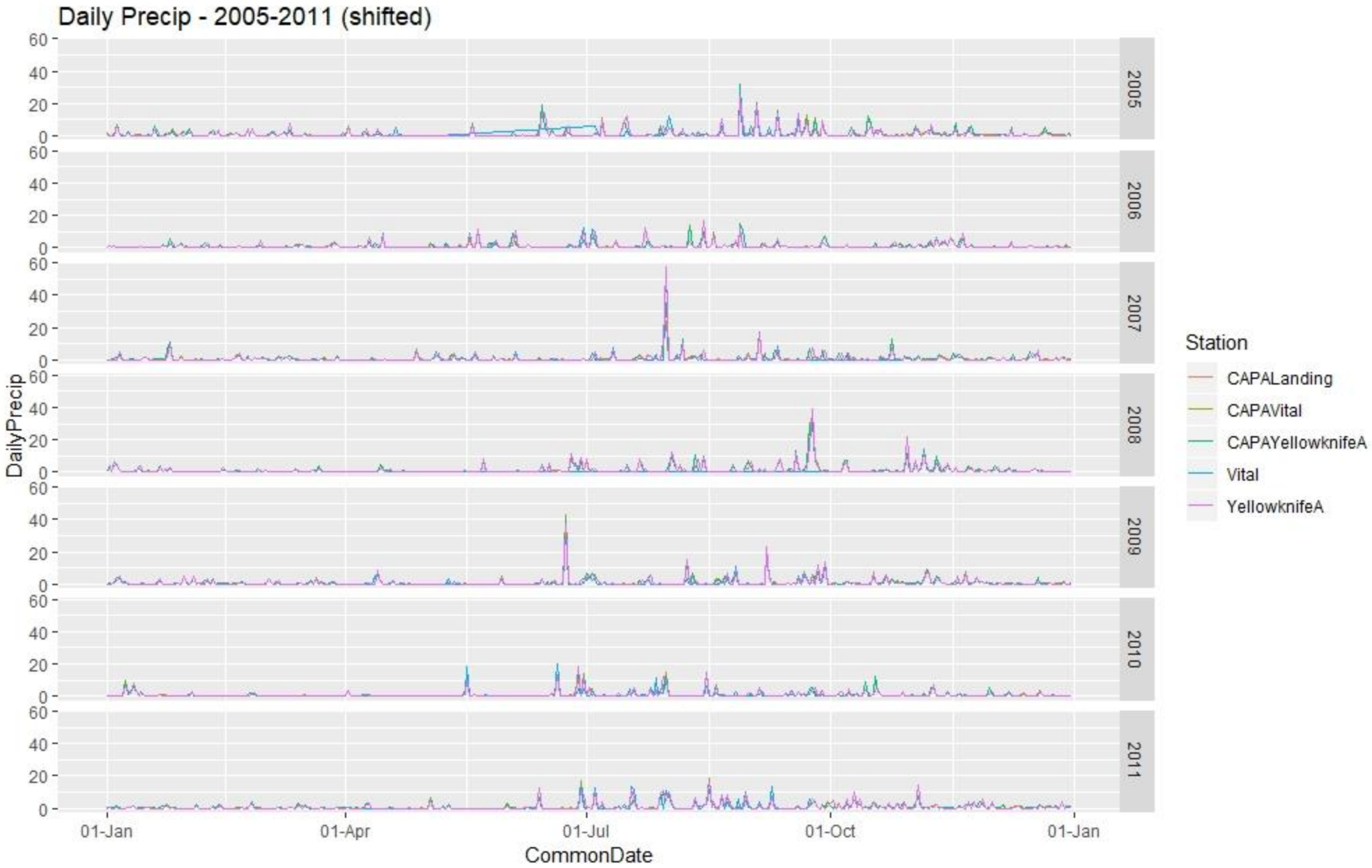

Daily Average Wind Speed - 2012-2018(scaled)
DailyAvgu
15
10
5
0
2012
2013
2014
2015
2016
2017
2018
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
GEMVital_10m
GEMVital_40m
Vital_4.4m
YellowknifeA_10m

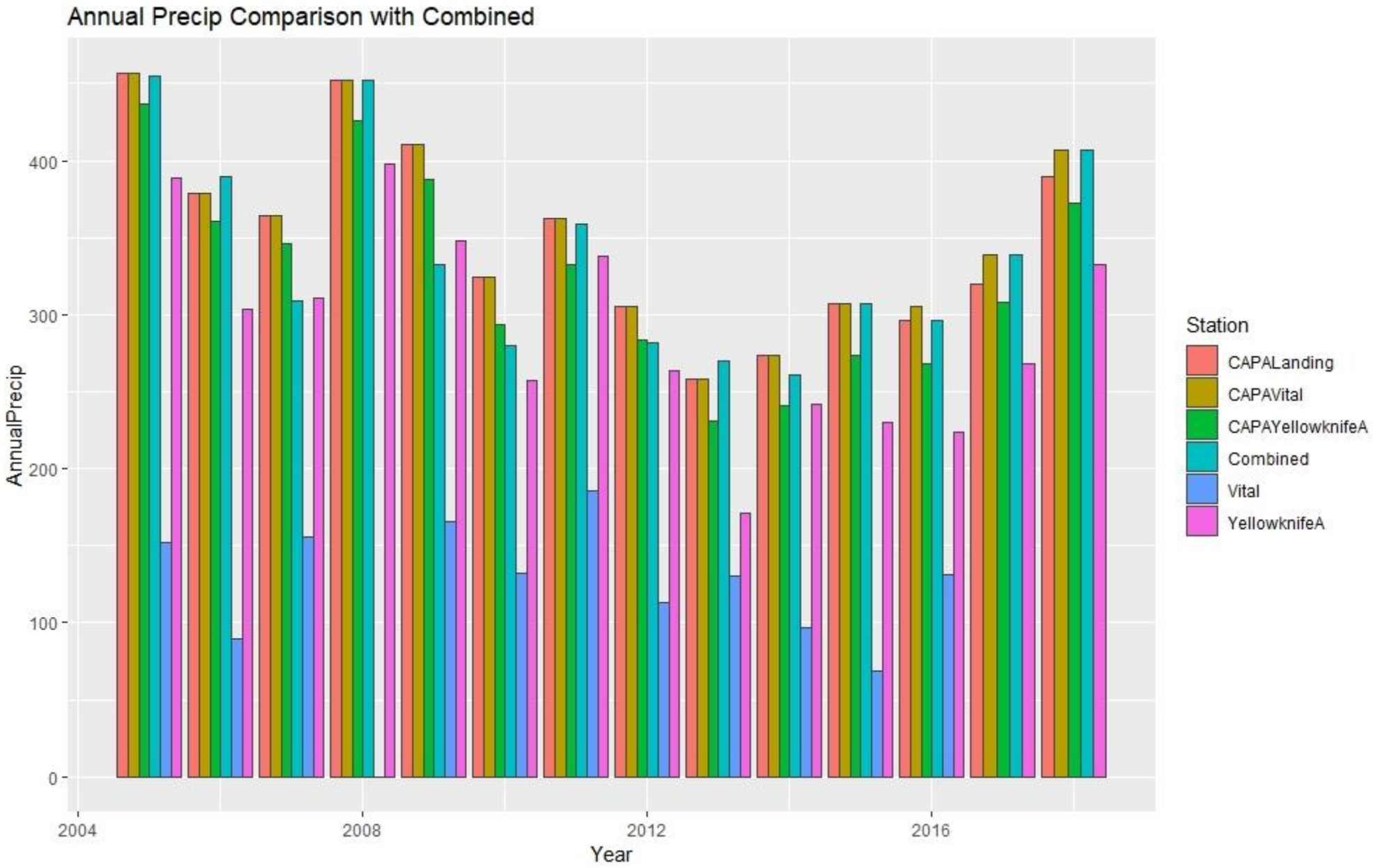
Precipitation

- Combining methodology:
- Used Vital as primary (shifted 2009 back by 6 days again)
- Gap-filled with CaPA @ the Vital location

- Note that looking at the annual cumulative bar graph (3 slides ahead), sometimes the combined precip is greater than CaPA, and sometimes less; this is due to the differences between the observed Vital data and the CaPA dataset


Daily Precip - 2005-2011
DailyPrecip
60
40
20
0
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
CAPALanding
CAPAVital
CAPAYellowknifeA
Vital
YellowknifeA


Daily Precip - 2005-2011 (shifted)
DailyPrecip
60
40
20
0
2005
2006
2007
2008
2009
2010
2011
01-Jan
01-Apr
01-Jul
01-Oct
01-Jan
CommonDate
Station
CAPALanding
CAPAVital
CAPAYellowknifeA
Vital
YellowknifeA


Annual Precip Comparison with Combined
AnnualPrecip
0
100
200
300
400
2004
2008
2012
2016
Year
Station
CAPALanding
CAPAVital
CAPAYellowknifeA
Combined
Vital
YellowknifeA