Anonymous Referee #2

Verma et al. discuss observations of sugars found in the aerosol-phase collected for 1 month in a forested site north of Beijing. The aerosol were collected onto filters and analyzed for the sugars. The authors then describe the pattern of the various sugars throughout the study period and speculate the sources via differences in day- and night-time mass concentration, wind patterns, and PMF. They discuss 5 potential sources, including biomass burning, vegetation, microbial and soil dust, pollen, and fungal.

The results presented here may be of interest to the audience and its scope generally fits within a measurement report. However, along with the concerns discussed by Reviewer #1, the authors nee to address the comments and concerns presented below prior to consideration for publication in ACP.

Major: (1) Statistics: Throughout the text, the authors state that the results are statistically different. However, conducting the t-test with the mean and standard deviation values listed in the table, majority of the observations are statistically similar at the 95% confidence interval and not statistically different. The lack of statistical difference in the observations makes many of the statements the authors use to differentiate day/night and thus sources less substantiated. Further, the correlations shown by the authors in Fig. 5 have very low R values (as stated throughout the text) and suggest that many of the correlations only explain 50% or less of the mass concentration.

Response: We found a positive correlation between sucrose and ambient temperature (r = 0.52), sucrose and solar radiation (r = 0.55), mannitol and RH (r = 0.57), trehalose and arabitol (r=0.58), trehalose and mannitol (r=0.58), with significance levels <0.05. Therefore we mentioned those positive linear correlation values in the text and discussed accordingly.

(2) Contextualization of results: I agree with Reviewer #1 that the listing of numbers from prior results makes it difficult to understand the conclusions in each section and the whole paper. Further, as highlighted with point (1) above, the data not being statistically different makes sections 3.1.1 thru 3.1.3 very long and repetitive. Also, the listing of numbers from prior studies to ascribe sources for the sugars makes the source apportionment very uncertain. This is also relevant for Section 3.5, where they found no differences in the levoglusoan/mannosan ratio and spend 1.5 pages on this. If this is important, it could be summarized in one paragraph at most.

Response: We deleted repeated sentences, several comparisons with previous studies and significantly modified section 3.1.1. to 3.1.3. We also shorten section 3.5. Please see section 3.1.1 – 3.1.3 and 3.5 in the revised MS.

(3) Methods: Reviewer #1 highlighted many of the methods that should be discussed in more detail. Further, PMF needs to be described in more detail to understand how the 5 results were determined (e.g., how many solutions were there allowed to be, how did the time series look, were the results compared against and investigated against external variables, etc.). Also, agree with Reviewer #1 in how were WSOC, OC, Ca2+, etc determined.

Response: Authors thank the reviewer's valuable comments and suggestions. We make significant changes in the manuscript especially in the section 2 (Materials and methods), and section 3 (Results and discussions). Please see the revised MS.

We added information about the PMF analysis in the revised MS. Please see lines 187 – 201, 389 – 407, 418 – 429, 442 – 445, 453 – 457, 460 – 462 in the revised MS.

We added Figure S-1 and S-2 as supporting information in the revised MS.

Figure S-1. The scatter plots between observed (input data) and predicted (modeled data) concentrations show statistical parameter (coefficient of determination (r), Intercept, and Slope) with linear equitation of individual sugar compounds. (A blue 1:1 line is provided on this plot for reference (a perfect fit would line up exactly on this line), and the regression line is shown as a dotted red line).

Figure S-2. The time series plots between observed (input data) and predicted (modeled data) concentrations of individual sugar compounds. Blue and red lines are shown for observed (input data) and predicted (modeled data) concentrations, respectively.

(4) PMF: I think this is the more interesting and compelling part of the paper. I highly recommend the authors spend more time expanding on this section while reducing the discussion in the other sections. As highlighted above, there are statistical concerns, thus shortening them while increasing the discussion about PMF, which had lower statistical concern.

Response: We added more sentences in the PMF analysis section. Please see line 386 – 468 in the revised MS.

(5) Figures: The x-axis/date is very hard to read in all figures. It is unclear what the values are shown in different colors in Fig. 3.

Response: We separated Figure 3 as Figures 4a-c, 5a-d and 6a-c. We also modified x-axis in the manuscript and changes are added in the figure captions.

Minor: Please review the grammar throughout the paper, as highlighted by Reviewer #1.

Response: According to the reviewer's suggestion, whole manuscript is properly checked for the grammatical mistakes.

Fig. 4

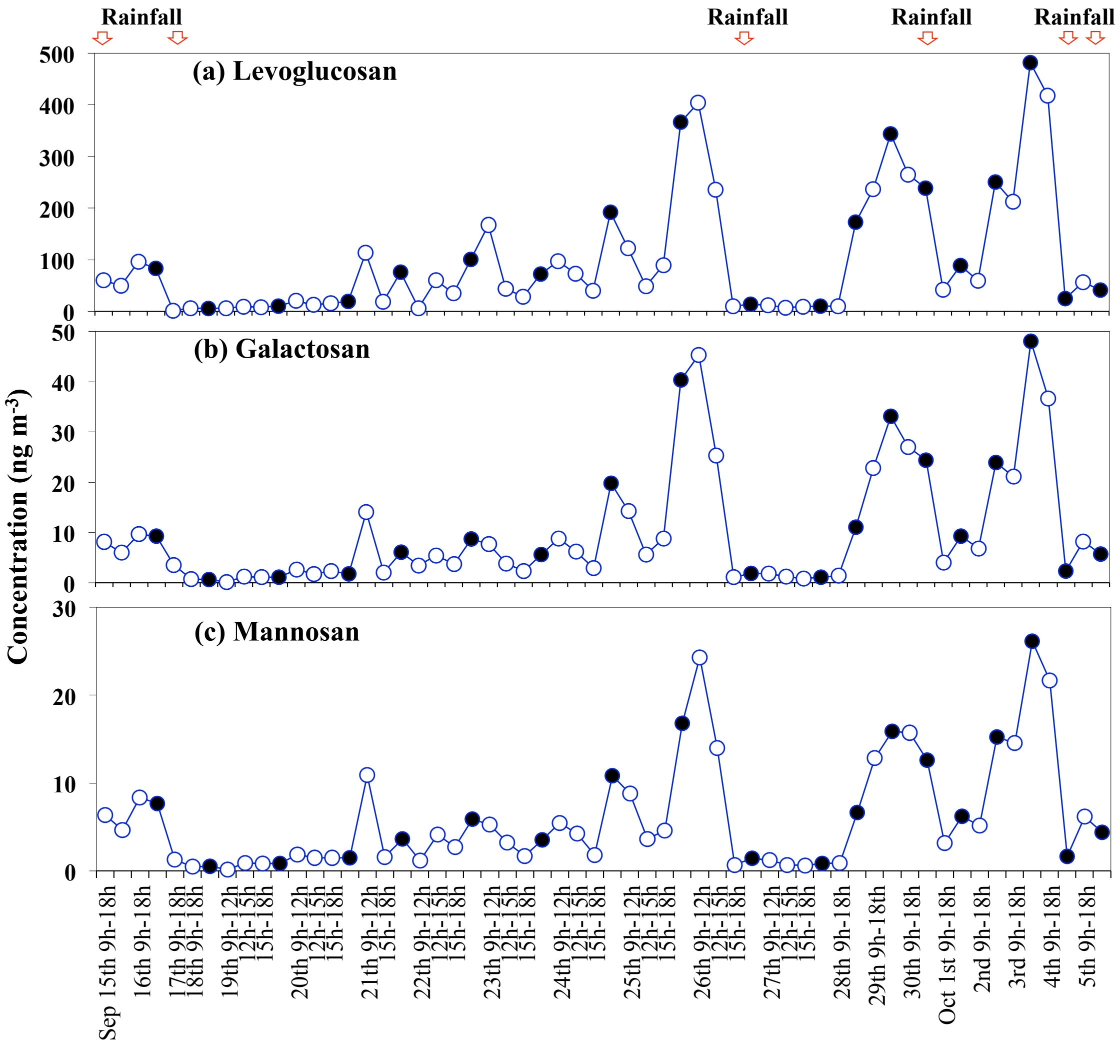
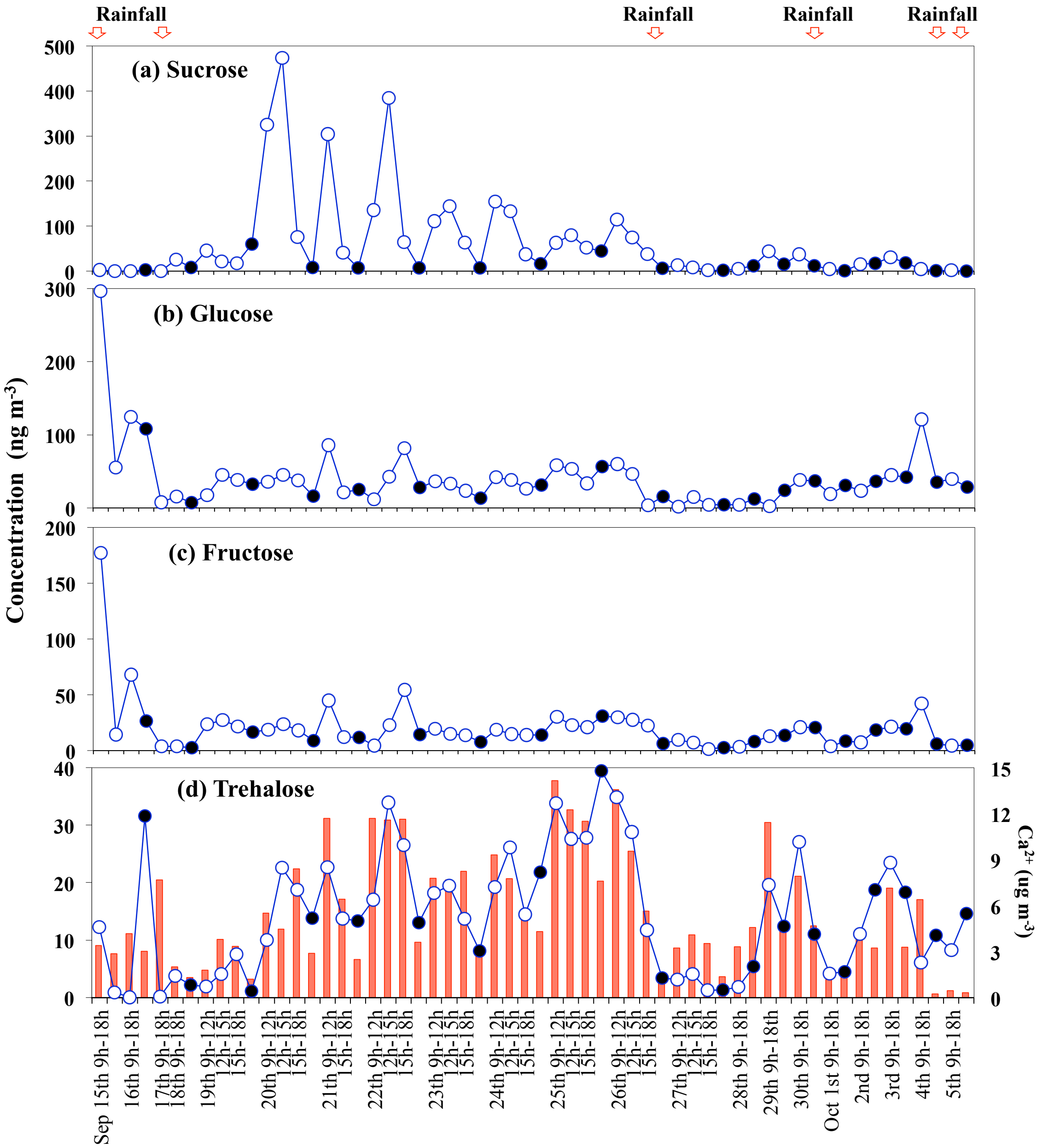
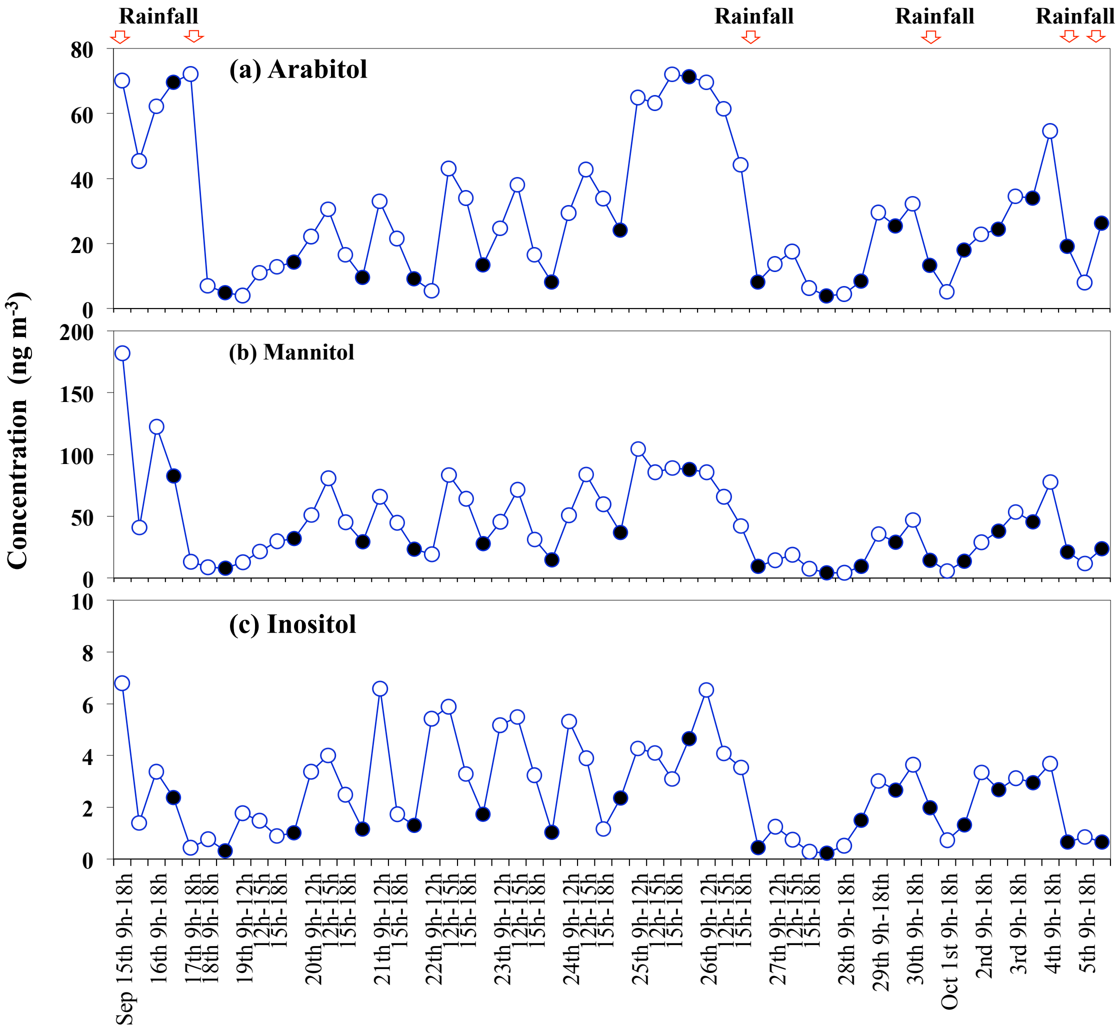

Rainfall
Rainfall
Rainfall
Rainfall
(a) Levoglucosan
(b) Galactosan
(c) Mannosan
Concentration (ng m-3)
Sep 15th 9h-18h
16th 9h-18h
17th 9h-18h
18th 9h-18h
19th 9h-12h
12h-15h
15h-18h
20th 9h-12h
12h-15h
15h-18h
21th 9h-12h
15h-18h
22th 9h-12h
12h-15h
15h-18h
23th 9h-12h
12h-15h
15h-18h
24th 9h-12h
12h-15h
15h-18h
25th 9h-12h
12h-15h
15h-18h
26th 9h-12h
12h-15h
15h-18h
27th 9h-12h
12h-15h
15h-18h
28th 9h-18h
29th 9h-18th
30th 9h-18h
Oct 1st 9h-18h
2nd 9h-18h
3rd 9h-18h
4th 9h-18h
5th 9h-18h

Fig. 5.



Rainfall
Rainfall
Rainfall
Rainfall
(a) Sucrose
(b) Glucose
(c) Fructose
(d) Trehalose
Concentration (ng m-3)
Ca2+ (ug m-3)
Sep 15th 9h-18h
16th 9h-18h
17th 9h-18h
18th 9h-18h
19th 9h-12h
12h-15h
15h-18h
20th 9h-12h
21th 9h-12h
22th 9h-12h
23th 9h-12h
24th 9h-12h
25th 9h-12h
26th 9h-12h
27th 9h-12h
28th 9h-18h
29th 9h-18th
30th 9h-18h
Oct 1st 9h-18h
2nd 9h-18h
3rd 9h-18h
4th 9h-18h
5th 9h-18h

Fig. 6.



Rainfall
Rainfall
Rainfall
Rainfall
(a) Arabitol
(b) Mannitol
(c) Inositol
Concentration (ng m-3)
80
60
40
20
0
200
150
100
50
0
10
8
6
4
2
0
Sep 15th 9h-18h
16th 9h-18h
17th 9h-18h
18th 9h-18h
19th 9h-12h
12h-15h
15h-18h
20th 9h-12h
12h-15h
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21th 9h-12h
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27th 9h-12h
12h-15h
15h-18h
28th 9h-18h
29th 9h-18th
30th 9h-18h
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3rd 9h-18h
4th 9h-18h
5th 9h-18h

Supporting Information

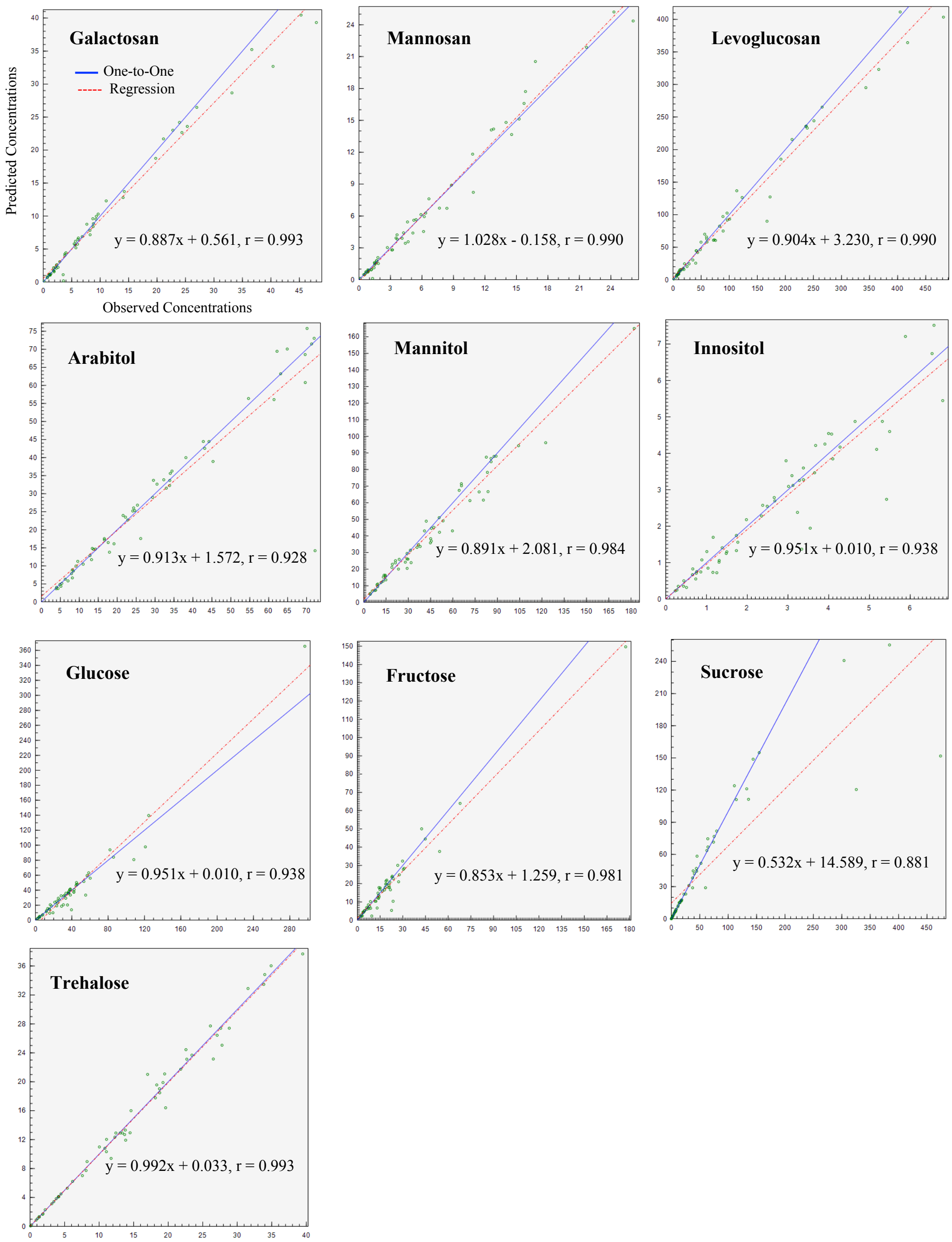

Figure S-1. The Scatter plots between observed (input data) and predicted (modeled data) concentrations show statistical parameter (coefficient of determination (r), Intercept, and Slope) with linear equitation of individual sugar compounds. (A blue 1:1 line is provided on this plot for reference (a perfect fit would line up exactly on this line), and the regression line is shown as a dotted red line).

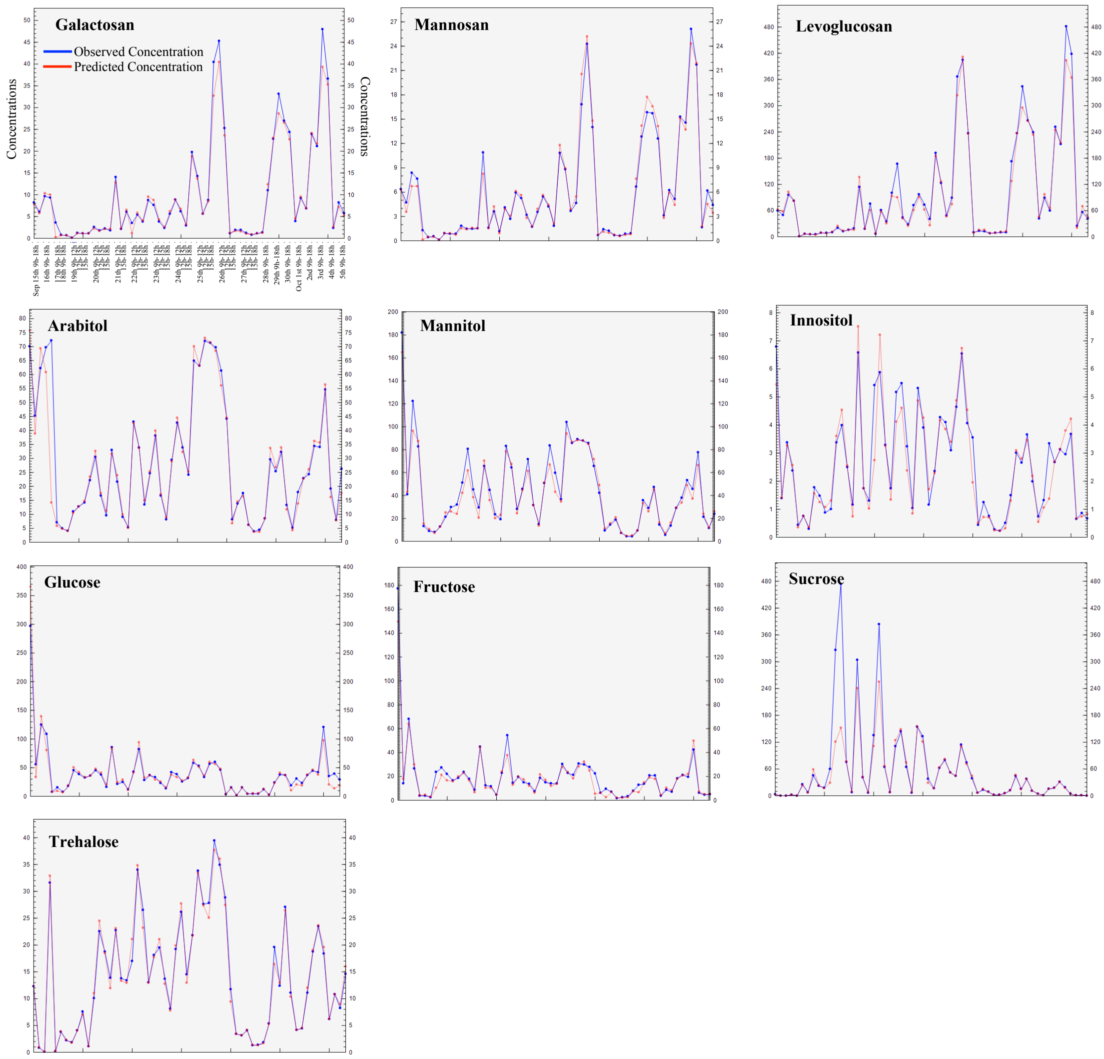

Figure S-2. The time series plots between observed (input data) and predicted (modeled data) concentrations of individual sugar compounds. (A blue line and redline shown as observed (input data) and predicted (modeled data) concentrations, respectively.

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