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# ***Interactive comment on* “Temporal variations in atmospheric CO<sub>2</sub> on Rishiri Island in 2006–2013: responses of the interannual variation in amplitude to climate and the terrestrial sink in East Asia” by C. Zhu and H. Yoshikawa-Inoue**

**Anonymous Referee #1**

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General comments

This paper is discussing characteristics of the difference of CO<sub>2</sub> seasonal pattern in Rishi Island, located in northern area in Japan. Atmospheric CO<sub>2</sub> concentration in this area seems to be affected locally by Siberian vegetation. Seasonal CO<sub>2</sub> pattern was precisely analyzed in terms of phenology. The difference of maximum of the CO<sub>2</sub> concentration and minimum of the CO<sub>2</sub> concentration (as interannual amplitude variation IAV) was studied and they found that some relation with climatic parameters, such as temperature and local NEP. Authors summarized that IAV had relation to the tempera-

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ture with 2 years lag time. However, physical explanation is unclear in this paper. This maybe a kind of challenging analysis.

### Specific comments

In this analysis, they used 120days filter to calculate (IAV= Delta-CO<sub>2</sub>) after long-term (667days filter) trend subtraction, which means that local events are reflecting to this seasonal variation. Actually, Fig S3b showed a large variation (plus and minus) in every summer season. If the wind circulation pattern tend to the continental wind (not from the Pacific) at that summer, it will easily lead to relatively lower concentration, making Delta-CO<sub>2</sub> larger, as shown in Fig.9 by themselves. Therefore, authors should clarify what the value of Delta-CO<sub>2</sub> means before the analysis. Otherwise, it seems to be very difficult to elucidate the relation between Delta-CO<sub>2</sub> and temperature by simple correlation figure (e.g.Fig.8). Can you separate the climatic (wind circulation) effect from the apparent temperature effect?

In general, NEP was thought to be anti-correlated with annual temperature, shown in Fig S6. Therefore, main variation of trend component (growth rate) should be affected by temporal average temperature. In the paper by Braswell (1997), they showed some relation between CO<sub>2</sub> growth rate and temperature with lag time of about 2 year. However, they also showed that CO<sub>2</sub> growth rate has a positive relation with temperature with 0 lag time. Because the function of Delta-CO<sub>2</sub> is not the same as CO<sub>2</sub> growth rate in the paper, it is very difficult to compare the result.

### Technical corrections

Page 3: GT should be Gt

line 55-57: However, ,,,,(Nisbet and Weiss,2010) This sentence can mislead the context. You should rewrite it.

Line 68: aircraft (Niwa et al. . .) You can refer a report by Machida et al.

Page 5: Model of pump, Temperature of electric dehumidifier and its model should be

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shown here.

Line 127 averaged over 1hr -> averaged for 1hr?

Page10-11: Authors is discussing the timing of drawing CO2 in the section of 3.3.2 and Fig.6&7, but the context is difficult to understand. For example, it is not understandable the relation between the length of summer and NEP. In 2010, it has the longest growing season, but NEP is not large but the lowest in the observing period. Therefore, this section can be shortened.

Page 15-16: Section 5: Discussion about relationships between growth rate and SIO index (and others) are not so helpful to understand total hypothesis. Authors may shorten this section.

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