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Interactive comment on "Seasonal and spatial variability of methane emissions from a subtropical reservoir in Eastern China" *by* Le Yang et al.

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Reported greenhouse gas fluxes from reservoirs located in subtropical zone are still insufficient to understand regional carbon cycling. The manuscript titled "Seasonal and spatial variability of methane emissions form a subtropical reservoir in Eastern China" presents methane effluxes from a reservoir with an age of about 60 years, which is helpful to understand the topic. Although I would give it a positive response, a major revision should be made for being reviewed again. I hope some key environmental factors (wind speed, water velocity, water temperature, air temperature, air temperature, water depth of each site in different periods, and so on) should be introduced to eluci-

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Discussion paper

date their viewpoints instead of guessing. Response: Wind speed, water temperature, air temperature, and the air-water temperature difference were correlated with CH_4 flux at each site. Results showed that weak relationships between wind speed, air-water temperature difference and CH_4 flux were found (Tables 2, 3), and there were no relationships between air temperature (or water temperature) with CH_4 flux. In addition, water levels were also correlated with CH_4 flux (Figure S4), which account for 15-48% of CH_4 flux variability. Based on these available data, some reasonable speculations were given in lines 298-305.

Specified comments: 1.Lines 125-137: Water depths should be presented for each sites. Response: Water depths of the sampling points were given in a new table (Table 1).

2.Lines 201-208: I don't think a para-curve model is suitable to fit gas concentrations in a chamber over time. The cited paper of Hutchinson and Livingston is about measuring gas exchange between soil and atmosphere. Pls see the following references. Xiao, S., Wang, C., Wikinson, R.J., Liu, D., Zhang, C., Xu, W., Yang, Z., Wang, Y., Lei, D., 2016. Theoretical model for diffusive greenhouse gas fluxes estimation across water-air interfaces measured with the static floating chamber method. Atmospheric Environment 137, 45-52. Tanka P. Kandel, Poul Eriklarke, Lars Elsgaard. Effect of chamber enclosure time on soil respiration flux: a comparison of linear and non-linear flux calculation methods. Atmospheric Environment 141, 245-254. Response: As the reviewer's suggestions, the linear regression was used to calculate the dc/dt instead of paea-curve model (line 186-188). Thus, the CH_4 flux data of manuscript was changed because of the different regression methods (Result section).

3.Line 218: Are there some mistakes in the equation (2)? The denominators m, n and i may be 5, 13 and 3 respectively. Response: The denominators m, n and i are 5, 13 and 3, respectively. No error. But the sampling points in different transects were distinct in the 5 transects, so m=5 in the NE, SW, and SE transects, m=4 in the downstream river, and m=3 in the NW transect. The original equation 2 moved into the supplement materials (Eq. S1) in the revised manuscript, according to the Review #1's suggestions.

4.Line 126-128: I think the natural physical grographical characteristics describes here is important. I think the changing hydrological situation may influence gas fluxes in the NW lake more or less. For example, can you correlate it with Lines of 315-328? Response: The relevant hydrological data were not measured during our sampling campaigns, so it was difficult to correlate it with CH4 flux. However, the data of mean monthly water levels were available to us, and average CH4 fluxes every month were correlated with their corresponding water levels (Seen Figure S4). From the results, water level fluctuation accounted for 15-48% of variability of CH4 fluxes.

5.Lines 354-370 This paragraph tries to explain "The seasonal variability of CH4 emission from the main body of Xin'anjiang Reservoir". However, I think they are feeble. I hope more environmental factors should be taken into considerations, such as wind speed, difference between the air temperature and water temperature, and so on. Response: According to the reviewer's suggestions, wind speed, air-water temperature difference were correlated with the CH4 fluxes in each transect (Table 2, Table 3). Wind speed accounted for 6.3-19% variability of CH4 fluxes in the reservoir main body (Table 2), and the air-water temperature difference accounted for 6-29% of CH4 fluxes variability (Table 3). Furthermore, seasonal dynamics of CH4 emission from the reservoir main body showed a similar pattern with the water level fluctuations in 2015 (Figure 1, Figure 5, Figure S4), and both of them had a high level in the second half of year. In addition, the thermocline depth and oxycline depth increased in Xin'anjiang Reservoir (called Qiandaohu Lake in Zhang et al. 2015) from July to Dec. and disappeared in Feb. and Mar. of next year. The stratification weakness periods (i.e., the second half of year) probably had an impact on CH4 oxidation and eventually CH4 emission at air-water interface, and the mechanism needed to be studied further (lines 293-305).

6.Lines 372-382: Reasons presented here for the high value of methane flux in the SW lake on August 1 are also weak. Figure 5 shows the methane flux in Feb. is also high, but the water level during the mon was low. Response: The 2 peaks on 1 August and

8 February were caused by the different reasons. The peak in 1 August was probably caused by the decomposition of vegetation in the littoral area. The average CH_4 flux value decreased from the shallow area to the deep area (CH_4 flux: SWP1, 0.47 mg m-2 h-1; SWP2, 0.33 mg m-2 h-1; SWP3, 0.098 mg m-2 h-1; SWP4, 0.1mg m-2 h-1; SWP5, 0.078mg m-2 h-1), and SWP1 and SWP2 was located in the shallow area (Table S4), and some submerged plants were distributed there. However, the CH_4 peaks on 8 February was caused by the strong wind speed, and the average wind speed reached 8-10 m/s when the gas samples were collected in SWP2 and SWP4, with average measured CH_4 fluxes of 0.23 mg CH_4 m-2 s-1 and 0.20 mg CH_4 m-2 s-1 respectively (lines 320-326).

7.English language needs a bigger improvement. For example: 1). Line 233: “from” should be “across”. 2) Line 271: “individual measurements” should be “The flux of individual measurements.” Response: English language has been polished by a professional company. The two errors were corrected in the revised manuscript.

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