Response to the comments of the anonymous referee:

We are grateful for spending your valuable time on our manuscript, and for your constructive suggestions! We have revised our manuscript carefully according to your suggestions. The following is the responses to your comments.

Question 1: There are more than 10 provinces where samples were taken; Guangdong is the eleventh, Beijing the twelfth. Please check Table 2 and the text.

Answer: We are very sorry for this mistake! And "10 provinces" was changed into "12 provinces" in the text (P. 10558, L.3; P10560, L.10; P. 10569, L.3).

Question 2: The description of the flux chamber on p. 10562, L.11 ff. is not quite clear. I assume the Teflon tubes were connected to the four inlets at the outside of the chamber, but I am not quite sure.

Answer: Yes, you are right! And the sentence was revised as: "Four Teflon tubes were connected to the four inlets at the outside of the chamber, and the other ends of the four tubes rose to 50 cm above ground."

Question 3: What do the equations (3) and (4) signify. Are these just best fitting equations or do they have also a theoretical background? Why were these equations chosen and not, for example, the Arrhenius equation?

Answer: The equations (3) and (4) were just derived by fitting the experimental data. The signification of the equations is that the empirical algorithmic model developed by Conrad and Kesselmeier (Conrad, 1994; Kesselmeier et al., 1999) from several kinds of soils for COS exchange between soils and the atmosphere couldn't widely applied to various soils, e.g. for the paddy soils investigated by this study.

Question 4: What are "certain sulfur-producing bacteria" (P. 10566, L.5) ? I know phototrophic bacteria or H2S-oxidizing bacteria which produce elemental sulfur. However, I am not sure whether it is these bacteria, which are here addressed. Please be more specific and precise in terms of bacteriology.

Answer: To our knowledge, there is still no report about COS-producing bacteria in soils. Therefore, it is difficult for us to specify the bacteria which are far from our research scope. The sentence could be deleted due to meaningless.

Question 5: When comparing the range of COS flux with literature data (p.10568, L.15 ff.) it would be good to explicitly mention the range of flux found in the present study.

Answer: As your suggestion, the sentence was revised as: "With the exception of paddy soils, all soils investigated in this study acted as sinks for atmospheric COS, the range of fluxes was 0—(-4.90) pmol m^{-2} s^{-1}, which agrees with field experiments:".

Question 6: P.10568, L. 22, The next two sentences starting after "Van Diest and Kesselmeier(2008) investigated COS exchanges: : :" I did not understand the meaning of these sentences. Please rephrase.

Answer: We are sorry for the unclear description. We wanted to express that the same optimal COS uptake at 19% WFPS for the three different boreal soils investigated by Van Diest and Kesselmeier(2008) couldn't be applied to various boreal soils. These sentences were rephrased as following:

Van Diest and Kesselmeier (2008) investigated COS exchanges between four kinds of soils and the atmosphere, and found the same optimal COS uptake at 19% WFPS for the three different boreal soils (two arable soils from China and Finland and one forest soil from Siberia). Supposing the bulk density of the investigated soils were about 1g/cm^3 (the bulk densities of the investigated soils were not measured), the calculated WFPS value of optimal COS uptake for W1 soil was coincident with theirs, however, the values for W2 (~37%) and F (~93%) soils were much higher than theirs, indicating large difference of the optimal WFPS values among various soils from boreal soils.

Question 7: Reference Conrad and Smith (p.10570, L. 19) is not correct; it is only Conrad, Smith is not a co-author.

Answer: Sorry for this mistake. And it was corrected in the text (P. 10566, L. 3) and the reference (P. 10570, L. 19).

Question 8: Table 1: OM = 1.726 x C(organic), which is a constant conversion factor. It is not worth listing both OM and C(organic) in the table. What is S(effect)? Please explain what it is and how it was measured.

Answer: According to your suggestion, we delete the OM of soils in the table 1. Soil available sulfur (S_{effect}) means the sulfur in the soil can be used for crops assimilation, including soluble sulfur and part of the adsorption sulfur and organic sulfur. Soil available sulfur was measured by turbidimetry method after extraction from soils with 0.5 mol L^{-1} $NaHCO_3$. The definition and measurement of S_{effect} were noted in Table 1 (P. 10575):

Table 1. The characteristics of five soil samples (W1: wheat soil in Beijing; W2: wheat soil in Zibo (Shandong Province); P1: Paddy soil in Jiaxing (Zhejiang Province); P2: Paddy soil in Guangzhou

(Guangdong Province); F: forest soil in Beijing).

Soil	pH	$C_{organic}$ g/kg	N_{total} g/kg	P_{total} g/kg	S_{total} g/kg	S_{effect}[a] mg/kg
W1	6.31	8.24	0.92	0.618	0.12	25.0
W2	7.74	15.1	1.13	0.783	0.40	94.8
P1	6.14	24.5	2.26	0.579	0.45	31.5
P2	6.42	29.1	2.42	0.860	0.65	56.2
F	6.44	61.5	4.94	0.967	0.90	21.2

[a] S_{effect} means the sulfur in the soil can be used for crops assimilation, including soluble sulfur, part of adsorption sulfur and organic sulfur. It was measured by turbidimetry method after extraction from soils with 0.5 mol L^{-1} $NaHCO_3$ (Liu, 1996).

Question 9: Table 3: Conrad and Meuser (Atmos.Environ. 34, 2000, 3635) report compensation points of 785 and 1470 ppt in laboratory experiments at 25C. Please add any other report on soil compensation point.

Answer: According to your suggestion, two additional reports were added in Table 3 as shown in the following:

Table 3. COS compensation point in this study compared with other studies (P1: Paddy soil in Jiaxing (Zhejiang Province); P2: Paddy soil in Guangzhou (Guangdong Province); W1: wheat soil in Beijing; W2: wheat soil in Zibo (Shandong Province); F: forest soil in Beijing).

Soil	Water content %	Compensation point, ppt(17°C)	Compensation point, ppt(25°C)	Reference
P1	20.7	491	765	This study (laboratory)
P2	19.37	572	780	This study (laboratory)
W1	8.0	255	267	This study (laboratory)
W2	17.5	120	149	This study (laboratory)
F	43.9	80	225	This study (laboratory)
Oak woodland		< 100		Kuhn et al. (1999) (field)
Sandy clay soil		~ 53		Kesselmeier et al. (1999) (laboratory)
Forest soil			785	Conrad and Meuser (2000) (laboratory)
Rape field soil			1470	Conrad and Meuser (2000) (laboratory)

Question 10: Soil water in Table 4 and Fig. 4: Since percentage water is sometimes used as gram water per 100 g dry soil and sometimes as gram water per 100 g moist soil please define soil water content at some point. Since soil texture affects water availability, percentage moisture does not tell much about the ecological effect. Water-filled porosity would be nicer, or since sieved soils were used, I would suggest using percentage of the maximum water holding capacity. This would allow a better

scaling of soil moisture. If the authors still have some of the soil samples, I would suggest measuring maximum water holding capacity (which is very easy) and use these values to scale the soil moisture. This would give data with more information.

Answer: The soil water content (WC) in this study represented the percentage of the weight (g) of soil water to the equivalent dry soil weight (g), and was noted in Table 2 (P. 10576). Yes, WFPS (water-filled-pore-space) would tell much more information about ecological effect than that of WC. Regrettably, we didn't measure the bulk densities of the investigated soils, and the soil samples were discarded after the measurements, and hence, we also have no way to give the percentage of the maximum water holding capacity as you suggested.

Table 2. COS fluxes and deposition velocities of various soils in China.

Site	Plant type	Parent material	Soil moisture %[a]	Flux (17 °C) pmol m^{-2} s^{-1}	Flux (25 °C) pmol m^{-2} s^{-1}	Flux (17 °C) pmol g^{-1} h^{-1}	Flux (25 °C) pmol g^{-1} h^{-1}	Deposition velocity mm s^{-1} (17°C)	Deposition velocity mm s^{-1} (25°C)
Beijing	wheat	Drab soil	8.00	-1.04	-0.73	-0.69	-0.44	0.05	0.03
Zibo, Shandong	wheat	Burozem	17.15	-4.32	-2.73	-2.80	-1.66	0.14	0.11
Jiaxing, Zhejiang	paddy	Drab soil	20.70	0.44	1.19	0.27	0.63	-	-
Guangzhou, Guangdong	paddy	Paddy soil	19.37	0.69	12.89	0.46	8.56	-	-
Beijing	forest	Drab soil	43.90	-4.05	-0.83	-3.21	-0.81	0.13	0.04
Zhumadian, Henan	wheat/paddy	Yellow-brown	13.11	-0.77	0.02	-0.48	0.03	0.04	-
Liaocheng, Shandong	cotton	Fluvo-aquic soil	16.50	-1.32	-1.10	-0.84	-0.69	0.07	0.05
	maize	Fluvo-aquic soil	18.89	-2.17	-1.41	-1.42	-0.90	0.09	0.07
Jinchun, Hubei	paddy	Red earth	23.20	0.57	2.00	0.40	1.34	-	-
Yancheng, Jiangsu	paddy	Solonchak soil	19.69	-0.41	-0.10	-0.27	-0.04	0.02	0.004
	cotton	Solonchak soil	17.77	-0.49	-0.11	-0.31	-0.05	0.02	0.005
Lanzhou, Gansu	plum blossom	Grey-drab soil	10.68	-2.46	-2.18	-1.51	-1.32	0.10	0.08
Dalian, Liaoning	wheat	Burozem	9.13	-2.10	-2.76	-1.26	-1.66	0.08	0.14
Jishui, Jiangxi	paddy	Red earth	18.75	-2.04	0.29	-1.33	0.22	0.07	-
Jinxian, Jiangxi	badlands	Red earth	19.02	0	-2.84	0	-1.84	0	0.10
Huangping, Guizhou	paddy	Yellow earth	27.78	-3.20	-3.56	-2.25	-2.15	0.13	0.16
Waliguan, Qinghai	grass	Chestnut soil	9.77	-3.76	-2.69	-2.28	-1.62	0.17	0.13
Beijing	lawn	Drab soil	8.35	-4.90	-4.83	-3.00	-3.08	0.17	0.19

[a] soil moisture % = soil water (g) / soil (dry weight, g) × 100%.

Question 11: Fig.3 and 4: It is not easy to see the effect of temperature or moisture on the flux. I suggest making the y-axis larger to emphasize the effect on flux.

Answer: According to your valuable suggestion, Figure 3 (P. 10581) and Figure 4 (P. 10582) were redrawn as following:

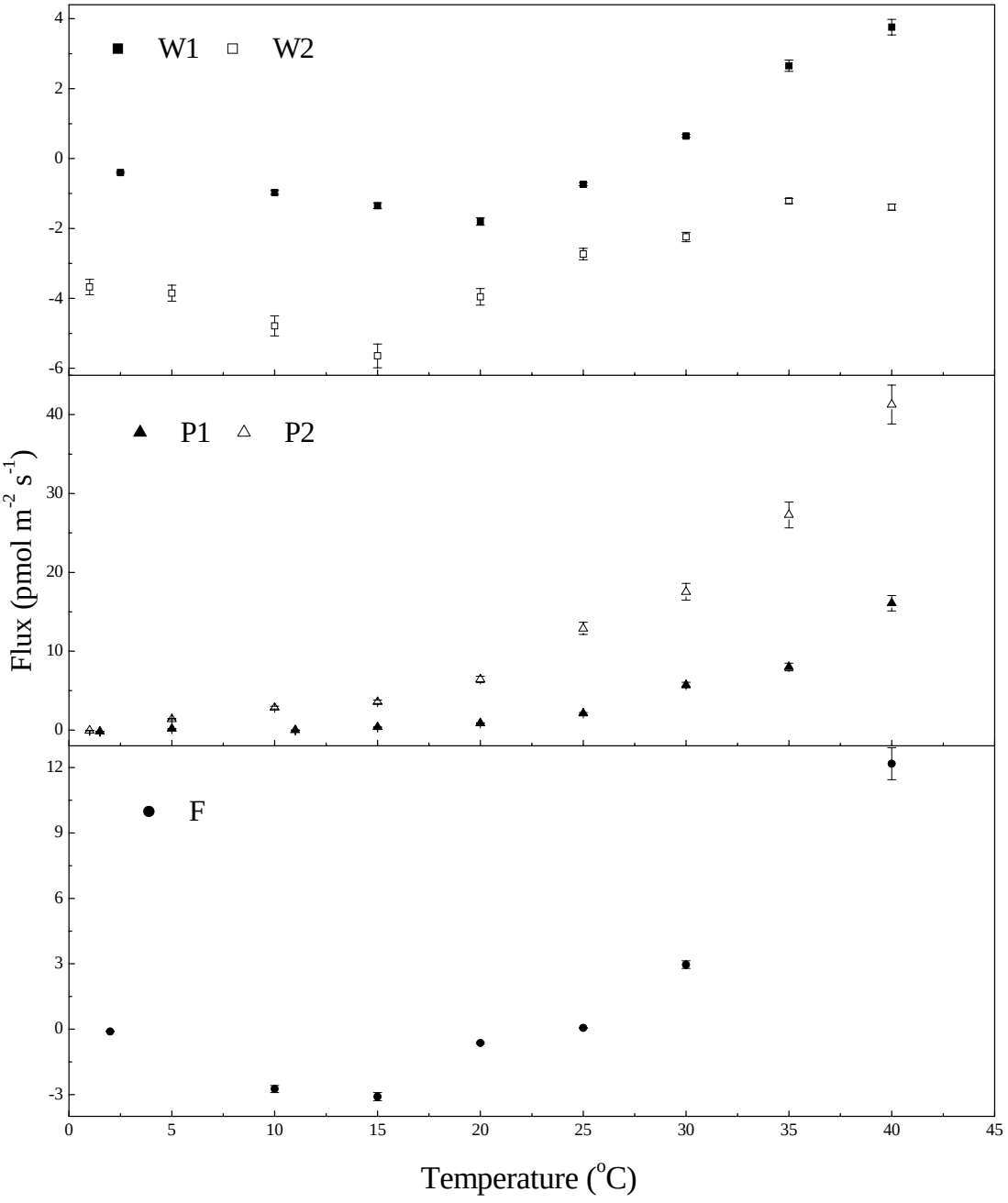

Fig. 3. COS fluxes in relation to the temperatures. (W1: wheat soil in Beijing, 8.00% moisture; W2: wheat soil in Zibo (Shandong Province), 17.15% moisture; P1: Paddy soil in Jiaxing (Zhejiang Province), 20.70% moisture; P2: Paddy soil in Guangzhou (Guangdong Province), 19.37% moisture; F: forest soil in Beijing, 43.90% moisture). The error bars are calculated from formula (2); each flux measurement was conducted twice.

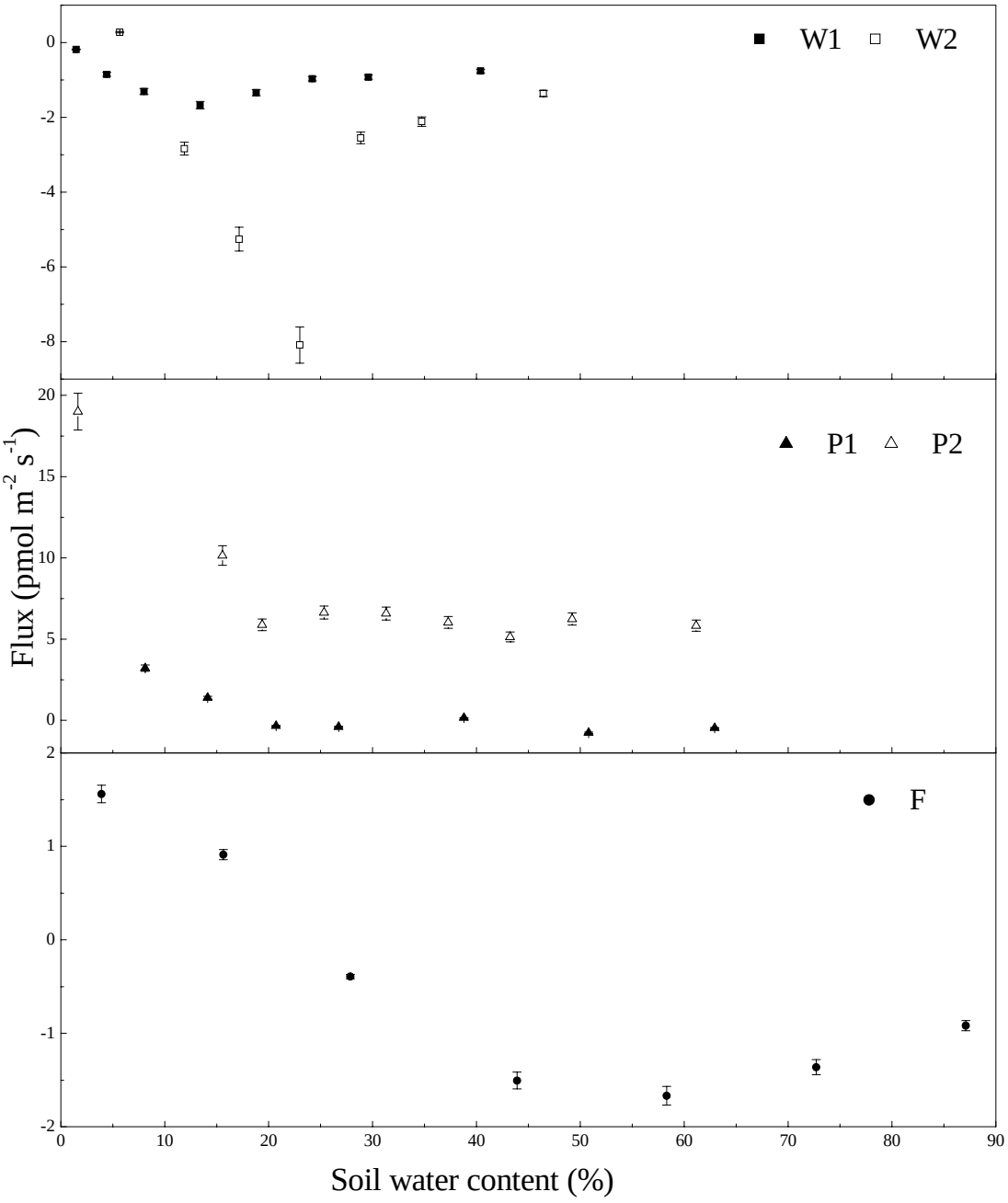

Fig. 4. COS fluxes in relation to soil water content at 17°C. (W1: wheat soil in Beijing; W2: wheat soil in Zibo (Shandong Province); P1: Paddy soil in Jiaxing (Zhejiang Province); P2: Paddy soil in Guangzhou (Guangdong Province); F: forest soil in Beijing). The error bars are calculated from formula (2); each flux measurement was conducted twice.