

## ***Interactive comment on “Climate changes recorded by Hani Peat in Northeast China over the past 13.8 cal ka BP” by Ge Shi et al.***

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Question 1: Two records were collected in Hani peat-land. The LOI550°C (organic matter content) and Rb/Sr ratios (chemical weathering) over the past 13.8ka were analyzed to discuss the climate change in Northeast China and the evolution of East Asian Summer Monsoon (EASM). The organic matter content and chemical weathering were compared with previous lake and peat-land temperature and precipitation proxy records from northeast China. The manuscript is well presented and provides results of two new proxies research for northeast China that will contribute to the knowledge of the evolution of East Asian Summer Monsoon (EASM) and adds relevant information to improve our understanding of the past climate based on multi-proxy climatic records in this region. The text mentions a long-term "positive correlations" trend between

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LOI550°C and Rb/Sr ratio over the past 13.8ka (decrease Rb/Sr ratio value while increase LOI550°C value) (Figure 6f, g). Also, three specific events marked by an abrupt decline in organic matter content at c. 8.2ka, 5.5ka and 0.22ka are identified. These events are "negatively correlated" with Rb/Sr ratio value (increase Rb/Sr ratio value while LOI550°C value decrease) (Figure 7c, d). However, I am concerned about the choice of time periods, when the authors used the terms "positive correlations" and "negatively correlated" (see below) and, about the figure 6t does not show Rb/Sr ratio value for the last 1.0ka, thus it is not possible to see any correlation between LOI550°C and Rb/Sr ratio by 0.22ka (as the authors present).

Answer: Thank you for the comment. The LOI550°C and Rb/Sr ratio data were obtained from core H3 and H2, respectively. The top 1m sediments of H2 was lost during the sample collection, and thus we do not have the Rb/Sr ratio data for the last 1ka to compare with LOI550°C data. The "positive correlations" and "negatively correlated" in the manuscript were used to describe the long-term trend of our data and your comments make us realize that this statement may not be appropriate. We changed these ambiguous description in the revision.

Question 2: The figure 6f and g do not show clear decreases in Rb/Sr ratios from early to mid Holocene in the Hani peat record (c.12-7.0ka.). The strength of the interpretations depend on where and when the starting point of the indicator arrow is chosen. For instance, if the horizontal line is drawn at 0.5, when the values for each element are the same (Figure 6f), the general trend of Rb/Sr ratio between (c.10-7.0ka.) is stable, with values remaining around 0.5 (slightly strong EASM intensity during the mid-Holocene). Then, the lowest Rb/Sr ratio value between c.7.0-6.0 ka suggests a strong EASM intensity, followed by general trend to increase in Rb/Sr ratio value (less strong/weak EASM intensity) towards present. The same comments for LOI550°C, if the horizontal line is drawn in Figure 6g at 80% of LOI550°C (water content versus organic content is linear up to loss ignition =80%), the figure show a general warmer climatic conditions between c.9.0-5.0ka suggests a strong EASM intensity (suc. mag)

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during the mid-Holocene, followed by general trend to increase in Rb/Sr ratio value (less strong/weak EASM intensity) towards present.

Answer: Thanks. The time interval of YD event in our records is about from 12.5ka to 11.4ka. In addition, the data between 11-10 ka were disturbed by rapid deposition event caused by volcanoes or floods. Thus, we can only discuss the Holocene EASM variations since the 10ka. The Rb/Sr ratios decreased slightly from 10ka to 6.7ka and increased since the 6.7ka. Meanwhile, the LOI550°C values increased gradually from 10-6.3ka and decreased since the 6.3ka. The consistent changes of two records indicated that the EASM strengthened gradually in the early Holocene, weakened in the late Holocene, and the strongest in the middle Holocene.

Question 3: In addition, this work highlights the decrease in LOI550°C and the correlation with the Rb/Sr ratio value, thus it is key to show any tephra layers in the stratigraphy to exclude them for the interpretation. The authors do not discuss two major periods of abrupt change shown in their work, these events show the lowest organic matter content due to the sandy layer deposition and the lowest Rb/Sr ratio by c. 11.3-10.3 cal ka BP and c. 2.0-1.4 cal ka BP, respectively. The authors suggest that there insufficient evidence to discuss “the dynamic mechanisms of the two depositions events”. However, there are previous works about tephra deposition in Hani peat-land coeval to both deposition events (Huang et al., 2015; Zhao et al., 2016 among others).

Answer: Thank you for your advice. We thought at first that these two events should have been caused by volcanoes. In order to verify this hypothesis, we selected three samples at the depth of 128, 133, and 139cm to do scanning electron microscope analysis, but we didn't find efficient evident. In this case, we didn't discuss these two events and just focused on the EASM variations in this paper. We are designing further sampling plans and will do more to verify whether these two events were caused by volcanoes, floods or something else, then discussing specially in our later works.

Question 4: The drastic decrease in LOI550°C by c. 8.2ka and the increasing of Rb/Sr

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ratio suggests a cold-dry climatic event (reduction of weathering intensity), consistent with falling in temperature is slight decrease in precipitation (Figure 6acd) in other published Hani peat proxy records. The evidence suggests a weak East Asian monsoon (hot/wet summer) during the 8.2ka event highlighting the sensitivity of the peat for EASM reconstruction. The comparison between Rb/Sr ratio and CaCO<sub>3</sub> (previous works) would have allowed stronger interpretations of specific time intervals Hani peat, because the Rb/Sr ratio appear to be a response to moisture conditions or effective moisture conditions (figure 7f). An increase of Rb/Sr ratio is consistent with increase in percentage tree cover at Daihai Lake, except during the short-time c.8.2ka event, perhaps because of the low resolution pollen intervals around 8.2ka.

Answer: Thanks for your comment. The higher Rb/Sr ratio in this paper represented a weaker chemical weathering degree, which indicated a colder/drier climate. The increased Rb/Sr ratio in our study is generally correspond to decreased tree pollen percentage at Daihai Lake, suggesting that the two records indicated similar EASM variations during the Holocene. At around 8.2ka, our Rb/Sr ratios increased while the LOI<sub>550°C</sub> decreased, indicating a cold/dry climate. However, the tree pollen record from Daihai Lake did not present significant changes during the 8.2ka, probably due to the relative low resolution of pollen record or regional difference. In addition, we also determined the LOI<sub>950°C</sub> to obtain the carbonate contents in Hani peat and the results showed that the lower carbonate contents corresponded to stronger chemical weathering degree, which further validated the EASM variations we obtained from Rb/Sr and LOI<sub>550°C</sub> records.

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