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Interactive comment on "MODIS NDVI and vegetation phenology dynamics in the Inner Mongolia grassland" *by* Z. Gong et al.

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To Reviewer: We appreciate your valuable comments on our manuscript. Most of them helped greatly in revising this manuscript. Our responses are listed below.

Comment 1: The relation between NDVI and precipitation/temperature measured by means of the correlation coefĩňĄcient does not seem to work well. Maybe, authors could explore other statistical procedures to investigate it. Also, it is known that sometimes vegetation response to climatic conditions with delay and could be affected by the previous climatic conditions one year before. Response 1: In order to analyze the correlation between phenology and climate change, we have changed the statistical method into population regression. Moreover, your reminder of the delayed effect from previous years has also been considered. Most of the regression models between the

phenology and climate obtained better output than before. Especially the start of the growing season (SOS) was closely related to the precipitation and temperature one year before. We have revised the results part and the Table 4 according to the new output.

Change in the manuscript (P11 L262–L281): The selected regression models at different phenological stages (SOS, POS, EOS, and LOS) between precipitation (monthly and accumulated value during different periods) and temperature (monthly and mean value during different periods) are presented in Table 4. The delayed effect from climate in SOS was obviously detected. Generally, the SOS negatively correlated with the cumulative precipitation, especially during the growing season in the last year (March–September, R2 = 0.95, P < 0.001). Furthermore, the temperature in the last May also negatively correlated with SOS well (R2 = 0.73, P < 0.05). Therefore, the increasing precipitation and the temperature in May in the last year could advance the SOS. The POS negatively correlated with the cumulative precipitation from May to June (R2 = 0.62, P < 0.001) and positively correlated with the mean monthly temperature from June to July (R2 = 0.52, P < 0.001). The increasing precipitation and colder weather were considered can advance the peak vegetation activity date. The EOS positively correlated with the precipitation in the last August (R2 = 0.68, P < 0.05) but the temperature in March with lower significance (R2 =64, P = 0.06). Thus the delay in the senescence of vegetation was considered because of the wetter autumn in the last year and the warmer spring in the current year. Overall, the LOS positively correlated with the cumulative precipitation from April to May (R2 = 0.49, P < 0.05) and mean temperature from January to March (R2 = 0.72 P < 0.001), indicating that the wetter and warmer weather during the early vegetation growing period could extend the LOS.

(P25): Table 4. The climate variables most strongly correlated with phenology, and the corresponding parameters of its linear model. Phenology Variable Slope Intercept R2 P SOS Prec March–September (last year) –0.77 310.15 0.95 <0.001 Temp May(last year) –49.68 861.99 0.73 0.03 EOS Prec August (last year) 0.13 151.96 0.68 0.04

Temp March 20.70 326.81 0.64 0.06 POS Prec May–June –0.35 243.54 0.62 <0.001 Temp June–July 7.69 49.75 0.52 <0.001 LOS Prec April–May 2.59 54.13 0.49 0.02 Temp January–March 12.25 281.26 0.72 <0.001

SOS is the start of growing season; POS is the maximum NDVI date during the growing season; EOS is the date of the end of season; LOS is the length of growing season. Prec and Temp represent the precipitation and temperature, respectively.

Comment 2: Discussion. Please, avoid to reference again tables and ïňĄgures mentioned previously in the result section. Response 2: The redundant information in the discussion part has been deleted. Some content in the discussion part has been revised as below (P14 L312–L324): Some researchers have indicated that the phenology could be influenced by the climate several months before (Estrella and Menzel, 2006; Miller-Rushing and Primack, 2008). In our results, this delayed effect has been found. Our results were in agreement: the global warming could promote the vegetation growth and extend the growing season (Linderholm, 2006). The temperature has increased significantly, particularly since the 1980s (Ding and Chen, 2008; Gao et al., 2009). However, from 2002 to 2014, the IMAR grassland tended to be slightly colder in the spring (from January to May). We speculated that the increasing precipitation might be the main driving factor of the advance in SOS and the delay in EOS. Nevertheless, previous work revealed that precipitation decreased slightly over the last 50 years compared with the obvious inter-annual change. Thus, the precipitation appeared to increase over the recent decade. Rather than the change in temperature, the wetter weather condition were considered the main reason for the phenology change in the IMAR.

Comment 3: It is unclear what the table 5 means, neither its caption nor the table itself. Response 3: Table 5 has been deleted.

Comment 4: Figures can be redone coloured. Response 4: All the figures have been changed to colored. Please also see the attached file. âĂČ

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/7/C1209/2015/sed-7-C1209-2015-supplement.zip

Interactive comment on Solid Earth Discuss., 7, 2381, 2015.