**Climate
of the Past**
Discussions

Interactive comment on "Summer precipitation reconstructed quantitatively using a Mid Holocene δ^{13}C common millet record from Guanzhong Basin, China" by Qing Yang et al.

Anonymous Referee #1

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general comments

The paper intends to demonstrate the suitability, accuracy and usefulness of d13C of millet seed as proxy of paleoprecipitation. Application is performed for late Holocene in nothern China. This study is innovative and definitively deserves to be published in Climate of the Past. I do not have any irremediable concerns : raw data should be provided and I have some propositions 1- to tone down a little bit the writing to make it closer to the reality, 2- to be more precise in the texte when talking about general concepts, 3- to be more accurate when reporting data by e.g. including uncertainty ranges and by propagating them and 4- to re-organize a little bit the manuscript. See details for these specific comments.

details * line 16: please replace "are highly suited" by "are suited", this is enough * line 40: "modern records", do you mean "instrumental records"? please correct. * lines 52-54: this better suits to late Holocene, even the newly acknowledged Anthropocene. Please be specific * lines 55-58: this is clearly overstatement. Megathermal was under quite different external forcings (insolation, CO2, ..) and can not be considered analog of future climate. This even for impacts as the warming recorded at mid Holocene was not global and the present global warming. This sentence does not furthermore have any added-value. Please remove * line 73: please correct Hetté into Hatté * line 74: please decline EASM * lines 101-102 : This has led [...] results. Aggressive and useless. please remove. * line 103: "... a continuous distribution.." I don't know here if you're talking "in general" or if you already focus on millet. Pollen records are continuous, that's not the case for millet records. They might be numerous in a sedimentary record, they remain discrete and their absence can be interpreted as both i- too dry to allow millet to growth and to produce seed" or ii- bad luck * lines 109-110: " ... agricultural rain-fed crop...": how can you deal with irrigation? I guess this biaise your signal towards more humid condition. How do you statiscally deal with that issue? * lines 132 and everywhere else: acronyms are OK on figure but please avoid them in the manuscript or restric them to DNA and USA. Nobody will remain what HDP is putting for. Keep the extended name in the manuscript. You don't have words limit! * line 145: please precise "continuous" sampling if you did slice sampling (I understand you did). * line 155: the total in table 1 is 66 not 67 seeds * line 159: what do you mean with "distilled water". I don't know any lab that still distilles water. is it ultra-pure water? reverse osmosis purified water? desionised water? * §2.2.: please complete the table 1 with the following information: how many measurements per site, did you run standard (even home reference) to evaluate the fractionation that can occur all along the different steps? please provide us with the values and varibility on reference (is it the 0.2‰ you mention at the end of the §?). * line 172: only to let me know, why did not you split the millet derived gas into 2 aliquots: one for d13C and one for 14C measurements? you would have had both data on a very homogeneous samples. *

§2.3: please provide us with more information on chemical treatment and reduction prior the 14C physical measurement as you did for 13C. * lines 181-186: - please separate these lines from the preceding, they should be in a §entitled "processing data" or something like that. - please provide us with raw data -> add a figure with all d13C and 14C versus depth and the group you built. - please show us in a figure where are the raw data and what the group you created we really need to understand what you did and what is the rationale behind this ANOVA that allowed you to do so. * lines 193-204: these lines seem to be the result of hard time for authors. It seems they had to fight a lot to impose this SMA. Your choice was acknowledged by the publication of the Yang and Li, 2015 's paper. No need to demonstrate, here again, the appropriatness of the methodological approach. Please remove. * line 207 "... Neolithic .." do you mean "all seeds" or do you restrict to some of them. Please specify. That's the first time , you're talking about neolithic * lines 208 and everywhere else: "... from -11.11‰ to -9.26‰ ...". If analytical error is 0.2‰ one digit is enough. The second does not have any signification. * line 209: you eliminated the -8.8‰ value based on statistics. Did you cross with the lab book to check if there is a physical (lab) reason for that? * line 218: "(Araus and Buxo, 1993)", please also refer to original work of Farquhar or O'Leary. They are the real pioneers. * line 222: the 2015 values in Mauna Loa is -8.5‰ (http://www.esrl.noaa.gov/gmd/obop/mlo/summary.html) please adapt your calculation. Mauna loa is an island, bare and far from any human activities. It was chosen to reflect the global CO2 free from any local impact (human, vegetation). You are not is this configuration and should include the local effect within your estimation. Your database was designed and completed in 2015 in agricultural regions fully impacted by vegetation and human CO2 emission. You were not in a free zone as Mauna Lo and likely your modern millet did growth in a much more negative atmospheric CO2 that you think. Please discuss this point and (if possible) add d13C measured on modern atmospheric CO2 sampled in locations you collected modern seeds to evaluate the modern shift between Mauna Loa and the CO2 modern millet used for photosynthesis. * line 228 "... growing season ... " should be defined.. but will be defined if you follow

my proposition to move up a part you presently have in discussion (see lines 302-310) * line 229 : - what is the subscript "gp" for? - can you provide us with error margin on a (0.0077) and b (-14.56)? * line 238 "-10.55±0.16‰; the very low value of uncertainty clear sems to show that you didn't propagate analytical uncertainties to the mean d13C of each group * line 246: what is the subscript "re" for? * §4.1 should be better just after the introduction, it is not part of the discussion but part of rationale behind the approach. This can be part of a "rationale" §with lines 302-310. * line 259: what is the biblio reference that attests that archeo combustion was performed at temperature of about 250°C? please add. * line 263-265: only accusations that do not bring any added value to the paper. Please remove and only keeep "The d13C signatures conserved in carbonized common millet are thus reflective of the true environment". * line 266: carbon without capital letter * line 273: do you mean concentration of CO2 and HCO3-? please correct * line 282: instead of IPCC reference, consider the vegetal physiology original bibliography * line 289: corect stamatal into stomatal * line 296-301: already stated in results, no need to repeat. remove * line 302-310: move up in a "rationale" §between intro and methodology * line 311-314: should better belong to methodology, in site description * line 323 and following: as the absolute value is highly dependent of the d13C value of the atmospheric CO2 you had for the reference equation, please consider to discuss relative values: this period of Holocene was wetter or drier than the other part of Holocene * line 338: please provide references for ".. other global records". * lines 357-358: no interest, remove * line 361: please be more specific, you don't have here the wettest climate but the wettest millet growth season. * line 377: please add a reference for PMIP2 and this specific result

* tables: legends are much too short. please extend them. Table and associated legend should have a stand-alone value. * table 1: what do you mean with "sources"? please replace "N°" by "number of grains", replace accronyms by extended names (or define in legend) * table 2: - replace accronyms by extended names (or define in legend), - I guess what you call "AMS 14C age (cal yr BP)" is conventional 14C age, thus replace the column title by "conv. 14C age (yr BP) – 1sigma", - calibrated age range can not be

presented as mean value of range extrema $\pm$ the half-distance between range extrema. This only because the mid point of the interval is not associated to the maximum of probability. Please follow the 14C convention and provide us with the range(s) and the associated probabilty density (yes, for this period of time you might have several intervals that share the 100% of the 2-sigma probability density. You might consider to add the age with the maximum of probability (last column of the IntCal output table) if it better suits to you. * table 3: - replace accronyms by extended names (or define in legend), - in legend, please specify what N and d13Cre are for. - instead of mean d13C provide us with d13C range or add another column - please respect the significance of digits and provide d13C with only one digit

* Figure 1: - make sure sites are visible and add their names (or acronyms) on the figure. - if possible add also the sites you mention in Figure 6 (if not possible, add a map with sites in Figure 6 itself) - please add a sign (star, point, arrow, ..) to show depths the seeds were extracted from (entlarge the figure if required) - this question is maybe more for publisher: is it require to provide references for CorelDraw or others Word or Excel? * Figure 6: the sites mentioned here should be geographically visible in a map, here or on the Figure 1 map. It would be great to locate them within a meteorological context, can you consider to add a limit of monsoon influenced zone?