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Interactive comment on “Primary productivity and its correlation with rainfall on Aldabra Atoll” by J. Shekeine et al.

Anonymous Referee #2

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Summary:

In their study, Shekeine et al. combine both rainfall records and two potential measures of primary productivity (i.e. tree-ring and satellite derived NDVI measurements) to assess the implication of rainfall trends on food resources for giant tortoises on the Aldabra atoll for 2001–2012. In their results, they focus on the satellite data as tree-ring analysis did not give the outcome they hoped for. Over four decades they observed a 6 mm yr⁻¹ rainfall decline. For the period 2001–2012 they found a correlation between productivity and rainfall, but did not find any changes in mean rainfall or productivity. Based on this shorter observation period they conclude that future declines in rainfall are likely to impact Aldabra's ecosystem.

General comment: I feel that Shekeine et al could have done better in their study on

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a very interesting and increasingly important topic. First of all, the authors should be clear from the beginning that the tree ring analysis did not provide useful ecological information, in contrast to what they claim at the end of their MS in the discussion and conclusion. Additional isotopic analysis on their stem samples and tortoise turf could helped to better understand the physiological backgrounds of both vegetation types. Now the authors are only relying on NDVI data, which is limited. Second, I believe that the authors are discussing NPP and not GPP. Third, you should be cautious when you want to talk about water (drought) stress. You should assess the actual plant water status (for instance using sap flow and transpiration measurements at plant level and soil water potential in the soil) in addition to precipitation measurements to know whether plants are really water stressed in the dry season. Finally, why focus on rainfall trends, why I expect that extremes are potentially much more important for this type of ecosystems.

Specific comments:

Abstract:

P982 L4: I agree that local rainfall trends are important. However I'm expecting that climate extreme events should have a much more important impact on Aldabra's ecosystem as compared to the long term decreasing rainfall trends, as vegetation potentially might adapt. The impact of such extreme events on primary production has been recognized (Reichstein et al. 2013 in Nature). The authors refer in their discussion to studies that relate such an extreme event to decreases in tortoises population dynamics due to the loss of important shade trees for tortoises (Bourn et al. 1999, P995 L5). However, the authors mainly focus on trends and ignore the possible impact of such extreme events on this ecosystem.

Introduction:

P983 L24 (and further): I guess you mean here net primary productivity (NPP and not GPP) as you refer to studies that have investigated NPP.

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P984 L9-L16: I think that this section should be discussed more in detail as this is of interest for the reader to frame your results. Don't you have more references that observed correlation between tree ring growth? Here you refer to dramatic fluctuations in rainfall (L12) which I agree is of greater importance than long term decreases in rainfall.

Methods:

P985 L6. would be good to mention dimensions (interesting to know for satellite analysis) here cause not everybody knows about the Aldabra atoll.

P986 L10 P987 L4: Is is interesting to give such a description for a method that only provided little information? I think the authors should be clearer that the treering analysis did not give the data they hoped for.

P 986 L12-14. I assume you mean radial stem cross sections. Why did you only select 32 out of 45 samples?

P987 L5- P989 L17: I think is not that well structured and more information should be given for non-specialists which are not familiar with MODIS data analysis and terminology (like TIMESAT, Savitzky-Golay filter and STL analysis...).

Results:

P991 L1: I don't see why 1998 should be left out. Such transition from extreme wet years to dry years could provide insightfull information in ecosystem functioning for this atoll.

P991 L15-17: This is more a discussion sentence so move to that section.

P991 L19: which clear tree-ring wood anatomical structures would you mean?

P991 L22: Absolute age of trees could be determined using 14C bomb analysis of your sampled cross stem sections.

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P993 L5-L10: In the way you mention it now, it is like you have left out year 2007 on purpose to have that correlation between NDVI and wet season rainfall. I would rephrase this and include the 2007 in the dataset (and give correlation analysis data) and hence better explain why 2007 data is left out. this way the reader will better understand this was an objective selection.

Discussion:

P994 L12-L15: These rooting depths are merely based on assumptions. Would have been interesting to check on rooting networks of the woody species as compared to the tortoise turf. Moreover 18O analysis of plant samples (like your stem cross sections) and ground and rain water could provided very interesting precipitation on the potential contrasting plant physiology. Now your reasoning is just based on assumptions and you're unsure wheter *O. ciliata* uses ground water or not (see P995 L20)

P994 L19: I don't see how Aldabra's susceptibility to drought is evident across its entire landscape? Moreover it is important to mention that you only measured rainfall and no real parameters that are generally used to assess drought impact on NPP like soil water potential, sap flow and transpiration.

P995 L16: Is there something known on the resprouting capacity of *O. ciliata*?

P997 L14: Here you overestimate the information that you obtained from tree ring analysis. Be clearer about this.

Table 3: write LOS in full for grande Terre east.

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