Responses to specific questions and comments are made below:

**Anonymous Referee #1**

This manuscript presents a long term study on the water storage in ponds, based on a number of different satellite images and aerial photography acquired over the Gourma Region in Mali. The authors report of a drastic increase in pond surface areas, despite a reduction of rainfall – an observation much in line with the "sahelian paradox" that has been described for that region with an increase of stream flow despite a reduction of rainfall.
While the topic is interesting and important from a scientific and water resources point of view, the manuscript suffers from language problems and has a number of structural and organizational flaws. More importantly, however, is that the results of the analysis are not presented adequately, and it is not obvious to the reader how certain conclusions are arrived at as a result of the analysis.

The most prominent concerns are the following:

- According to the authors, 92 ponds were analyzed. However, only the results from two such ponds are presented (Agoufou and Ebang Mallam) at greater, but still limited, detail. Much of the authors' argumentation is based on the presented data from these two ponds.

As stated in the general comment from the authors, the analyses of the flooded areas of the 91 ponds (formerly 92) have been complemented by classifying all the available Landsat images for September and November over the area. Two series of Landsat scenes area included one in September, matching the peak of the flood (1975, 2001, 2002, 2007), one in November, early in the dry up of the ponds (1972, 1984, 1986, 1999, 2003, 2006). One additional scene has been classified in October 1999.
Because of data availability (aerial photographs, CORONA, FORMOSAT, SPOT images), the seasonal dynamics of flooded areas in ponds was studied more at depth for the two ponds of Agoufou and Ebang Mallam, but their dynamics is now compared to that of other ponds (New figures 9 and 10). It can be seen that these two ponds behave like the average 'blue' ponds of the centre region. Thanks to the additional figures, most of the argumentation can now be based on a broader dataset of 91 or 51 ponds.

In the context of lake turbidity in ponds the authors state on p. 5063, l.12-14 "[: : :] and, like in the case of Agoufou, expansion of the watershed by capture of a neighbor watershed that till the late 1980's was only feeding the ponds of Sabangou and Taylalelt." Information on how much the catchment of the Agoufou pond expanded are not presented.

We agree it is very useful to provide such information. The area expansion of the watershed feeding Agoufou (same done for Ebang Mallam) that result from the increased connectivity of the stream web in relation with reinforced concentrated run-off is now documented. In fact, the sum of the ponds present in the three catchments (Agoufou, Sabangou and Taylalelt) undergoes a drastic increase, almost only due to the Agoufou pond (+360.2 ha for Agoufou, + 36.4 ha for Tayalelt, +0.3 ha for Sabangou between 1975 and 2002). This information is provided in the revised version. It is not just a change of catchment, which causes the increase of the Agoufou pond. It is however important to mention the changes in connectivity in the pond network.

It is not apparent how observations from this pond are used to argue that the flood regime of ponds started to change in the late 1980's (i.e. stated in p. 5048, l. 15-17, or p. 5067, l. 13-16 ) and attribute this to the effect of droughts on herbaceous and woody plant vegetation over shallow soil (p. 5067, l. 26- p. 5068, l. 2).

This is an interesting point, and it relates to the two main concerns dealt with in our general comment. The additional data give a more precise view of the timing of the changes. In addition to the curve and points already given for the Agoufou pond, the graphs presented for the 91 ponds in central Gourma

(and 51 ponds flooded in November) confirm the changes in flooded areas, initiated in the 1970's accelerated in late 1980's. (New figure 9 and 10).

Even though there are only a few satellite images available from the 1970's and 1980's (Landsat MSS and Landsat TM, see Table 1), the results from these images are not shown anywhere.

Additional satellite images are now included in the analysis, and the Landsat archive has been extensively searched for. We now present as much data as possible (September and November time-series, histogram of the 91 ponds for the 1975-2002 change)

There is also no other line of argumentation, i.e. drawing on different research, that would allow coming to the conclusion that a change can be pinpointed to the late 1980's.

Recent analyses of vegetation, soils and run-off monitoring over the Gourma region, and western Niger region are now referred to in the text, and a graph is added (New fig 11) to illustrate differential dynamics of woody population depending on soil types.

- P.5062, l. 18-20 reads: "Despite the overall 98% surface increase between 1975 and 2002, 17 ponds had no flood increase, and the rate of increase of the other 75 significantly varied between ponds." There is no presentation of any of these results and no more information on the variation observed in the 75 ponds that showed an increase in surface area over time. It is unclear why this information is withheld.

Systematic reanalysis of the 1975 and 2002 Landsat scenes along with the analysis of the new scenes provides slightly different figures of 108% increase for the flooded area of 91 ponds in September 2002 compared to September 1975; and again 305% increase between 1972 and 2002 for 51 of these ponds in November. The histogram (Fig 12 formerly 9) displays differences in flood dynamic behaviour, according to the turbidity of the water and the latitudinal position of the pond. In addition increase (or decrease) in flooded area from 1975 to 2002 for each individual of the 91 ponds are displayed in a new graph (New figure 10) illustrating the variability of the processes, and helping in putting the case studies in a regional context.

p. 5048, l. 9-11: "The high-frequency MODIS data document the seasonal cycle, with an abrupt rise early in wet season and a progressive decrease in the dry season." Please specify what the abrupt rise refers to.

The precision is now given: rise and decrease of the flooded area of the studied ponds during the seasonal cycle.

p. 5048, l. 27- p. 5049, l 1: "Instead, major responsibility is attributed to increased runoff triggered by the lasting impact of the 1970–1980's droughts on the vegetation and on the hydric system over shallow soils." The first part of the statement is not arrived at through thorough analysis in the manuscript. If this statement is to be made, the authors should provide sound reasoning for this statement.

Indeed no measurements were made of run-off and water flows in the Gourma watersheds in recent years. Yet, herbaceous and woody plant vegetation cover have been monitored in the area. This survey indicates differential dynamics following the drought, mostly depending on soil types and related to the mode and intensity of run-off. References of recently published papers are given, the text is revised and a figure added (new figure 11), as said in our general comment.

p. 5048, l. 27- p. 5049, l 1: "[: : :] and on the hydric system over shallow soils." It is not entirely clear what the term "hydric system" (also p. 5051, l. 25, p. 5063, l. 10 and l. 15, p. 5068, l. 1) refers to (hydric soils?). A variation is the term "hydric web" (p. 5052, l. 9 "The position of the pond along the hydric web, [: : :]") which is also unclear. p. 5050, l. 4: period is missing at the end of the sentence.

‘Hydric system’ is a literal translation of French ‘systèmes hydriques’ that encompasses the modes and patterns of run-off, run-on, infiltration and subsurface water flows. To clarify this, ‘hydric system’ has been converted into ‘runoff system’ when adapted, and ‘hydric web’ into ‘stream web’.

p. 5050, l. 5-6: “The aim of this work is to document and discuss the evolution from the mid twentieth century of surface water in the pastoral region of Gourma, in Mali.” Should be “The aim of this work is to document and discuss the evolution of surface water from the mid twentieth century in the pastoral region of Gourma, in Mali.”

Corrected, thank you.

p. 5050, l. 26: “: : :used to outline water level in ponds: : :” should be “: : :used to outline the extent of surface areas of ponds”

Corrected, thank you

p. 5051, l. 13-16: “Indeed, rainfall of most years from 1970 onwards stand below the average over the whole series (375.2mm_110.8 from 1936 to 2008) with average rainfall dropping of 20% prior (422.2mm) and since (336.2mm) 1970.” should be “dropping by”. Please also rephrase the sentence to clarify

Corrected, thank you

p. 5053f, Subsection “Data”: There is no description of the precipitation data.

The information on the data sources are added in methods

p. 5055, l. 12-14: It should be explained why the NDPI can separate aquatic vegetation from adjacent, land based vegetation.

As it is stated in the text, the NDPI separates ponds from surrounding land by the low reflectance in MIR, conferring low values to NDPI. As stated in the following paragraphs, this applies more to the turbid water ponds with no aquatic vegetation than to the less turbid water ponds associated with aquatic vegetation. Yet, even is aquatic vegetation is abundant, NDPI is relatively low compared to that of green vegetation on land (see example of the Massi pond in Fig. 4)

p. 5057, l. 6-9: ” The average values of the NDPI and the MIR band within this region were then computed, and a tolerance was applied to those values to define the thresholds used for the classification (namely _0.1 for the index values and _5% for the reflectance values)” What are these values based on?

These values have been empirically set based on the radiometric and indexes profiles.

p. 5059f: Section “Results”, general comment: The result of the analysis of the 92 ponds is largely absent, except for some detail that is given for two selected ponds. It is essential to present much more of the results if the reader is to be convinced of the later conclusions. (What is the size of these ponds? Temporal dynamics? : : :)

The point is well taken. Complementary analyses of Landsat scenes have been performed, their results are included in the text as well as in figures (New figure 9 and 10, actualised figure 12 ex 9), see general comments by authors.

p. 5059: Subsection 4.1 “Assessment of the classification”: This section is under “Results”, but it contains mostly the methodology. The methodology should be extracted and presented under section 3 (Methodology).

Agreed, most of the subsection 4.1 is now brought in section 3 as subsection 3.7

p. 5059, l. 10-13: “For LANDSAT TM and ETM, images, the accuracy of the maximum likelihood classifier is evaluated by comparing classified data with an independent set of well characterized areas resulting from field studies (Hiernaux unpublished).” Please clarify what the well characterized areas are.

The text has been changed to refer more clearly to a mapping exercise done with photo-interpretation of aerial photography (1/50000 IGN aerial photography, 1/200 000 printed LANDSAT scenes) systematically checked in the field, unpublished work (AMMA project report).

p. 5059, l. 16- p. 5060, l. 9, general comment: MODIS data makes up the largest number of images this study is based on (366 images, Table 1), but the accuracy assessment is described rather vague, although it is described as difficult. Please be more specific, i.e. when the size of the ponds decline, what ratio of mixed to pure pixels do we end up with (maybe to be compared to this ratio for a full pond).

The accuracy is assessed by comparison with high resolution satellite outputs. Because of the extent to which pixels located within the area of the pond are entirely flooded, is not known, the precision of the un-mixing relation is degrading as the area flooded in the pond shrinks. An example is given of the worse relationship found between MODIS assessment and high resolution satellite estimates of flooded area.

p. 5060, l. 6-7: “[: : :], which concluded that surface estimation is accurate above a given threshold of a few ha or tens of ha, allowing pure pixels to be present.” This is too vague. If you have used a threshold you need to present a specific number.

Based on the comparison of MODIS and high resolution classifications, a minimum size of 40 ha is retained for a good estimation of pond surface. This is modulated by the shape of the pond, with smaller water bodies being well measured by MODIS when highly compact, but not when mixed pixel are dominant. Note that the MODIS images are used with two objectives: assessing the seasonal cycle of the case-study ponds and the inter annual variability, so as to inter-compare all historical data acquired at different time of year and different years. Details on the estimation of pond surface with low or medium resolution sensors (MODIS, AVHRR, VGT) are documented in the cited references.

p. 5060, l. 23-25: “Only a few (Gossi, see Fig. 2 also Benz0ema, which is west of the LANDSAT scene) were permanent until the 1990’s (Ag Mahmoud 1992) but since, additional ponds (Agoufou, Ebang Mallam for example) became permanent.” Please specify: How many are a few? And how many are a few more?

Only two were considered permanent in Ag Mahmoud monography (1992), while at least 6 more have not dried up since early 1990. Corrected in the text.

p. 5061, l. 4-6: “The variations of the surface of the Agoufou pond inferred from 2000– 2007 MODIS data (Fig. 7) show a linear relation with precipitation.” What is the $r_2$ of the linear relationship?

The coefficient of regression is indicated ($r^2$=0.78 for the 1999-2007 data). However, we do not want to over-emphasize this regression. Rather, we want to provide an easy way to have the precipitation data and the pond surface data presented. Therefore, we prefer not to show the regression line. The r2 coefficient is now mentioned in the text

p. 5061, l. 9-13: “However the values of the pond’s surface do not appear to be widely scattered over the last 10 years: for cumulative rainfall ranging from 300mm to 400 mm, the surface of Agoufou pond falls between 150 ha and 230 ha and Ebang Mallam (not shown) falls between 300 ha and 450 ha.” Why are the results from Ebang Mallam not shown?

The relation between annual rainfall and area flooded at Ebang Mallam are not shown because the rainfall records at Ebang Mallam only started in 2005. All numbers, however, are found in the figures (6 and 7) so that building such a relation is feasible.

p. 5061, l. 15-18: “The analysis reported above provide a range of seasonal values of the flood surface of the ponds that allows the interpretation of their comparison with the few data available for the historical period (single points in Fig. 6). Each historical data can be compared to pond’s surface at the same time of year and for similar rainfall amount.” The part “: : :and for similar rainfall amount” is only possible in connection with Figure 7 (also indicated in the following sentence). However, because the size of the contributing area of the Agoufou pond changed during the period of observation, the conclusiveness of the results are limited. Data from Ebang Mallam which could back the argument is not shown in Figure 7.

In order to correct for the bias due to the increasing connectivity between watersheds at Agoufou (it also applies to Ebang Mallam and many other ponds, indeed), the text now comments on the sum of the areas of the ponds in the overall watershed (Agoufou + Taylalelt + Sabangou) as mentioned above. The dynamics of the component ponds are also presented separately in the diagram (new fig 10).

p. 5062, l. 2-6: “The swelling of the ponds flood do not match the onset (early 1970’s) nor the peak of the drought (mid 1980’s). It did not coincide either with the wetter years of (1991, 1994, 1996 and 1999) but preceded them, starting in the late 1980’s with open water remaining during the whole dry season in both ponds from1990 onwards.” There is no evidence given that would support the argument that a change to the late 1980’s. Please explain how you pinpoint the start of a regime change without any data shown.

We agree. Additional data have been provided from the analysis of additional LANDSAT images including images from 1972, 1984 and 1986. Then, the formulation used to describe the inter-annual dynamics of the flooded areas of the Gourma ponds has been adjusted recognizing that flood first started to increase slightly following the droughts of the 1970’s, but that a real jump occurred, for a majority of ponds (not all of them) in the late 1980’s.

p. 5062, l. 9: “The supervised classification of flooded and moist soil surface in September 1975 and [: : :]” Several questions arise in relation to this sentence. A) it is not clear why the classification of moist soil surfaces is pointed out here. Is moist soil included in the pond area? If remotely sensed moist soil surfaces are relevant in this study (i.e. in relation to runoff production, etc.), please describe it and explain its classification in the methodology section. B) It mentions the year 1975 – there no data shown for 1975 in any of the graphs.

We agree. Flooded plains, either in open woodlands or in herbaceous wetlands, have been systematically classified (supervised classification), as well as other land surfaces such as bare clay soils, bare loamy soils, rock outcrops. None of them are included in pond classes. The objective was not to assess the area covered by these soil/vegetation cover classes but to improve the classification of the water bodies, by avoiding confusions between some of them and pond water bodies. This was done systematically for all LANDSAT scene classification, including 1975.

p. 5062, l. 9: “All together, the flooded area of these ponds reached 12 441 ha in 1975, 20 321 ha in 1999 and 23 119 ha in 2002, thus an overall increase by 98% over the 1975–2002 period of time. The following analysis focuses on the 2002– 1975 paired classifications, since these two years are closer in terms of precipitation and span a longer time-period.” If we believe Figure 1, then the years 2002 and 1975 are quite different (1975 ca 150mm above average, 2002 ca. 50mm below average) – in terms of precipitation, the years 1975 and 1999 are closer. Please correct.

Reviewer is right, thank you for pointing this. Rains were more abundant in 1999 than in 1975 and 2002. Although 1975 rainfall is closer to 1999 than 2002 rainfall, we preferred to select a year with less rain than in 1975, to discard any rain effect. Another reason why 1999 is not retained in the September series is that there are no scenes at the right time, one is too early (August) and includes large extends of very

shallow surface water just following a rain event, and the other scene is from October, a bit late to be compared with the other September scenes (shown on figure 6 and 7). On the contrary the scene from November 1999 is included in the November series. The use of longer Landsat series (September and November) makes the selection of 1975 and 2002 less central to the paper.

p. 5063, l. 9-14: "This is due to a structural modification of the hydric system with the shortcut of some of the relay ponds upstream, acceleration of the flood speed by deepening of the channels, [: : :]" Apart from the need to clarify the term "hydric system", what evidence are these statements based on? The sentence continues "[: : :] and, like in the case of Agoufou, expansion of the watershed by capture of a neighbor watershed that till the late 1980's was only feeding the ponds of Sabangou and Taylalelt." It is not clear to me why a pond was selected as the most prominent example that had an increase in contributing area during the period of observation. If there is an explanation for it, the reader should be informed of this much earlier in the text so that this aspect can be taken into account in reviewing the analysis.

The apparent bias related to the expansion of the watershed due to increased connectivity of the streams is corrected by commenting the sum of the water body areas and the final watershed. Then, Agoufou is not an exception as indicated by the comparison of the area flooded with that of the mean pond, at least for the turbid water category of ponds (fig 9). Moreover, the two case study ponds do not rank as extremes among the ponds arranged by amplitude of change in flooded area (new figure 10). Then, the expansion of watershed (always functionally partial, i.e. only a fraction of the water flows reach the final outlet) is part of the functional change of the run-off system observed on the shallow soil component of the landscape (also in Western Niger, Descroix et al. 2009).

p. 5064, l. 2-3: "When using coarse resolution images (MODIS), a critical size was identified." Please state this minimum size.

As explained earlier the comparison of MODIS to high resolution classification sets the minimum size of 40 ha for a good estimation of pond surface.

p. 5064f, Subsection "A paradoxical dynamics": Referring to the title of the manuscript I would expect most of the interesting results condensed and discussed in this section. However, this section is a little detached from the rest and not easy to follow. I under- stand that the authors point out differences observed in "blue" and "red" ponds, but I don't see the conclusion of the discussion. I suggest the authors re-write this section, or combine it in a clearer form with section 5.3.

The section is rewritten and put under a new title: 'what are the possible causes of the uneven increase in pond flooded areas'. It concludes that 'Increased surface runoff is the most plausible factor causing the observed increase of the pond area'. The subsection articulates better with the following one (5.3) titled 'what are the possible causes of increase in surface runoff?

p. 5066, l. 19-23: "While the vegetation of rangelands set on sandy soils and on lowland clay soils monitored in the Gourma revealed very resilient to the drought, with a fast regeneration (2–5 years to reclaim production) of the herbaceous layer and a slower one for woody plants (10–25 years to reclaim production), that of the shallow soils did not recover from the drought 25 years later." Please give evidence/a reference, especially for the last part of the sentence.

This interesting point is commented in the author's general comment. References are made to recently published papers giving a synthesis of the vegetation monitoring conducted in 25 rangeland sites in the Gourma (Hiernaux et al. 2009 a, Hiernaux et al. 2009 b). In addition, a graph is added to support the differential dynamics of woody populations depending on soil types (New fig 11).

p. 5067, l. 22- p. 5068, l. 2: "The causes of the changes in flood regime of ponds are discussed in relation to their geographic location, the particularities of the watershed feeding them, and the dynamics

of the radiometric characteristics of their flood. The possible impact of cropland expansion and intensification of forestry and pastoral use are discussed and considered secondary. Instead, it is argued that the lasting impact of the climatic droughts of the 1970's and 1980's on the herbaceous and woody plant vegetation over the shallow soils on rock and hard pan outcrop, and its consequences on the hydric system, are the main causes of this spectacular phenomenon." With reference to the previous chapters I don't feel like I experienced a thorough, well structured, and conclusive analysis and discussion of the causes of the changes of the flood regime. Several aspects were mentioned, but not discussed at depth. An additional shortcoming is the lack of presentation of results from the 92 ponds which were part of this analysis.

This is amended now in the text and in adding (new fig 9 and 10).

With well over 400 satellite images and aerial photographs at hand it is surprising that no effort was made to evaluate whether the herbaceous and woody plant vegetation over the shallow soils on rock and hard pan outcrop were affected by drought to such an extent that an increase in runoff from these degraded areas can explain the drastic increase in pond size.

Satellite remote sensing, associated or not to vegetation growth modelling, has been extensively used to study the inter-annual dynamics of the vegetation cover over the Gourma (e.g. Mougin et al. 1995, Tracol et al. 2005; Jarlan et al. 2005, Jarlan et al. 2008). Results have confirmed, documented and located in space the regeneration of vegetation cover, as part of the so called 're-regreening' of the Sahel. However, by construction of the NDVI, the signal is dominated by the herbaceous layer and by its development on sandy soils. The interannual changes in vegetation cover of both herbaceous and woody plant over eroded slopes, rock outcrops and associated shallow soils are too sparse to be quantified by remote sensing with large field of view sensors like the AVHRR (they remain at the level of 'noise'). Yet, it at least proves that there is no strong regeneration of the vegetation cover on them, but fails to demonstrate a persistent trend to degrade. This discussion and the references are now added to the paper discussion.

Figures:

Almost all figures contain illegible text. Text size needs to be improved and figure size increased to give the reader the chance to study the presented information.

Figures will be checked on the size of the text, the width of the curves…and fixed in the revised paper, thank you

Additionally:
Figure 2: state date and band combination of the image acquisition. It is not explained what the N-C and C-S lines are, and how they were determined.

The North-Centre and Centre-South lines delineate main boundaries in landscape based on watersheds, their distribution also follows the biogeographic arrangement from more humid Sahel to the south, to more arid to the North.

Figure 4, 5: Figures are too small. Especially the line graphs are not legible at all.

Fixed in the revised paper, thank you.

Figure 6: Figures are too small, graphs not legible. It should be indicated what kind of satellite images are shown. "Up" and "Down" should be replaced by "a" and "b".

Fixed in the revised paper, thank you.

Figure 7: add a trend line to show the linear relationship and highlight the data points used (data points from 2000-2007), show $r^2$. The data point in the lower right corner has no date label. I would encourage the authors to add the data from the EbangMallam pond.

The coefficient of correlation has been added in the text. Unfortunatly for Ebang Mallam rainfall data only start in 20052005 and there are not records before Rainfall recorded at Hombori could be used as a rough approximation for rainfall over the area (this can be done by comparing fig. 1 and the Ebang mallam values given in fig. 6). We don't think that adding an extra figure, that will be anyway imprecise given the unavailability of rainfall records at Ebang Mallam, will add much to the paper findings, our aim here being just to state that the expected existing relationship between rainfall and precipitation is only valid for the recent period and was not the same in the past

Language:

The language of the manuscript should be reviewed.
At his point I just want to point out some recurring mistakes:
- "Ponds area" or "ponds' areas" should be "pond areas" or "areas of ponds"
- Most sentences containing "which" need to be corrected, i.e. p. 5050, l-25-29; p. 5052, l. 4-9; p. 5052, l. 23-26; p. 5064, l. 5-9 and l. 28.

Corrected, Thank you.

**Anonymous Referee #2**

General comments
This paper is very interesting and gives new insights on the rainfall/runoff changes occuring in the Sahel since several decades, lets say more runoff and less rainfall. Up to now these changes where assessed to be mainly due to the increase of agricultural areas, but this paper suggests that runoff has increased in areas only poorly cultivated. The material is rich, and the methodology is correct. Nevertheless, this paper needs to be improved in several ways. There must clarified what is a pond's (hydrological) regime. To me in this paper what is discussed is the variability of the pond surfaces over years. Is speaking of hydrological regime, we should see times series of discharges to the ponds.

The point well taken and expression referring to pond regime have been changed to what was really observed in this work (mostly by remote sensing): the flooded area of the pond.

To be sure that the runoff coefficient has increased, one should calculate the ratio of runoff/rainfall. It should be possible to calculate the rainfall on the surface of the pond basins, and estimate the ponds volume.

We agree. Yet we have not assessed the ration of runoff to rainfall, first because rainfall data were insufficient (only since 2006, the density of rain gauges was increased thanks to the AMMA project), and second because crude topographic profiles were only available for two ponds. However, I would be very interesting to develop this approach further in the future.

There are not clear hypothesis of why the runoff would have increased early in the 1990s. What has changed in the vegetation? It is very important to bring some features of the changes in the vegetation to support the conclusion that it is the main cause of the pond surface increase.

Point well taken: references to recently published paper on the dynamics of the vegetation, and a figure to illustrate differential woody vegetation dynamics depending on soils types have been added (fig 11, see the general comment by the authors). Also the text has been revised to be more explicit.

Even if we know, from the rainfall time series, that the period extending from the years 1981 to 1993 was the worst drought period ever recorded in the Sahel. This should be also discussed more deeply, as the

rainfall shortage is the main driver hypothesized for triggering the vegetation change. For instance the authors can show a rainfall time series longer than that presented on the figure 1.

Unfortunately, it is the longest series existing in the region. Moreover, we do not have the corresponding long term information on vegetation dynamics nor pond surface.

It is referred in the text to the variability of the surface of many other ponds, but one would like to see a table with detailed information about these ponds.

You are right, the analyses on the 92 ponds of central Gourma have been rerun, and expanded to other LANDSAT scenes. The results complement the results presented in the first draft, with a more precise assessment of the interannual dynamics (new figure 9 and 10). Moreover, the two new graph help in setting the two case-study ponds in the regional context of pond dynamics. See also the general comment by the authors.

For these reasons, I suggest the paper to be bringed a number of minor revisions.

Detailed comments
Abstract l1: "flood regime of ponds", this is not detailed in the paper. The topic do not seem to be the flood regime, but the variability of flooded areas. Studying the regime would mean that you present daily or monthly discharges to the ponds.

Corrected, Thank you.

Introduction p5049, l22-24: It is refered to Descroix et al, 2009, that the land clearing in the Sudanian area did not provoked a runoff increase as in the Sahel. But both areas can not be compared in term of runoff/rainfall processes over basins. Groundwater do not participate in runoff in the Sahel (or occasionnaly during the rainy season, and with very low amounts), while they are a significant part of the runoff for Sudanian rivers.Several papers discuss the decline of the groundwater table in the Sudanian area and its impact on river runoff (several papers on the Bani river for instance).

Water flows processes certainly differ between Sahelian and Soudanian ecosystems, and rainfall trends also differ, the scope of the point made was limited to the result of the processes on the water stored/ or flowing at the outlets.

p 5050, l7-8: it should be good to give a definition of what is a flood regime of ponds.

As your noticed earlier, the flood regime is not treated per se in the paper, only the flooded area is observed. Yet, the increase of the area flooded that follows the onset of the rain is interpreted as the rise of the flood, the filling up of the pond, while the slow shrink of area during the dry season, is interpreted as the drying up of the pond.

Chap 2.1. p 5053, l 1-4: it is said that ponds or lakes feed local shallow aquifers. It would be interesting to describe the mechanism of the feeding.

This has not been studied but would certainly deserve a study as these local shallow aquifers are only present at the vicinity of some of the ponds, and also seem to be subject to large historical and interannual variations.

Chap 2.2 p 5053, there are no data about water levels in ponds, nor about "flood regime" data, that could be interesting to present if they exist.

A few data only have been collected recently at Agoufou. Ponds in this area are not well-equipped.

Chap 4.3 p 5061, the interannual variability of the pond's surface is discussed. But it is difficult to interpret the figures, as we have not yet been presented the variability of the pond's surface.

This is now presented earlier in the text.

Chap 4.4 p 5061, l 14: the title should be modified, as, to me,the "pond's hydrologic regime", should refer to the variability of the input discharges.

The title as been modified accordingly

Chap 4.5 p 5062, l 18-19: the ponds' data should be presented in a table, as for now figures are given without any support.

A table with all 92 ponds will be to large for a paper, instead a diagram (new figure 10) as been added to illustrate better the dynamics with the increase in area flooded from 1975 to 2002 and proportions of 'turbid' versus less turbid waters in 2002. We agree it is important to present such data.

Chap 5.2 p 5065, l 1: "...it seems that red ponds did not increase as much as blue..." according to your results, they DID not, why do you write "seems" ?

Corrected, Thank you. The accuracy of classification of red ponds with MSS is less good than with ETM and TM (and less good that for turbid water in both MSS and ETM/TM). Whether it is a small decrease or a small increase should not be over-emphasized in our opinion, therefore the 'seems' that we employed.

p 5065, l 11-17: why at the outlet plain of these rivers (containing red ponds), excess runoff water would be "absorbed" and not in blue ponds? Conclusion

That is one of the differences between 'blue' and 'red' ponds. The last ones are often (not always) located in the bottom of valleys and surrounded by alluvial plains that may absorb part of the peak flood as temporal shallow flooding.

p 506, l 24-27: the surfaces of croplands, herbaceous and woody vegetation should be mapped over time. Are there not enough images to map theses surfaces ?

Yes and the work has been done. References are given and results are now mentioned in the paper.

p 5081, Figure 7: it is written that the change in pond regime started in the early 90s, but it seems much more difficult to assess this when you only show points for the years 1985, 1986, 1990 and 1996. Are there not values for the other years? Without these points it is very hard to give a year as being the start of the ponds change.

Unfortunately, the availability of high resolution satellite data is limited over the region. However, adding and crossing all existing information, including field ones, allow assessing the overall dynamics, which is not simple anyway. The ponds did not increase flooded area at once, nor in the same proportions. Yet the magnitude of observed changes implies profound mutation of the run-off system and the routing of the water flow in the ecosystem.