Solid Earth Discuss.,
doi:10.5194/se-2016-31-AC1, 2016

Solid Earth Discussions
Open Access
EGU

Interactive comment on "Vegetation Cover Change Detection and Assessment in Arid Environment Using Multi-temporal Remote Sensing images and Ecosystem Management Approach" *by* Anwar Abdelrahman Aly et al.

Anwar Abdelrahman Aly et al.

rasoul@ksu.edu.sa

Received and published: 30 March 2016

Dear Prof. Artemi Cerdà

Editor, Journal of Solid Earth

We would like to thank you very much for useful comments and suggestions of our manuscript titled "Vegetation Cover Change Detection and Assessment in Arid Environment Using Multi-temporal Remote Sensing and Ecosystem Management Approach". We modified the manuscript according, and detailed corrections are listed below point by point: We look forward to your positive response. Sincerely, Corresponding author

Printer-friendly version

Discussion paper

E-mail: rasoul@KSU.EDU.SA or anwarsiwa@yahoo.com

Anonymous referee 1

Comment: Lines 17-19 Please revise the sentence. “A multi-temporal set of image was processed. . ..landsat8 2013 to investigate the drivers responsible for the VC pattern and changes which are linked to both natural and social processes”. Respond: The sentence is revised.

Comment: Line 51 become more complicated? Authors should provide more information about this statement. Responds: More information included.

Comment: Lines 67 Please complete the sentence with the location of the study of Setiawan and Yoshino (2012). Responds: Setiawan and Yoshino (2012) compared series of images through time to derive the land changes in Tsukuba, Japan.

Comment: Line 102 I suggest to include the population of the two mentioned large towns to include a more detailed information about the study area. Responds: The population of the two mentioned large towns is included.

Comment: Line 105 The authors could provide an estimation of the number of springs in order to provide the magnitude of this source of water. Responds: No accurate estimation available of the total number of springs in the studied ecosystem.

Comment: Line 180 using electrical conductivity (EC) meter. Responds: Revised.

Comment: Line 186 Please include both abbreviations in the text distinguishing between EC measured on groundwater samples (ECw) in line 180 and EC measured on soil samples (ECe) since these abbreviations are used in lines 273-294. I suggest including the soil-water ratio of prepared saturated paste extracts in line 186. Responds: Both abbreviations included in the list of abbreviations.

Comment: Lines 207-212 Lines 220-221 Authors mentioned the purpose of using PRA approach and the characteristics of this method. This paragraph seems to correspond

to Materials and Methods. Responds: Paragraph on line 207-212 is transferred to Materials and Methods; however, the sentence on lines 220-221 found suitable in its part due to consistent with the context of the following sentences.

Comment: Line 226 revise sentence. Responds: Revised to be “Agricultural problems summarized by community study”.

Comment Lines 227-242 This is a major result and it should deserve a bit more discussion. I might recommend the authors to include references, examples or data. Responds: More discussion included.

Comment: Line 268 Figure 8 What type of kriging did authors selected to model the spatial distribution of EC? Responds: The kriging, geostatistical method, interpolation in Fig 9 was carried out using kriging interpolation tool of Geostatistical analyst in ArcGIS 9.3. This was included in the materials and methods, the part of Coordinate & GIS Analysis.

Comment: Line 279 Please revise the sentence “the ecosystem showed more vulnerable soil conditions for soil degradation” “the ecosystem was more vulnerable for land degradation”. Respond: The sentence revised.

Comment: Line 294 Please specify in which sites. Responds: In western AE.

Comment: Lines 304 – 311 This paragraph is a description of the three date palm fields studied that it should be included in Materials and method section. Responds: The paragraph included in the Materials and method section.

Comment: Lines 310 – 311 “A 5TE (Decagon devices) soil moisture . . . . . .at each field” is repeated in lines 187 – 188. Responds: The paragraph was revised.

Comment: Line 314 “therefore the ECe (measured in saturated soil past extract) is presented (Fig.11)” can be removed. Responds: Removed.

Comment: Lines 331 – 335 According to the objective iii) in line 93. The proposed

interventions should be discussed in more detailed.

Responds: The following paragraphs were included to the manuscript:

Sand dune fixation is generally used to stop the dunes encroachment. Two methods are usually used; biological i.e., planting trees, shrubs and grasses species, and mechanical i.e., wooden sand fences and footpaths. Shelterbelt systems and afforestation, biological methods, using Atriplex spp., Acacia spp, and Casuarina spp were found efficient in stabilizing dunes in arid environment of Egypt, Senegal, and India (Draz et al., 1992; Kaul, 1985). In fact, the importance of the sand dunes fixation by afforestation is not only sand dune fixation but also can conserve arid ecosystem balance, and produce fuel and animals feed (Draz et al., 1992; Kaul, 1985). In the USA, Tunisia, and Egypt saline waters have been successfully used for long irrigation time. The crops grown using this water are cotton, sugarbeet, alfalfa, date palm, sorghum, barley, alfalfa, rye grass and artichokes (Rhoades et al., 1992). In Texas, USA, the saline groundwater (TDS = 2500 to 6000 mg/l) has been successfully used for three decades (Rhoades et al., 1992). The suitability of saline groundwater for irrigation should be assessed for specific conditions including; crops type, soil characteristics, irrigation methods, cultural practices, and climatic conditions (Minhas, 1996). Many rational management option of saline irrigation water have been currently in use, some of them are: cyclic strategy, which involves using non-saline water and saline water in a repeating sequence, blending strategy which involves blending (dilution process) fresh with saline water, rotation strategy which means irrigation with low-salinity water for salt sensitive crops in a rotation with saline water for salt-tolerant crops (Rhoades et al., 1992), planting salt tolerant crop varieties or genotypes / cultivars i.e., amaranth and quinoa which can survive under harsh conditions (Fghire et al., 2015; Pulvento, et al., 2015), and finally the use of computer model for assessing water suitability for crops production (Aly et al., 2015).

Figures and Tables

Comment: Figure 4 there is no a full view of the shape for the year 2013. Responds: Revised.

Comment: Figure 5 sampling points of soil samples (n=50) can be included. Responds: Included.

Comment: Figure 8 replace less and above by “<, >” symbols. Responds: You mean Figure 9, revised .

Comment: Figure 10 caption: Salinity of selected soil samples (n=33). Responds: Revised.

Comment: Table 3 descriptive statistics of EC (ds/m) of soil and water samples. Please include the number of soil samples (n=50) and groundwater samples (n=180) as in Table 4. Responds: Included.

Comment: Table 4 replace Mini. by Min; use the same abbreviations for standard deviation and median in Tables 3 and 4 and place a table note with the abbreviations i.e. St.Dev: standard deviation Vari: variance? and Swe: skewness. Responds: Replaced and abbreviations included.

Technical corrections:

Comment: Please ensure that the references are listed first alphabetically and then chronologically (e.g. see lines 39, 49, 52, 57, 58, 63,131,209). Responds: Revised accordingly.

Comment: Line 100 delete “and”. Responds: Deleted.

Comment: Line 120 (Aly, 2007; Reed et al.,2009). Responds: “;” included.

Comment: Line 169 A and B in lowercase letter and include A and B letters in Figure 3 as in Figure 2. Responds: A and B in lowercase letters are included and A and B letters included in Figure 3.

Comment: Line 186 “sample” instead of “samples”. Responds: Revised.

Comment: Line 228 salinization. Responds: Revised.

Comment: Line 339 in addition to. Responds: Revised.

Comment: Line 263 findings. Responds: Revised.

Comment: Lines 268, 271 and 287 Figs. Responds: Revised.

Comment: Line 289 replace waters by water samples. Responds: Replaced.

Comment: Appendix Environment – replace “is” by “it”; Forget and Lebel, 2001. Responds: Replaced.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/se-2016-31/se-2016-31-AC1-supplement.pdf

---

Interactive comment on Solid Earth Discuss., doi:10.5194/se-2016-31, 2016.

Printer-friendly version

Discussion paper

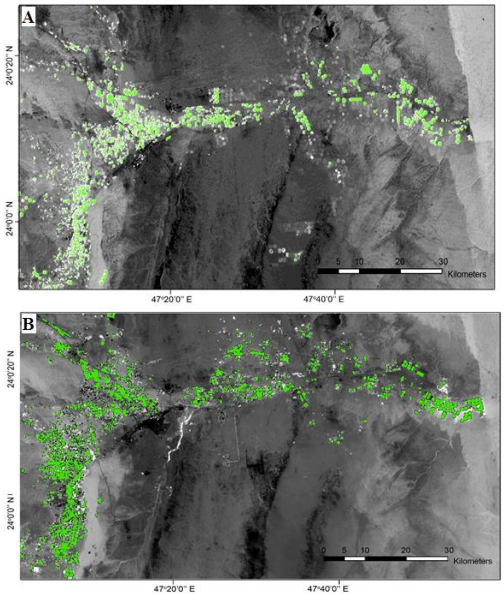

Figure 3. NDVI classification for Landsat satellite image of Al-Kharj A) 1987 B) 2013

Fig. 1. Revised fig 3

Printer-friendly version

Discussion paper

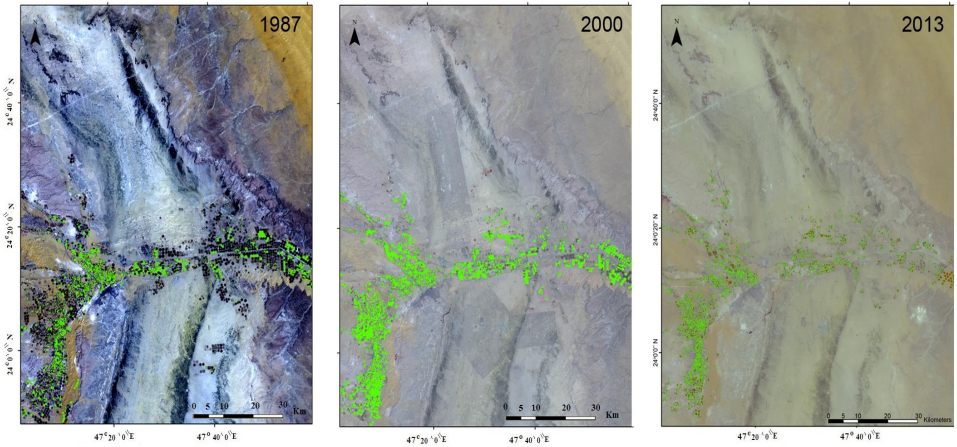

Figure 4. Vector layer for classified NDVI over Landsat satellite image 1987, 2000, and 2013 (Green color = cultivated area)

Fig. 2. Revised fig 4

Printer-friendly version

Discussion paper

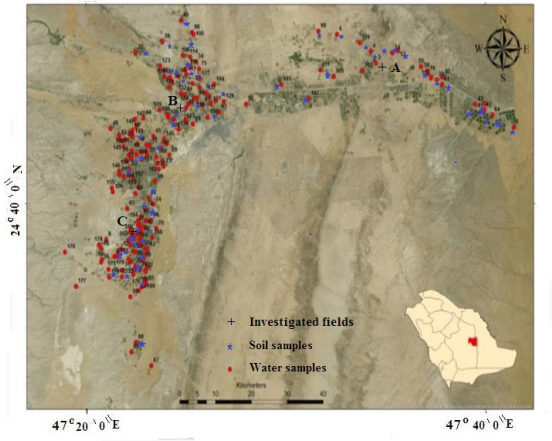

Figure 5. Location of the studied groundwater and soil samples, and investigated fields

Fig. 3. Revised fig 5

Printer-friendly version

Discussion paper

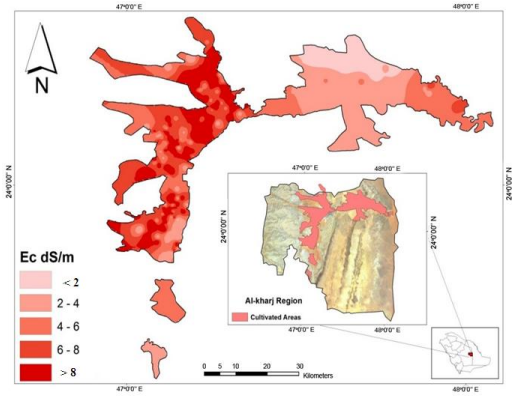

Figure 9. Interpolation of groundwater EC

Fig. 4. Revised fig 9

Printer-friendly version

Discussion paper

Table 1. Accuracy assessment and ecosystem calculated areas of the classified images.

Reference Year	Classified image	Ecosystem calculated area (Km^2)
1987	Landsat4 TM	163
2000	Landsat7 ETM+	338
2013	Landsat8	245

Fig. 5. Revised table 1

Table 2. Water and soil deteriorated parameter (salinity) in relation to VC area

		EC_w			ECe		
		≤ 3	3 - 4	4-10	≤ 4	4-10	>10
Eastern Ecosystem	% of samples	83	17	-	76	18	5
	VC % decrease (2000-2013)			18			
Middle and western Ecosystem	% of samples	64	20	16	19	50	31
	VC % decrease (2000-2013)			33			

Fig. 6. Revised table 2

Table 3. Descriptive statistics of EC (dS/m) of soil (n=50) and water samples (n=180) in ecosystem areas subjected to sand dune encroachment (eastern part) or salinization (middle and western part)

	Soil		Water	
	Eastern part	Middle and western part	Eastern part	Middle and western part
Max	17.63	47.35	3.82	10.15
Min	2.50	2.34	1.31	1.83
Mean	3.05	12.11	2.50	3.22
Med.[1]	2.66	7.12	2.54	2.73
St.Dev.[2]	7.51	12.01	0.71	1.42

[1] Med. = Median [2]St.Dev. = Standard deviation

Fig. 7. Revised table 3

Table 4. Statistical analysis of groundwater chemical composition of Al-Kharj (n=180)

	PH	EC dS m^{-1}	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	Cl^{-}	HCO_3^{-}	CO_3^{-2}	SO_4^{-2}	SAR
						meq L^{-1}					
Max.	8.60	10.15	36.75	29.85	43.40	0.72	58.17	18.83	4.33	43.19	9.14
Min.	6.78	1.05	3.45	0.79	2.24	0.05	3.13	0.87	0.00	3.22	1.08
Mean	7.72	3.00	10.79	7.78	11.28	0.25	10.86	3.99	0.13	15.03	3.74
St.Dev	0.44	1.29	5.09	3.93	5.96	0.10	7.32	1.49	0.37	7.05	1.47
Vari.[1]	0.66	1.13	2.26	1.98	2.44	0.31	2.71	1.22	0.61	2.66	1.21
St. error[2]	0.18	0.23	0.33	0.31	0.34	0.12	0.36	0.24	0.17	0.36	0.24
Med.	7.72	2.64	9.60	6.69	10.21	0.23	9.50	3.83	0.00	12.83	3.51
Skew.[3]	-0.15	2.47	1.39	2.16	2.53	1.66	3.85	5.96	8.20	1.18	1.12

[1]Vari. = Variance [2]St. error = Standard error [3] Skew. = Skewness

1

Fig. 8. Revised table 4