Comments from the Reviewer:

Reviewer #1 (Formal Review for Authors):

Since the remote sensing vegetation indices have been well developed, extensive research has been conducted on vegetation change (greening or browning) and corresponding driver identification. Studies about the impact of land management is still lacking due to data and methods limitations. In this paper, the authors demonstrated a typical browning case over Syria by involving land management due to social unrest, which is quite innovative. This paper fits the scope of Biogeosciences and uses several methods with coherent results to support the conclusion. Therefore, an acceptance is suggested with some minor comments.

Dear Reviewer,

Thanks for your time. We strive to present an original work and your suggestion are of great help to improve this paper.

Regards,

Prof. Dr. Tiexi Chen and coauthors

1) In section 2.2, the authors need to clarify which year or which period of the land cover data are used to abstract different vegetation types.

REPLY: Thanks for your comments. The land cover data was used in 2010 which is in the middle of the study period, this detail has been added in the revised version.

2) cropland or farmland? Should be consistent

REPLY: Thanks for your comments. We checked the full text and unified it as cropland.

3) Line 171, "The vegetation change in the study area is mainly constrained by the soil moisture and precipitation." this sentence is ambiguous, soil moisture and precipitation are not independent factors.

REPLY: Thanks for your comments. We agree with your concern. A precise term should be water availability, which could be indicated by precipitation, soil moisture and other related indices. Therefore, in the revision, this sentence is:

"The vegetation change in the study area is mainly constrained by water availability."

4) The growing period is firstly defined in 3.1 section, which is used in the following analysis. The growing season usually defined in the method section. Meanwhile, growing season also should be labeled in figure 3.

REPLY: Thanks for your comments. The use of growing season is presented in the section 2.6 as “The growing season is defined from February to May (F-M) based on the vegetation phenology (Figure 2).” Meanwhile, both “Annual” and “Growing Season” were added as titles in Figure 3.

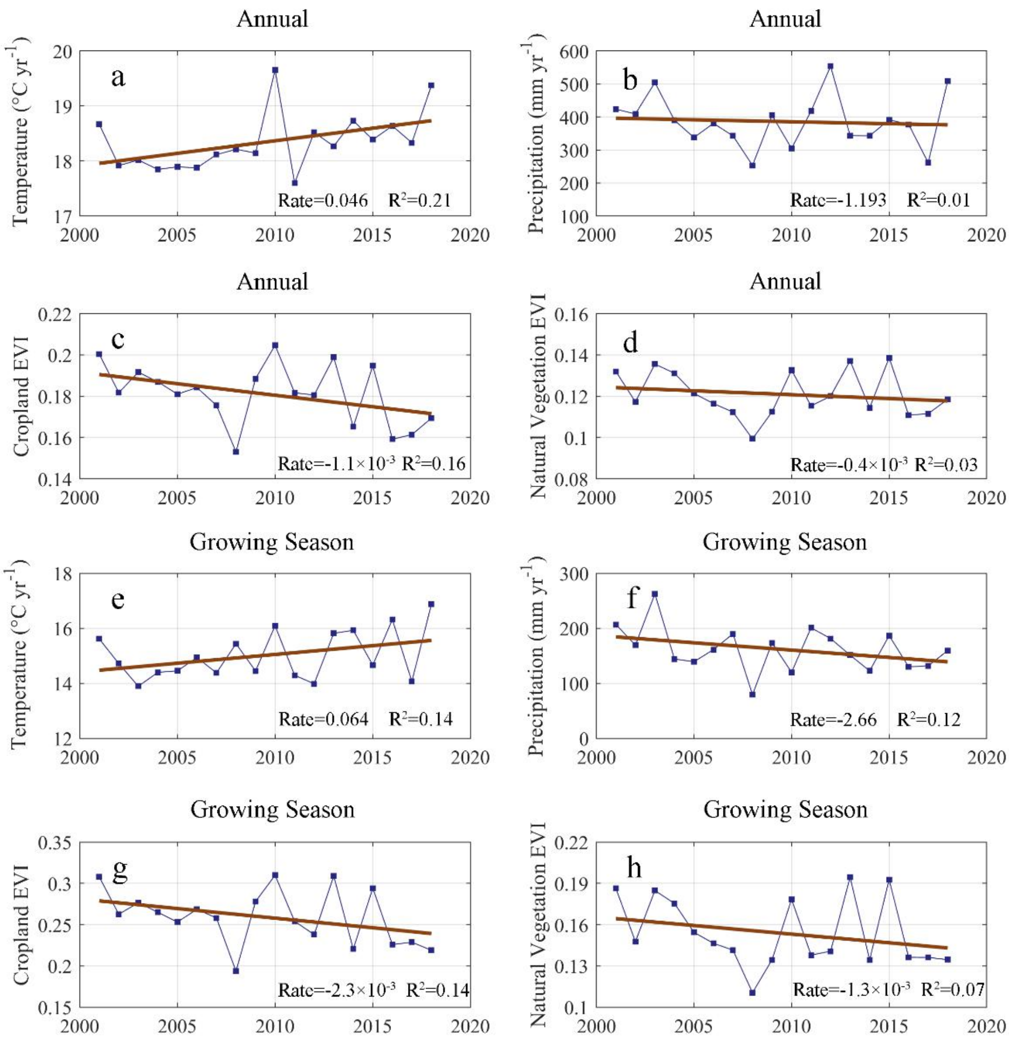

Figure 3. inter-annual variations of climatic factors and vegetation during 2001–2018. (a) – (d) are annual averages of temperature, precipitation, cropland EVI and natural vegetation EVI. And (e) – (h) are growing season (F-M) averages of temperature, precipitation, cropland EVI and natural vegetation EVI

5) irrigation distribution data was used in this study which is not mentioned in the method section?

REPLY: Thanks for your comments. The irrigation information was added as a new section 2.5 being “2.5 Cropland irrigation data”.

2.5 Cropland irrigation data

Irrigation is an important method for conducting farmland management and increasing production, especially for dryland. Irrigation facilities are also vulnerable to severe social stability and economic fluctuations. We selected the "Global Irrigation District Map" (latest version 5) from FAO (Food and Agriculture Organization of the United Nations), which shows the percentage of the total cropland area used for irrigation around a reference year 2005 with a resolution of 5 minutes (Stefan et al., 2013).

6) section 3.3 is quite interesting, Figure 7b is not clear, maybe the authors could demonstrate the subregion in Figure 7a.

REPLY: Thanks for your comments. Due to the color problem, the rectangle and border line in Figure 7b are blurry, we adjusted the color with black, and the figure is clearer now, as shown below. We also added this box in Figure 7a.

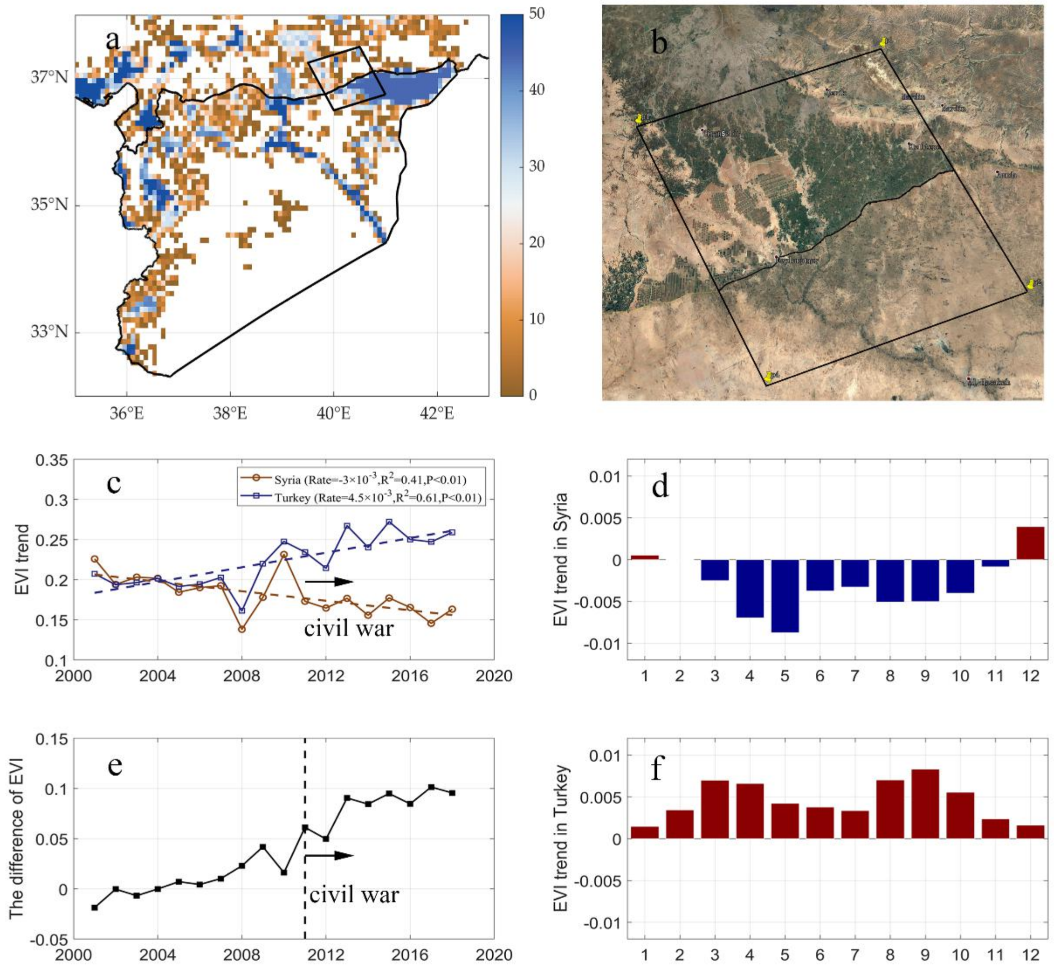

Figure 7. (a) The percentage of the total cropland area used for irrigation for the reference year of 2005. (b) The Khabur River Basin and cropland distribution (from Google Earth © Google Earth 2019, a KML file is attached). The vertex coordinates of the parallelogram are [37.5°N, 40.5°E], [36.75°N, 41°E], [37.25°N, 39.5°E] and [36.5°N, 40°E]. (c) Annual EVI series of cropland in the Syria side and Turkey side with linear fitting. (d) EVI trends of each month of cropland in the Syria side. (e) EVI difference between Turkey and Syria sides (Turkey's EVI minus Syria's EVI). (f) EVI trends of each month of cropland in the Turkey side.

7) in the discussion section, the significance of Figure 7 is not well illustrated.

REPLY: Thanks for your comments. We also realize that the content shown in Figure 7 is a very meaningful result, and the idea is worth digging deeper. In the revised version, we added a paragraph in the discussion section:

"In a local region where the climatic conditions (including average and variations) are quite similar, vegetation changes induced by natural factors should theoretically be similar. The difference in vegetation change of the two parts in such a region could be caused by human activities rather than natural factors. The paired analysis across the border between Syria and Turkey confirmed hypothesis. After removing the linear trend in EVI of both sides, the correlation coefficient reached 0.8. However, the annual and monthly trends of the two are completely opposite. This difference can only be attributed to human activities which refer land management in this case. In Turkey, since 1977, the government has built 22 dams, 19 hydropower stations and some irrigation networks, which has promoted the development of agriculture in the region (Eklund et al., 2017). For Syria, this can only be attributed to the adverse effects of cropland abandonment and insufficient planting caused by social unrest. Especially after the outbreak of the war in 2011, the gap of these two regions in the annual average EVI gradually increased, reaching more than 0.1 at the end of 2001 – 2018."