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Comparison of optics and radar images to obtain vegetation cover in Zagros forests (study area: Yasuj)

Abstract

Forests in the Zagros region have undergone many changes in recent years due to the uncontrolled interference of humans and the dependence of people on these resources. The use of remote sensing and geographic information systems is widely used in many scientific and research fields and it is important to use this science to obtain vegetation cover. In this study, we tried to use optical images including Landsat 8 OLI satellite imagery, sentinel 2 and Power Sentinel 1 radar images (GRDH) on dates 30/05/2017 to 23/10/2017 to obtain vegetation cover before and after from the fires of the region on the specified dates, then with the comparison between the backscatter values, the power and power values and the values of the normalized vegetation index (NDVI), from the optical images, the precision of the images used for Obtaining coverage was discussed.Further, the specified fire areas were determined by creating a buffer of 200metre away, and the average NDVI and Backscatter were calculated from the desired optics and radar images. The results showed that Landsat 8 and Sentinel 2 images are complementary, and both images can be used to calculate vegetation and can be used for studying low-lying forests such as Yasouj forests, NDVI indexes for obtaining The amount of vegetation is appropriate. Also, the use of Powerline images of Sentinel 1 due to C bandwidth can show us the amount of coating variation.
Keywords: Fire, Landsat 8, Sentinel, NDVI, Backscatter

1- Introduction

Forests in the Zagros region have undergone many changes in recent years due to the uncontrolled interference of humans and the dependence of people on these resources. Interventions that have been carried out mainly to meet the basic needs of life have led to a lot of variation in foam and crown variability (Nekoieh Mehr, Mohammad 2006).Increasing and irrational use of land in the last few decades has led to the destruction of natural resources, increased pollution, reduced vegetation and various dilemmas. On the one hand, the destruction of natural resources and the reduction of their levels and, on the other hand, the unnecessary increase in exploitation, have been followed by acute problems such as the occurrence of devastating floods, urban water scarcity, increased soil erosion, land degradation, landslides and eventually transformation of the geomorphologic forms. The development of a vegetation map and the detection of its changes using satellite data have grown vastly in recent years, and the use of this information to retrieve vegetation changes reflecting their spatial location has been of great importance (Hossein Zadeh, Mohammad Mehdi et al., 2009). Land use and landslide are not constant and often undergo changes due to human activities. Also, due to the deforestation process in recent decades, the destruction process is important in different periods of time.

Getting information about the past and discovering the changes that have taken place in order to find the way to this phenomenon is necessary. Identifying and discovering these changes can help managers and planners identify effective factors in land use change and land cover, and have useful and effective planning to control them (Archi et al., 2012). The amount of forest cover over time, either by natural or human-induced changes, will be the main source of information for designers and decision-makers on land resource management. Remote sensing technology can be used to detect changes occurring in vast areas. (Ranjbar, Abolfazl et al., 2012).

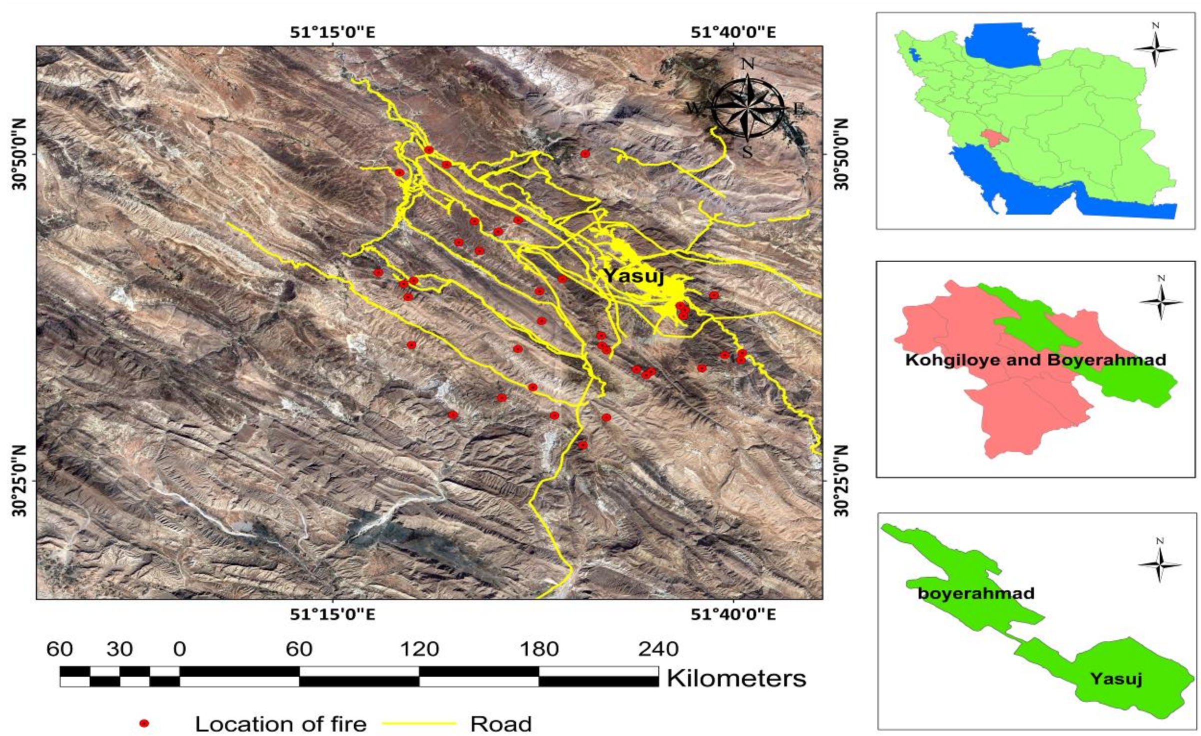
Renewed natural resources are the wealth that God has given as a lasting and valuable trustee for the enjoyment of human beings on earth, in order to use wisely and preserve it, to set a platform for the growth and development of mankind (Rezvani , Mohammad et al. 1392). Forest fires and forest degradation as a crisis in recent years are one of the major challenges. One of the other important factors that threaten the future of Zagros forests is deliberate and unintentional fires in these forests.

The fire cause many plant and animal species to die, and leach leaves and organic matter in the soil, and destroy the cycles of elements in an ecosystem, which ultimately leads to the death of forest ecosystems. Experts say the most important reason for the increase in fires in recent years is rainy days in the wet season and, on the other hand, preventing grazing of livestock in these forests. As rainfall increases, the grass cover of the forest floor is expanded and its lack of training by the livestock provides the raw material required for fire (Jafarzadeh et al., 1395). Preserving and restoring damaged areas requires comprehensive research at various levels. The first effective action in this area is to seek out the status quo, monitor the change process, and access statistics and information at the thickness of the vegetation crown. The purpose of this study is to compare the optical and radar images using the normalized vegetation index (NDVI) and the correlation between these data in obtaining vegetation cover before and after forest degradation by fire.

2- Research background

Sae'i (2004) in a research entitled Forest density mapping using remote sensing technology through digital data of ETM + sensor mapped forest density. Akbari et al. (2007) using the satellite imagery and digital elevation model (DEM), the study area, which was part of Japan, identified areas with high fire hazard. Rezaei Banafsheh et al. (2007) investigated and evaluated the trend of changing forest levels using remote sensing and GIS in the Arasbaran woods. The results showed that among the factors influencing the change in the use of Arasbaran forests, settlement centers are the most important factor in the process of change that should be considered in the future planning of the region. Mansoori et al. (2011) developed a forest fire crisis management program with GIS & RS technology. This study, which focused on the role of the spatial information and remote sensing system in the formulation of a crisis management program and the forest fire in particular, showed that GIS & RS technology can play a role in all crisis management

phases. Ghasemi et al. (2012) using a combination of SAR images and optics and used optical and radar images in a forest area to estimate tree biomass. The results of the studies showed that the replay of radar images with virtual stomata depends not only on the entire biomass of the plant, but also on its components, such as branches, leaves and trunk, or other plant parameters such as the height and diameter of the breast, and in this study with the help of images The biomass satellite was carefully measured.
Ramezani et al. (1394) investigated biomass estimation using SAR and optics satellite imagery. The results showed that the proposed method could measure biomass of large and tall forests with a precision of over 70%. Garew et al. (2008) conducted a survey on spatial and temporal modeling of vegetation change patterns between 1973 and 2020 using GEOMOD in southwestern India. The results showed that during the studied period (31 years), 16 percent of the evergreen forests were declined; Natural disasters such as fires, wildlife, soil erosion, and subsequently human activities have been identified as causes of the destruction of the area. Abdi et al. (2009) compared the variety of indices from ETM + images to determine the most appropriate vegetation index in determining the most suitable vegetation index in the forest, and concluded that the MSAVI index in the separation of higher density forest areas got higher accuracy and NDVI index are more accurate dealing with the delimited areas. Mirzaei (2012) In a research entitled "Causes and Factors of Destruction of Zagros forests and their solutions to deal with them", expressed that the most important factors in the degradation of Zagros forests are the use of wood as fuel, grazing livestock, the development of infrastructure, fires and the phenomenon of dust. M.Mekonen et al. (2016) investigated the evaluation and measurement of forest resources using GIS and remote sensing. In conclusion, the results of this study showed that GPS and GIS and remote sensing were recognized as an important tool for assessing and mapping forest resources.



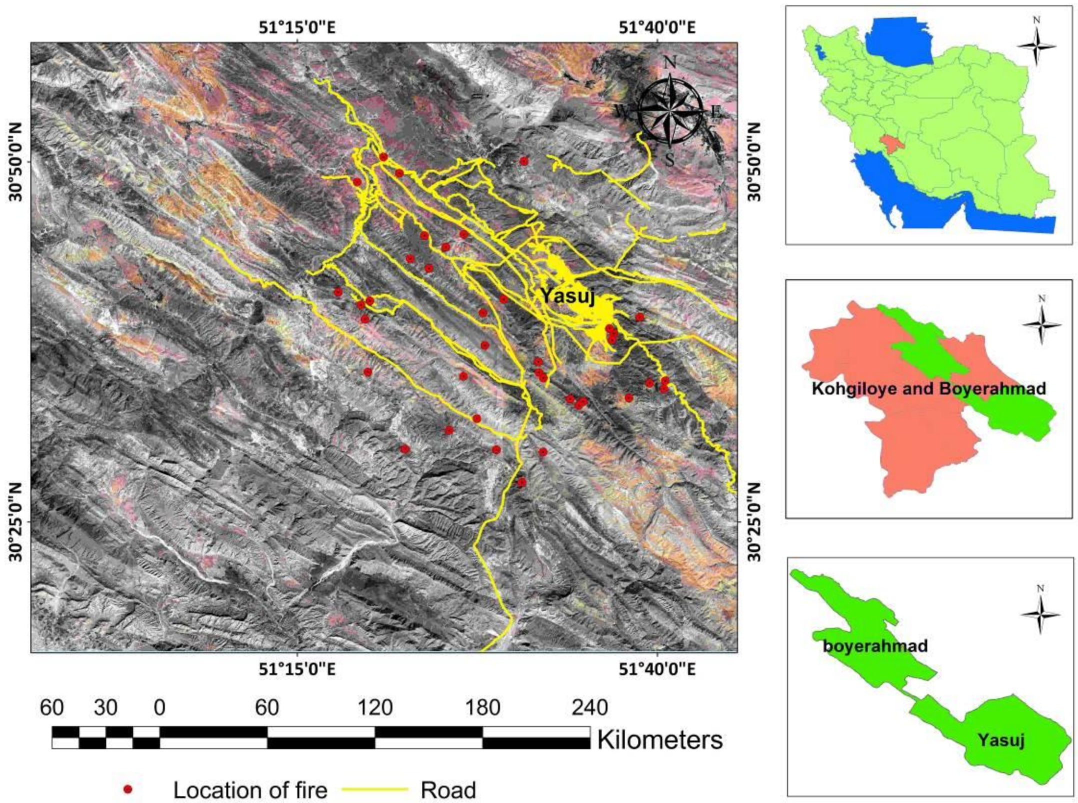


Figure2. Map of the geographic area of the study area.

3-2- Geographical location

Kohgiloyeh and Boyer Ahmad province with an area of 16264 square kilometers in the southwest of Iran, The province is between 29 ° 52 ', 31 °, 26' north, and 49 °, 55 ', 51 ° and 53' eastern. The city of Yasuj is located 30 degrees 28 minutes north of the equator and 51 degrees 36 minutes east of the Greenwich meridian. In winter, a lot of snow falls in the city and most of the surrounding areas and places remain snowy for a long time. Of course, since 2006, the rainfall has declined, and in 1396, it was extremely low and even snow only on the highlands such as Dena. Heat, drought, uncontrolled harvesting of vegetation and forest with the help of dust decreased the amount of vegetation and forest cover, which increased the velocity of the drought cycle in the province.

3-4- Used data

The data used in this study is divided into two terrestrial and satellite categories. The ground data includes information on the fire points taken from the environmental and natural resources organization of the city of Boyer Ahmad. The satellite data used includes the Sentinel 1 radar data, the Landsat 8 and Sentinel 2 optical data. According to 1396 statistics, there were 107 fires, 37 of them belonging to Boyer Ahmad and 22 points in the forests of this study. The following figure shows the fire points in different regions of the study area.

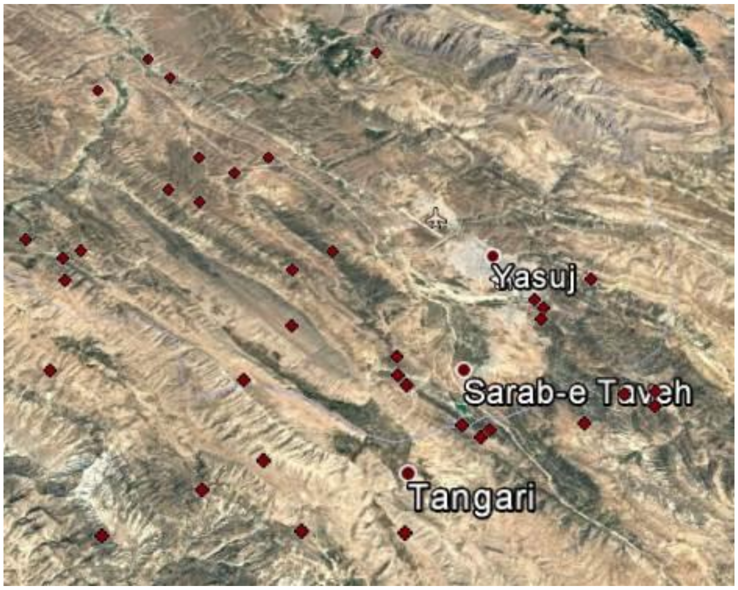


Figure 3.The location of the fire points in Google Earth

3-5- OLI sensor data

Table 1.Landsat8 image information OLI sensors

Satelite	Sensor	Date
Landsat8	OLI	30.05.2017
Landsat8	OLI	16.06.2017
Landsat8	OLI	02.07.2017
Landsat8	OLI	03.08.2017
Landsat8	OLI	20.09.2017
Landsat8	OLI	22.10.2017

3-6- Sentinle- 2A data

Table 2.Sentinel2 Pictures Information

Image type	Date	Direction of the satellite
S2MSI1C T39RWP/ S2MSI1C T39RWQ	30.05.2017	descending
S2MSI1C T39RWP/ S2MSI1C T39RWQ	19.06.2017	descending
S2MSI1C T39RWP/ S2MSI1C T39RWQ	08.08.2017	descending
S2MSI1C T39RWP/ S2MSI1C T39RWQ	17.09.2017	descending
S2MSI1C T39RWP/ S2MSI1C T39RWQ	17.10.2017	descending

3-7- Sentinel-1 data

Table 3.SentinelImage Information

Image mode	Image type	Date	Polarization	Direction of the satellite
IW	GRDH	01.06.2017	VV VH	descending
IW	GRDH	16.06.2017	VV VH	descending
IW	GRDH	04.08.2017	VV VH	descending
IW	GRDH	21.09.2017	VV VH	descending
IW	GRDH	23.10.2017	VV VH	descending

Table 4.Sentinel-1 images Orbit information

Image date	File name
01.06.2017	S1A_OPER_AUX_POEORB_OPOD_20170621T121438_V20170531T225942_20170602T005942
16.06.2017	S1A_OPER_AUX_POEORB_OPOD_20170703T121920_V20170615T225942_20170617T005942
04.08.2017	S1A_OPER_AUX_POEORB_OPOD_20170824T121723_V20170803T225942_20170805T005942
21.09.2017	S1A_OPER_AUX_POEORB_OPOD_20171011T121535_V20170920T225942_20170922T005942 (1)
23.10.2017	S1A_OPER_AUX_POEORB_OPOD_20171112T121758_V20171022T225942_20171024T005942 (1)

3-7- Landsat

In this research, Landsat 8 OLI images of the dates specified in Table (1) in 2017 were used for the study area, Boyer Ahmed and Yasuj cities.
To use these images, you must first have a series of initial processing that includes the following steps:

3-8- Radiometric corrections

Radiation corrections include those corrections that apply only to gray grades and only by varying their values,individually (pixels to pixels), try to compensate for some of the existing errors. Radiometric corrections should be made for landscape changes, exposures, geometric visibility, atmospheric conditions and noise. Each of these conditions depends on the characteristics of the sensors and the timing of the data acquisition, and includes corrections or methods of removal as described below:
1. Errors in distracting sensor detectors such as missing scan lines, stroke error or start error, 2. Atmospheric effects caused by atmospheric dispersion and absorption, 3. The topographic effects created in the image due to slope and elevation differences and the effects on the surface of the earth. , 4 Noises in images may be due to abnormalities or errors in data storage and transmission (Mohammadyari, Fatemeh, 1393).

3-9- Atmospheric correction

Atmospheric error occurs due to the absorption and diffusion of atmospheric particles. Atmospheric errors will erode the detail of the image; thereby reducing the spatial resolution of the sensor. The largest atmospheric effect is the distribution, which is highly dependent on the wavelength, so the effect of the atmosphere in the bands of a sensor is not the same. When discovering variations and comparing two images at two different times, it is better to remove atmospheric effects from pixel values so that a better comparison can be made of the images used to detect changes. It is also important for the multi-image imaging system, such as the Landsat Satellite Sensor scanners that record information in the visible and infrared spectrum, and atmospheric absorption affects mainly visible and infrared bands. Atmospheric correction is the most important part prior to remote satellite image processing (Fatemi, Seyyed Baqer, 1396).

3-10- Calculation of NDVI vegetation index

Vegetation indices are widely used as benchmarks for the analysis of land cover changes, including plant coverings and other factors. NDVI is one of the most widely used indicators for monitoring vegetation changes, which is close to the red and infrared banding. In order to investigate the vegetation changes in the studied area, a normal vegetation index was calculated in a few months in 2017.
For this research, the rate of this index has been calculated in the images before and after the fire and forest degradation.

3-11- Sentinel -2

In this research, the images of Sentinel 2 on the dates set out in Table (2) were used in 2017 in the city of

Boyer Ahmed, Yasuj, in order to be able to use these images to obtain vegetation cover and ultimately Destruction the following processing steps should be taken:

3-12- Mosaic

The practice of combining two or more rattles with each other is called mosaic. In practice, mosaics of rattles with the same boundary are completely aligned and converted into a single raster (Sanjari, Saar 2016), in this research also due to the fact that the study area was located in two images of Sentinel 2. Therefore, in order to be able to use the whole area, the technique of mosaicking of satellite images was used in the Snap software, and then for further processing the mosaic images were used.

3-13- Calculation of NDVI vegetation index

To calculate the NDVI, using mosaic images and using the Snap software and the Send2cor plugin, Sentinel 2 processes are performed and the amount of this index is specified.

3-14- Sentinel -1

In order to obtain the amount of vegetation changes in the region, the Sentinel 1 images in the GRDH format, which is in fact the same image, require a series of preprocesses using the SNAP software.

3-15- To remove images thermal noise

Noise is a random variation in the intensity of the pixel color of an image; noise is one of the classic and primary problems in satellite imagery processing. In Sentinel 1, the first step that needs to be taken for processing is to remove thermal noise from the image, SNAP software was used to do this end and to remove the noise.

3-16- Calibration

The calibration of an aerial or spatial sensor is the process of quantitative interpretation of the output from that sensor so that the sensor response can be related to the physical properties of the imaging surface. In other words, the geometric and radiometric accuracy of the images owes its correct calibration. Therefore, calibration of the spatial sensors plays a key role in the practical operation of the data collected by these sensors. Precision monitoring of the components of the sensor in order to ensure its accuracy and create conditions for the physical interpretation of the sensor output as well as controlling and adjusting the components and sub systems of the sensor before assembling and completing the sensor, and then during the operation in space, have been done in this unit. In general, at this step, geometric and radiometric corrections are applied to satellite data.

3-17- Generating corrected power image

After the processing, the corrected power image was obtained and the values of each pixel were determined and then the values were obtained for the images before and after the fire, and were compared with the NDVI values obtained from the images before the and after the fire, for Landsat 8 and Sentinel 2. After completing these steps, obtaining NDVI from optics images and specifying the amount of pixels in the image from the Sentinel 1 satellite in EXCEL software, between the obtained power values and the NDVI for images Regression was taken before and after the fire in the area. In the following, the details of the methods used to achieve the research objectives will be discussed and examined the results and outputs from the processing of satellite images used including images of optical satellites Landsat 8 and Sentinel 2 and Sentinel 1 radar satellites. There is also a full description of the various comparisons of the images before and after the fire, for the normalized vegetation index in optics and the amount of reflection from radar images.

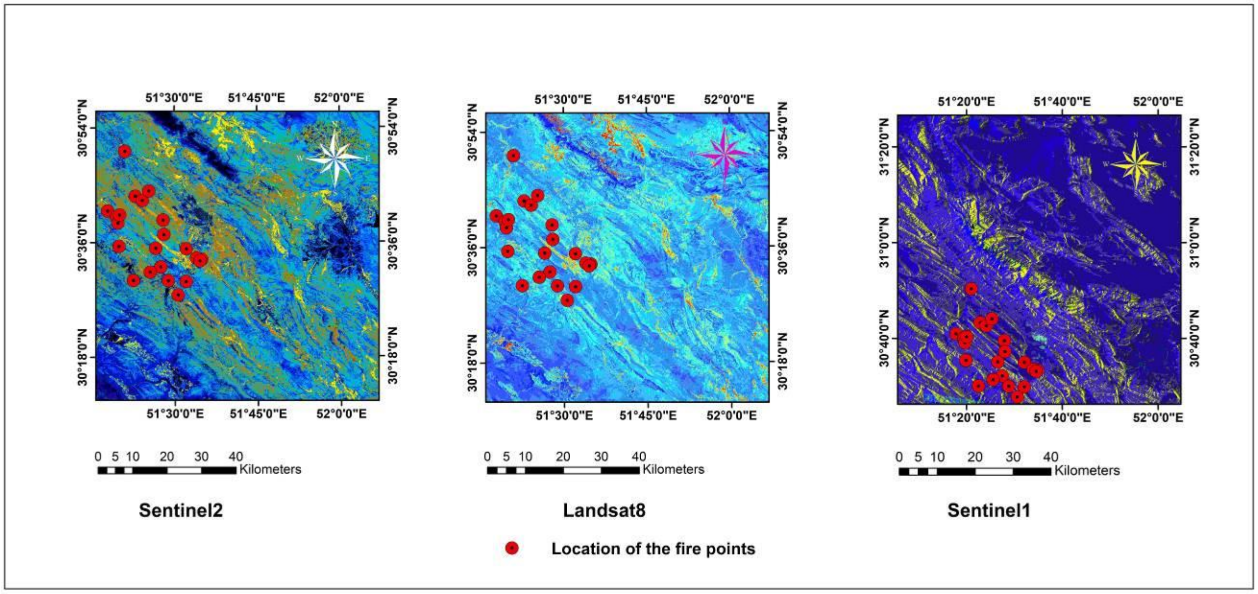
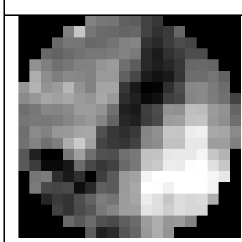
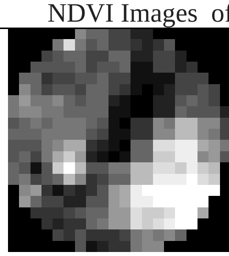
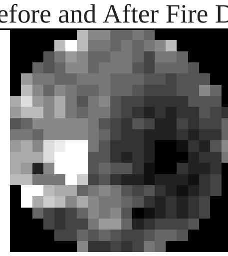
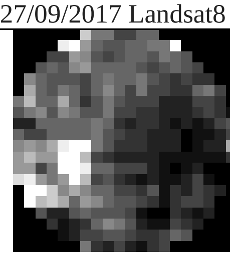
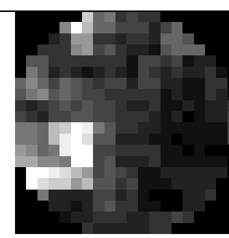


Figure 4: Map of the location of fire points in radar images and optics

3-18- Comparison of NDVI values and reflections in the images before and after the fire

In this section, first, the buffer points were 200 meters away, and then the mean NDVI for the image before and after the fire for Landsat 8 and Sentinel 2 images and the Backscatter level in the images before and after the fire Sentinel 1 was calculated. Figure 5, in the fire range for the sample of 27/09/2017 for all three Landsat 8, Sentinel 2 and Sentinel 1 images shows NDVI value from Landsat 8 and Sentinel 2, as well as Backscatter in the Sentinel 1 image for both polarization VV and VH. As shown in Fig. 5, the NDVI has decreased on pre-date fires for both the Landsat 8 and Sentinel 2 satellites, and the Backscatter has also dropped in most places.

NDVI Images of Before and After Fire Date 27/09/2017 Landsat8				
				
0.239805	0.194391	0.147898	0.131269	0.117126
Image Date 31.05.2017	Image Date16.06.2017	Image Date03.08.2017	Image Date20.09.2017	Image Date22.10.2017
NDVI Images of Before and After Fire Date 27/09/2017 Sentinel 2				

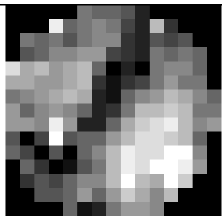
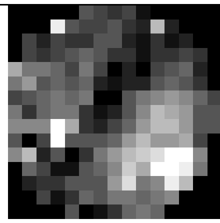
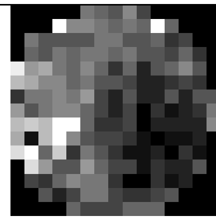
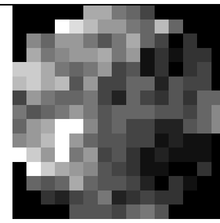
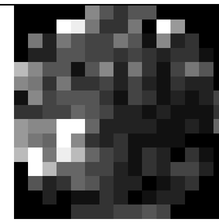
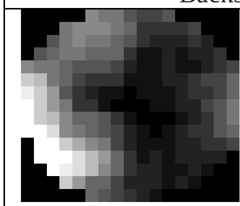
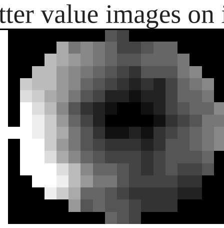
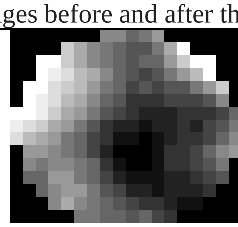
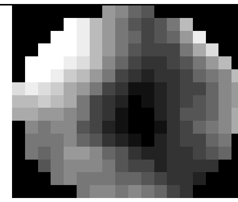
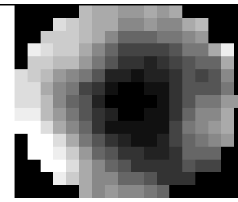
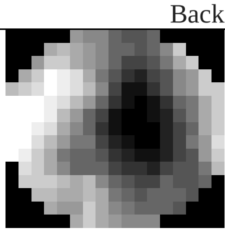
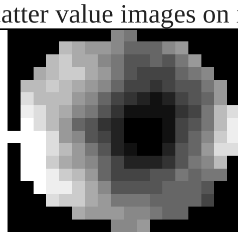
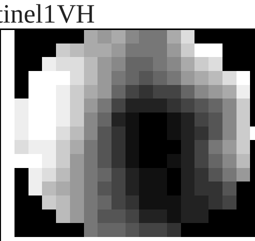
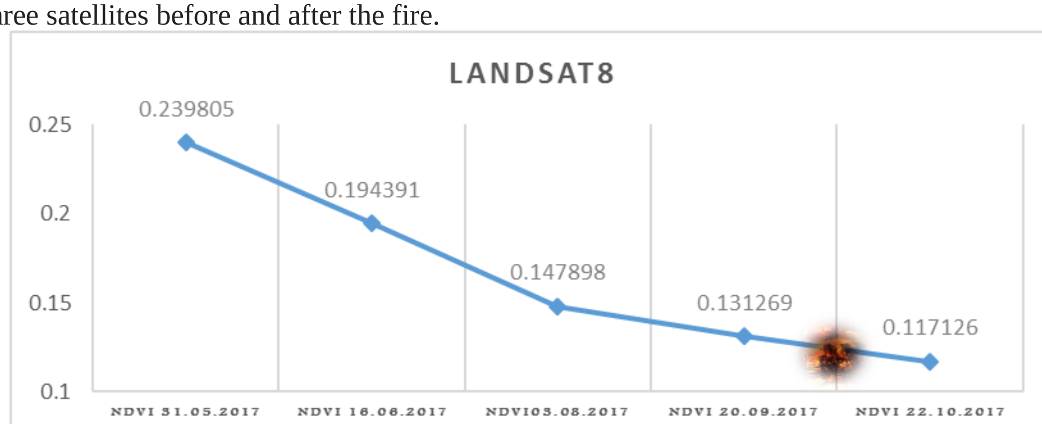
 0.232796	 0.17042	 0.116808	 0.103642	 0.101189
Image Date 31.05.2017	Image Date16.06.2017	Image Date03.08.2017	Image Date20.09.2017	Image Date22.10.2017
Backscatter value images on images before and after the fire Date 27/09/2017 Sentinel1- VV				
 0.075953	 0.067179	 0.074053	 0.071411	 0.063876
Image Date 31.05.2017	Image Date16.06.2017	Image Date03.08.2017	Image Date20.09.2017	Image Date22.10.2017
Backscatter value images on images before and after the fire Date 27/09/2017 Sentinel1VH				
 0.018233	 0.01542	 0.018084	 0.015287	 0.014633
Image Date 31.05.2017	Image Date16.06.2017	Image Date03.08.2017	Image Date20.09.2017	Image Date22.10.2017

Figure (5) Comparison of NDVI in Landsat 8 and Sentinel 2 and Backscatter in Sentinel 1 images

4- Regression

At this stage, the values obtained in Fig. 5 are regressed in the Excel software and the graph for the vegetation cover and the reflection from the surface of the plant will be plotted in different dates of each of the three satellites before and after the fire.



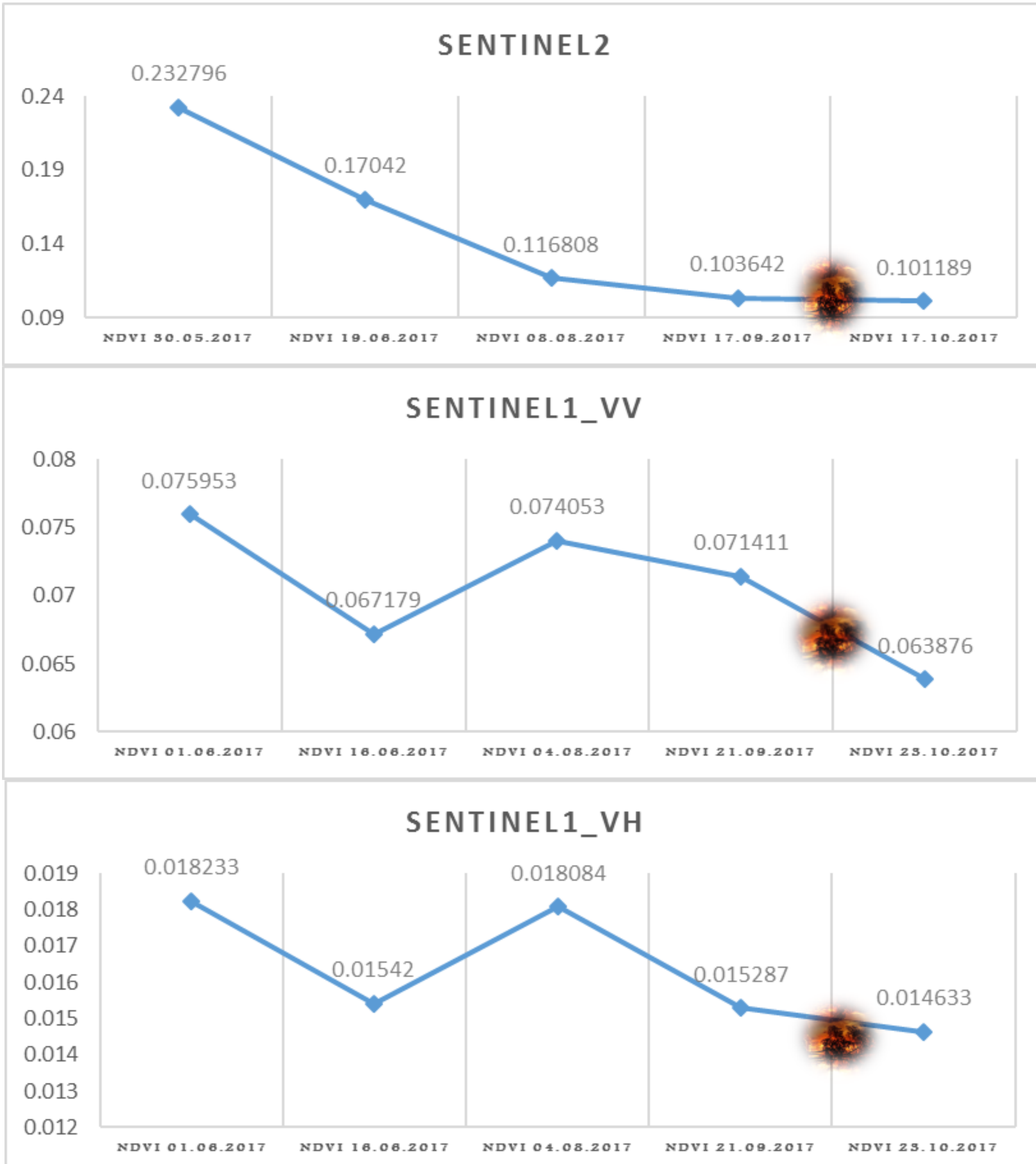


Figure (6) Comparison of the values obtained from NDVI and Backscatter.

Table 5 The NDVI value in the images before and after the fire on Landsat 8

22.10.2017	20.09.2017	03.08.2017	16.06.2017	31.05.2017	Fire Date
0.241175	0.273778	0.257328	0.26435	0.286787	8.06.2017
0.088336	0.094294	0.108169	0.131646	0.157162	09.06.2017
0.232751	0.259625	0.236523	0.242843	0.286125	13.06.2017
0.164941	0.183644	0.189884	0.214271	0.235982	17.06.2017
0.230683	0.249159	0.242158	0.250508	0.278162	20.06.2017
0.219844	0.255055	0.250474	0.254901	0.272893	22.06.2107
0.114731	0.121469	0.136349	0.164205	0.194257	25.06.2017
0.128843	0.139259	0.150902	0.183719	0.214285	30.06.2017
0.163275	0.17274	0.179976	0.201655	0.22868	1.07.2017
0.101304	0.109267	0.114889	0.137762	0.187251	11.07.2017
0.228871	0.253726	0.241363	0.255269	0.274495	12.07.2017

0.165191	0.17442	0.17313	0.197946	0.210567	18.07.2017
0.186218	0.206271	0.205846	0.226437	0.263599	21.07.2107
0.137937	0.163552	0.172107	0.18902	0.209048	28.07.2107
0.225227	0.252451	0.230803	0.241437	0.259425	5.08.2017
0.144504	0.158572	0.180121	0.216224	0.265335	11.08.2017
0.116171	0.124672	0.149623	0.171067	0.193646	29.08.2107
0.18305	0.209354	0.260027	0.269407	0.290271	6.09.2017
0.134729	0.148086	0.161338	0.180983	0.236734	26.09.2017
0.117126	0.131269	0.147898	0.194391	0.239805	27.09.2107
0.138514	0.184655	0.178162	0.194571	0.224676	29.09.2107
0.126221	0.137491	0.158966	0.192498	0.234291	6.10.2017

Table 6 NDVI Numbers Before and After Fire in Sentinel Satellite 2.

17.10.1017	**17.09.2017**	08.08.2017	**19.06.2017**	**30.05.2017**	**Fire Date**
0.2645	0.101794	0.269294	0.279352	0.290454	8.06.2017
0.082896	0.116712	0.111022	0.098976	0.120924	09.06.2017
0.265848	0.061813	0.260299	0.285017	0.30298	13.06.2017
0.194554	0.091344	0.188013	0.203249	0.241529	17.06.2017
0.232429	0.105989	0.246954	0.266172	0.286105	20.06.2017
0.245677	0.25546	0.265943	0.274232	0.28343	22.06.2107
0.103681	0.110406	0.115273	0.142052	0.180982	25.06.2017
0.116359	0.112275	0.129292	0.166053	0.203538	30.06.2017
0.157738	0.159182	0.160481	0.182961	0.213349	1.07.2017
0.088448	0.057035	0.100768	0.119975	0.175966	11.07.2017
0.243827	0.142897	0.245148	0.263823	0.274576	12.07.2017
0.182794	0.145454	0.169256	0.188535	0.201907	18.07.2017
0.188864	0.173076	0.200919	0.227162	0.268979	21.07.2107
0.153707	0.139221	0.160494	0.177238	0.202843	28.07.2107
0.260745	0.12475	0.238694	0.256627	0.266639	5.08.2017
0.114818	0.128515	0.140462	0.182299	0.247029	11.08.2017
0.097754	0.114983	0.121071	0.147444	0.179333	29.08.2107
0.224488	0.249694	0.269443	0.306509	0.314287	6.09.2017
0.118775	0.121577	0.139914	0.162557	0.234934	26.09.2017
0.101189	0.103642	0.116808	0.17042	0.232796	27.09.2107
0.160969	0.180587	0.162978	0.18403	0.223308	29.09.2107
0.116929	0.032319	0.138423	0.178012	0.229795	6.10.2017

Table 7 Backscatter in the images before and after the fire on the Sentinel 1-VV satellite

23.10.2017	**21.09.2017**	**04.08.2017**	**16.06.2017**	**01.06.2017**	**Fire Date**
0.085189	0.130909	0.122014	0.086207	0.080499	8.06.2017
0.103707	0.131043	0.138749	0.114297	0.09864	09.06.2017
0.088693	0.123661	0.124816	0.090584	0.08105	13.06.2017
0.148182	0.109736	0.116763	0.153602	0.140416	17.06.2017
0.12037	0.143565	0.142035	0.124449	0.110277	20.06.2017
0.094394	0.10306	0.101127	0.113594	0.100709	22.06.2107
0.159269	0.151511	0.14685	0.16021	0.144535	25.06.2017
0.194716	0.13778	0.13699	0.188518	0.162956	30.06.2017
0.128745	0.099862	0.107964	0.133127	0.11548	1.07.2017
0.156402	0.162849	0.175045	0.147091	0.145299	11.07.2017

0.127974	0.211865	0.21773	0.133379	0.124754	12.07.2017
0.289789	0.12696	0.149591	0.296577	0.294343	18.07.2017
0.095951	0.226986	0.236659	0.091509	0.086512	21.07.2107
0.151521	0.16506	0.174578	0.152941	0.154303	28.07.2107
0.12693	0.127997	0.133576	0.13331	0.134954	5.08.2017
0.100607	0.078515	0.086081	0.100232	0.079191	11.08.2017
0.175498	0.161559	0.157008	0.202825	0.174375	29.08.2107
0.224168	0.092514	0.088325	0.206101	0.181909	6.09.2017
0.097496	0.127991	0.124945	0.092081	0.08346	26.09.2017
0.063876	0.071411	0.074053	0.067179	0.075953	27.09.2107
0.204725	0.168963	0.197638	0.187678	0.175172	29.09.2107
0.155975	0.134374	0.145515	0.158118	0.12994	6.10.2017

Table 8 Backscatter in the images before and after the fire on the Sentinel 1-VH satellite

23.10.2017	21.09.2017	04.08.2017	6.06.2017	01.06.2017	Fire Date
0.023106	0.031291	0.033887	0.022547	0.021237	8.06.2017
0.023408	0.030012	0.032712	0.02902	0.023026	09.06.2017
0.026372	0.031305	0.033872	0.02552	0.021683	13.06.2017
0.037075	0.023434	0.025176	0.032601	0.029641	17.06.2017
0.037034	0.039436	0.04088	0.039016	0.031828	20.06.2017
0.027797	0.027695	0.03016	0.030126	0.027387	22.06.2107
0.04018	0.033766	0.033411	0.040953	0.036722	25.06.2017
0.054292	0.038481	0.0384	0.046628	0.038267	30.06.2017
0.031725	0.028162	0.029081	0.031563	0.02858	1.07.2017
0.041281	0.041619	0.044899	0.036721	0.03327	11.07.2017
0.039497	0.062143	0.06115	0.037924	0.036651	12.07.2017
0.074324	0.037796	0.039409	0.071197	0.064441	18.07.2017
0.029307	0.056538	0.051133	0.025834	0.024498	21.07.2107
0.03794	0.038573	0.041431	0.041257	0.035974	28.07.2107
0.031027	0.033367	0.035278	0.032956	0.034037	5.08.2017
0.022641	0.02195	0.024264	0.022883	0.019139	11.08.2017
0.043238	0.040497	0.042069	0.042893	0.037485	29.08.2107
0.047844	0.028527	0.026731	0.048132	0.043202	6.09.2017
0.018204	0.020944	0.022278	0.017979	0.015327	26.09.2017
0.014633	0.015287	0.018084	0.01542	0.018233	27.09.2107
0.04506	0.045225	0.045111	0.041661	0.042167	29.09.2107
0.037216	0.037232	0.041202	0.039982	0.033081	6.10.2017

4-1- Findings and discussion

Forests in the Zagros region have undergone many changes in recent years due to the uncontrolled interference of humans and the dependence of people on these resources. Interventions that have been carried out primarily to meet the basic needs of life have led to many changes in foam and crown variability. The mapping of vegetation and the detection of its changes using satellite data has grown vastly in recent years, and the use of this information to retrieve vegetation changes reflecting their spatial location has been of great importance. Using remote sensing and geographic information systems has many applications in many scientific and research fields. As it was observed, the use of normalized vegetation index in this study was acceptable to achieve the correct results and the use of this index for ternary and low forest areas, according to Abdi, who in his research to determine the most appropriate plant index in determining Forest density They compared different types of indicators from ETM + images and concluded that the MSAVI index is more reliable in distinguishing between forest areas with higher density and higher NDVI indices. The separation of low vegetation areas is more accurate, Suitable and satisfying.

5- Conclusion

In this study, using optical and radar images, the amount of vegetation coverage in Zagros forests in Yasuj city of Kohgiluyeh and Boyer Ahmed province was calculated and the relationship between the vegetation index in optics and the to gain reflection of the surface of the plant in radar images, Landsat 8 and Sentinel 2 satellite images and Power Sentinel 1 have been used. According to the explanations given in the previous sections, images were first required for the research to be carried out and the processing was performed on raw data so that it can be imported into the software environment used for vegetation cover and Reflected from the surface of the coating. After completing these steps, the NDVI index for the Landsat 8 and Sentinel 2 images was calculated first and the Backscatter value in the Power Sentinel 1 images for the pre and post-fire dates in the region as well. Charts, tables, and comparative maps for all dates were also identified and the results showed that the amount of NDVI variations in optical images, including Landsat 8 and Sentinel 2, was so that in Landsat 8 and Sentinel images 2 the rate of this index in post-fire images has decreased compared to pre-fire images. Also, the reflectance level of the plant for radar data in most pixels has decreased. Due to the fact that the C-band images are used and these images penetrate up to half the vegetation, the Backscatter's decline actually indicates the destruction of vegetation and trees in the region, and the increase in this reflects that trees has not disappeared despite the fires in the area.

According to the observations, the results show that, despite the relationship between optical data and radar data, using these data vegetation cover in the region can be obtained, and according to the region tropical and low-lying forests, the use of normalized vegetation index (NDVI) as well as the use of Sentinel-1 satellite C-band images can yield acceptable results. Also, the use of Sentinel 2 and Landsat 8 data is appropriate for calculating the amount of vegetation due to the amount of coverage before and after the fire. In fact, the data from Landsat 8 and Sentinel 2 can complement each other for research on vegetation.

It is proposed to use X-band radar images such as TERASAR-X satellite imagery and L-band images such as ALOSPALSAR images to obtain more precise and more reliable results of damage in the proposed area.

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