Vegetation Mapping of Iran by using NOAA AVHRR Data

A. Mohammadpour

M. Forouhar

Iranian Remote Sensing Center

P.O.Box 11365/6713

Tehran-IRAN

Abstract

This report describes and demonstrates techniques for vegetation and land cover mapping by the use of NOAA AVHRR DATA.

The NDVI combined with maximum Liklihood (MLC) Method were found to give good results for such studies. NOAA-9 AdVanced Very High Resolution Radiometer(AVHRR) were examined to determine their utility for vegetation and land cover of whole country.

Introduction

Iran with an area of about 165 m.ha. bounded by Latitude 25° 40′ N and 39° 45′ (N) and a Longitude of 44° to 63° (E), situated in the south west of Asia in the Dry Lands Belt of the world.

About 60% of the country is mountainous and the remaining is desert.

Iran central Plateau is Located between two major mountain ranges of Alborz and Zagross.

Average annual Precipitation throughout the country is approximately 230 mm. which is unevenly distributed . From the climatological point of view Iran is considered as an arid to semi arid zone

Regarding biodiversity, Iran is divided into three main regions as Caspian, Balouch and Omanian, and Irano Touranian regions.

Because of the bioclimatical conditions and water resources scarcity in this country, the vegetation has very little chance to grow,therefore protection of vegetation cover, is of vital importance.

Objectives:

The main Purposes of this study are as follow :

1- Vegetation mapping of the country by utilizing of the NOAA Data (LAC).

2- Land cover mapping of the country by using of the AVHRR Data.

3- Evaluation of the AVHRR Data, regarding to their application in vegetation mapping.

Materials

Iranian satellite Receiving station is now acquiring the Data from NOAA 11 and 12, 4 times a day. Due to instrumental limitations the acquired Data are not geometricaly corrected,so it is impossible to provide computer compatible data of AVHRR.

The data used for this study acquired by NOAA 9 which is directly received by IRSC Receiving station in 1986.

Methodology

The spectral reflectance of chlorophyl pigment in both the visible and infrared Portions of electromagnetic spectrum, provides a means to evaluate and monitor green vegetation vigour and density in the band widths of Channels 1 (.58 to- .68m) and band 2 (.72 to 1.1m) of the AVHRR.

" Mathematical Combinations of channels 1 and 2 were in some cases, found to be good indicators of the Presence of green vegetation "(Gray and mccrary 1981).

The Gray and Mccrary Index (GMI) is defined as GMI= CH2- CH1,but in this paper we applied NDVI (Normalized Difference vegetation Index) method. This method uses the red and near infrared bands (i-e. Band 2 and band 1) of the NOAA AVHRR Data which is calculated using the following equation:

$$NDVI = \frac{CH2 - CH1}{CH2 + CH1}$$

The NDVI is basically a measure of the amount and vigour of vegetation within a scene. the values ranges from -1 to +1 with +1 representing very high vegetation cover and viguor while -1 represents non vegetation areas.

Before to do any digital processing of data it is necessary to correct and register the data, and resample them to a map grid, so that the resampled data could be integrated into a National Geographic Information system if needed

In order to do Geometric correction the control points have been extracted from 1:2,500,000 scale national topographic map.

Resampling was considered most acceptable.

Application of NDVI to the project Area

An unsupervised clustering routine was applied to the composite NDVI data set resulting in 16 clusters after 2 iterations.

A maximum likLihood classification procedure , was applied to the data. Maximum Likilihood classification revealed 8 different classes which are composed of 7 different vegetation types,the latest class represents water bodies.

The various class means are shown in figure 1, plotted on a bi-Spectral plat of NDVI.

The various numbered class are as follows:

class no	class name
Class 1	Mixed Dense Forest with Agriculture
Class 2	Grass and shrub Land
Class 3	Mixed Shrub with Deciduous Vegetation
Class 4	Sparse Range Land
Class 5	Mixed Psammophile with Halophite Veg.
Class 6	Semi Desert Steppique
Class 7	Mixed Bare Soil with Steppique Vegetation
Class 8	Water Bodies (Seasonal and Perrenial)

Land Cover Mapping

The same procedure has been applied for land cover mapping of the country. An unsupervised clustering on data set, disclosed 14 different clusters.

14 different clusters are obtained by an unsupervised clustering techniques.

The various class means are shown in figure 2 as follows:

Class	Definition of class
Class 1	Water bodies(Seasonal and Perrenial)
Class 2	Dense vegetation (mostly Forests)
Class 3	Mixed
Class 4	Rangeland,(Hilly-mountainous)
Class 5	Desert Area
Class 6	Bare,Saline Soils (salt plats)
Class 7	Sandly Area (Sand Dunes)
Class 8	Unclassified

From the 14 clusters, only 9 classes are identified, the other clusters are remained Unknown due to the small amount of Pixel association and interfering the Pixels.

Conclusion

The Remotely Sensed Data acquired by NOAA Meteorological satellite can provide very useful and important information in meteorology, oceanography, as well as vegetation and land cover mapping.

This kind of satellite can observe a wide range scene within a simultaneous view.

By comparing the NDVI (derived from AVHRR) for every data set on a Pixel by pixel it should be possible to determine whether vegetation has changed from time to time and where such a changes have been occured.

Vegetation mapping requires temporal data on growth and autumn time according to crop calendar.therefore a better results

could be accomplished if all required temporal data were available

Due to lack of efficient data, change detection of V.C.were not possible .

Generally ;

1- Despite of its resolution,NOAA Data can be used for evaluation purposes in earth resourses progect.

2- Change detection of dynamic features through continious monitoring in a regional scale is feasible if the required data were available .

3- vegetation mapping on a regional base requires multitemporal data according to crop calendar of the study area.

References:

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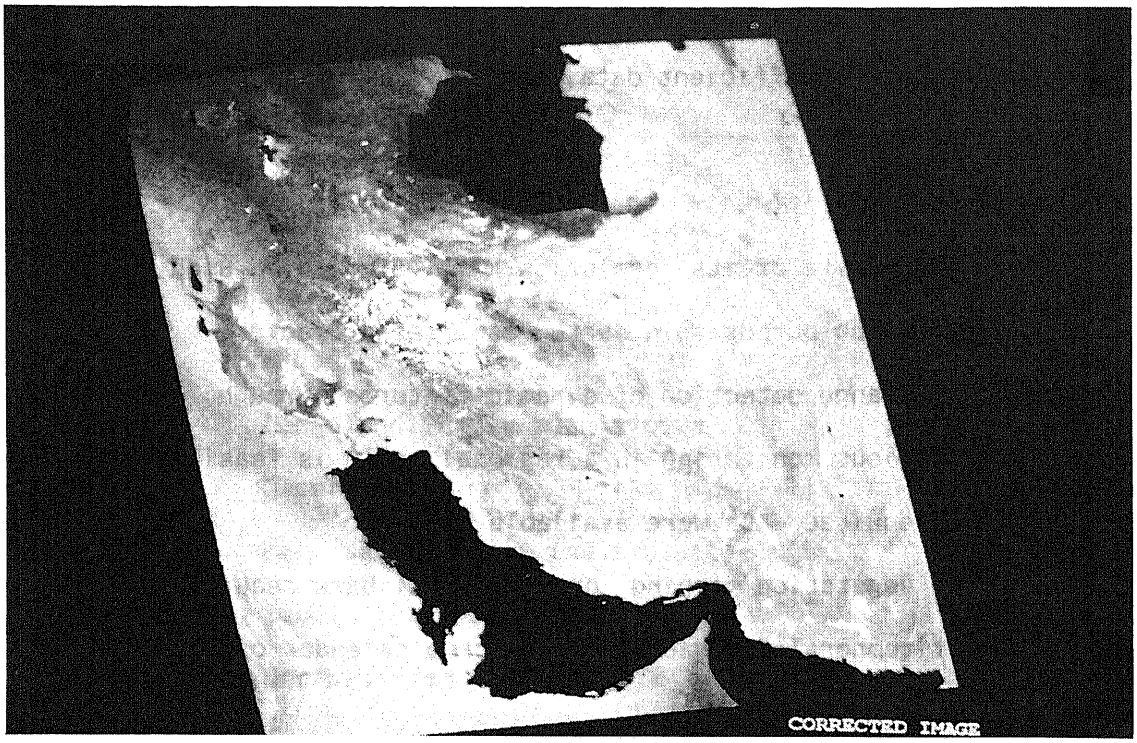
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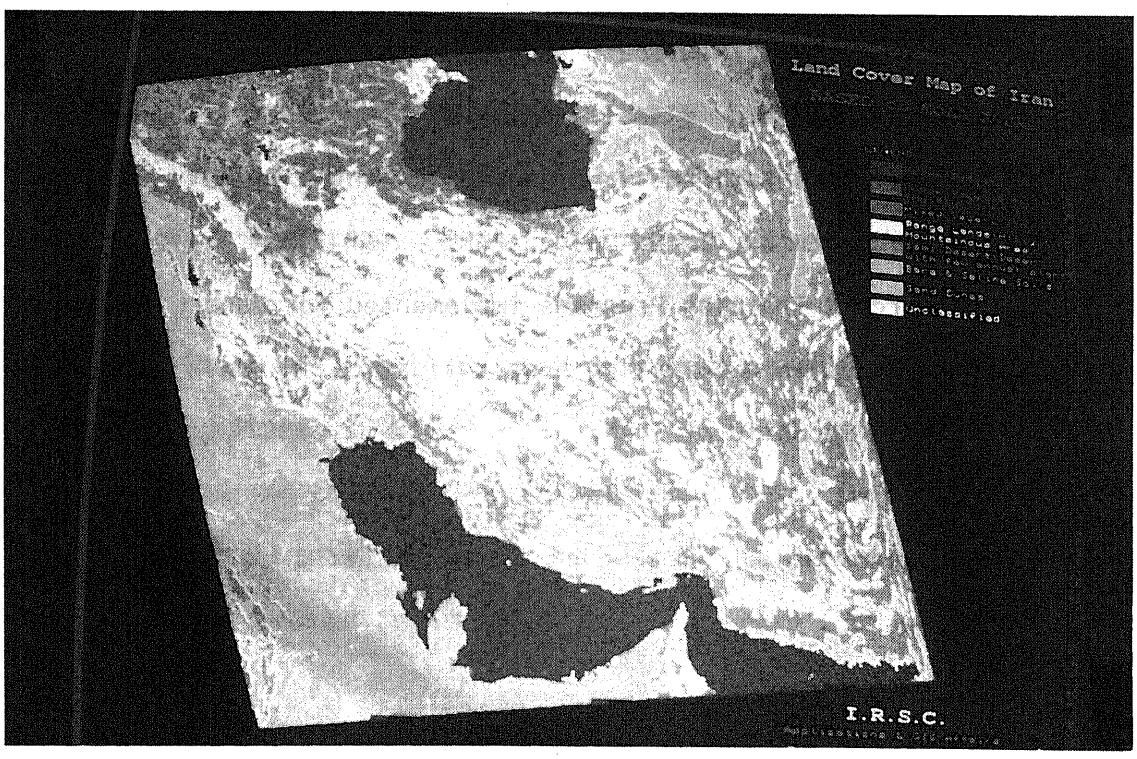
Land Cover Map of Iran
I.R.S.C.