



Islamic Azad University-Ahar Branch
Geographic Space An Approved Scientific,
Research-based Quarterly

*Elahe Akbari*¹
*Shahram Bahrami*²
*Atefe Doran*³
*Majid Ebrahim*⁴

The Effect of some Geographical Parameters on the Land Surface Temperature by Using SEBAL and Decision Tree Methods in Taftan Volcanic Cone

Date received: 7 June 2013

Date accepted: 11 January 2015

Introduction

Soil temperature and its changing with regards to place and time is not only one of important factors that effects on energy and material exchange but it may be said the rate and direction of all physical processes of soil are temperature- dependent directly or indirectly. Usually the surface temperature is monitored point by point in some limited locations that generally are measuring stations. In some situations that there is a need to evaluate the spatial distribution of surface temperature in the vast area simultaneously, remote sensing technique shows its efficiency. The Surface Energy Balance Algorithm for Land (SEBAL) is a rather new algorithm used to estimate the temperature and other fluxes on surface in most parts of the world that has satisfactory results. Taftan volcanic cone is one of the important and unusual phenomena that are considered as the single volcano of the country, but because of

1- MSc of Remote Sensing and GIS, Coach of Hakim Sabzevari University, Sabzevar, Iran.

2- Department of Geography, Hakim Sabzevari University, Sabzevar, Iran.

3- MSc in Geomorphology, Hakim Sabzevari University, Sabzevar, Iran.

4- ph.D Student of Geomorphology, Hakim Sabzevari University, Sabzevar, Iran.

hard situations that are dominated on it and the lack of facilities in that area; there isn't enough information about the condition of cone surface temperature yet. There is no research about estimating surface temperature using ETM+ satellite image at volcanic zone in Iran and because this is a volcanic cone and has varied temperatures during a year, using satellite images could study the process of temperature changes in Taftan cone. So with preparing the map of effective factors on surface temperature of this cone, its surface temperature could be analysed. The aims of this research include preparing heat map of Taftan volcanic cone, determining a dominant landform of Taftan cone, analyzing the heat difference between landforms and studying the relation of surface temperature degree with height and directions of different formations.

Materials and Methods

For accessing to the aims of research, at first, the heat map was prepared using SEBAL algorithm and decision tree classification by ArcGIS 9.3 and Envi 4.4 software. Then the 1:250000 geological map was repaired at ArcGIS software. On the other hand, we extracted digital model of height, lithology, direction and the dominant landform of the study area. Then, with the aim of studying the statistics of surface temperature at heights, lithology, directions and landforms, the zonal statistical analysis was used. By choosing the ETM+ image at May of 2001, and because of single heat band, we used from SEBAL method for estimating the surface temperature of the land. In this method, we get the surface temperature was obtained based on corrected heat radian. For computing the emission rate at heat band we need to compute spectrum radian ($L\lambda$), the reflection rate at each band ($P\lambda$) and surface.

Discussion and Conclusion

At the studied bound, around Taftan volcano, the surface temperature of land is changing between 13.875 and 31.921 centigrade and maximum surface temperature

of land is around the summit and beside the peak. The most temperature average and maximum temperature belong to height levels of 1700- 2000 and the lowest temperature average and minimum temperature belong to height levels of 3500- 3900. Because of this correct evidence that height effects on air temperature rate, by every 1000 meters increase in height, air temperature decreases to 6 degrees, so surface temperature of the soil with decrease in air temperature and by increase in height, will be decreased. Moreover, minimum temperature is in qa3 formation (new andesite of Taftan) and maximum temperature is in qlu formation (siltstone with lichen with middle layers of tuff andesite). Also the most temperature average is in EF (sandstone and shill) and the least temperature average in q1a (old andesite flows). It seems that because of andesite formation placement of high and low heights, direction has more important role at the temperature decrease of this formation, by the way, height factor has effect on temperature decrease in this formation. Minimum temperature is in north direction with 13.87 degrees, maximum temperature in east direction with 31.92 degrees, the most temperature average is in east with 27.90 degrees and less temperature average is in west with 24.95 degrees. Because of sun rising from east and the time of image taking (10 A.M), so east directions are more exposed to the sun and have more increase in temperature. The most temperature average of EF formation is in east and the least surface temperature of qal formation is in west that are coordinate with the most and least temperature average of directions. At divides (water sheds), the difference between maximum temperature at east and minimum temperature at west is 5.73 centigrade. At thalwegs, the difference rate is 5.38 centigrade.

Conclusion

Regarding temperature conditions in geographic directions and different formations, could plan for implanting compatible agricultural crops and products and appropriate

environmental conditions. Using satellite images by better spatial resolution is effective in preparing heat map that is helpful in studying these conditions.