MARS 3D: A VIRTUAL FIELDTRIP BY THE RED PLANET IN THE CLASSROOM. *I.Montoya[1], A.B. Nieto[1], M.A. de Pablo[1,2].* [1]Facultad de Ciencias Geológicas. Universidad Complutense de Madrid. 28040 Madrid. Spain. [2]Área de Geología. Escuela Superior de Ciencias Experimentales y Tecnología. Universidad Rey Juan Carlos. 28933 Móstoles, Madrid. Spain. (depablo@geo.ucm.es).

Introduction. Mars, one the most famous planets of our Solar System, it can be used as tool to draw attention of the pupils (and of the public) toward a great variety of topics related to the Natural Sciences, and that they are contained in the curriculum of the Obligatory Secondary Education in Spain, as can be the subjtes of technology, Astronomy, Geology, Biology,... [1,2]. There are many material and published books with activities on Planetary Sciences to develop in the classrooms, that show the interest by that science [3,4,5,6,7]. Furthermore, there was developed numerous activities of this kind, with the aid of informatic tools, to elaborate topographic maps [8,9], to create photographs mosaic on-line of the various planets and satellites surfaces [10], and others activities about Mars [11,12] with planetary data [13]. In this abstract we show how create 3D Digital Elevation Models and anaglyphs of the surface of Mars in a easy way.

About the didactic activities. The objetive of this activity is show, through a virtual fieldtrip with a computer, the most important features and regions of the planet Mars: highlands, lowlands, dicotomy, polar regions, craters, channels, volcanoes and canyons; and of its surface: rocks, sediments, landscapes,… We development that two didactic activities with students between 10 to 18 years old of the secundary education, and with a general public in diferent contexts: some local simposiums of astronomers, an international congress of didactic and geology, some expositions in differents universities,… It show that is possible to approach the planetary geology to the public by a fun and easy way. The teacher could emply the idea that we show here with their pupils with differents modifications depending of the subjets were it could be employ: informatic, geology,... and the edge of the pupils.

Materials. The didactic activities need of some materials very easy of obtaining. The first of all is a computer where the students could create and view their own 3D images of the Red Planet. For the creation of 3D digital elevation models of the surface of Mars its necessary to have the topographic data obtained by the Viking missions. It is available on a single CD-Rom. Its possible to buy it or download from the JPL homepage where NASA have available all its CD-Roms with planetary missions data (http://www-pdsi-mage.jpl.nasa.gov/PDS/public/resources/cd_viking.html#vkoERD). The CD-Rom that we employ is the number Vo_2007, that also it contains fotomosaics of all its surface. An informatic program is necessary to proccess the data and to create the 3D digital elevation models. The program that we emply, called *3Dem*®, has a freeware version available on-line at the *3Dem*® homepage: http://www.visualizationsoftware.com/3Dem.html, that is possible employ for uncomercial and educational purposes.

For the creation of anaglyphs its necessary to have the stereographic images obtained by the Mars Pathfinder–sojourner mission of the surface of Mars. Its possible download it from the JPL homepage: http://mars.jpl.nasa.gov/MPF/parker/highres-stereo.html. To convert these photographs into anaglyphs there are a lot of programs, but we employ an easy and freeware computer program called *Z-Anaglyph*®, that its available at: http://z-graphix.ch. When there is not time of the pupils are so youngers to use the computer, its possible to download the anaglyphs from some webpages of the JPL (http://mars.jpl.nasa.gov/MPF/Sitemap/anaglyp.html).

When the 3D digital elevation models and the anaglyphs are elaborated it is necessary to have some red-blue glasses to see the images of Mars in 3D. Its possible to buy or make it in the classroom. The last option it is chepper and fun for the more younger students to create its own glasses (Fig. 1). That is all the material that we need for develop that activity, but it could be interesting to have a printer for make some copies of the images for the pupils.

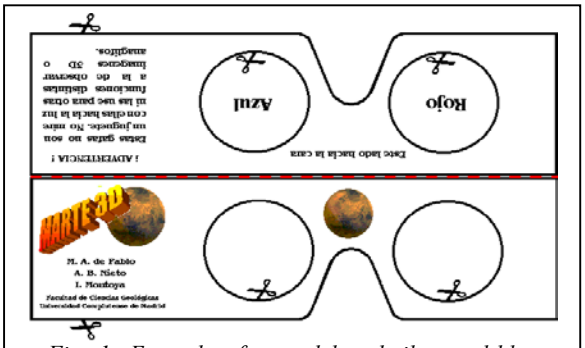

Fig. 1: Example of a model to built a red-blue glasses that could be development by the pupils.

Data processing. The easy elaboration process of the 3D digital elevation models consists on first place, the executing of the program *3Dem*® and to open one of the topographic data file contents in the CD-ROM before mentioned. In the principal screen of the program is selected the interest zone, the direction and orientation of the image, the source of light, and other parameters. Selecting the option to generate 3D images, are obtained three-dimensional models from the martian surface (Fig. 2) and/or digital videos that could be and interesting tool for the teching of the geology of Mars [14]. With this simple process the pupil or the teacher could select the most characteristic regions of the planet and to study its morphologys. To elaborate the anaglyphs is a much more simple the process. First, it is necessary to execute the program *Z-Anaglyph*® and introduce the two images (right and left) downloaded from JPL homepage before mentioned. Executing the option of generate the anaglyph is obtained the three-dimensional image from the surface from Mars (Fig. 3).

Didactic activities. There are many possibilities that offer the 3D digital elevation models and the anagliphs of the martian surface. The most simple is the exposition of the created images in order to capture the attention of pupils and/or of the public. However, with the high quality obtained images, it is possible to study the most characteristic geological features of Mars: highlands, lowlands, dicotomy, polar regions, craters, channels, volcanoes and canyons. In this way, our students enough about the martian geology as to be capable of explain it to the public assistant to the III Feria Madrid por la Ciencia, where there were shown the three-dimensional images and anagliphs. These images served so that the pupil analyzed the most characteristic properties of these regions and features in order to change the bored theoretical classes by this most didactic and funny activity.

Conclusions. The three-dimensional images and the anagliphs that we have described in this work are a simple way to introduce the informatic processing data tools in the secondary education at the same time that it serve to attract to the pupils toward the mystery and the lovelines of the Solar System. It is a form of approaching a pioner science and a scientific frontier to the classrooms.

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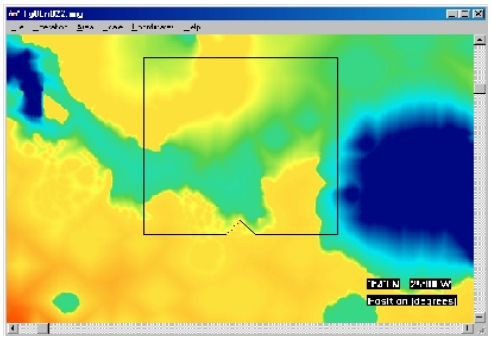


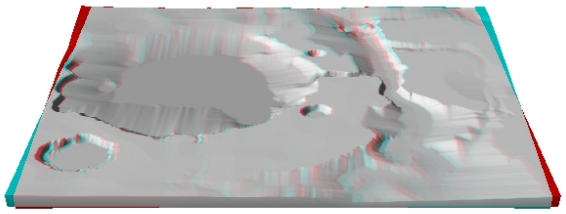
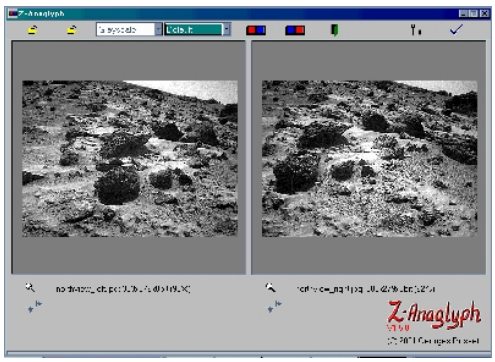


Fig. 2: Screen of the program 3Dem® (left) and an example of a three-dimensions digital elevation model (above) of the surface of Mars.



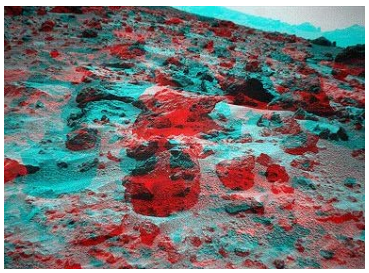


Fig. 3: Screen of the program Z-Anaglyph® (left) and an example of an anaglyph of some rocks of the martian surface (above).