**Introduction:** Water is one of the oldest aims of the research about Mars [1] and thanks of the gullies observed some years ago at the walls of impacts craters [2] the search for signs that could reveal a part of the history of water on Mars is the goal of a lot of works developed by scientists around the world. Today, the public feel this same curiosity about what was the history of the martian water, why and how it desapeared, and if it is possible the existence of liquid water on Mars today. In order to show the physical reasons that could allow the existence of liquid water on the martian surface we develop a didactic activity (used with High School students and a general public) based on the temperature and pressure data obtained by different spacecrafts and landers on Mars.

**Data and materials:** This activity is possible thanks to pressure and temperature data obtained by Viking landers during some martian years at the end of the 70s decade in two different regions of the martian lowlands: Utopia Planitia (48.0°N, 225.6°W) and Chryse Planitia (22.5°N, 47.8°W). These data are available at the Planetary Data System (PDS) webpage [http://atmos.nmsu.edu/PDS/data/vl_1001/]. Other data temperature and pressure obtained in 1997 by the Mars Pathfinder lander at Chryse Planitia (19.33 N, 33.55 W) were used too. These data are available through the PDS [http://atmos.nmsu.edu/PDS/data/mpam_0001/].

Finally, in order to allow a planetary point of view and to introduce new physical parameters, topographic and atmospheric temperature maps elaborated by Mars Global Surveyor data were used too. The MOLA (Mars Orbiter Laser Altimeter sensor on board of the Mars Global Surveyor spacecraft) topographic maps are available at USGS astogeology branch [http://astrogeology.usgs.gov/DataAndInformation/ImagesAndMaps/]; and the diary global atmospheric temperature maps are availables at the TES (Thermal Emission Spectrometer sensor on board of Mars Global Surveyor spacecraft) webpage [http://tes.asu.edu/].

Together with these data, only a temperature-pressure graphic of physic stability conditions for water is necessary for complete this didactic activity. These graphic could be obtained through different internet webpage. In our sessions with students and public, a interactive graphic with mobile axis (Fig. 1) was used in order to convert this activity in a dynamic, easy and faster one.

**Didactic activity:** For introduce slowly to the students into the problem of the stability of water on Mars, this activity was divided in five steps:

**First step: stability of water.** The goal of this step is explain or review the meaning of pressure-temperature stability condiction for water. For this step we only need the P-T graphic with the limits of water, ice and vapour stability regions represented (Fig. 2-Left). During some moments the students could represent ramdom values of pressure and temperature in order to understand the graphic and what could be the stablish phase of water in that conditions.

**Second step: stability of water on Mars.** The goal of this step is represent some of the temperature-pressure data (Fig. 2-Left) obtained by Viking landers in our interactive graphic in order to know is actual (1976) dry conditions of the martian surface, and frost observed in some of the Viking Lander and Mars Pathfinder pictures are explained by the atmospheric pressure and temperature conditions.

**Third step: topography and seasons.** Previous step allow to know that most of pressure-temperature data imply the ice phase of water at the martian surface nowadays. Then, the goal of this step is introduce other parameter important for the study of variations of
pressure conditions, the topography. Assuming that the increase of altitude imply the decrease of the pressure, students could use a MOLA topographic map of Mars (Fig. 2-Right) in order to locate sites or regions where superificial pressure could be higher than at the different landing sites of Viking landers that obtain the P-T data used at previous steps of this activity.

**Fourth step: martian seasons.** The goal of this step is to introduce a new parameter, the seasonal variations of temperature. Using maps of atmospheric temperature of Mars (Fig. 2-Right) the students should discuss the possibility of existence of different places were the variation of temperature could allow the existence of liquid water on Mars today.

**Fifth step: Water on ancient and recent Mars.** The goal of this step is to review ancient pictures and other high resolution recent images of Mars showing water-related geomorphic features trying to explain what could were the climatic conditions of the planet in ancient times. On the other hand, the students and the public could try to propose possible mechanisms for the global climatic change of Mars and its relation with the possible evolution of the terrestrial climate.

**Conclusions:** This activity show how is possible to relate physic and chemical concepts with the geomorphological features observed in the pictures and images obtained by spacecrafts. In this way, this didactic activity shown how it is possible to review basic concepts of physic and chemistry, and to emphasize the multidisciplinary character of Planetary Sciences.

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![Fig. 2](1293.pdf)