AvH6-46, 2010
6th Alexander von Humboldt International Conference

Pico de Orizaba as an analogue to study planetary ecosynthesis on Mars

R. Navarro-González

Laboratorio de Química de Plasmas y Estudios Planetarios Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México Circuito Exterior, Ciudad Universitaria, Apartado Postal 70-543, México D.F. 04510, México (navarro@nucleares.unam.mx)

Studies of Mars by spacecrafts, landers and rovers have indicated that it was once a wetter, more habitable world than the cold desert planet of today. If water was once stable as a liquid on the surface and flowed in such vast quantities, then the atmosphere must have been denser and the climate warmer in the past. The same processes that led to the origin of life on Earth may have occurred simultaneously on Mars, and living organisms may have colonized the planet. It is unclear how or when Mars lost its thicker atmosphere and as a result lost its habitable environment. The Viking landers of the mid-1970s carried experiments designed to detect the presence of extant life and showed the martian soil to be lifeless on the surface. Future space missions will continue to explore if there was or still is life on Mars, perhaps in the subsurface. However, if there is no life on Mars, there is an opportunity to explore the potential for survival and biological evolution for terrestrial life beyond their place of origin, and do planetary ecosynthesis on Mars, a process of making the planet habitable for terrestrial organisms. The evidence that Mars was once habitable is important for planetary ecosynthesis as it provides a proof in principle that Mars can support a habitable state on timescales that, while short over the age of the solar system, are long in human terms. Artificial greenhouse gases, such as perfluorocarbons, appear to be the best method for warming Mars and increase its atmospheric density so that liquid water becomes stable. The process of introducing terrestrial ecosystems to Mars can be compared with a descent down a high mountain. Each drop in elevation results in a warmer, wetter climate and more diverse biological community. This is shown in Pico de Orizaba which is located at 19.03°N, 97.27°W and rises 5,636 meters above sea level. It is the highest mountain in Mexico, the third highest in the tropics after Mount Kilimanjaro (5,892) in Tanzania and Pico Cristóbal Colón (5,700 m) in Columbia but with the highest tropical treeline in the world. Pico de Orizaba is a good analog on Earth of a warmer and wetter Mars with trees confined to tropical regions.