

Evaluations of wind electric energy at Martian Planetia and Mons

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In planetary exploration such as a lander and a rover operating on the surface ability of electric power supply puts decisive limit on the operation. In the situation of Mars solar energy generation has been considered as a unique way to generate electricity. But sometimes martian strong surface winds cause some troubles for solar panels. MER-A(rover spirits) stopped on sol 2210 (March 22, 2010), because of its low electric power. With the increase amount of sand, the solar energy production decreases. In this presentation we report possibility of electricity generation by wind on Mars. Several lines of observation data indicate that Mars is a windy planet. Kaydash et al.,2006 estimated wind velocity up to 80[m/s] by cloud tracking. This wind velocity corresponds to the altitude above 30[km], while the surface wind was measured by the lander of Viking (Murphy et al., 1990) and Phoenix. On the surface of Mars, many eolian features are also discovered. They indicate that Mars is a windy planet (Fenton et al., 2005; Hayward et al., 2009). Fenton et al consider the surface winds over 20[m/s] as indicative of potential sand transports on the floor of Proctor Crater. On the surface of sloped ground much higher wind velocity is estimated (Toyota et al., 2011). We estimated wind electric energy at 3 different locations. Elysium Planetia, Chryse Planetia and Arsia Mons. Arsia Mons is one of the most windy place on Mars, because of its slope wind, Elysium Planetia is one of the candidate landing site for InSight mission and we have wind velocity data of Chryse Planetia (because Chryse Planetia was Viking Lander 1 Landing site.). These amount of energy wind turbine can generate strongly depends on the site and geography. We can generate only 3.4 [Watt hour] in a day, if we can install 1 meter square(sweep area) wind turbine on Chryse Planetia. But if we can install same turbine in Arsia Mons area, we can generate 137 [Watt hour] in a day.

We compared these results to other techniques (solar panels and nuclear batteries) with electric energy per mass. Finally, we found that wind electric is useful on Mars.

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