

# Distributions and the process of lineaments on Phobos

(フォボスにみられる線状構造の分布と形成過程)

Hiroshi Kikuchi and Hideaki Miyamoto<sup>1</sup>

<sup>1</sup>The University Museum, The University of Tokyo  
7-3-1 Hongo, Bunkyo-ku, Tokyo-to, 113-0033 Japan

## ABSTRACT

Numerous linear depressions are found on Phobos, but not on Deimos. This might be important to understand their origins and surface evolutions. Even though several formational processes of linear depressions on Phobos were proposed and discussed for years, none of them could really tell why the above difference occurs. In this study, we map the linear depressions by using high-resolution images of Phobos. We plot the results on a numerical shape model in order to examine their distributional patterns. We find that any of the linear depressions we identify lies on a plane. This result indicates that the linear depressions are not results of surface collapses into interior, which is one of the most major formational hypothesis. Instead, we consider their formations are related to series of aligned impacts. However, this hypothesis has a difficulty in explaining why these fragments are aligned toward the travelling direction because this requires fixed relative velocities in a single direction for all fragments.

We propose that a small body of a collection of smaller fragments held together by self-gravity in form of a rubble-pile is pulled apart and stretched straightly by tides during a close approach to Mars. Using an N-body numerical code, we find that the placement of fragments patterns is consistent with the observational facts only when these revolve around Mars. We also find that the orbit of impactors do not intersect the orbit of Deimos, which can explain the deficiency of linear depressions on Deimos.