

Proposals on new scientific experiments using a reusable rocket

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New scientific experiments and the significant results are expected to be achieved by a reusable rocket. For progress on physics and chemistry in the upper atmosphere, the most beneficial feature of the reusable rocket is that rocket-borne instruments can be retrieved. This feature allows scientists to obtain large-volume data such as a movie and to take a sample of materials in the upper atmosphere. Moreover, it is possible to save costs for experiments by using the expensive payload repetitively. If the similar experiments can be done several times a day or everyday, these experiments have great significance to extract semidiurnal or diurnal variations, which are prominent in the upper atmosphere. Secondary, low speed flight or hovering of the reusable rocket will provide significant development in physics and chemistry of the upper atmosphere. Low speed flight reduces the aerodynamic effects on the observations and removes uncertainties of the present measurements. A longer period of the observation time will be achieved by the low speed flight and new measurement techniques, which require more measurement time than the sounding rocket experiment gives, will be realized. We will propose three experiments using the reusable rocket: observation of the ionospheric plasma by imaging resonance scattering from magnesium ion, in situ sampling of meteoric smoke particles, and observations of atomic oxygen density and neutral temperature using a Raman lidar.