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A Circumpolar Stratospheric Telescope for Observations of Planets ? FUJIN

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It is important to conduct long-term continuous observations of time-dependent events in planetary atmospheres and plasmaspheres. The aim of the FUJIN project is to carry out continuous observations of planets using a telescope that is lifted by a balloon to the polar stratosphere. The FUJIN-1 experiment was organized at Taiki Aerospace Research Field in Taiki-cho, Hokkaido, Japan, from May to June 2013, but the experiment was canceled due to a failure found in the balloon operation system provided by JAXA. However, the results of various prelaunch ground tests clearly established the feasibility of the experiment.

We have recently begun organizing the FUJIN-2 experiment, in which scientific observations of planets will be conducted in the Arctic. Wind speed in the stratosphere is very low during April and May. The FUJIN-2 experiment will be conducted during this period in 2015 at ESRANGE in Kiruna, Sweden, since this is when Venus will be in the most favorable position for observations. The gondola will be recovered somewhere in the Scandinavian peninsula after one or two days of continuous observations.

In summer, an eastern circumpolar wind is dominant in the stratosphere. If a balloon is flown under these conditions, it will take a week to fly from Kiruna to Alaska and more than two weeks for it to fly back to Scandinavia along a constant-latitude path around the Earth. We are currently organizing another experiment (FUJIN-3) involving such a circumpolar flight that will be conducted in 2017 or later. The system used in FUJIN-2 will also be used for FUJIN-3, but with the inclusion of a high-sensitivity CCD camera and a liquid-crystal tunable filter. Venus, Jupiter, and Mercury will be the planets of interest for FUJIN-3. Moreover, a next-generation stratospheric telescope with a meter-class aperture, a mobile gondola to approach the center of the polar vortex, and a super-pressure balloon for year-round observations are being studied to upgrade the FUJIN system for future use.

Keywords: Circumpolar, Stratospheric, Telescope, Venus, FUJIN-project