Advanced Observations of the Solar Atmosphere by a Balloon-Borne Telescope SUNRISE-3

*Yukio Katsukawa[1], Carlos Quintero Noda[2], Masahito Kubo[1], Hirohisa Hara[1], Toshifumi Shimizu[2]

1. National Astronomical Observatory of Japan, 2. ISAS/JAXA

The solar chromosphere interfacing the solar surface (i.e. photosphere) and the corona is not a simple intermediate atmospheric layer transmitting magnetic energy, but a region where strong non-linearity drives dynamic phenomena, such as turbulence, shocks, and jets. Because the dynamics are likely to be responsible for injection of non-thermal energies into the corona and the solar winds, the chromosphere is one of the most important targets in the solar and stellar physics. It is necessary to quantitatively observe 3D magnetic and velocity fields to cover the dynamics in the chromosphere together with energy generation in the photosphere. We plan to acquire high-quality 3D magnetic and velocity fields for the first time by the SUNRISE-3 balloon-borne solar telescope planned for 2021. We are building a high precision spectro-polarimeter called SCIP (SUNRISE Chromospheric Infrared spectro-Polarimeter) to be installed in SUNRISE-3 for precise spectro-polarimetric observation of near-IR spectral lines sensitive to magnetic fields in the photosphere and the chromosphere. To interpret the SUNRISE-3 data, we are developing numerical modeling of the dynamic phenomenon in the solar atmosphere as well as tools to interpret radiative transfer through the atmosphere. The goal is to understand the conversion process of magnetic energies in the astrophysical plasma based on spatially resolved observations of the Sun.

Keywords: Sun, Chromosphere, Corona, Magnetic field, Balloon observation

