

## Current status of the IUGONET project

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The earth's atmosphere in a height range of more than 80 km is called the upper atmosphere, and the atmospheric layer is influenced by both the solar activity and the atmospheric waves propagating from the lower atmosphere. Therefore, in order to understand the physical mechanism of the short-term and long-term variations in the upper atmosphere, we need to perform the integrated analysis of various kinds of ground-based and satellite observation data taken by different instruments. Since these observation data were separately being managed by each institute, it was difficult for users to effectively find and analyze them for promotion of an interdisciplinary study. In order to solve this problem, the Inter-university Upper atmosphere Global Observation NETwork (IUGONET) project has been initiated in 2009, consisting of five institutes (Tohoku University, National Institute of Polar Research, Nagoya University, Kyoto University, and Kyushu University). In this project, we created a metadata for various kinds of ground-based observation data such as solar image, geomagnetic field, optical image, neutral wind, and several metrological data, and built a metadata database to share them on the Internet. We also developed an integrated data analysis tool, which is called the IUGONET Data Analysis Software (UDAS) written in an Interactive Data Language (IDL). This analysis tool is a plugin software for Space Physics Environment Data Analysis Software (SPEDAS) to analyze and visualize various kinds of ground-based and satellite observation data. However, since there are several major problems on usability of the IUGONET metadata database (for example, no Quick Look (QL) images, no description of how to use the UDAS for each dataset, and high operation cost etc.), we replaced the old IUGONET metadata database by the IUGONET Type-A to solve these problems on October 1<sup>st</sup>, 2016, and we opened it for users on November 1. In the IUGONET Type-A, we rearranged a dataset category of each instrument or project displayed on the top window so that users can easily search and find the data and related information they want to know. Since this web service has a function to display the QL images/plots related to the selected dataset on the top window, users can easily learn the characteristics of different types of the IUGONET ground-based observation data and find several interesting phenomena observed in the upper atmosphere by looking at the QL images/plots. Moreover, the time range of all the QL plots created by the UDAS/SPEADS tool becomes 7 days, so users can investigate the characteristics of upper atmospheric phenomena aligned to every date and time on the basis of different type of observation data taken by various kinds of instrument distributed all over the world. In order for students and young scientists to learn how to use these IUGONET data and products, we hold tutorial seminars several times a year in Japan and sometimes foreign countries. It is expected that the two main IUGONET products (IUGONET Type-A and UDAS/SPEDAS) promote an interdisciplinary study on coupling processes of solar-terrestrial system and space climatology and contribute to an open science and cultivation of human resources to promote it.

Keywords: IUGONET, Upper atmosphere, IUGONET Type-A, Open Science, IUGONET Data Analysis Software (UDAS), Interdisciplinary study