Mongolia

Presenter: Lkhagvadorj Nanzad who is a Chief Engineer at Remote Sensing Division, Information and Research Institute of Meteorology, Hydrology and Environment (IRIMHE). He is now responsible for managing the day-to-day operations of receiving real-time satellite data and leading all engineering activities to the methodology of value-added products.

Introduction: IRIMHE is a research institute under the National Agency of Meteorological and Environmental Monitoring and the Ministry of Environment and Climate Change. IRIMHE has been serving real-time and predicted information on weather, climate, water, and environment as operationally based on scientific research outputs since 1966. IRIMHE acts as the National Remote Sensing Center and is responsible for ensuring reliable and prompt operation of ground stations for receiving data from satellites, and processing and delivering data to users.

What we do in the field of Remote Sensing: It's been over 50 years since remote sensing applications have been used for natural resource and environmental management, monitoring, and support to reduce damage caused by natural disasters. We operate the satellite data storage system for MODIS, NOAA, SUOMI NPP, HIMAWARI-8, and FY series satellites. We also publish (www.icc.mn) and share value-added information such as NDVI, NDVI anomaly, Snow Coverage, Land Surface Temperature, and Dust monitoring extracted from satellite data. Plus, we have been generating a National Land cover map every 5 years and the map can be a good reference for the Environmental change monitoring even due land degradation and desertification process also, land management. Meanwhile, we detect forest and steppe fires and inform the locations to the National Emergency Management Agency and they work on-site to distinguish the wildfires.

Highlights:

1. To help address the challenges of drought monitoring, Mongolia was nominated as the pilot country for ESCAP's Regional Drought Mechanism in 2013. We developed several drought indices with the support of the Aerospace Information Research Institute (AIR) under the Chinese Academy of Sciences. Since that IRIMHE has been fully operating the system on our own, monitoring drought and servicing the users. Accordingly, the Drought watch system successfully transformed from a pilot project into an established service and has successfully extended to other countries.
2. We run a dzud monitoring system which includes the dzud risk mapping and the dzud assessment mapping is critical to tailor early action and response efforts in a timely and effective manner. IRIMHE releases the Dzud risk map for the entire country at each early stage of winter. Once the Dzud situation worsened, IRIMHE produce a Dzud assessment map reflecting the current Dzud status in the country. Dzud risk maps are developed using 11 different parameters based on remote sensing data collected from

Moderate Resolution Imaging Spectroradiometer (MODIS) sensors, such as snow cover mapping and drought mapping, and on-ground observation data, including summer conditions, anomalous precipitation, and temperature, snow depth, air temperature forecast, and precipitation forecast. The weight of each parameter is determined through multi-criteria decision analysis and weighted layers are overlaid in a geographic information system (GIS). Following Government Decree No. 286, the dzud assessment map is based on snow depth and density, air temperature data, and previous summer conditions. The assessment reveals that all the soums categorized as the Near white dzud, White dzud, Black dzud, and Iron or Ice dzud situation. This shift from a dzud risk map to a dzud assessment map highlights that dzud is no longer a risk but is happening at the time.

3. The Mongolian Data Cube was installed in October 2020 at the IRIMHE with support from the UK Space Agency. This technology makes it possible to access the most up-to-date satellite imagery showing the current pasture conditions, levels of snow, temperatures, and drought, and compare these with long-term average conditions, covering the whole of Mongolia at 10 to 1000-meter resolution. It stores all products indexed with the Data Cube and is currently able to store up to 186 TB of data. An important feature of the Mongolian Data Cube is its Visualization Website, which allows anyone to access satellite-derived information, regardless of whether they know anything about satellites. To do that, users need to log in to be able to export a map using Internet web services. This tool allows users to export a map of the current view showing the current information. The map can be printed or saved as a PDF or GeoTIFF. Otherwise, users can use Jupyter Hub to access the data directly from the Data Cube, kind of using Python scripts.

4. Mongolia plans to increase air quality management using data from GEMS which only covers the southern part of the country in its field of view. Two Pandora instruments were installed in Mongolia – Pandora 216 in Ulaanbaatar City and Pandora 217 in Dalanzadgad to validate the scientific products of GEMS. Accordingly, the GEMS data were conducted by comparison with data obtained from ground-based Pandora measurements at two sites in the country.

Perspective for using space technology and its application:

In 2022, the government of Mongolia approved the direction of documentation in developing Space technology in Mongolia. The new strategy of Space technology included the following activities:

Objective 1: Using space technology and its application to Social and Economic Development

Objective 2: Develop a National Remote Sensing Data Center.

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