Data Types and Products

There are two types of data used in geoinformatics. One is raster data and the other is vector data.
Raster data represent a continuous surface that is divided into grid cells of equal size. Each cell is assigned a particular value and appears as a specific color based on that value. The value can represent very different things, such as height, color, sensor value, observation count and so forth. Common raster objects include air photos, satellite imagery, and paper maps that have been scanned. There are many different file formats, some common ones include Tiffs (.tif) and JPEGs (.jpg) and Digital Elevation Models (DEM). Unlike regular .tif or .jpg files, GIS raster files are georeferenced.

Vector data consist of discrete coordinates and surfaces that are represented as individual points, lines, or polygons (areas). Often, data files are separated by the geometry type. A point consists of a coordinate pair (i.e. latitude and longitude coordinates). A line consists of several points. A polygon consists of several points and wraps around a surface, which then makes up an area. It is useful for storing data with discrete boundaries, such as country borders, streets, land use, biodiversity areas and cities. Vector data can come in several data types and formats. Some examples are: ESRI shapefile (.shp), GeoJSON (.geojson), Geography Markup Language (.gml), AutoCAD DXF (.dxf), Comma separated values (.csv), GPS eXchange Format (.gpx), Keyhole Markup Language (.kml), SQLite/SpatiaLite (.sqlite/.db).

When we talk of remote sensing data, we always mean raster data.

The data from various sensors are presented in a form and format with specified radiometric and geometric accuracy which can be readily used by various application scientists for specific themes of their interest. Remote sensing data can be procured by a number of users for various applications and information extraction, in the form of a 'data product'. This may be in the form of photographic output for visual processing or in a digital format amenable for further computer processing.

Data Products are basically data from various sensors in a suitable and standard form and format, which can be readily used by user.

There are varieties of remote sensing data which are acquired by different sensors and satellites. Before reaching to users, the data undergo some processing steps. Requirements of users may vary depending upon their interests and project objectives, hence there are various remote sensing data providers/suppliers which prepare variety of data products in different formats. To order, a data the user should be aware of the types of data products available with the data agencies/suppliers. Once the data are received by the users, these need to be changed into a form required to perform image analysis task. To convert the data into required form, the users should have basic understanding of the characteristics of different data formats. It would be a time consuming and difficult task for users to understand all different data and their formats. Hence, there are some standards which are followed by data centers/suppliers with regard to the data products and formats for sharing with a variety of users.

Types of data products may vary from country to country and/or from one data provider to another.

Here a brief account is given of some of the most popular satellite missions and their products.

Landsat data products

There are several Landsat data products that are useful for science applications and land use/land change studies:
Landsat Collections Level 1 - Ensures that the data in the Landsat Level-1 archive are consistent in processing and data quality to support time-series analyses and data stacking. Each Level-1 data product includes individual spectral band files, a metadata file, and additional ancillary files.

U.S. Landsat Analysis Ready Data (ARD) - Uses Landsat Collections Level-1 data as input to provide data that is processed to the highest scientific standards and placed in a tile-based structure to support time-series analysis.

Landsat Science Products - Level-2 and Level-3 products that are processed to include atmospherically corrected data, surface reflectance, provisional surface temperature, and biophysical properties of the Earth's surface.

User are advised to visit the links provided in the references to learn more about the specific data products.

Sentinel-2 Data Products

Sentinel-2 products available for users (either generated by the ground segment or by the Sentinel-2 Toolbox)

Level-1C product: provides orthorectified Top-Of-Atmosphere (TOA) reflectance, with sub-pixel multispectral registration. Cloud and land/water masks are included in the product.

Level-2A product provides orthorectified Bottom-Of-Atmosphere (BOA) reflectance, with sub-pixel multispectral registration. A Scene Classification map (cloud, cloud shadows, vegetation, soils/deserts, water, snow, etc.) is included in the product.

Level-1C and Level-2A products are made available to users via the Copernicus Open Access Hub

Accessing Satellite data

There are several web portals for dissemination of satellite data, here below is a list of some portals used to access satellite data

Bhoonidhi web portal

- https://bhoonidhi.nrsc.gov.in/bhoonidhi/index.html

USGS earthexplorer

- https://earthexplorer.usgs.gov/

Bhuvan

- https://bhuvan.nrsc.gov.in/home/index.php

The Copernicus Open Access Hub

- https://scihub.copernicus.eu/