

5. Glossary

C-band. Portion of the microwave region of the electromagnetic spectrum, including waves with frequencies comprised between 4 and 8 GHz (corresponding to wavelengths ranging between 7.5 to 3.75 cm).

Cell. Element of a data grid or data matrix. Each cell corresponds to a portion of the ground surface. The value associated to each cell represents either a thematic attribute or the average value of a parameter, associated to the corresponding surface.

Ellipsoid. The Earth surface is approximately described by an ellipsoid, a closed surface all planar sections of which are ellipses. In general, an ellipsoid has three independent axes, and is usually specified by the length of the three semi-axes. If the lengths of two axes are the same, the ellipsoid is called “ellipsoid of revolution” or spheroid. Due to the rotation around its axis, the Earth has the shape of a spheroid. Several spheroids are used to model the Earth surface and project it onto a two-dimensional map; the choice of the reference spheroid depends on the region of the Earth to be represented and the required precision. The spheroids quoted in this work are Clarke 1866, WGS72 and WGS84. Clarke 1866 is used to map the North America and the Philippines. The World Geodetic System (WGS) spheroids have been developed to be used for global mapping; the number indicates the year of calculation. WGS84 is the most recent version, and is also used by the Global Positioning System.

Geocoding. Procedures applied to a satellite image to generate a new image with the projection and scale properties of a map. In particular, map coordinates are associated to the center point of each element (pixel) of the resulting image.

GIS (Geographic Information System). A collection of computer hardware, software, and geographic data for capturing, storing, updating, manipulating, analysing, and displaying all forms of geographically referenced information.

GPS (Global Positioning System). A constellation of twenty-four satellites, developed by the U.S. Department of Defence, that orbits the Earth at an altitude of 20 200 km. These satellites transmit signals that allow a GPS receiver anywhere on Earth to calculate its own location. The Global Positioning System is used in navigation, mapping, surveying, and other applications where precise positioning is necessary.

Landsat. The U.S. Landsat satellites are the first series of Earth Observation satellites providing global, repeated coverage of the Earth surface. The sensors onboard these satellites operate in the visible up to middle infrared wavelengths, and in the thermal infrared. The first satellite of the mission, ERTS-1 (later renamed Landsat-1) was launched in 1972. The current Landsat-7 mission hosts the Enhanced Thematic Mapper sensor; of its nine channels, seven acquire data in the visible up to middle infrared, at 30 m resolution. More information on the Landsat-7 mission can be found in the USGS Web pages (<http://landsat7.usgs.gov/index.php>) and in the NASA Web pages (<http://landsat.gsfc.nasa.gov/>).

Pixels (Picture elements). Cells of an image matrix. The ground surface corresponding to the pixel is determined by the instantaneous field of view (IFOV) of the sensor system, e.g. the solid angle extending from a detector to the area on the ground it measures at any instant. The digital values of the pixels are the measures of the radiant flux of electromagnetic energy emitted or reflected by the imaged Earth surface in each sensor channel.

Polygon. In a GIS framework, a polygon is a closed line (or a closed set of lines) representing a surface. The surface is generally homogeneous with respect to some criteria; for example, land use or type, administrative units, etc. Map coordinates (easting, northing and height) are associated to the vertices of the polygon.

Polyline. In a GIS framework, a polyline is a set of straight line segments (connected or not) representing a linear geographic feature, such as a road or a railway. The polyline may also connect points homogeneous with respect to some criteria, such as a contour line. Map coordinates (easting, northing and height) are associated to the vertices of the segments.

RADARSAT. Canada's series of remote sensing satellites. RADARSAT-1 was launched on November, 1995; RADARSAT-2 will be presumably launched on 2005. RADARSAT-1 hosts a Synthetic Aperture Radar (SAR), an active sensor operating in the microwave portion of the electromagnetic spectrum at C-band in HH polarization. The SAR operates in seven different acquisition modes, with spatial resolution ranging from 6.25 to 100 m. RADARSAT-2 will carry an enhanced version of the same sensor. More details on RADARSAT-1 and -2 are available in the Canadian Space Agency Web pages (http://www.space.gc.ca/asc/eng/csa_sectors/earth/radarsat1/radarsat1.asp and [.../radarsat2/radarsat2.asp](http://www.space.gc.ca/asc/eng/csa_sectors/earth/radarsat2/radarsat2.asp)).

SAR (Synthetic Aperture Radar). An imaging radar is an active instrument that transmits microwave pulses toward the Earth surface and measures the magnitude of the signal scattered back towards it. The return signals from different portions of the ground surface are combined to form an image. A Synthetic Aperture Radar (SAR) is a special type of imaging radar. It is a complex system that measures both the amplitude and phase of the return signals; their analysis exploits the Doppler effect created by the motion of the spacecraft with respect to the imaged surface to achieve high ground resolution. As the source of the electromagnetic radiation used to sense the Earth surface is the system itself, it can be operated during day and night. The atmospheric transmittance in the microwave interval used by remote sensing SAR systems (2 to 30 GHz) is higher than 90%, also in presence of ice and rain droplets (except under heavy tropical thunderstorms); thus, SAR can acquire data in all weather conditions.

Scale. The ratio between a distance or area on a map and the corresponding distance or area on the ground.

Shapefile. A vector file format for storing the location, shape, and attributes of geographic features.

Spatial Resolution. The area of the ground surface corresponding to a pixel in a satellite image.

Speckle. Noise affecting Synthetic Aperture Radar (SAR) images. The noise is created by constructive and destructive interference between the backscattered energy from different portions of the ground surface included in the same pixel of the SAR image. The value of the pixel is thus increased or decreased; the SAR image appears to be covered by randomly scattered bright and dark spots.

SPOT (Système Pour l'Observation de la Terre). French Earth Observation satellites operating in the optical wavelengths. The first satellite, SPOT-1 was launched in 1986; the most recent satellite, SPOT-5, was launched in 2000. Among its instruments, the HRG acquires data in five channels useful to study land cover: a panchromatic channel (spatial resolution 2.5 or 5 m), three channels in the visible and near infrared wavelengths (spatial resolution 10 m) and one channel in the short-wave infrared (spatial resolution 20 m). More information on the SPOT satellites can be found at the SPOT Image Web site (<http://www.spotimage.com>) and at the CNES Web site (<http://www.cnes.fr>).

UTM (Universal Transverse Mercator). A commonly used projected coordinate system that divides the globe into 60 zones, starting at -180° longitude. Each zone extends north-south from 84° North to 80° South, spans 6° of longitude, and has its own central meridian.

Vector. A data structure used to represent geographic features. Features are represented by points, lines or polygons. A line is made up of connected points (vertices), and a polygon of connected lines. Map coordinates (easting, northing and height) are associated to each point or vertex in a vectorial feature. Attributes are also associated with each feature (as opposed to the raster data structure, which associates attributes with grid cells).

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Recommended further reading

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