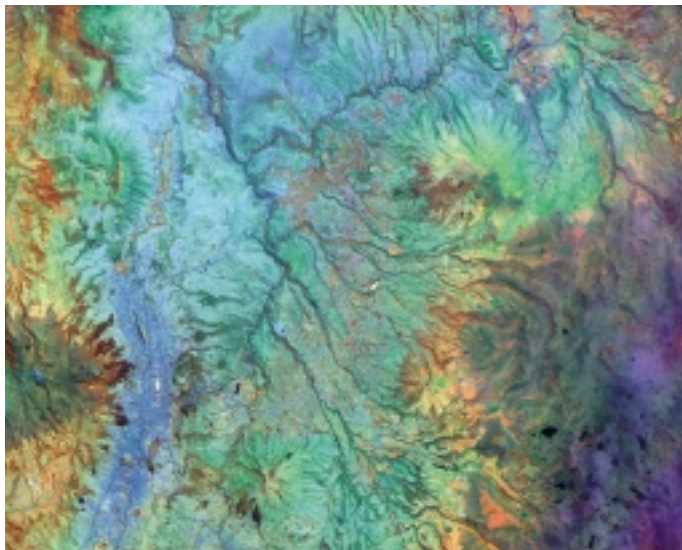# Preprocessing levels and location accuracy

◆ SPOT Scene products

◆ Level 1A

Level 1A imagery is corrected by normalizing CCD response to compensate for radiometric variations due to detector sensitivity. No geometric corrections are performed. Level 1A preprocessing thus leaves data in almost raw form.

20-metre colour (full scene) – Quito, Ecuador – 01/09/1998

Location accuracy

For Spot 1 through Spot 4, metadata (coordinates of the scene centre and corners) offer ground location accuracy better than 350 metres (1σ*). On Spot 5, a new star tracker provides more accurate satellite altitude data and therefore significantly enhanced image location accuracy better than 50 metres (1σ*). Location accuracy calculations do not allow for parallax errors due to relief.

Use

Level 1A products are for experienced users working with image processing software. They are designed primarily for mapping applications and are used for geometric processing—to orthorectify images and generate digital elevation models (DEMs)—and for precise radiometric processing.

◆ Level 1B

Level 1B applies the same radiometric corrections as level 1A. Geometric corrections compensate for systematic effects, including panoramic distortion, the Earth's rotation and curvature, and variations in the satellite's orbital altitude.

Location accuracy

Location accuracy is equivalent to level 1A, i.e., better than 350 metres (1σ*) for Spot 1 through Spot 4 and better than 50 metres (1σ*) for Spot 5. Location accuracy calculations do not allow for parallax errors due to relief.
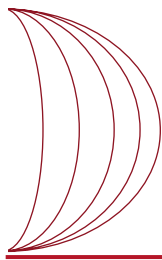
Use

Level 1B products are for users who require basic geometric corrections. They are well suited for geometric measurements (distances, angles and areas), photo-interpretation and thematic studies. Thematic analysis may be visual, computer-assisted or fully digital.

* Location accuracy is evaluated on the basis of a statistic calculated from a large number of scenes acquired across the globe.

2.5-metre B&W (subscene) – Tunis, Tunisia – 19/06/2002

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Preprocessing levels and location accuracy

Level 2A

Level 2A scenes are rectified to match a standard map projection (UTM WGS 84), without using ground control points. Level 2A is the entry-level map product. For Spot 1 through Spot 4, the mean rectification elevation is constant across the scene. For Spot 5, a global DEM with a post spacing of one kilometre is used. Geometric corrections use a resampling model that compensates for systematic distortion effects and performs transformations needed to project the image in a standard map projection (UTM WGS 84). This model is based on known viewing parameters (satellite ephemeris data and attitude, etc.) and does not use external measurements. Other map projections or mean rectification elevations are available on request.

Location accuracy

For a scene with constant elevation, location accuracy is the same as level 1B, i.e., better than 350 metres (1 σ*) for Spot 1 through Spot 4 and better than 50 metres (1 σ*) for Spot 5.

Use

Level 2A products are for users who want to combine different kinds of geographic information, from different sources, and apply their own colour processing in order to extract specific information. While allowing for location error, level 2A images register directly with other layers of geographic information - vector data, raster maps or other satellite images - in the same map projection.

* Location accuracy is evaluated on the basis of a statistic calculated from a large number of scenes acquired across the globe.
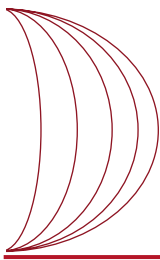
Note:

Unless requested otherwise, all products in the SPOT Scene range are delivered in DIMAP format (SPOT Scene profile). Products generated from imagery acquired by Spot 1 through Spot 4 can optionally be delivered in the old CEOS format.

5-metre colour (subscene) - Iguaçu National Park, Argentina/Brazil - 26/09/2002

SPOT
IMAGE

Preprocessing levels and location accuracy

SPOTView products

Level 2B (Precision)

Level 2B imagery is georeferenced, that is, scenes are framed in a given map projection and tied to ground control points (GCPs, obtained from a map or topographic surveys) for even better location accuracy.

Geometric corrections use a resampling model that compensates for systematic distortion effects and performs transformations needed to project the image in a specified map projection (Lambert conformal, UTM, polar stereographic, polyconic, etc.). Corrections are based on a model of the satellite's flight dynamics, calculated from viewing parameters (satellite ephemeris data and attitude, etc.) and GCPs.

Location accuracy

Location accuracy depends on the quality of maps used to obtain GCPs, which are generally taken from topographic maps or GPS measurements, depending on available documents covering the area of interest. At the rectification elevation or on flat terrain, the location error is generally lower than 30 metres ($1\,\sigma*$).

Use

Level 2B products are satellite imagemaps, in full-scene or standard mapsheet formats (30′ x 30′, 15′ x 15′; 7′30 x 7′30). They are designed for use as digital maps, providing up-to-date geographic information and global coverage. Level 2B products can be used whenever relief distortions are not a major concern (for example, when imaging relatively flat terrain).

10-metre B&W (full scene) – Orange River, South Africa - 18/06/1987

Level 3 (Ortho)

Level 3 imagery is georeferenced like level 2B. Level 3 products, also called orthoimages, are pre-processed using a digital elevation model (DEM) to correct residual parallax errors due to relief. Geometric corrections consist in "orthorectifying" imagery using a resampling model that compensates for systematic distortion effects and performs transformations needed to project the image in a specified map projection (Lambert conformal, UTM, oblique equatorial, polar stereographic, polyconic, etc.). Corrections are based on a model of the satellite's flight dynamics and on GCPs and a DEM.

Location accuracy

DEMs are taken from a global, georeferenced database called Reference3D. DEMs are derived from stereopair images acquired by Spot 5's HRS instrument. This database contains a DEM layer and an orthoimage layer with accompanying image-quality data. It was developed by Spot Image and IGN, France's national survey and mapping agency. Reference3D makes it possible to reduce the location error in a level 3 image to less than 15 metres per pixel ($1\sigma*$). If Reference3D has no data for the area of interest, other DEMs can be used, provided they are sufficiently accurate. In such cases, location accuracy depends directly on the quality of the DEMs and GCPs.
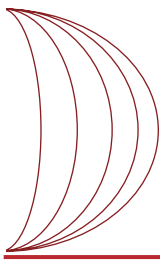
Use

Level 3 products are satellite imagemaps, in full-scene or standard mapsheet formats (30′ x 30′, 15′ x 15′; 7′30 x 7′30).

They are thus ideal for mapping relief. Such a sophisticated level of preprocessing is designed to offer maximum accuracy for producing and updating maps. It also allows images to be registered with other kinds of data.

Note: All products in the SPOTView range are delivered in DIMAP format (SPOTView profile).

> **Spot Image's wide choice of preprocessing levels offers precise and reliable analysis tools to meet users' diverse geographic information needs.**

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Preprocessing levels and location accuracy

		SPOT Scene			SPOTView		
		1 A	**1 B**	**2 A**	**2 B (Precision)** With GCPs*	**3 (Ortho) With DEM** From Reference3D	**3 (Ortho) With DEM** From other source*
2.5-m colour	Spot 5	50 m	NA	50 m	30 m	15 m	30 m
2.5-m B&W	Spot 5	50 m	50 m	50 m	30 m	15 m	30 m
5-m colour	Spot 5	50 m	NA	50 m	30 m	15 m	30 m
5-m B&W	Spot 5	50 m	50 m	50 m	30 m	15 m	30 m
10-m colour	Spot 5	50 m	50 m	50 m	30 m	15 m	30 m
10-m colour	Spot 4	350 m	350 m	350 m	30 m	15 m	30 m
10-m colour	Spot 1 to 3	NA	NA	NA	30 m	15 m	30 m
10-m B&W	Spot 1 to 4	350 m	350 m	350 m	30 m	15 m	30 m
20-m colour	Spot 1 to 4	350 m	350 m	350 m	30 m	15 m	30 m

- **NA:** not available.
- The location accuracy indicated for levels 1A, 1B and 2A applies to flat terrain. It is given at one sigma (1 σ), and evaluated on the basis of a statistic calculated from a large number of scenes acquired across the globe.

* The mean location accuracy depends on the quality of GCPs or DEMs obtained for the area of interest.

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