

# DEM extraction and orthorectification of an ASTER image of Rabat, Morocco

## Raw ASTER image

R = Band 3 (760 - 860 nm)  
G = Band 2 (630 - 690 nm)  
B = Band 1 (520 - 600 nm)

The Advanced Spaceborne Thermal Emission and Reflection Radiometer is part of NASA's Terra (EO1) satellite, which was launched in December 1999.

Sensor characteristics:

Orbit: 705 km, 10:30 am decending node, sun-synchronous, near polar

Swath: 60 km x 60 km

Bands: 14 (3 VNIR, 6 SWIR, 5 TIR)

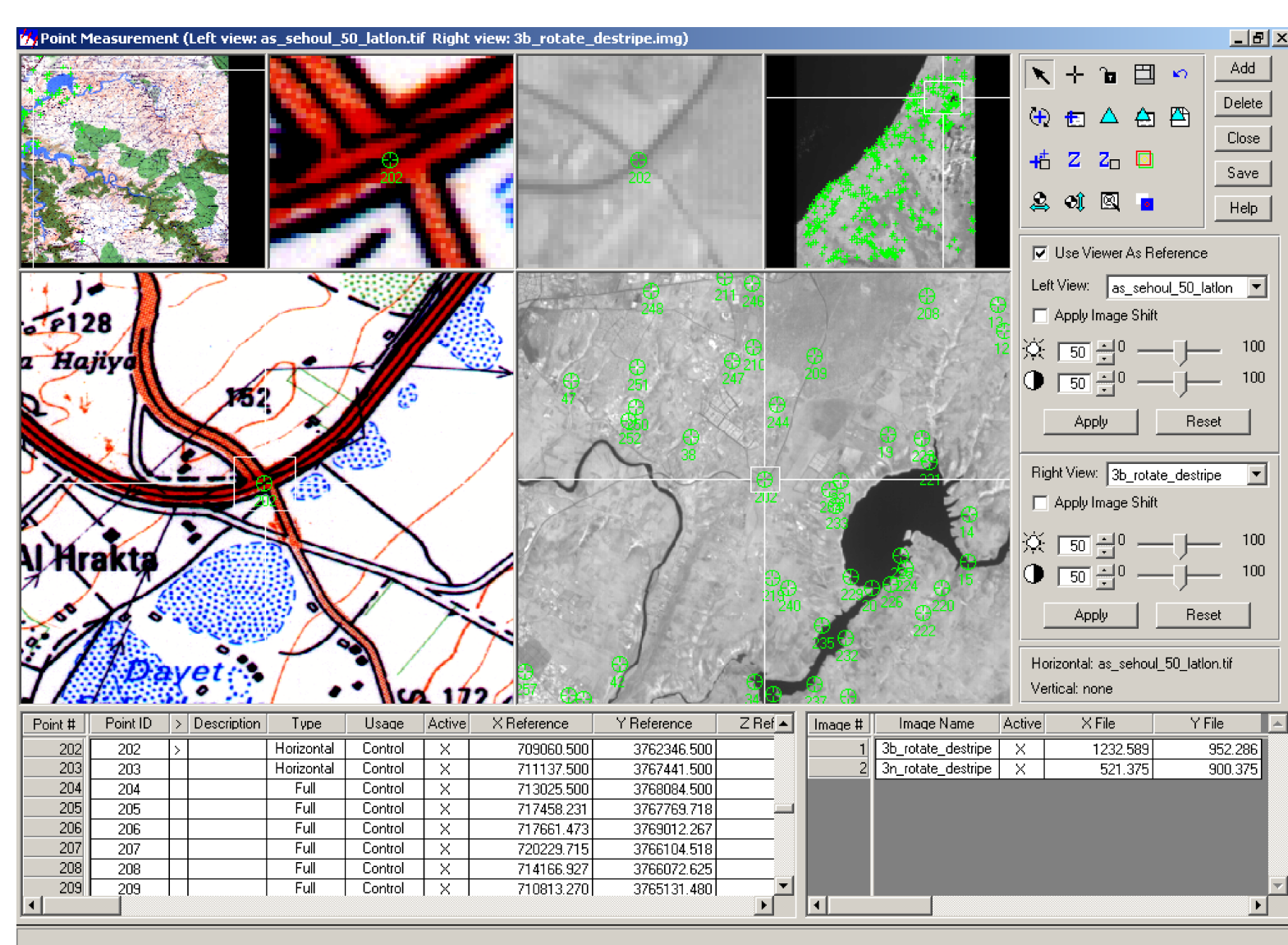
The VNIR bands have a resolution of 15 meters and are captured in nadir direction.

The third VNIR band has both nadir and backward oriented optics, which makes it useful for the generation of Digital Elevation Models (DEM's). The DEM can be used to orthorectify the ASTER image.

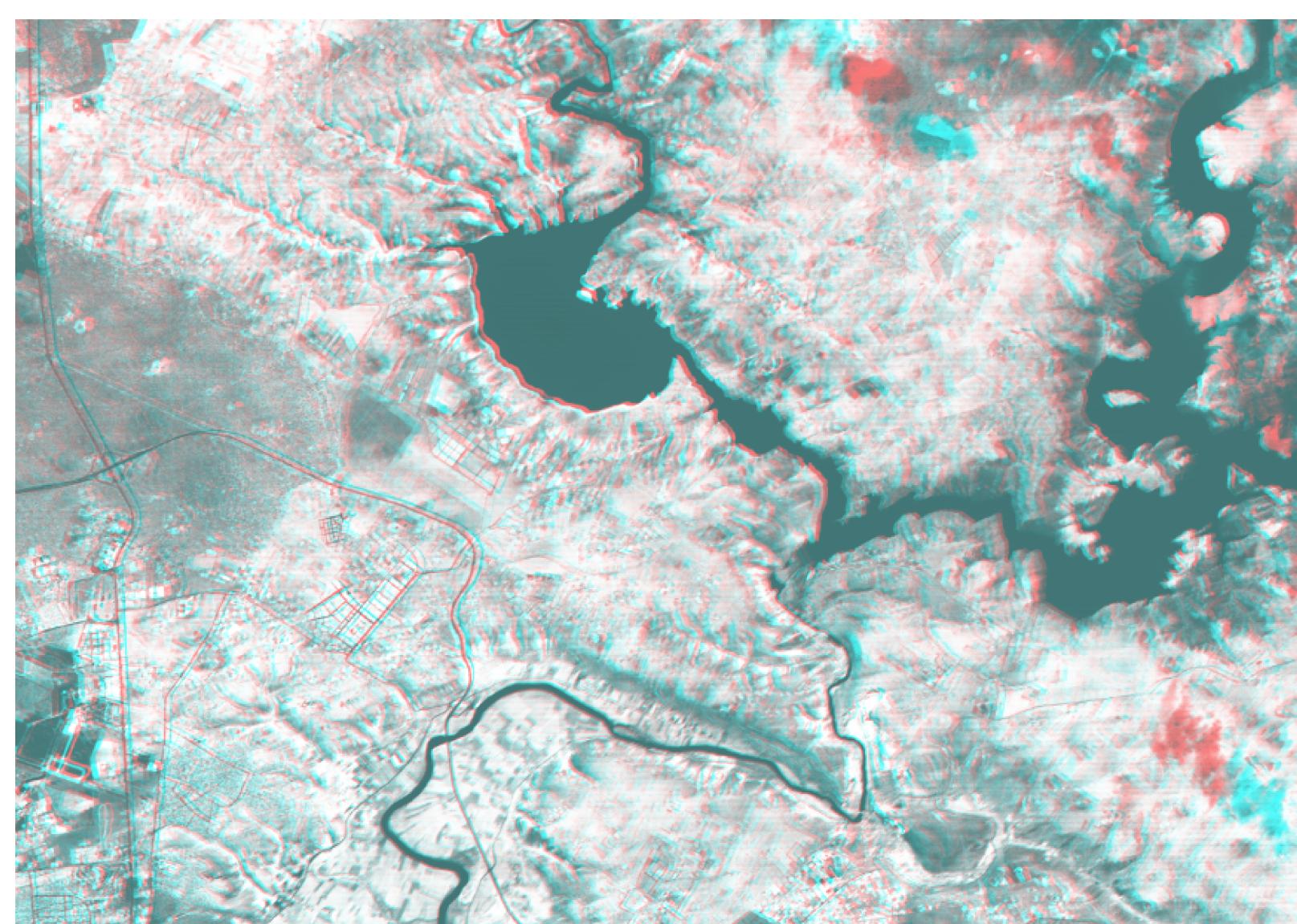
A level 1A ASTER image of Rabat is first preprocessed.

Preprocessing consists of a 90 degrees counter clockwise rotation and destriping of the image.

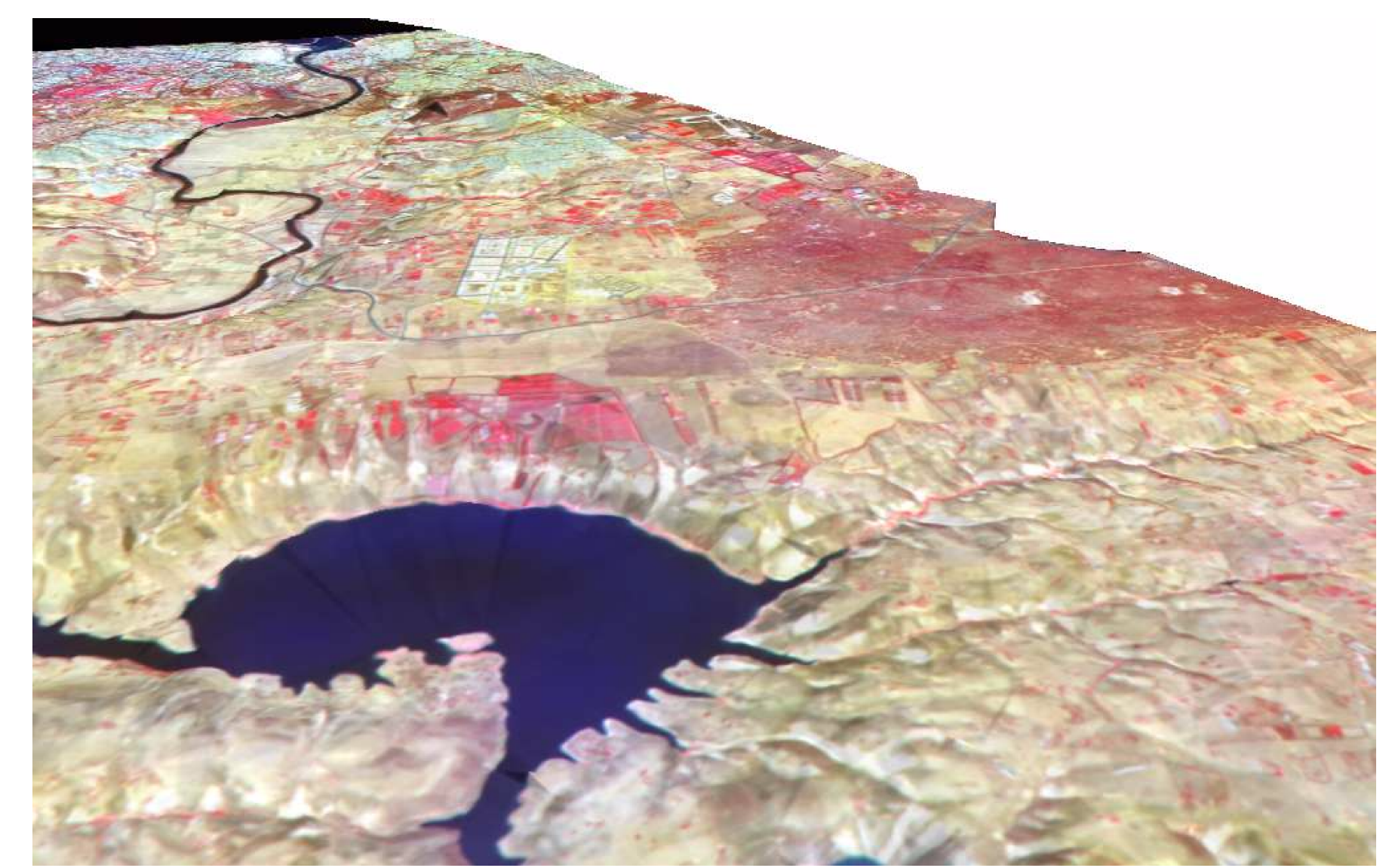
Rotation is needed to display the stereo model in ERDAS Imagine Stereo Analyst and to perform destriping.



GCP and tie point collection in OrthoBase Pro



3D red/blue Anaglyph



Digital Elevation Model with draped ASTER image

DEM extraction and orthorectification can be performed with ERDAS Imagine OrthoBase Pro.

First, the sensor properties need to be defined. Some of these can be obtained from the ASTER header file.

The next step is to acquire ground control points (GCPs).

In this case 1:50 000 topographical maps were used to obtain x,y,z GCPs.

In addition, the software can calculate tie points. Tie points are points that can be recognised visually on both images.

The software uses contrast matching in order to find tie points.

Both GCPs and tie points are used to establish the geometry of the sensor relative to the objects on the Earth's surface.

This process is called triangulation.

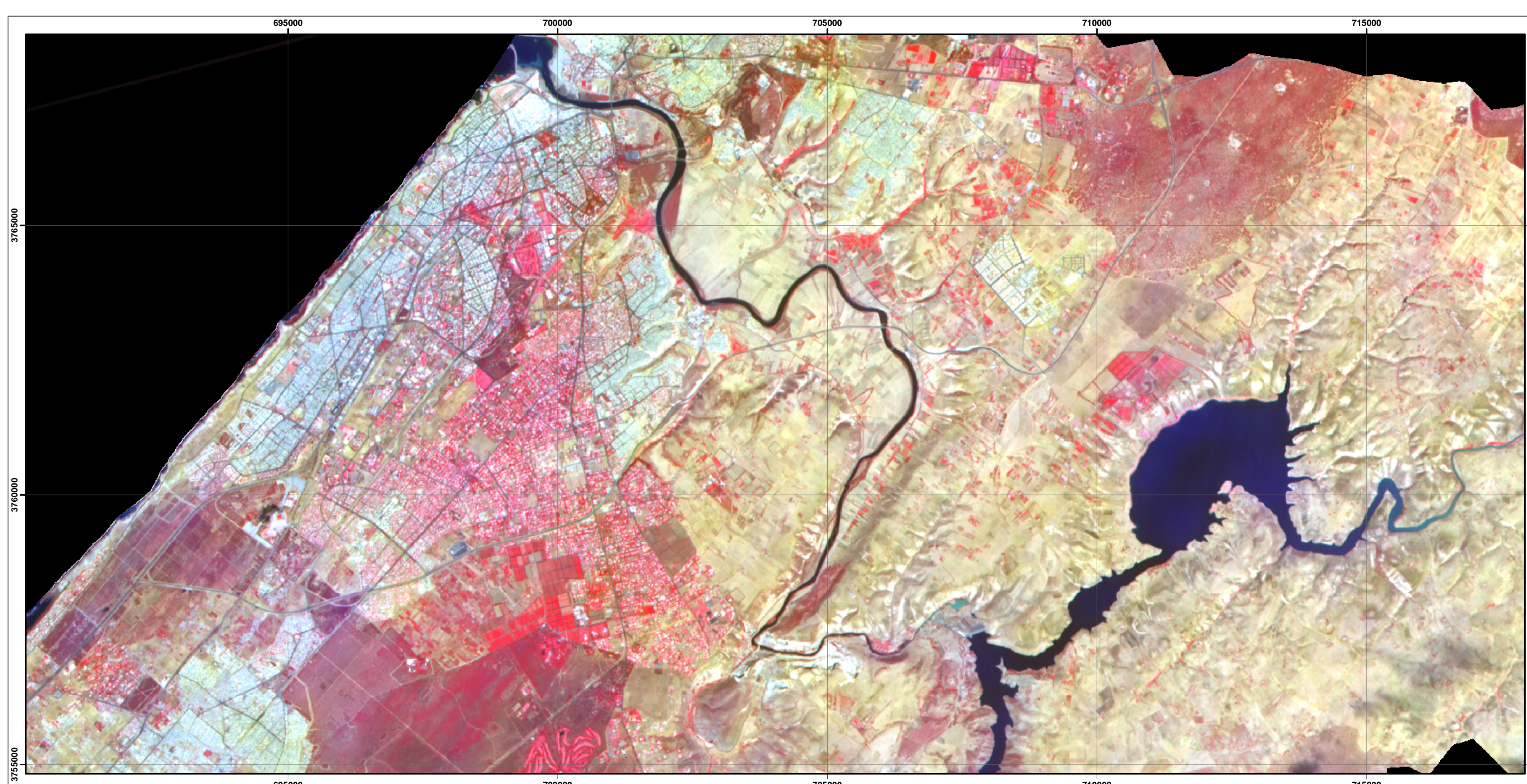
After triangulation, the stereopair can be viewed in Erdas Imagine Stereo Analyst.

The final steps in this process are DEM extraction and orthorectification. DEM extraction also uses contrast matching.

The elevation of the matched points is calculated and interpolated to produce a continuous DEM.

Orthorectification is the process of removing geometric errors caused by relief displacement and the sensor.

The result is a geometrically correct satellite image, which can be draped over a DEM.



## Orthorectified ASTER image of Rabat, Morocco

R = Band 3 (760 - 860 nm)  
G = Band 2 (630 - 690 nm)  
B = Band 1 (520 - 600 nm)

Pixel size: 15 meter  
Clouds are masked

Coordinate system:  
Projection: UTM zone 29, WGS-84

Acquired: 28 August 2002, 11:16 am



Faculty of Geographical Sciences  
Department of Physical Geography  
Utrecht, The Netherlands

J. van der Kwast, August 2003  
E-mail: J.vanderKwast@geog.uu.nl  
Internet: <http://www.remotesensing.tk>