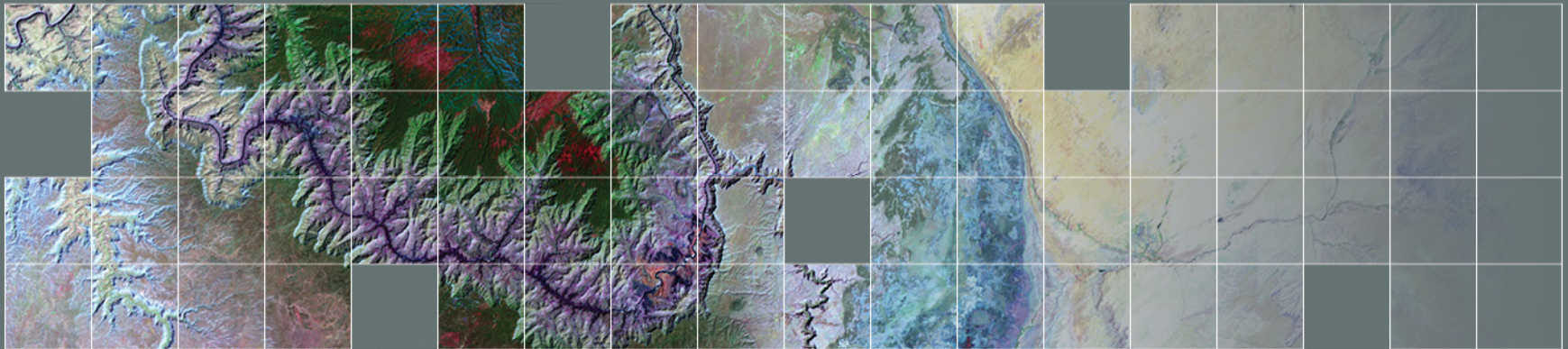




# Climate and Land Use Change Earth Resources Observation and Science (EROS) Center

## GeoSUR SRTM 30-m / TPS

Wm Matthew Cushing (USGS)  
16 May 2013



# SRTM Mission

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## Shuttle Radar Topography Mission (SRTM)

Space Shuttle Endeavour during the 11-day STS-99 mission in February 2000

Used a technique known as Interferometric Synthetic Aperture Radar to generate a DEM at a near global extent of 56° S to 60° N



# GeoSUR SRTM Derivative Products

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## Data offerings:

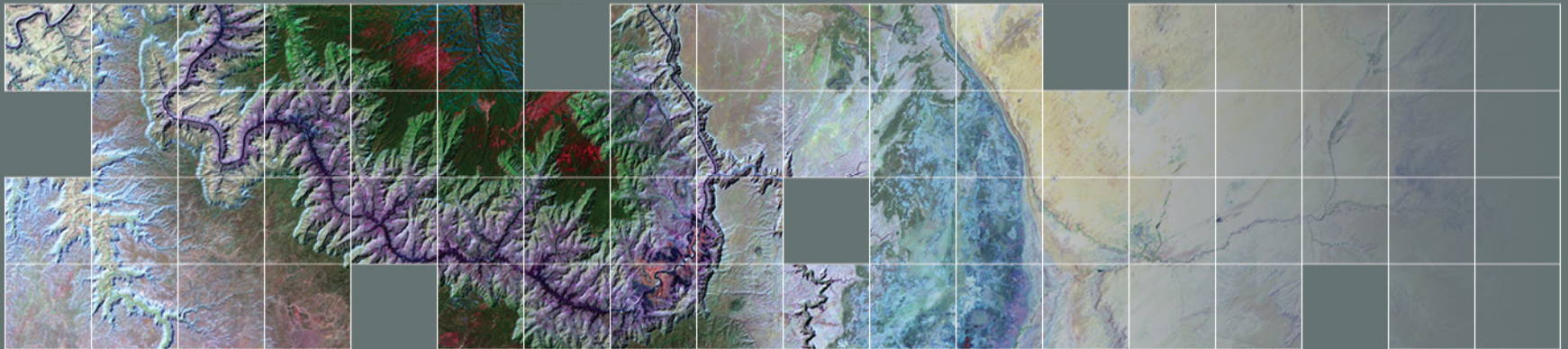
- SRTM derivatives:
  - Aspect
  - Hillshade
  - Shaded Relief
  - Slope
- Elevation Data
  - SRTM Level 1 (90 m, 3 arc-second)
  - HydroSHEDs conditioned DEM
  - GMTED2010 Median (7.5, 15, and 30 arc-second)



Climate and Land Use Change  
**Earth Resources Observation and Science (EROS) Center**

**The Global Multi-resolution Terrain Elevation Data  
(GMTED2010)**

Work performed with support from the National Geospatial-Intelligence Agency (NGA)



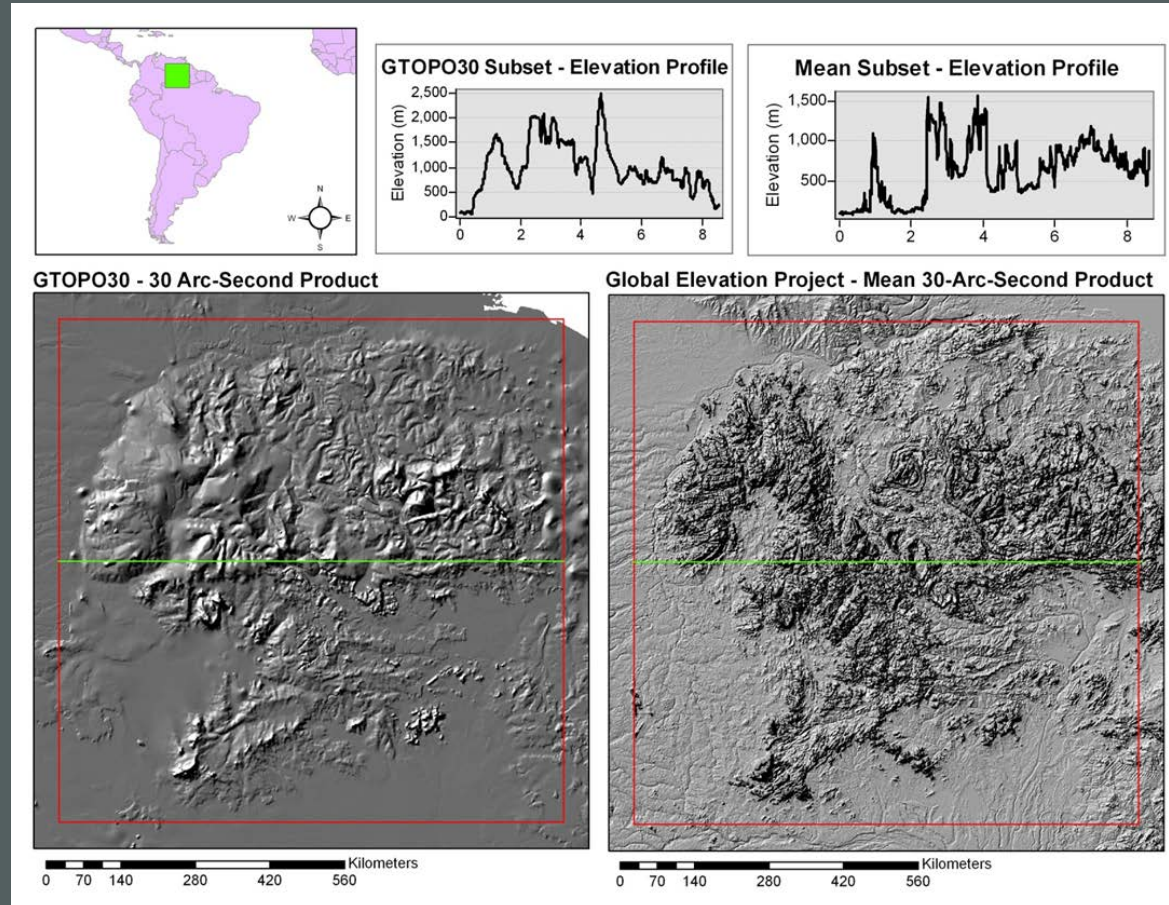
# Global Multi-resolution Terrain Elevation Data 2010

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## Primary Goal

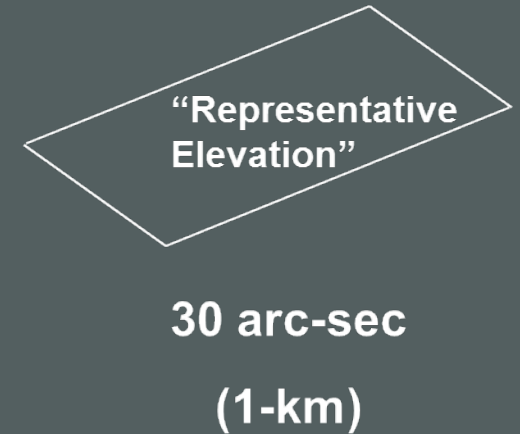
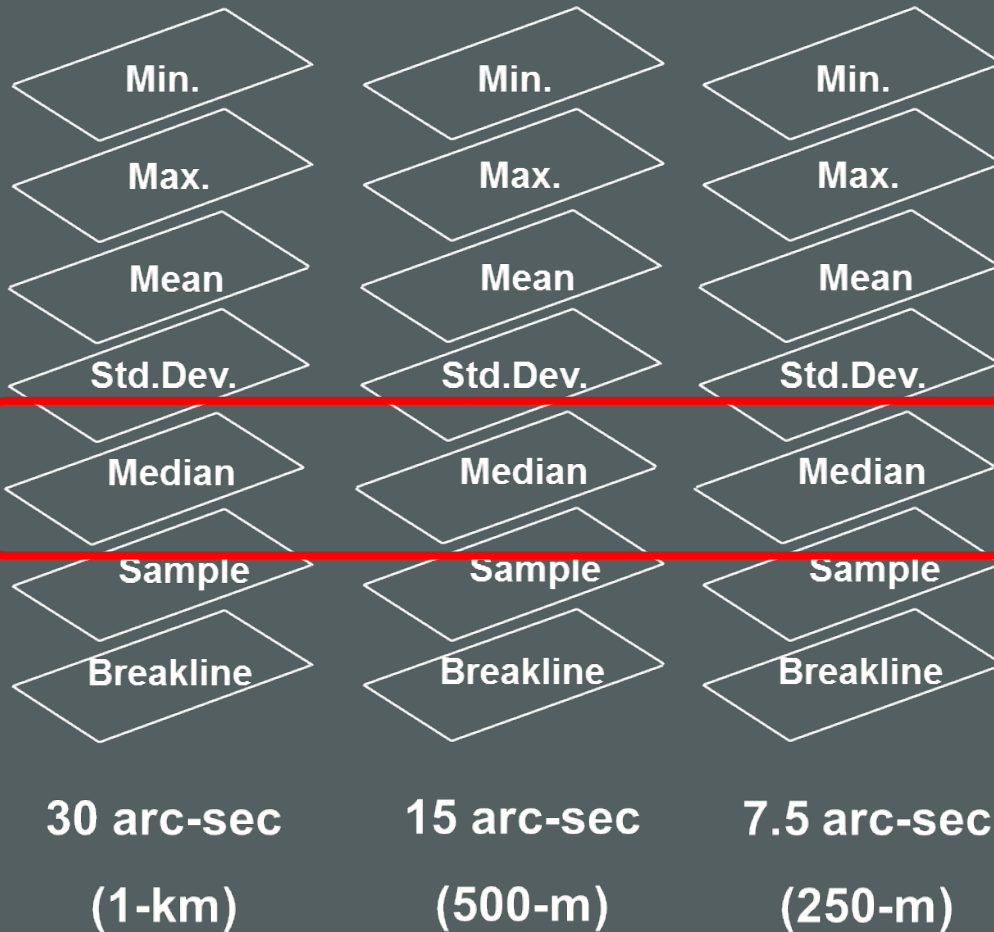
Developed a global medium scale elevation model to replace GTOPO30. Generated seven products at three separate resolutions (horizontal post spacings) of 30 arc-seconds (1 km), 15 arc-seconds (500 m), and 7.5 arc-seconds (250 m) from the best available higher resolution data sources.

# GTOPO30 and GMTED2010 Mean 30 Arc-Second Product Comparisons



# GMTED2010

# GTOPO30

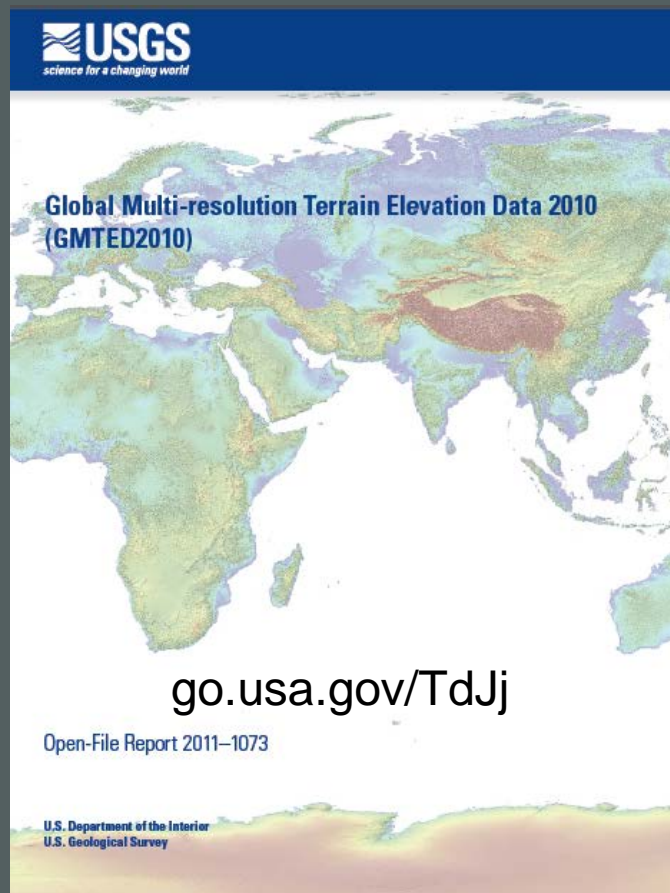


*Currently available on  
TPS for download*

# GMTED2010 – Technical Documentation

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Available online at <http://pubs.usgs.gov/of/2011/1073>

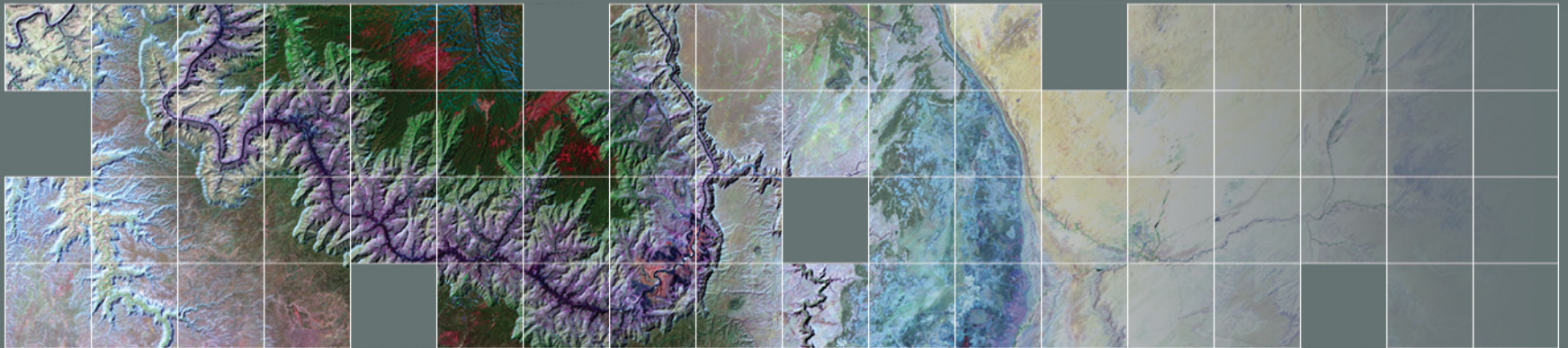






Climate and Land Use Change  
**Earth Resources Observation and Science (EROS) Center**

# Topographic Processing Service (TPS)



# Objectives

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- **Enhance South America's (SA) regional Spatial Data Infrastructures (SDI).**
- **Provide open access to the Shuttle Radar Topography Mission (SRTM) 1 arc-second (~30 meter) Digital Elevation Model (DEM) derivative products\*.**
- **Develop a data distribution service that can efficiently adapt to the needs of its users.**

\* Only derivative product approved by U.S. National Geospatial-Intelligence Agency (NGA).

# Approach / Rationale

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## Approach

- Provide a dynamic service that can efficiently adapt to the user community's requirements.

## Rationale

- Developing services that generate products dynamically rather than prepossessed giving the user an opportunity to define the requirements of a product.
  - The Web service approach provides an efficient environment to create new products that meet the ever changing needs of the GeoSUR user community.
-

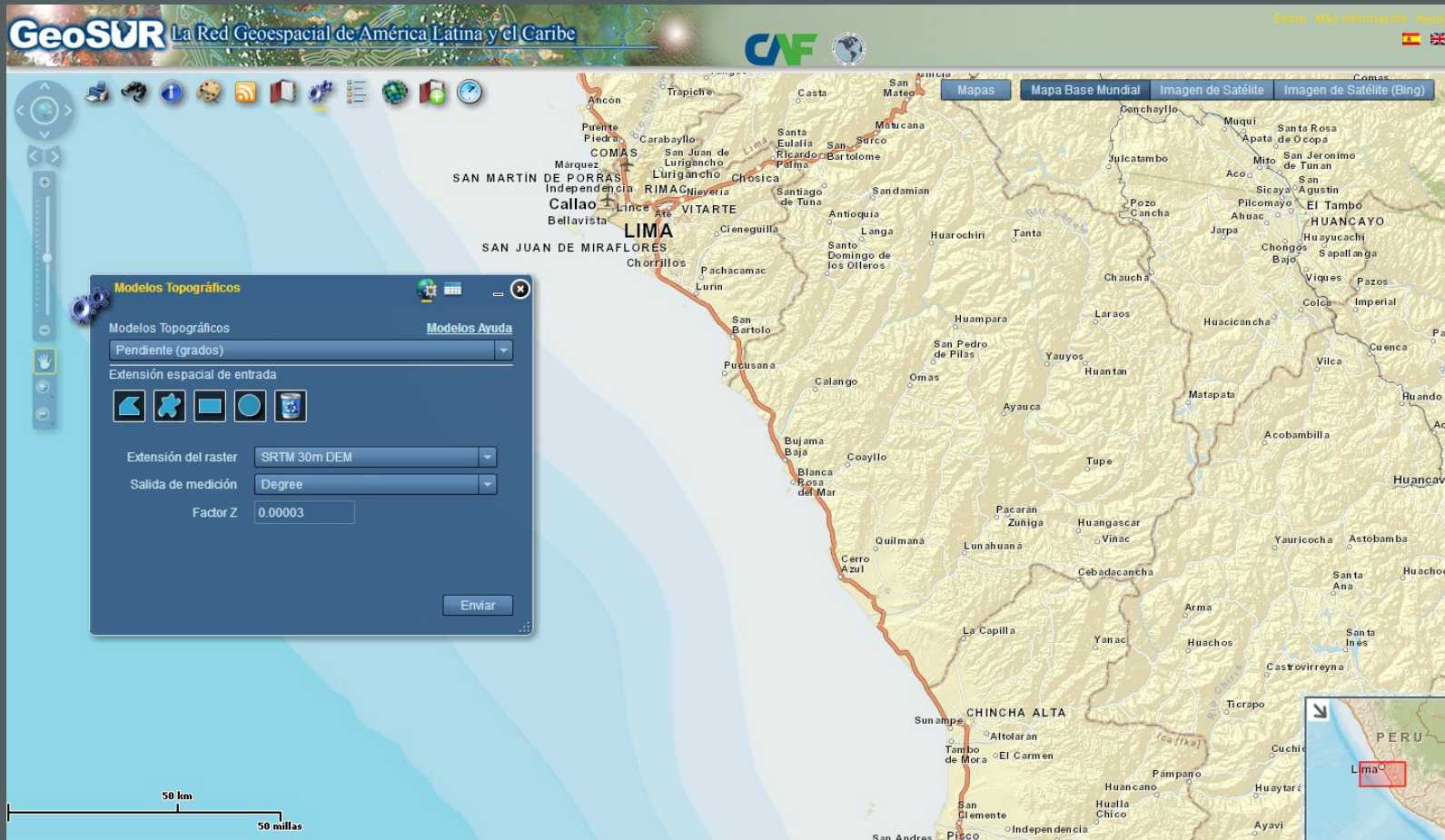
# Result

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## Topographic Processing Service (TPS)

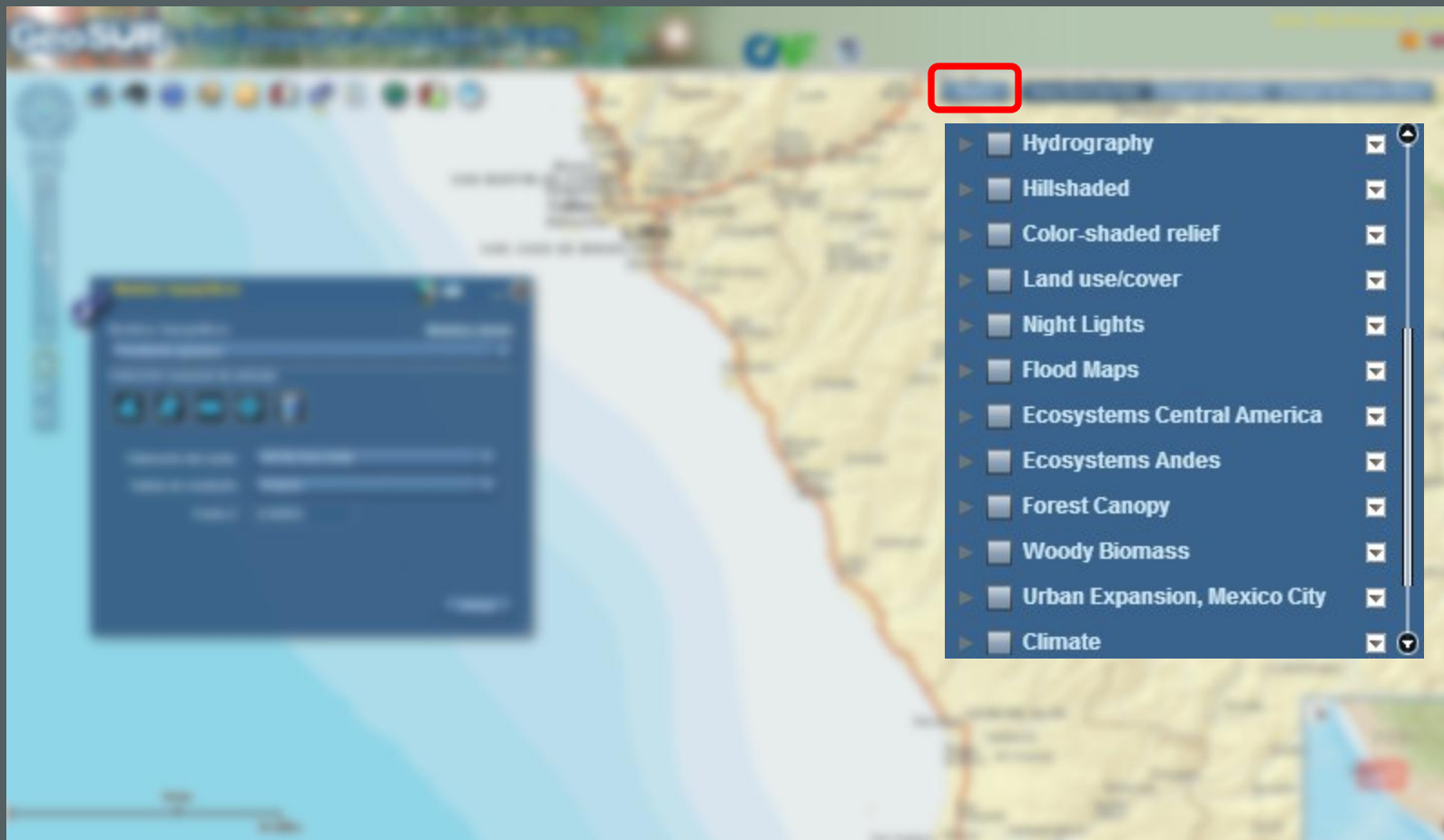
- The TPS provides a geo-processing Web service accessible through GeoSUR's Regional Map Service (RMS), ESRI's ArcGIS desktop software, Python scripting environment, and has a JavaScript API for custom Web development.
- The service allows users to request 6 SRTM 30-m derivative products: *slope, slope classification, aspect, shaded relief, classified elevation* and an *elevation profile report*.

# Web Application Interface



<http://www.geosur.info/map-viewer/index.html>

# Web Application Interface



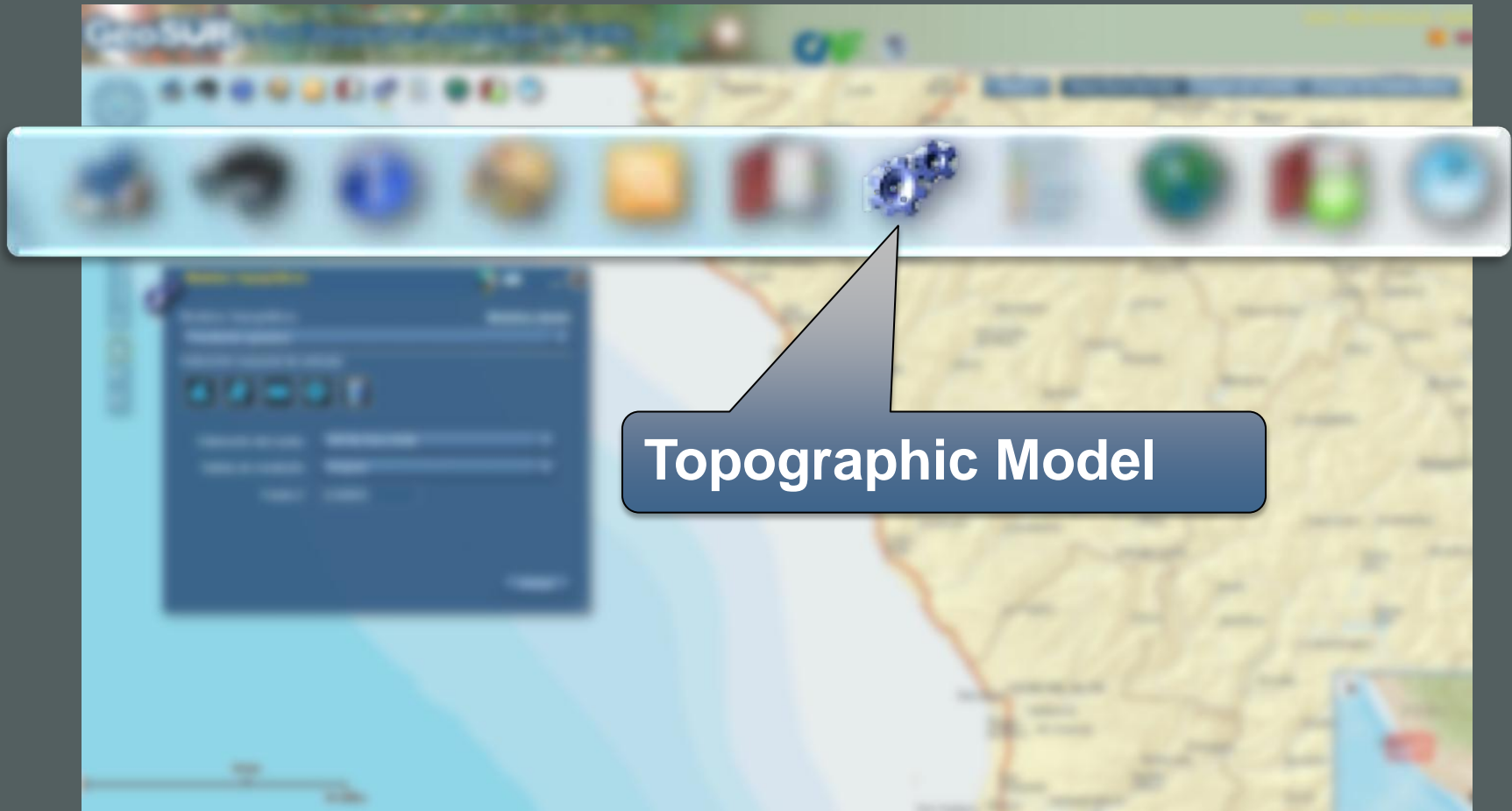
<http://www.geosur.info/map-viewer/index.html>

# Web Application Interface



# Web Application Interface

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<http://www.geosur.info/map-viewer/index.html>

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# Web Application Interface

The screenshot displays a web application interface for a topographic model. A blue dialog box titled 'Topographic Model' is overlaid on a map. The dialog box contains the following elements:

- Select Topographic Model:** A dropdown menu set to 'Slope Classification' with a 'Models Help' link.
- Input Spatial Extent:** Five icons representing different spatial extent selection tools: a rectangle, a polygon, a circle, a square, and a point.
- Input Dataset:** A dropdown menu set to 'SRTM 30m DEM'.
- Slope Class List:** A text input field containing '5,10,20,30,40,50'.
- Z Factor:** A text input field containing '0.00003'.
- Unit of Measure:** A dropdown menu set to 'Degree'.
- Submit:** A button at the bottom right of the dialog box.

Four yellow callout boxes with chevron arrows point to the following features:

- TPS model selection
- Geographic selection tool
- Elevation data source
- Model processing parameters

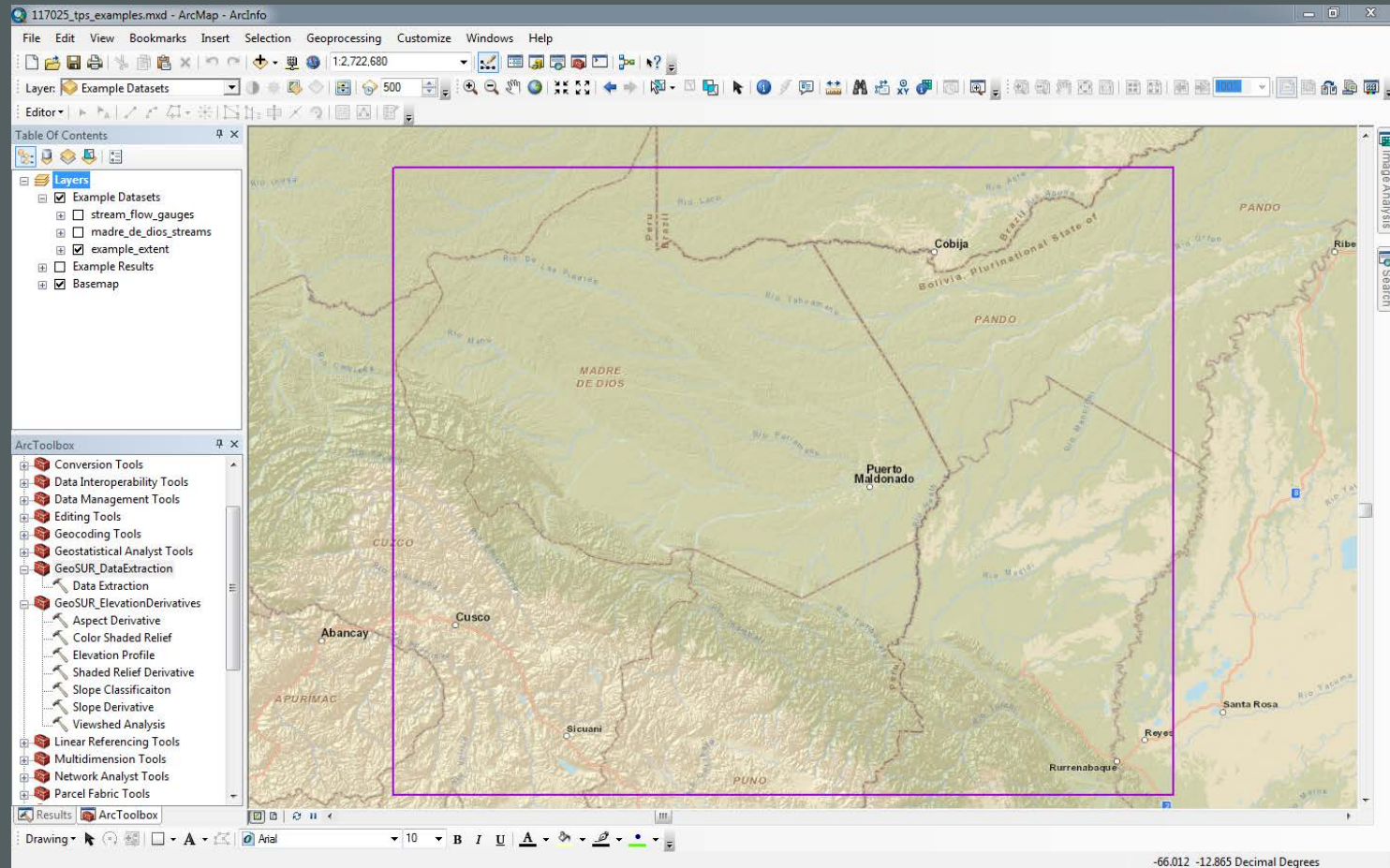
<http://www.geosur.info/map-viewer/index.html>

# Web Application Interface

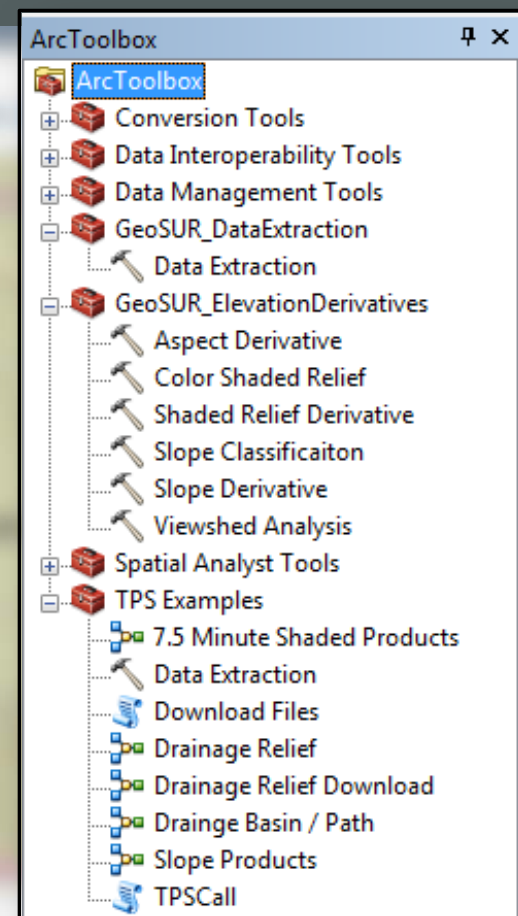
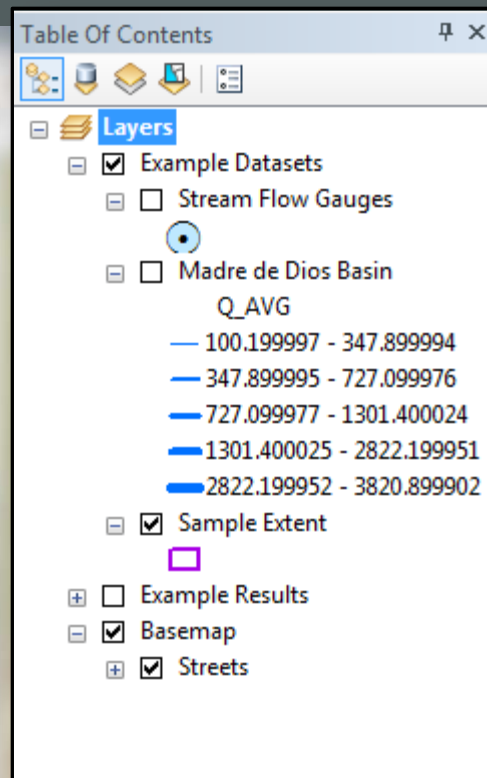


<http://www.geosur.info/map-viewer/index.html>

# ESRI ArcGIS ArcMap Interface

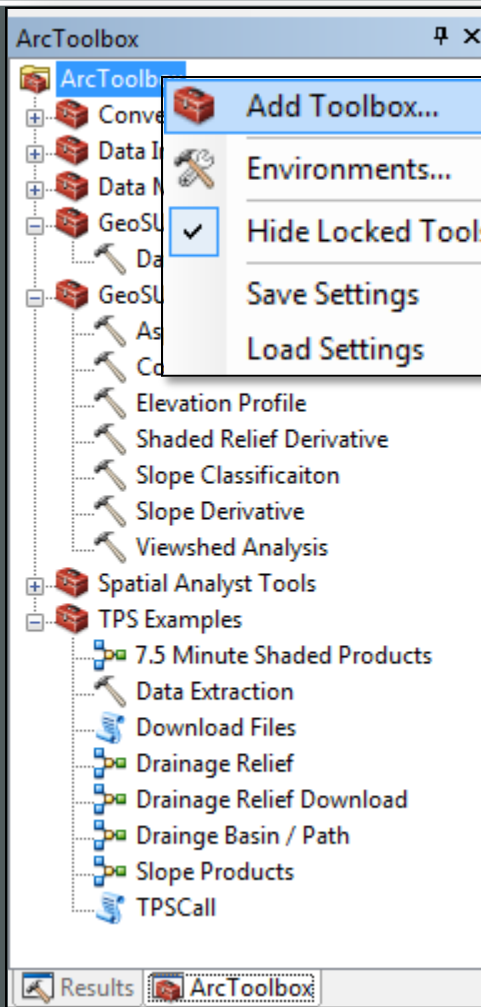


# ESRI ArcGIS ArcMap Interface

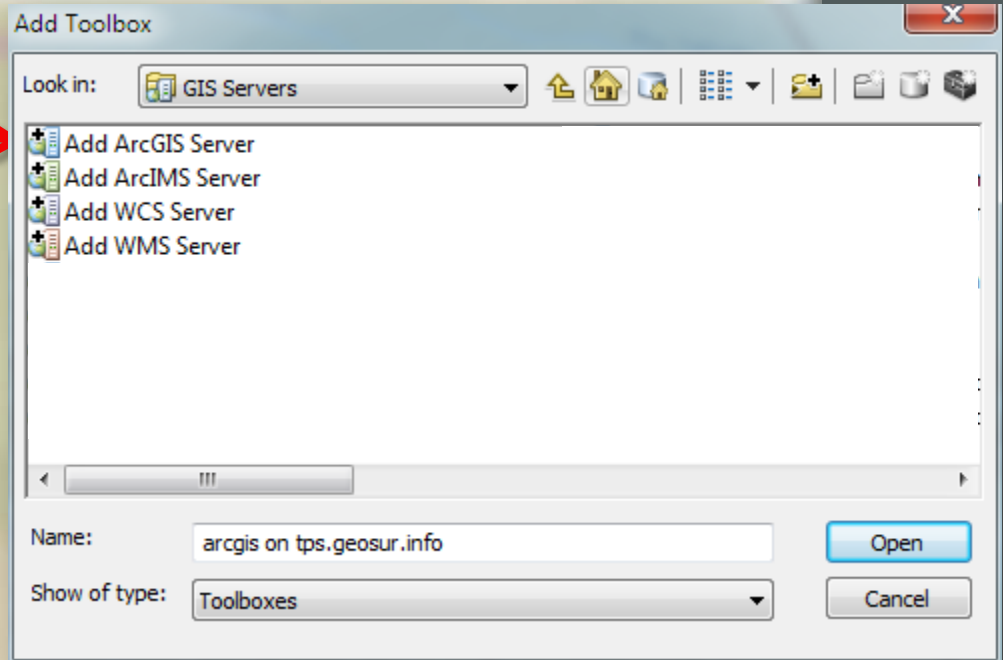


# ESRI ArcGIS ArcMap Interface

## Adding Geoprocessing Service

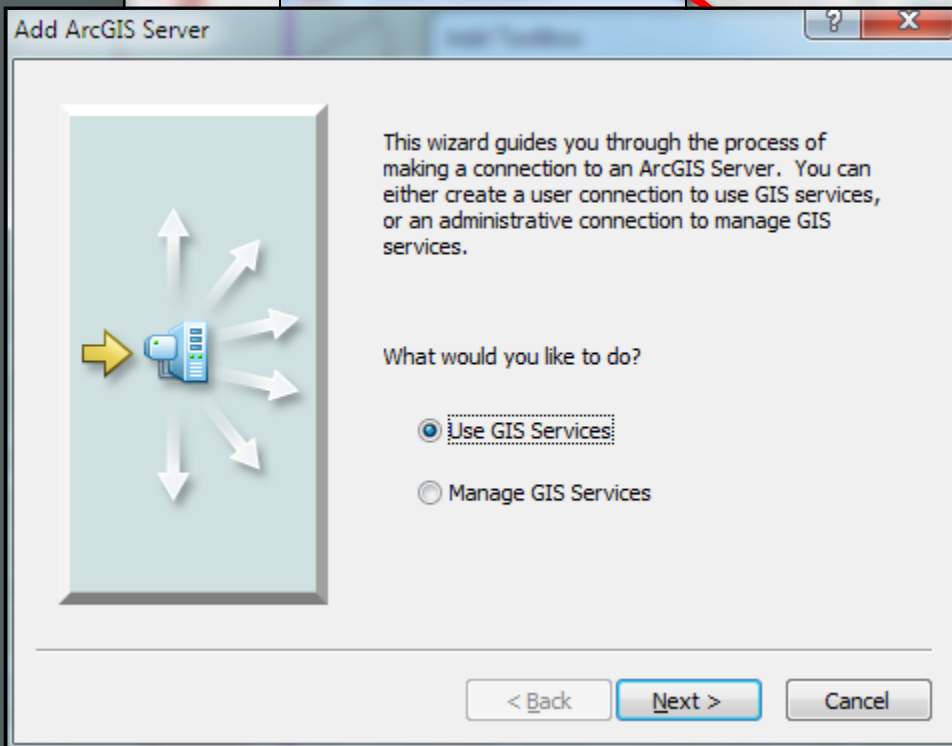


- Add Toolbox...
- Environments...
- Hide Locked Tools
- Save Settings
- Load Settings



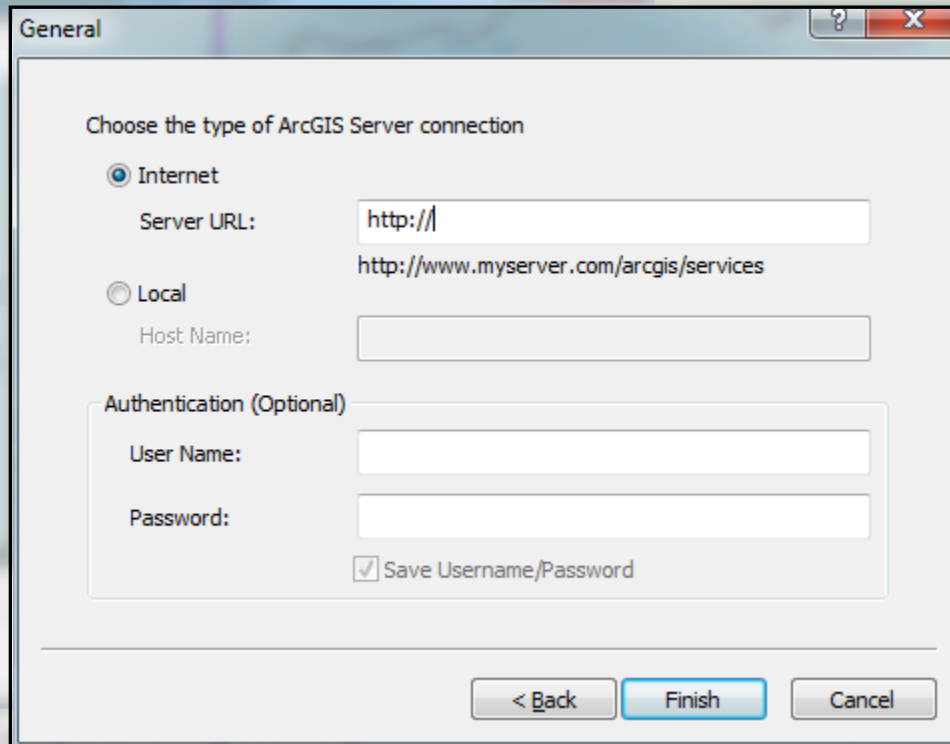
# ESRI ArcGIS ArcMap Interface

## Adding Geoprocessing Service



# ESRI ArcGIS ArcMap Interface

## Adding Geoprocessing Service



The image shows a 'General' dialog box with the following fields and options:

- Choose the type of ArcGIS Server connection**
  - Internet
    - Server URL:
  - Local
    - Host Name:
- Authentication (Optional)**
  - User Name:
  - Password:
  - Save Username/Password

Buttons at the bottom: < Back, Finish, Cancel

# ESRI ArcGIS ArcMap Interface

## Adding Geoprocessing Service

General

Choose

Internet

Server URL:   
http://www.myserver.com/arcgis/services

Local

Host Name:

Authentication (Optional)

User Name:

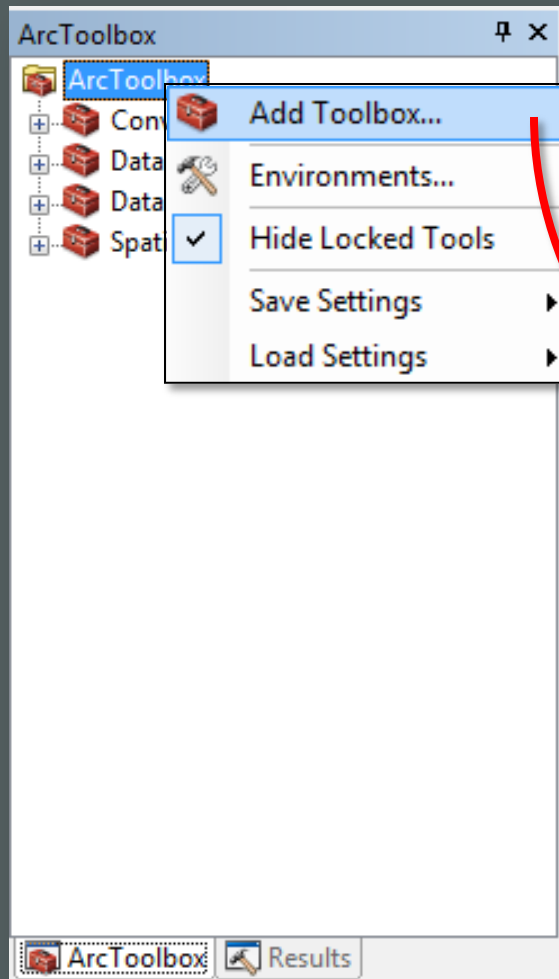
Password:

Save Username/Password

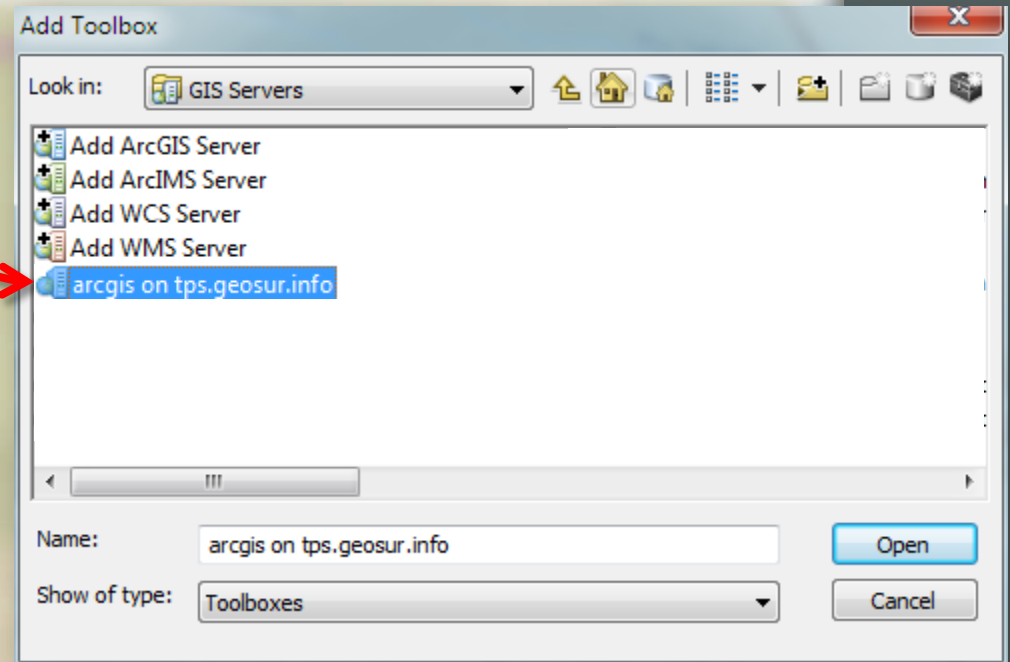
< Back Finish Cancel



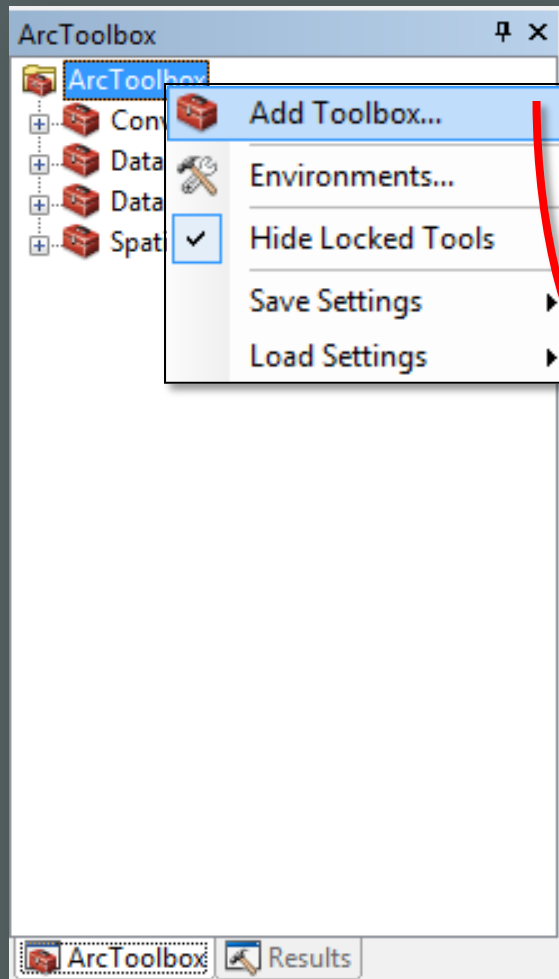
# ESRI ArcGIS ArcMap Interface



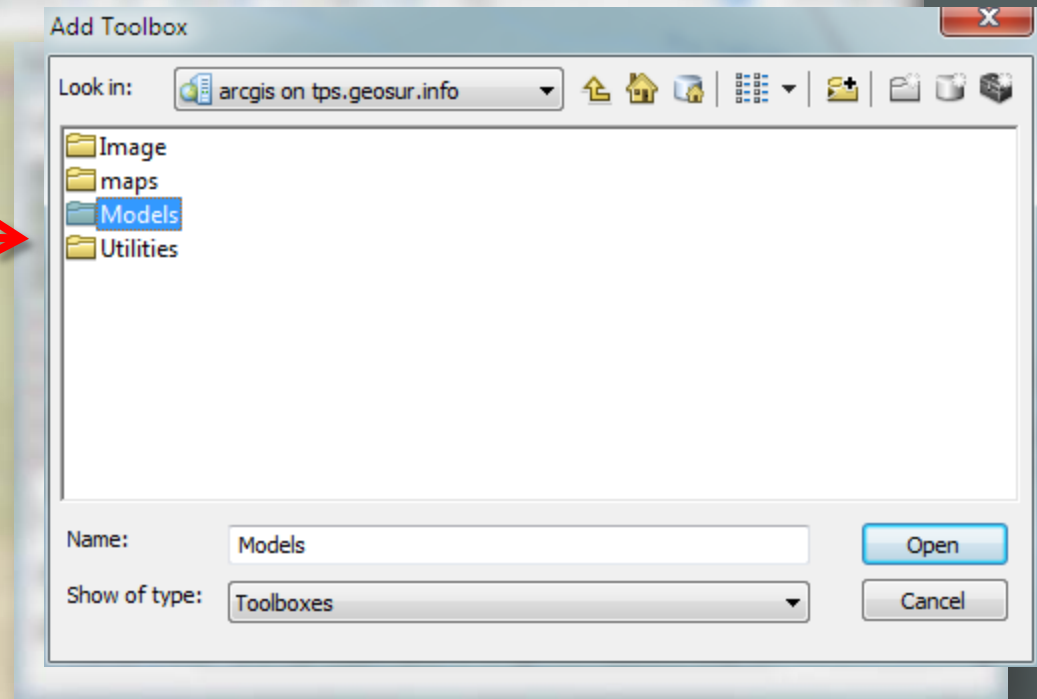
## Adding Geoprocessing Service



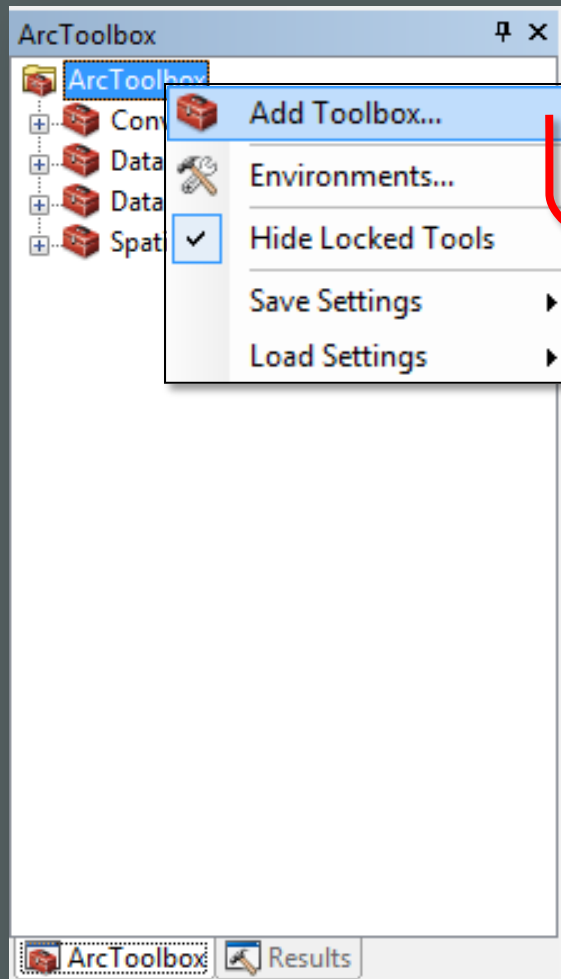
# ESRI ArcGIS ArcMap Interface



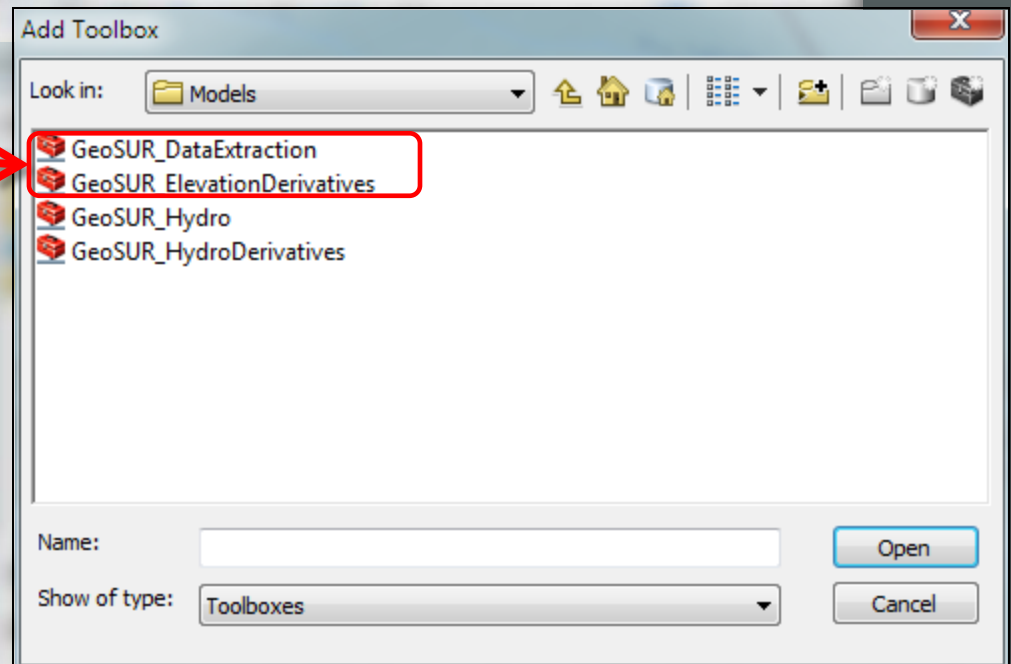
## Adding Geoprocessing Service



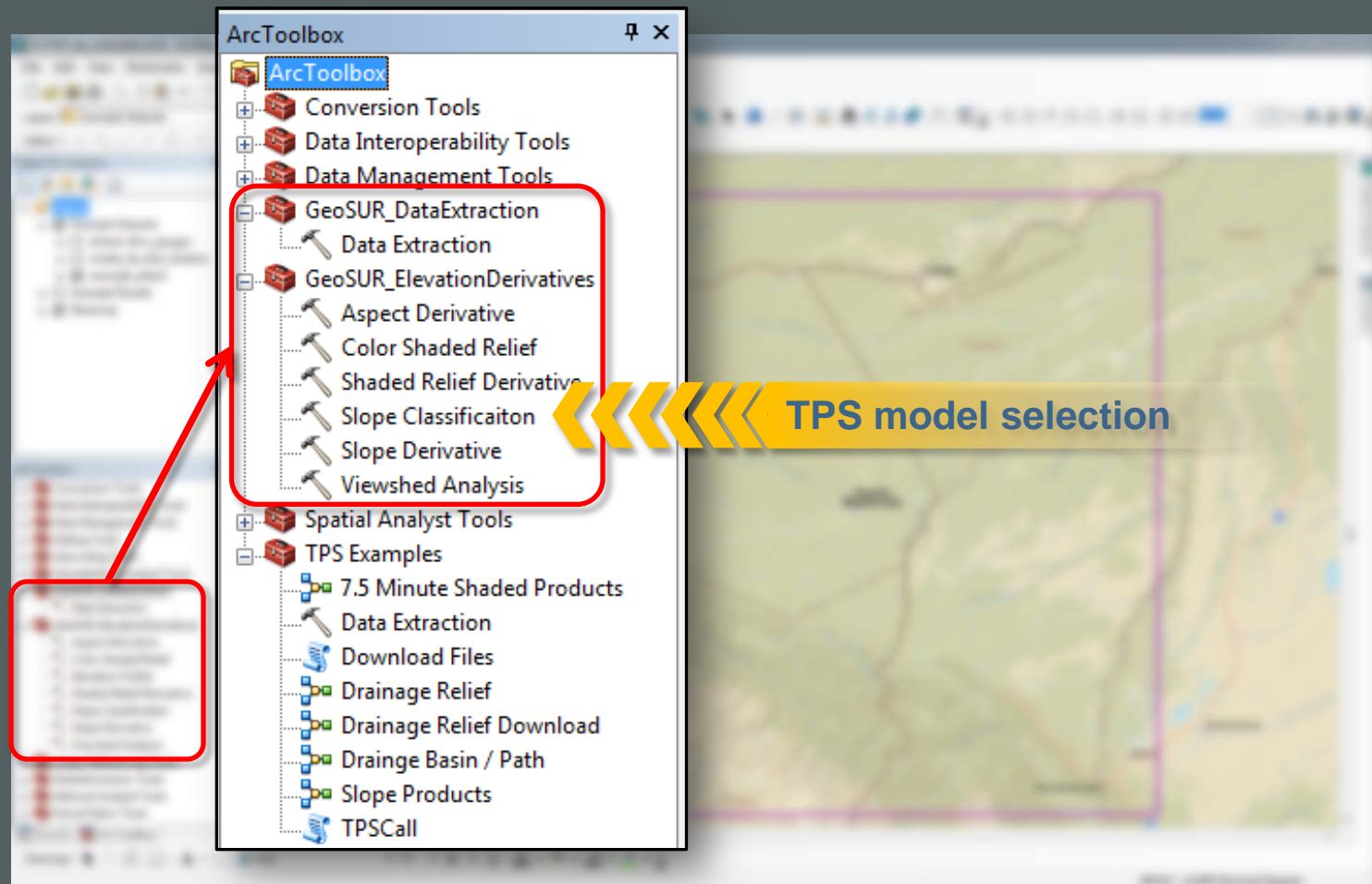
# ESRI ArcGIS ArcMap Interface



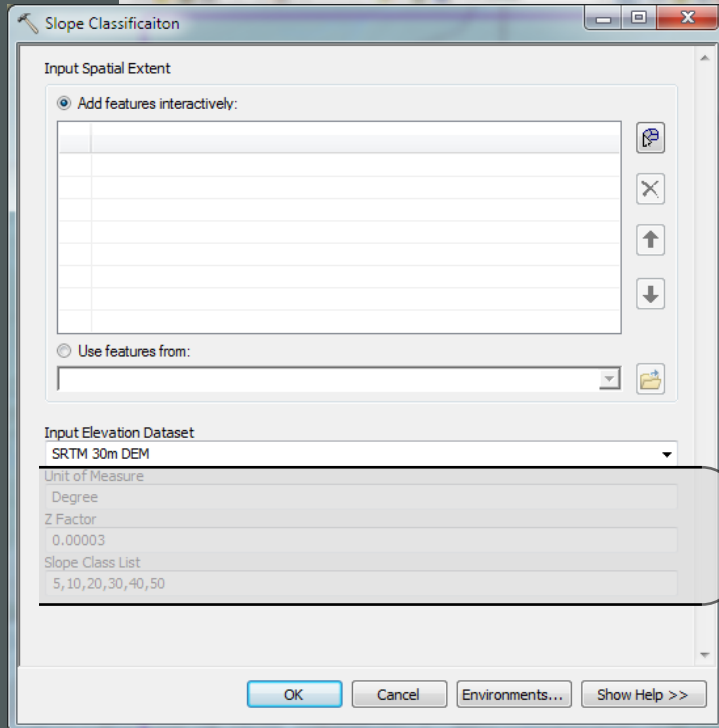
## Adding Geoprocessing Service



# ESRI ArcGIS ArcMap Interface



# ESRI ArcGIS ArcMap Interface



Geographic selection tool

Elevation data source

Model processing parameters

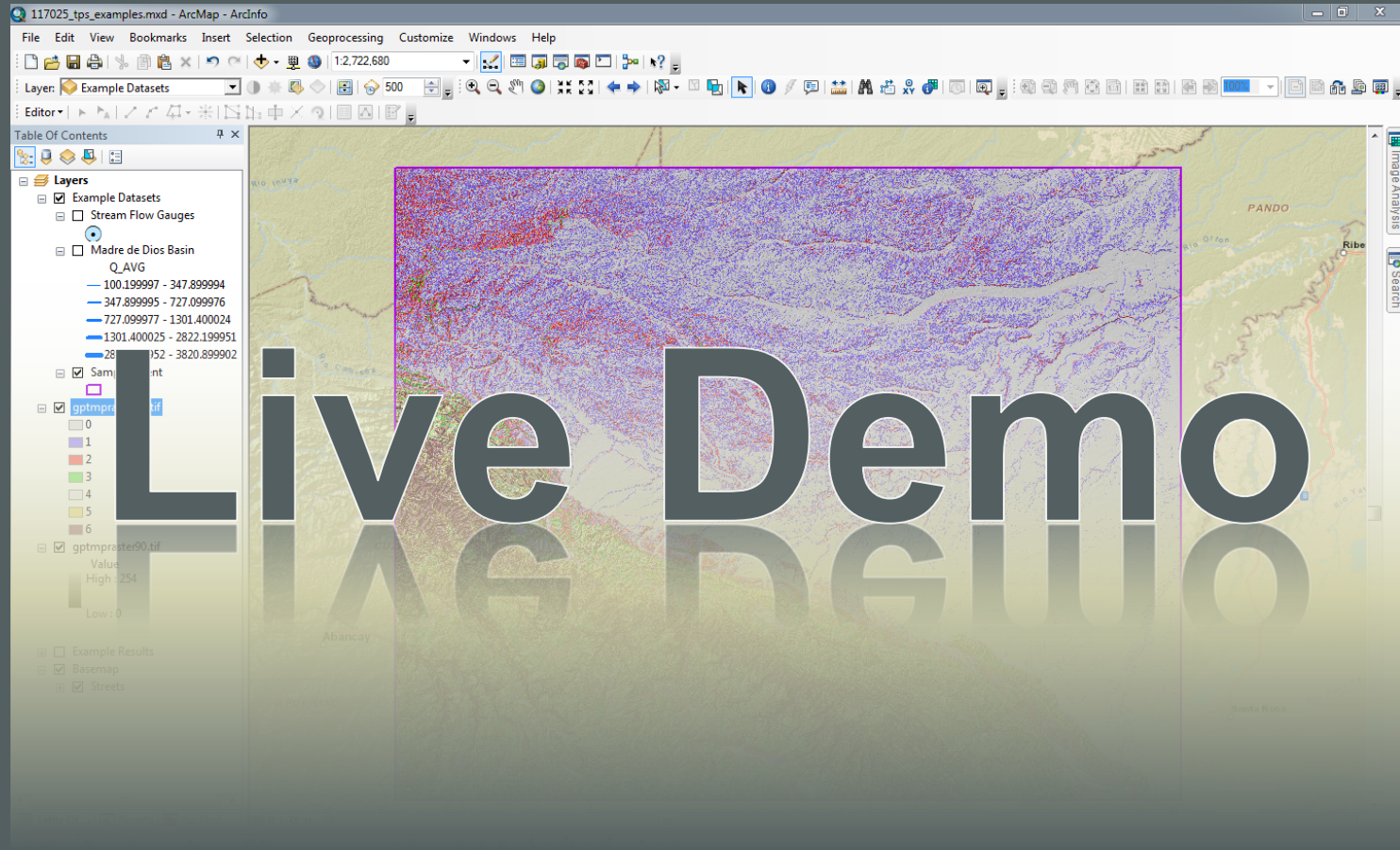
Click "OK" to submit process

# ESRI ArcGIS-ArcMap Interface

The screenshot displays the ArcMap interface with the following components:

- Table of Contents:** Shows the 'Layers' pane with 'gptmpraster89.tif' selected. The legend for this layer includes a color key for slope classes: 0 (grey), 1 (blue), 2 (red), 3 (green), 4 (white), 5 (yellow), and 6 (purple).
- Main Map Area:** Displays a terrain map with a semi-transparent box highlighting a 'Classified Slope product delivered to client from TPS'. The map shows a river network and topographic features.
- Properties Window:** A floating window for the 'gptmpraster89.tif' layer, showing:
  - Unit of Measure: Degree
  - Z Factor: 0.00003
  - Slope Class List: 0, 5, 10, 20, 30, 40, 50
  - Legend: A color key corresponding to the slope classes 0 through 6.

# ESRI ArcGIS ArcMap Interface







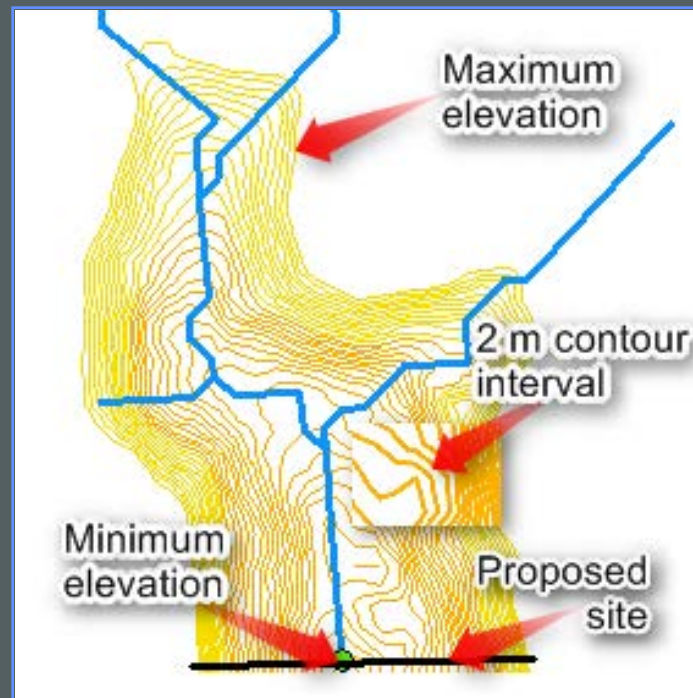
# ESRI ArcGIS ArcMap Interface

## Python Demo

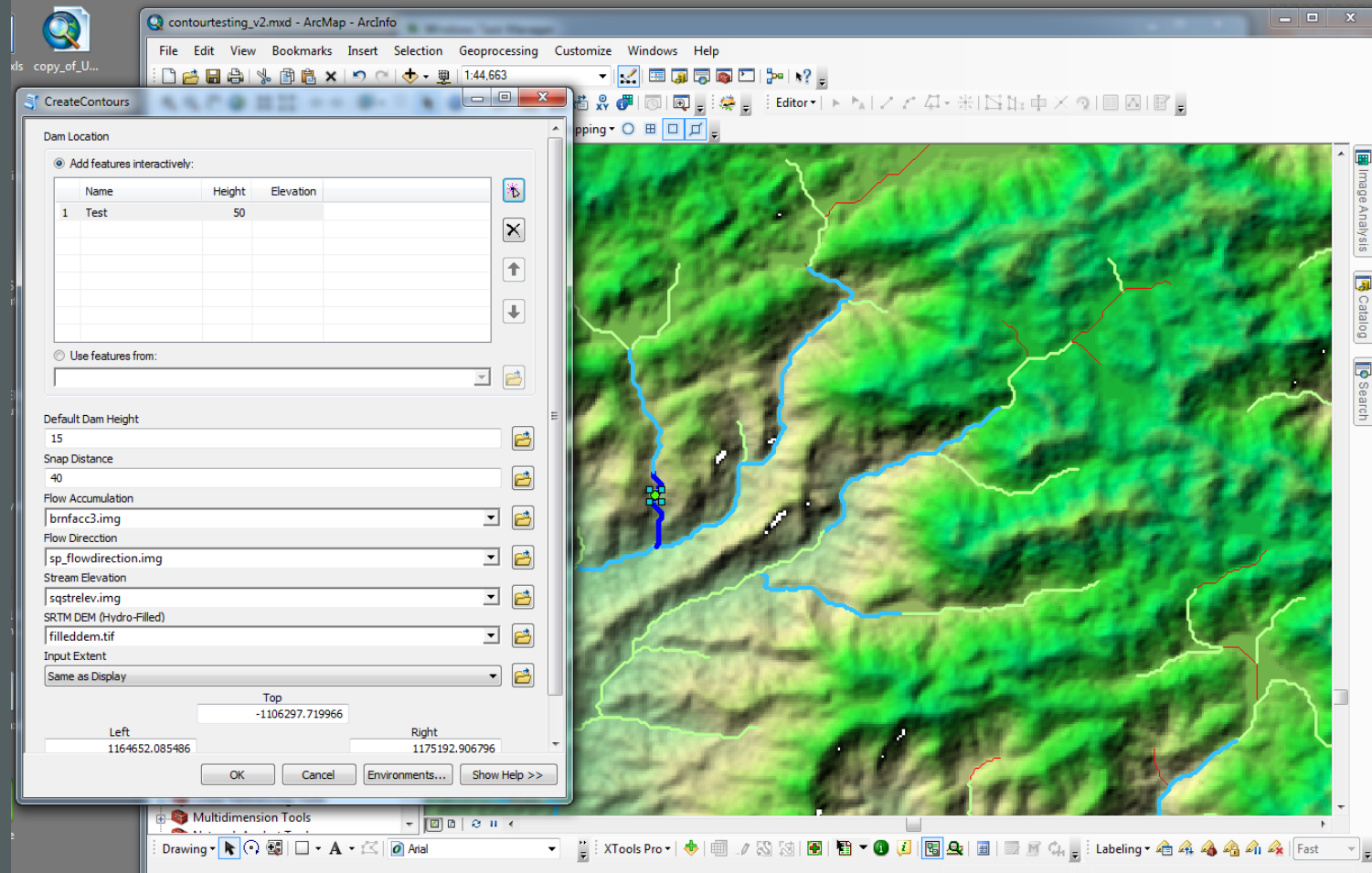
```
1
2 # Import arcpy, time
3 # Import FilledDownloads
4
5 # Add web processing service as a toolbox
6 tpsServer = "http://ps.gis.com/arcgis/services"
7 tpsNode1 = "ModelBuilder/ElevationDerivatives"
8 arcpy.ImportToolbox("No,No" % (tpsServer, tpsNode1))
9
10 # Create a FeatureSet object to pass to the remote service
11 # This FeatureSet will be a polygon layer which will be used to define the
12 # spatial extent
13 # to extract the requested derivative product
14 InFeatureSet = arcpy.CreateObject("FeatureSet")
15
16 # Add and edit the feature class to the FeatureSet object
17 InList = arcpy.ListLayers("No,No")
18 InList[0].parent = InFeatureSet
19
20 # Call an arcpy tool to get the web
21 # store a result in a FeatureSet object
22 arcpy.AddMessage("Calculating slope derivatives...")
23
24 Slope_Class_List = "0,5,10,15,20,25"
25 resultObj = arcpy.SlopeClass_Spatial_ElevationDerivatives(InFeatureSet,
26 "Slope Class List", "Slope", "0,0000", Slope_Class_List)
```

# Web Tool for Counter Level Creation

---

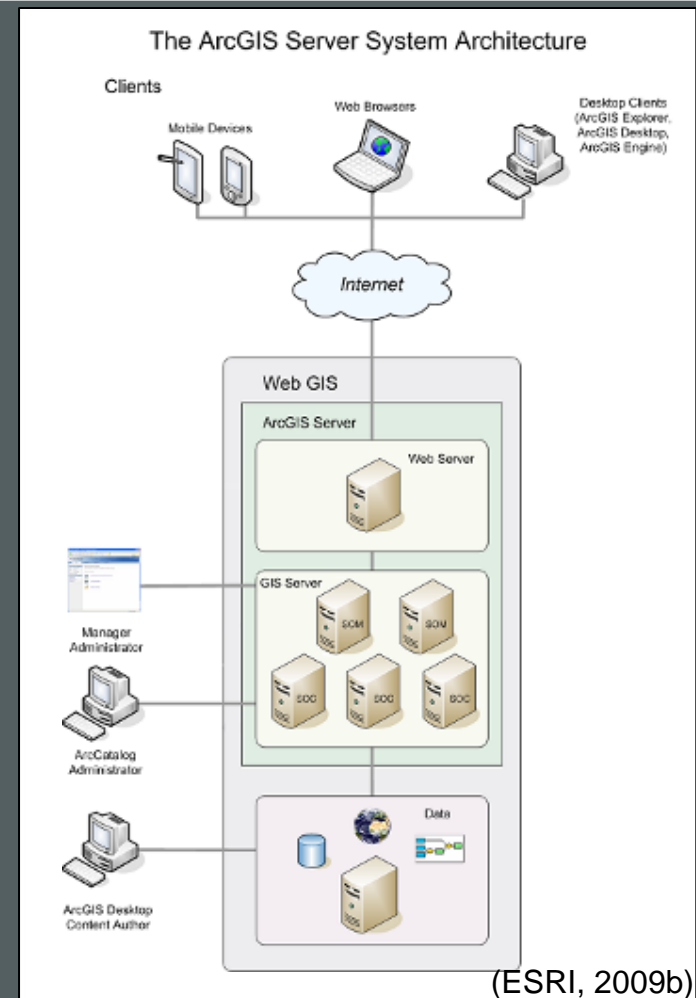


# Web Tool for Counter Level Creation

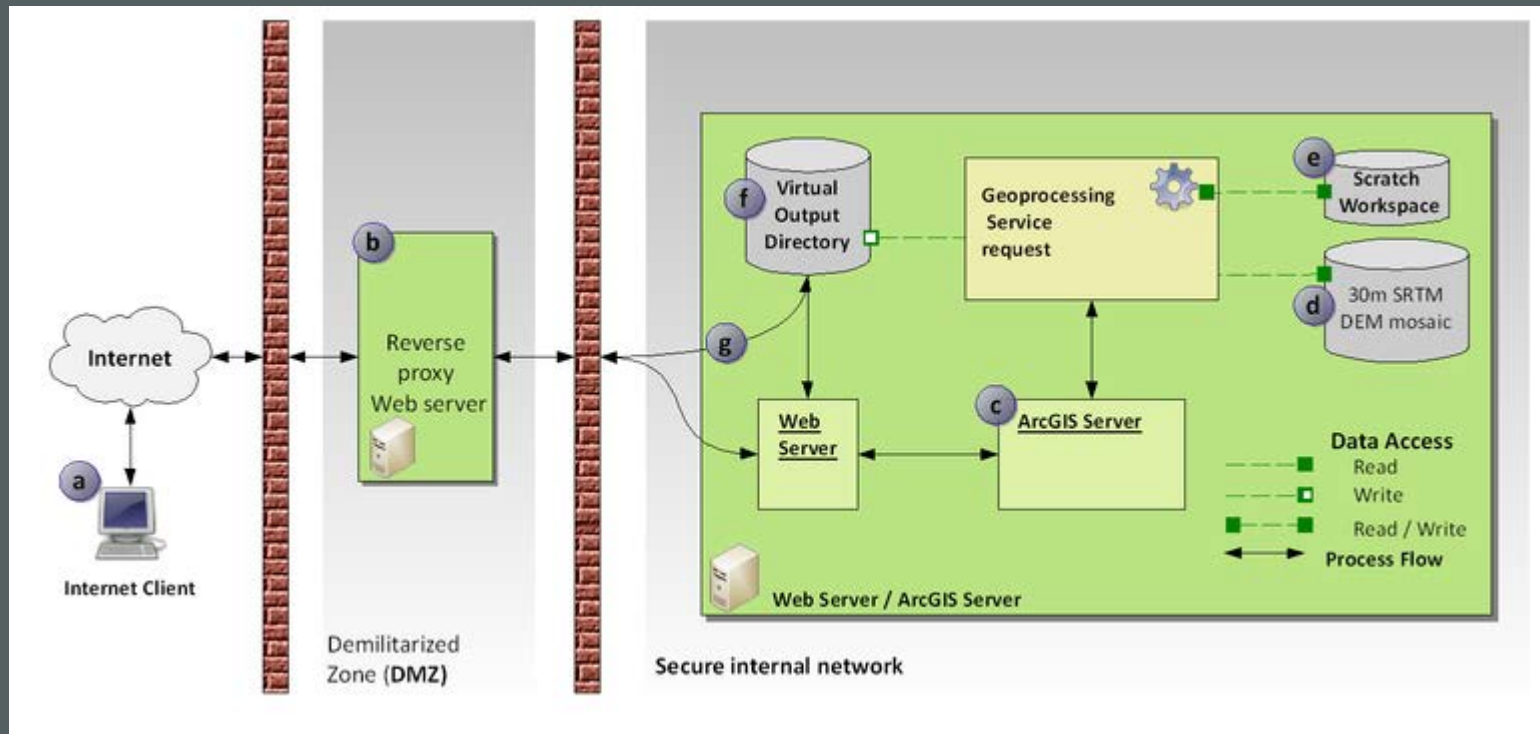


# GeoSUR ArcGIS Server Architecture

- **Web Clients**
  - Mobile devices, Web Browser, and desktop clients.
- **Web Server**
- **GIS Server(s)**
- **Administrative Client**
- **Desktop Clients**



# TPS Data Security



# Status...

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**The TPS provides the countries of SA the best available seamless continental DEM derivatives products. In addition it offers a platform for developing geographic processing services to meet regional geospatial needs.**

# User Community

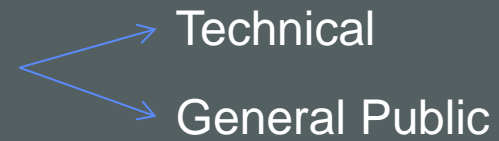
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## Identifying the user communities.

Developers



User

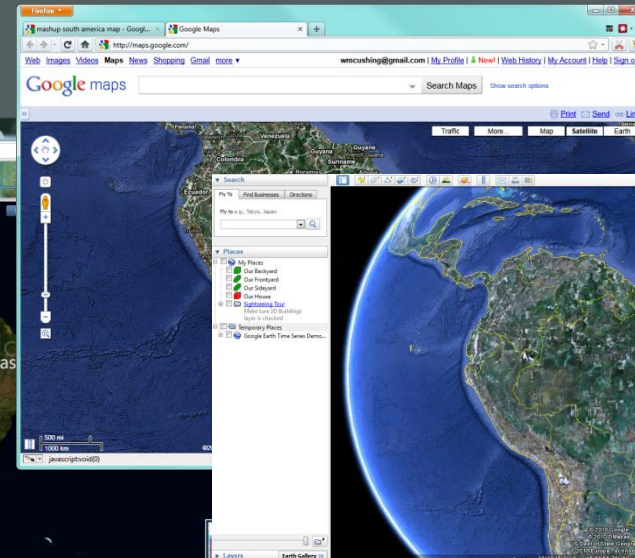
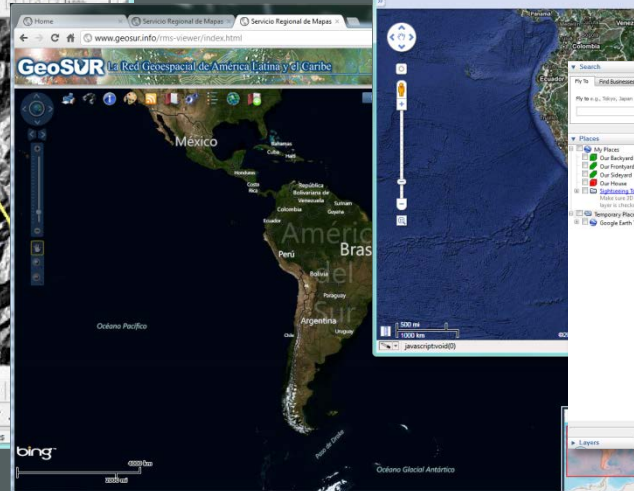
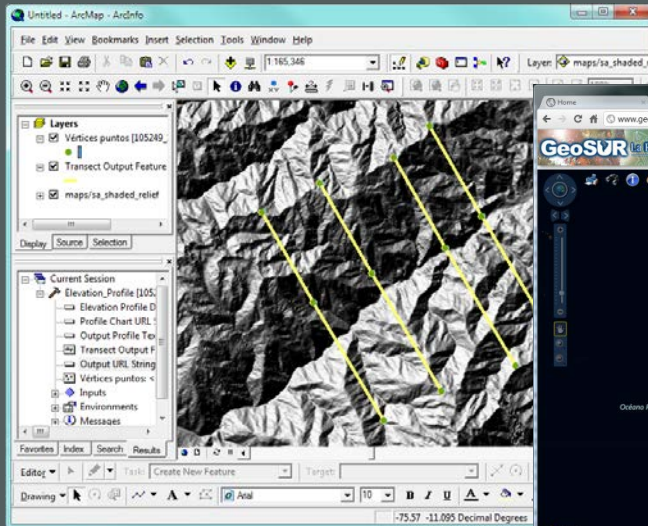


# User Community

## Software Developers



- Localized tools for regional communities: States, Local Governments, Interest groups (Hiking, cycling clubs, etc)
- Private industry for project planning





# User Community

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Users

Technical

General Public



# TPS Resource Links

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## **TPS Background:**

<http://go.usa.gov/TvjG>

## **CAF - Development Bank of Latin America GeoSUR**

<http://goo.gl/46xF5>

## **GeoSUR Regional Map Service (RMS)**

<http://goo.gl/y2vL4>

## **GMTED2010 Documentation**

[go.usa.gov/TdJj](http://go.usa.gov/TdJj)

## **USGS Earth Explorer**

<http://go.usa.gov/TvDR>