



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

# GeoSUR SRTM 30-m / TPS

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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)



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

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



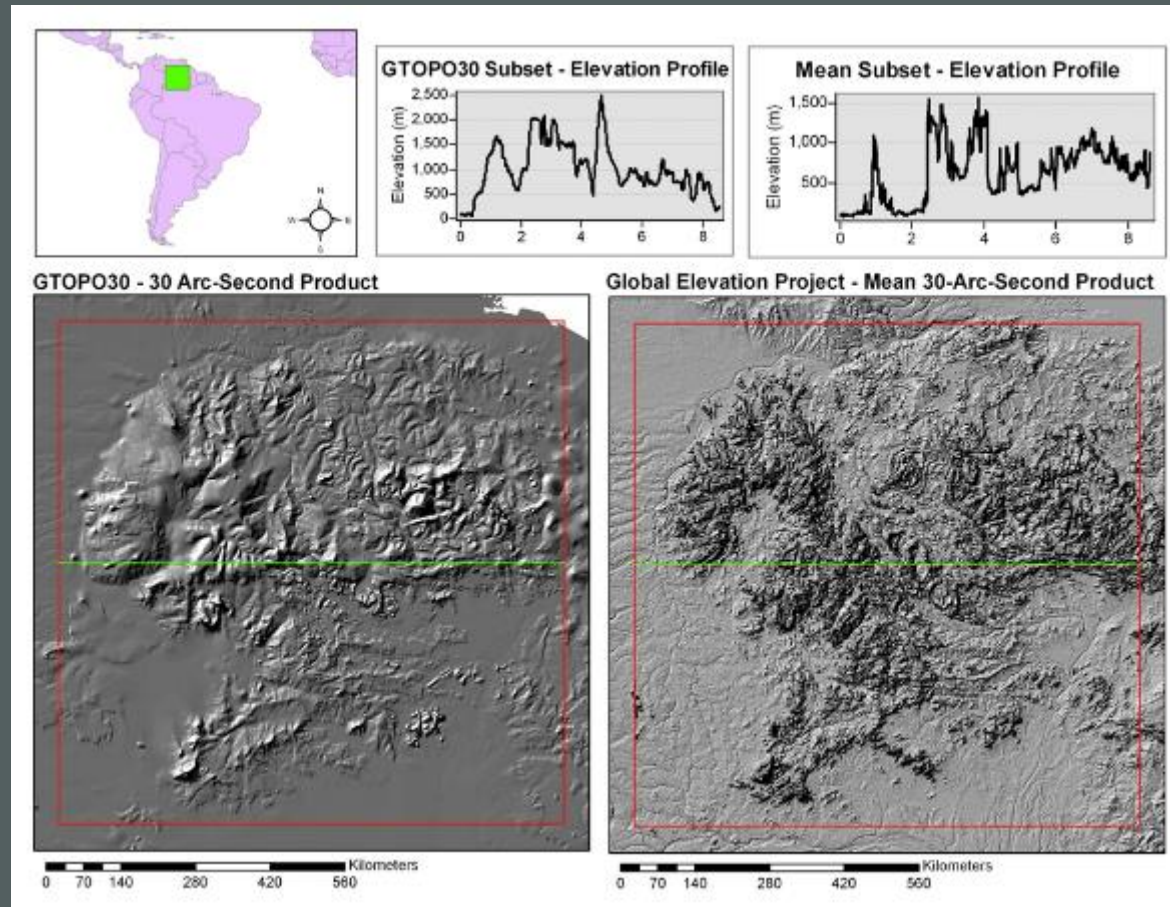
# Global Multi-resolution Terrain Elevation Data 2010

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## Primary Goal

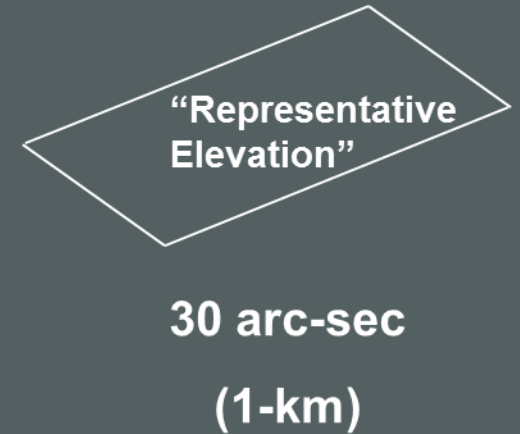
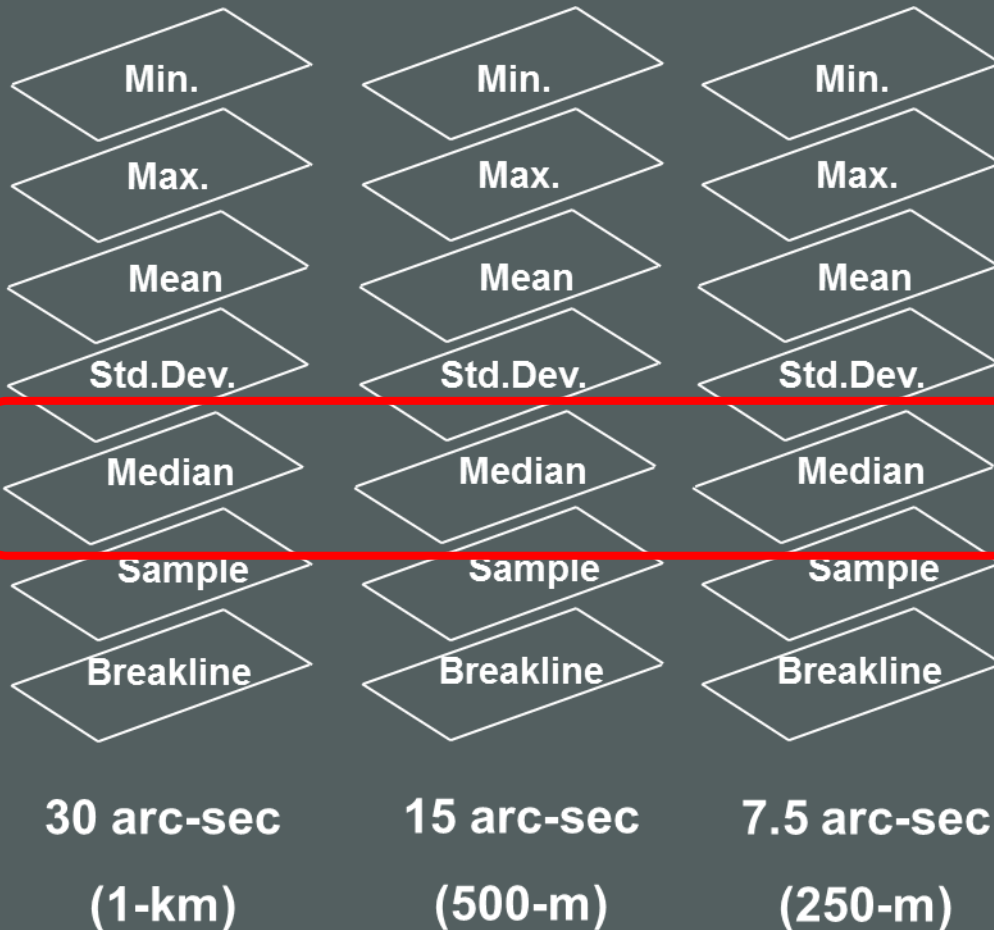
Developed a global medium scale elevation model to replace GTOPO30. Generated seven products at three separate resolutions (horizontal post spacings) of 30 arc-seconds (1 km), 15 arc-seconds (500 m), and 7.5 arc-seconds (250 m) from the best available higher resolution data sources.

# GTOPO30 and GMTED2010 Mean 30 Arc-Second Product Comparisons



# GMTED2010

# GTOPO30

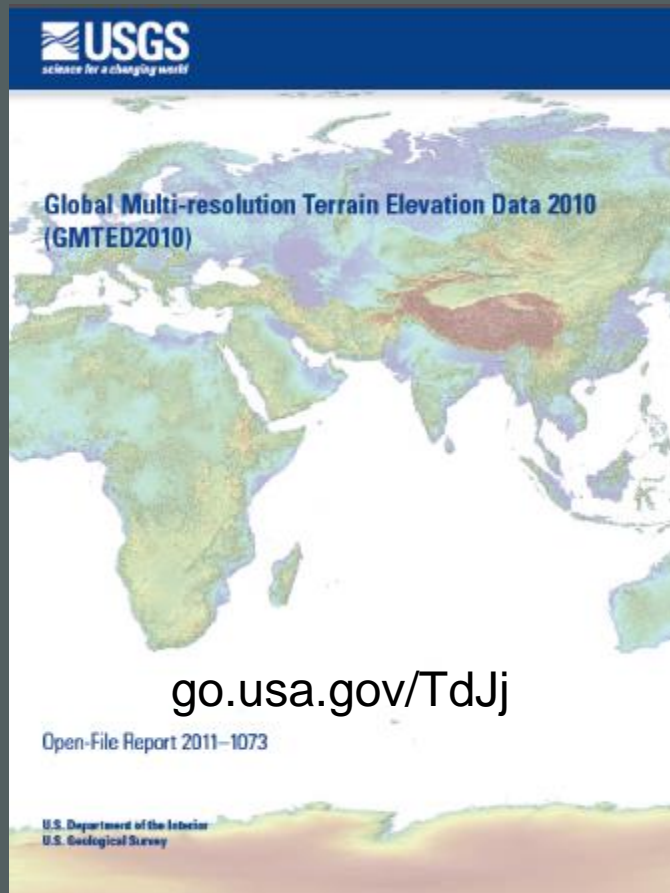


*Currently available on  
TPS for download*

# GMTED2010 – Technical Documentation

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







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# 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.
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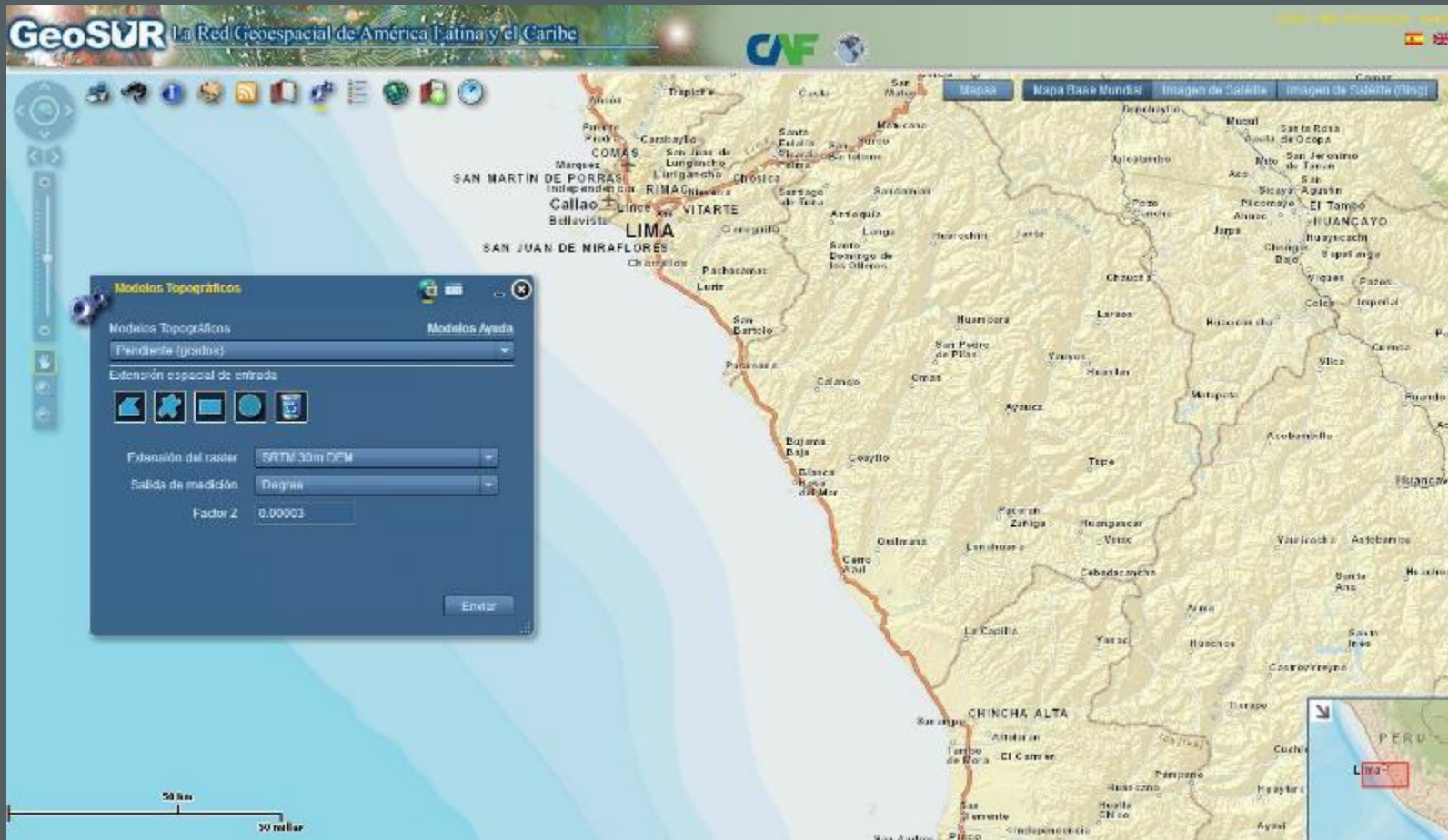
# Result

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## Topographic Processing Service (TPS)

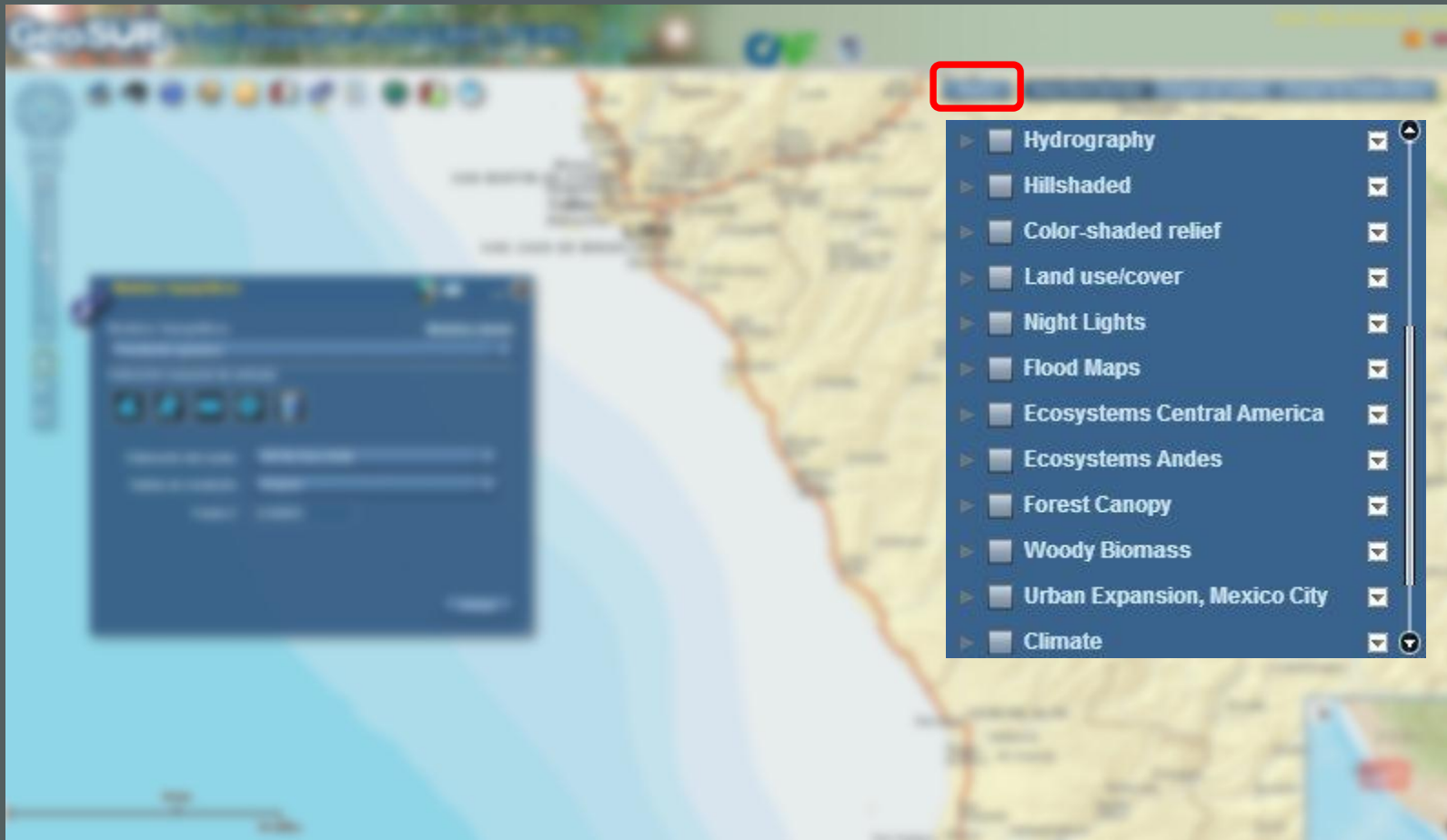
- The TPS provides a geo-processing Web service accessible through GeoSUR's Regional Map Service (RMS), ESRI's ArcGIS desktop software, Python scripting environment, and has a JavaScript API for custom Web development.
- The service allows users to request 6 SRTM 30-m derivative products: *slope, slope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

# Web Application Interface



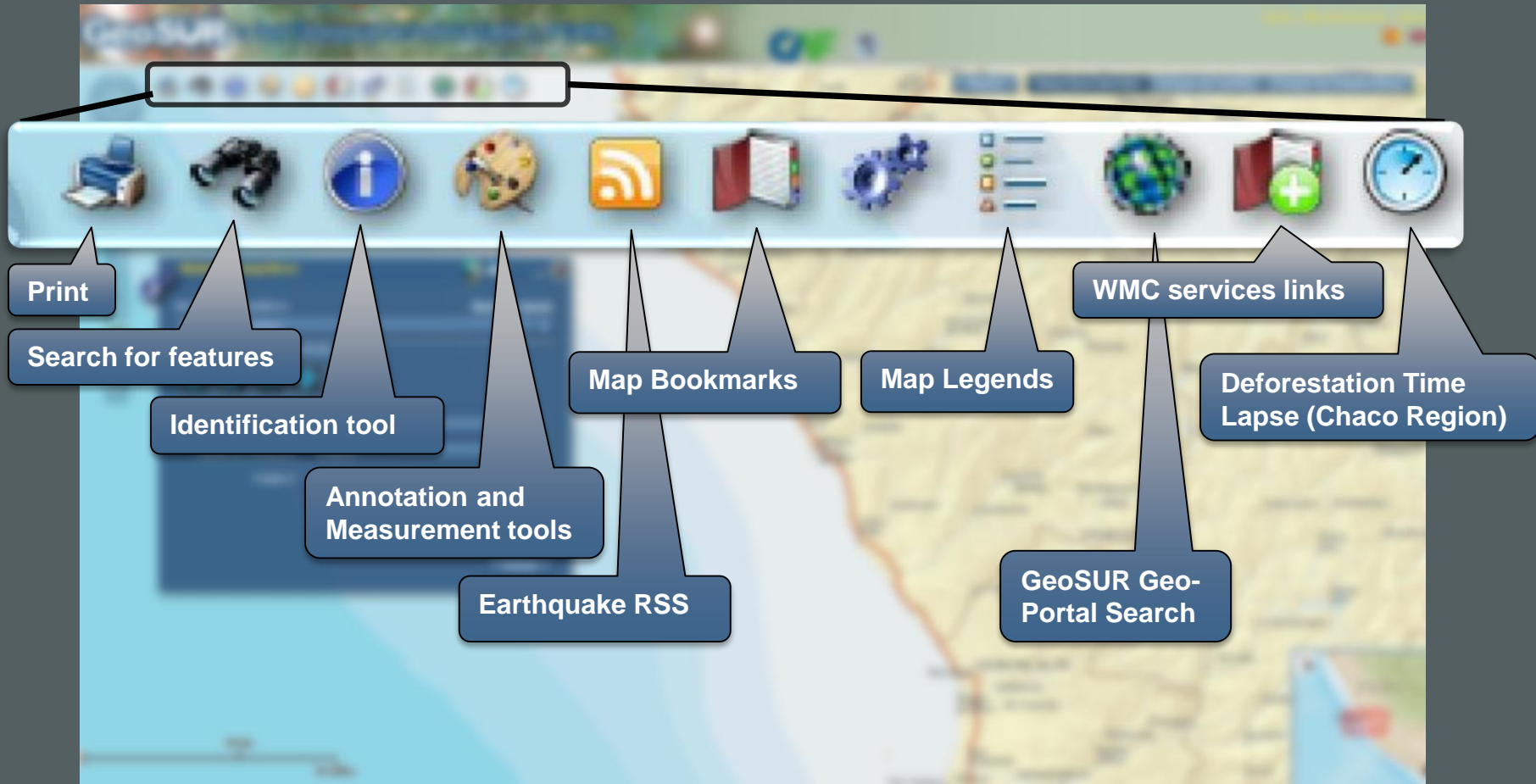
<http://www.geosur.info/map-viewer/index.html>

# Web Application Interface



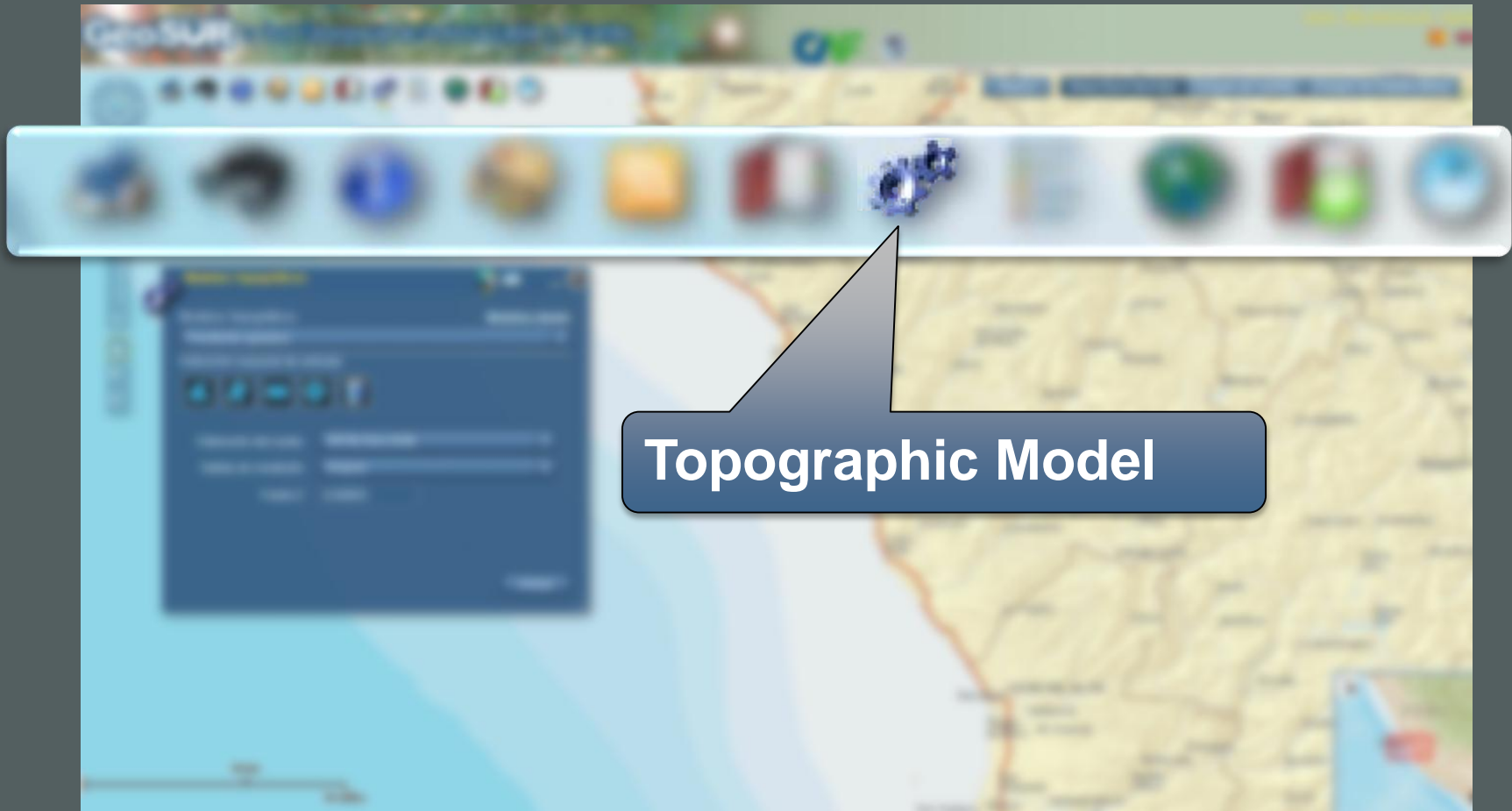
<http://www.geosur.info/map-viewer/index.html>

# 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

**Topographic Model**

Select Topographic Model Models Help

Slope Classification

Input Spatial Extent

Input Dataset: SRTM 30m DEM

Slope Class List: 5,10,20,30,40,50

Z Factor: 0.00003

Unit of Measure: Degree

Submit

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

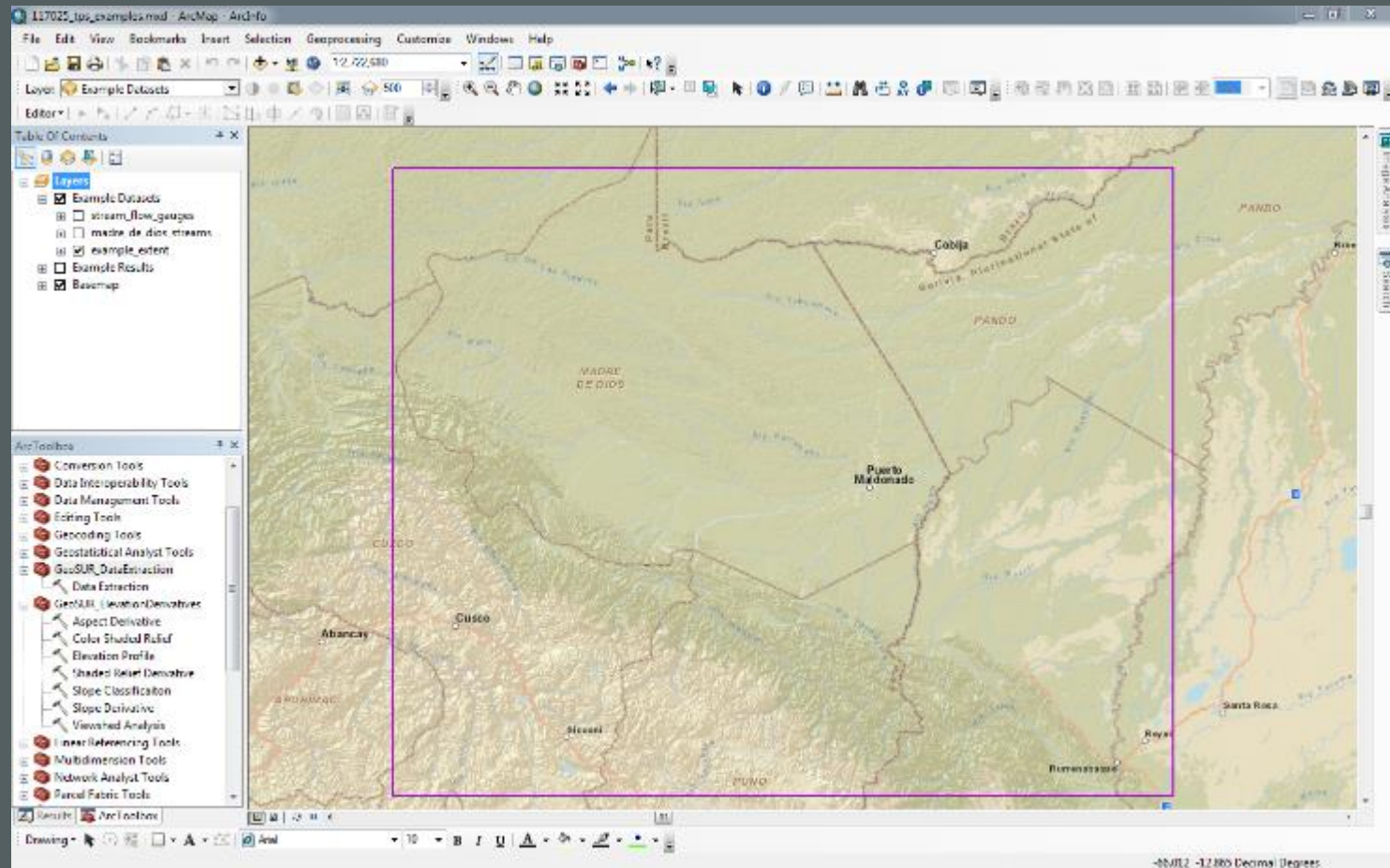
<http://www.geosur.info/map-viewer/index.html>

# Web Application Interface

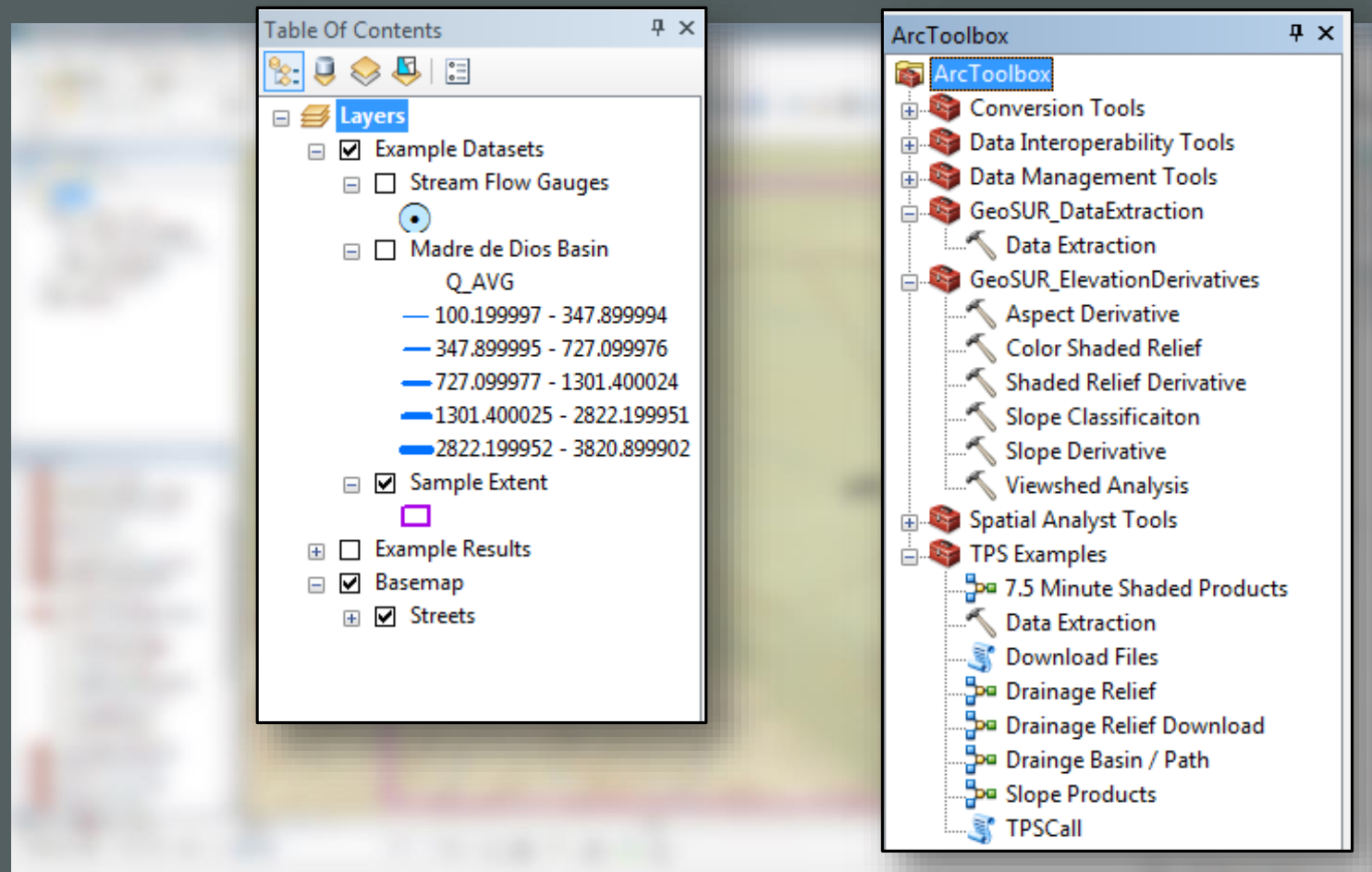


<http://www.geosur.info/map-viewer/index.html>

# ESRI ArcGIS ArcMap Interface

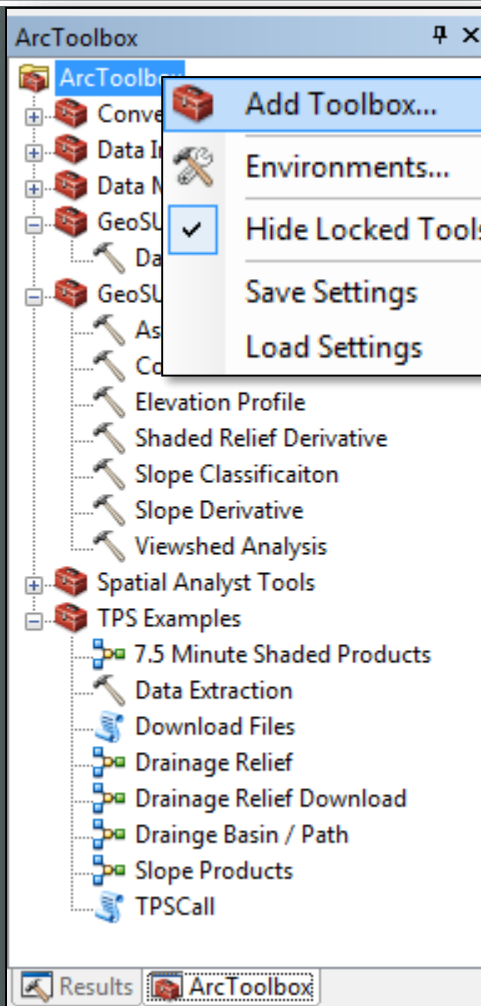


# ESRI ArcGIS ArcMap Interface

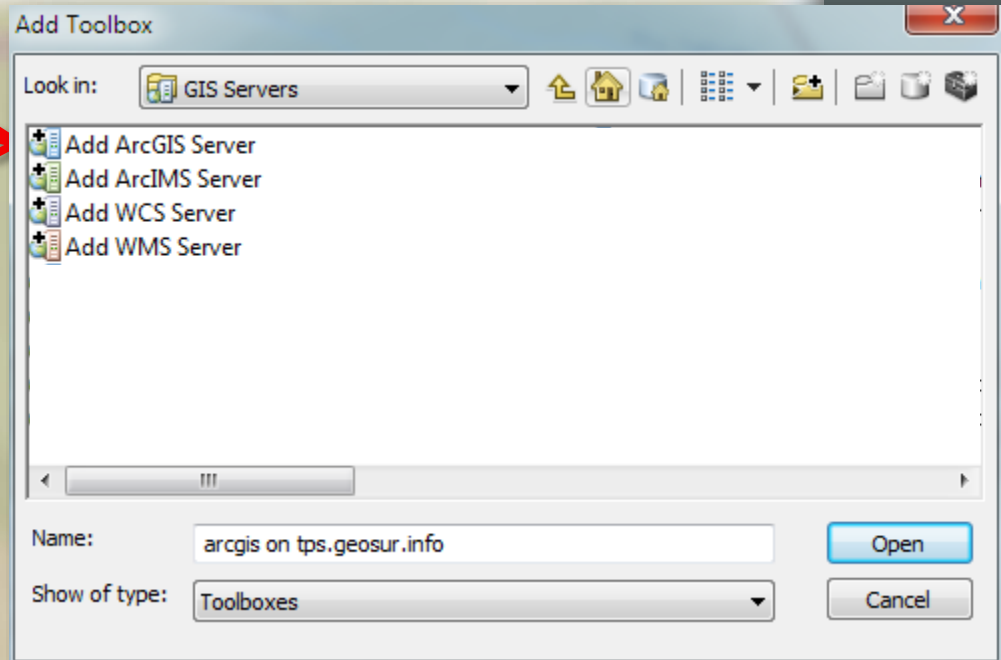


# ESRI ArcGIS ArcMap Interface

## Adding Geoprocessing Service

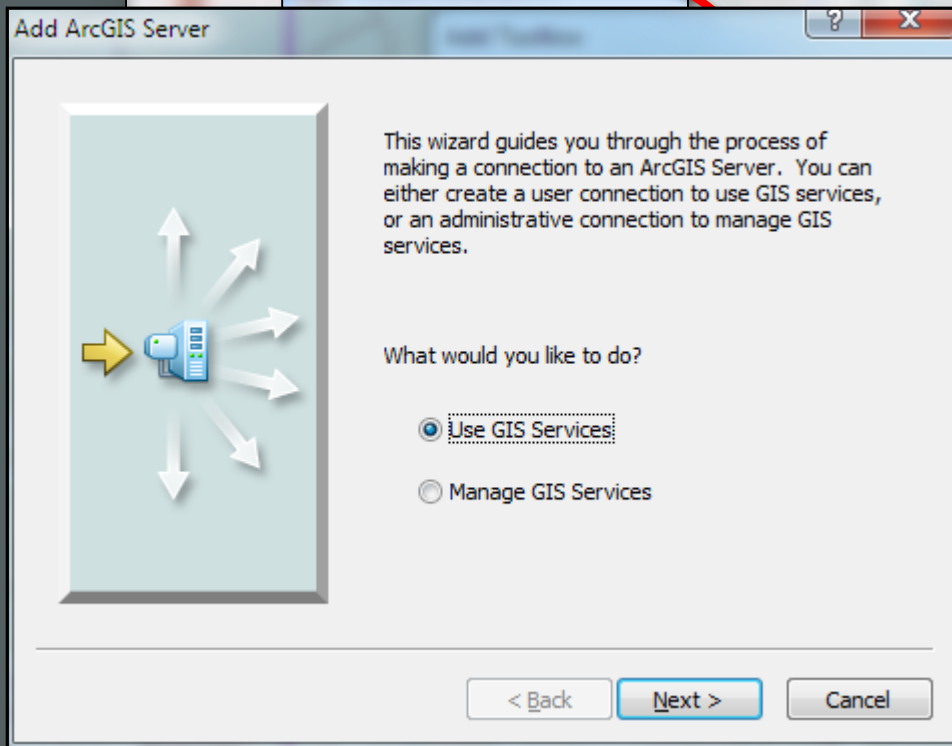


- Add Toolbox...
- Environments...
- Hide Locked Tools
- Save Settings
- Load Settings



# 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:   
http://www.myserver.com/arcgis/services
  - 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 from:

Internet

Local

Server URL:

Host Name:

Authentication (Optional)

User Name:

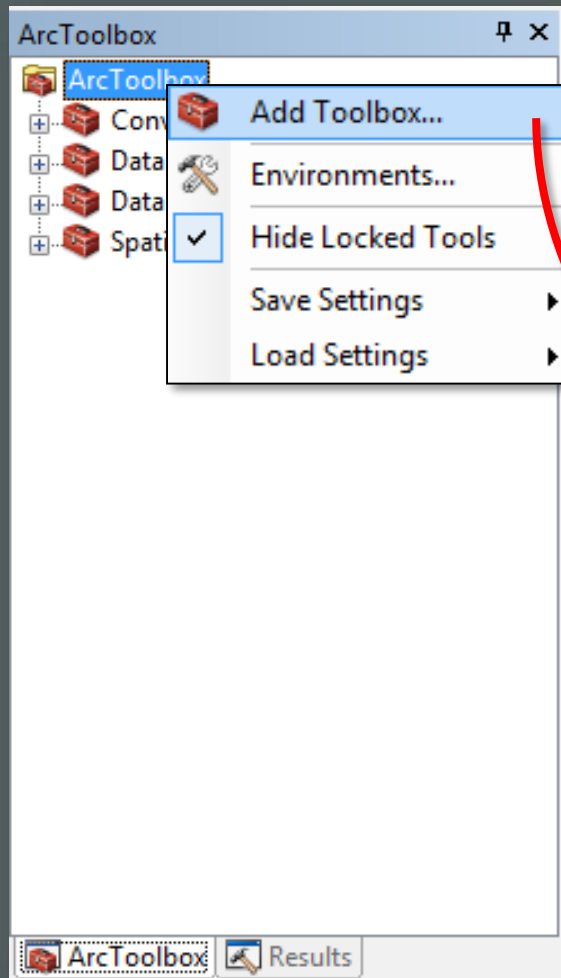
Password:

Save Username/Password

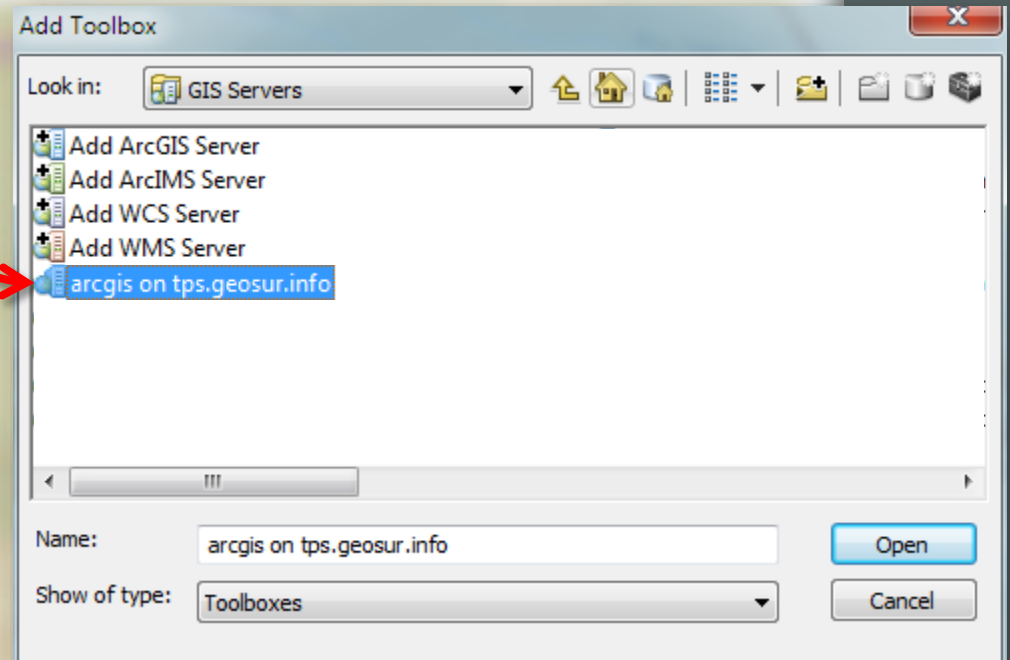
< Back Finish Cancel



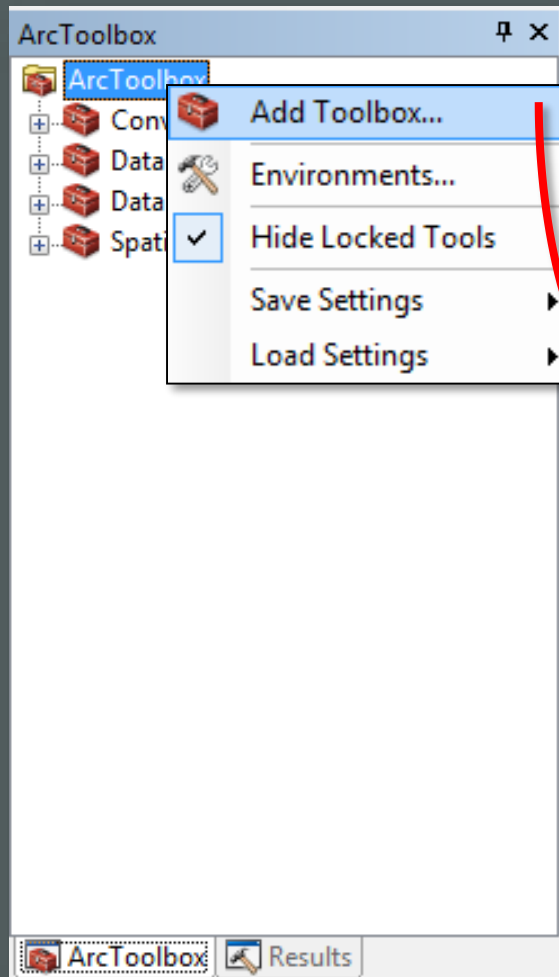
# ESRI ArcGIS ArcMap Interface



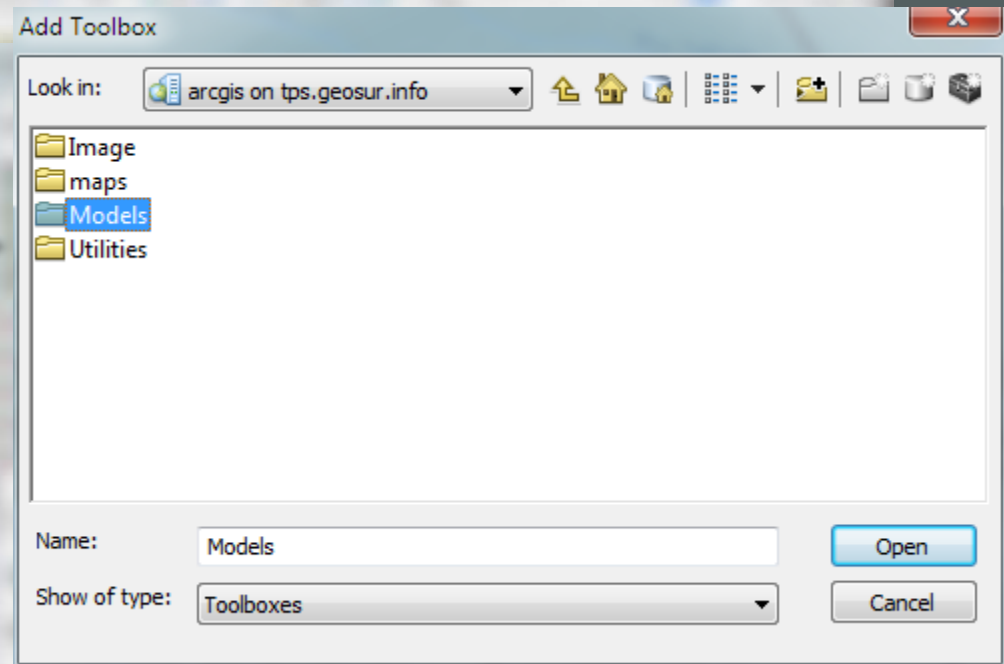
## Adding Geoprocessing Service



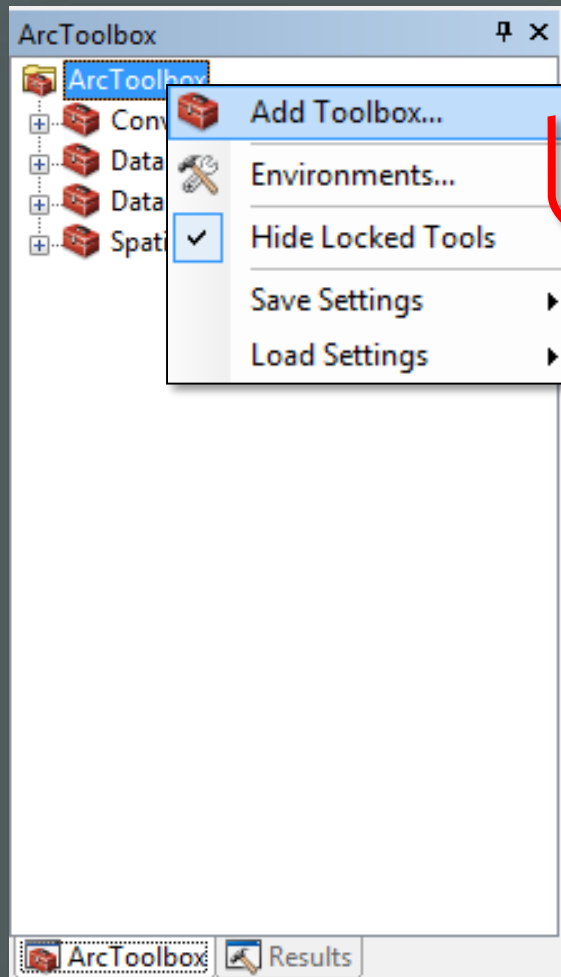
# ESRI ArcGIS ArcMap Interface



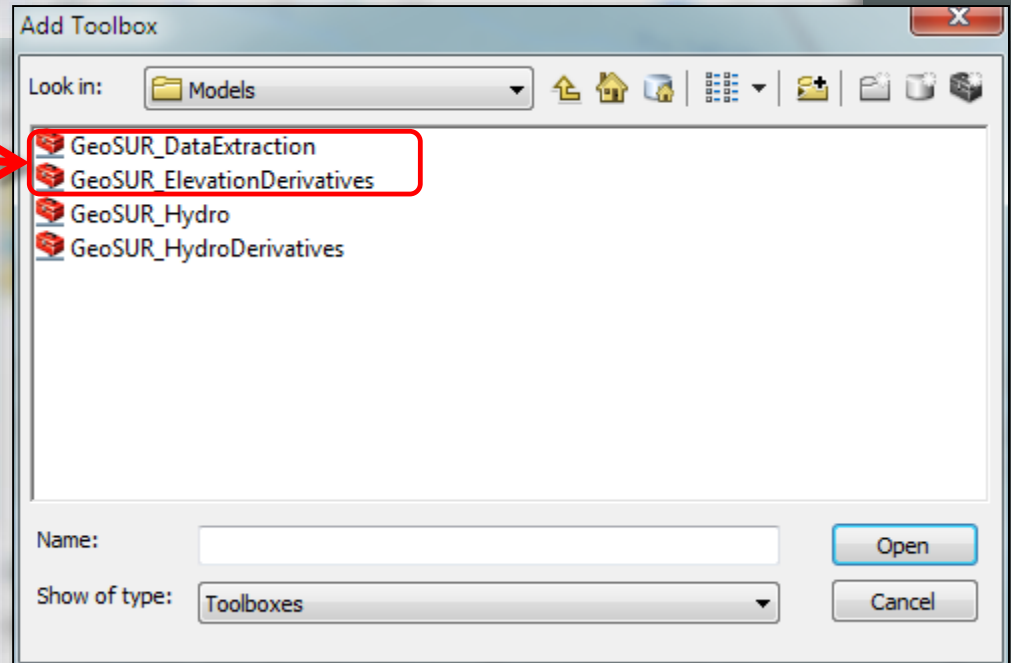
## Adding Geoprocessing Service



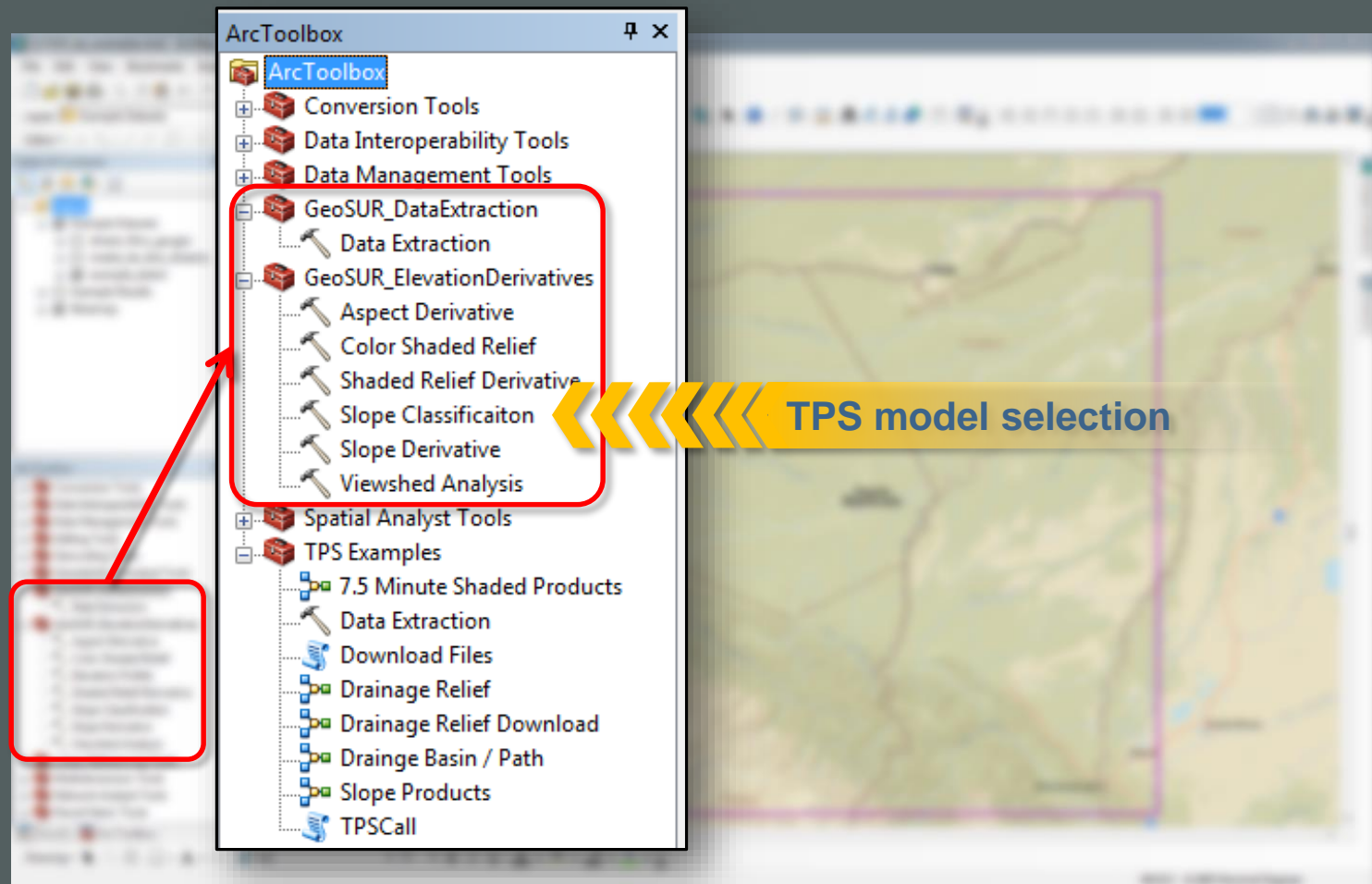
# ESRI ArcGIS ArcMap Interface



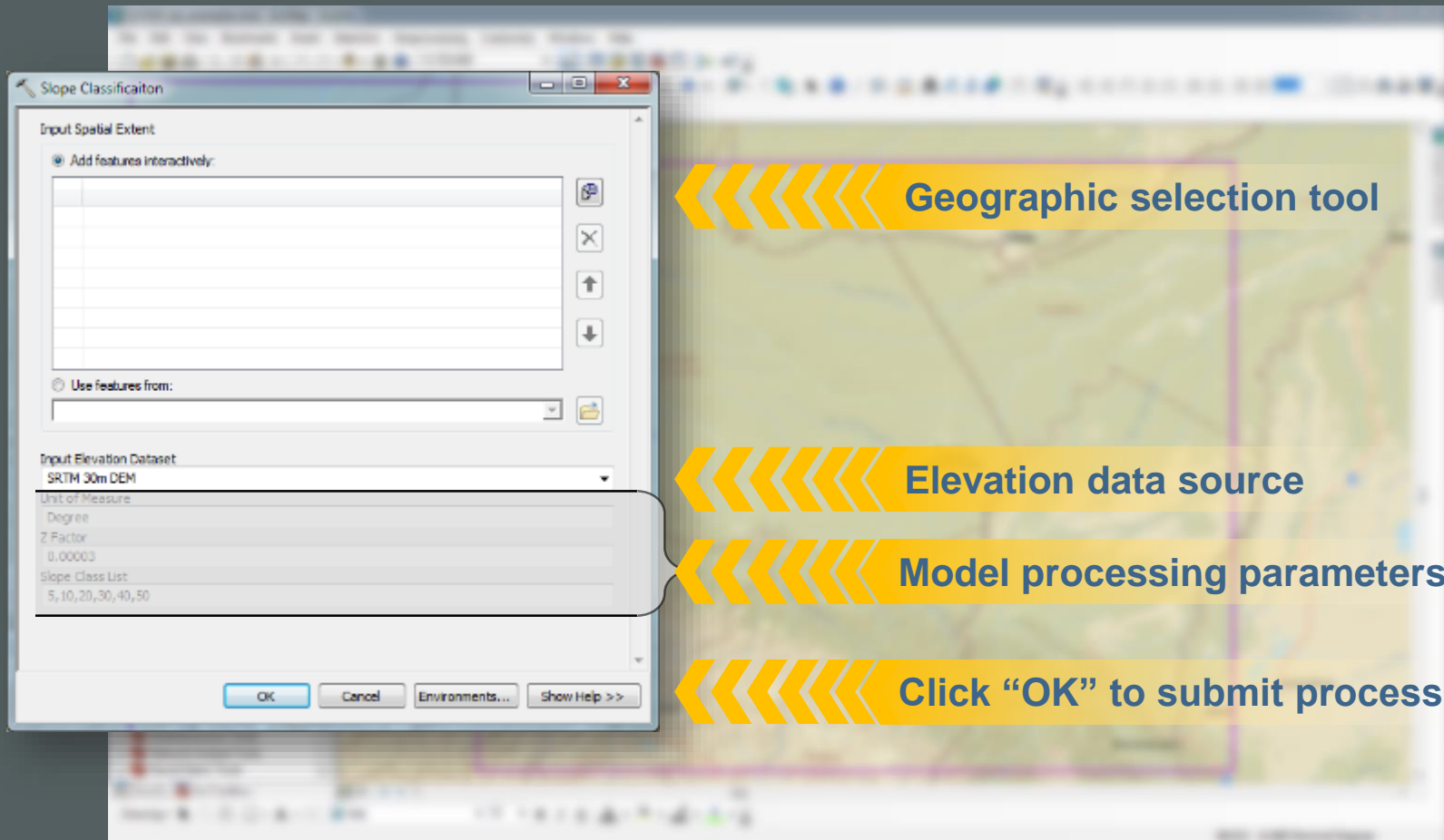
## Adding Geoprocessing Service



# ESRI ArcGIS ArcMap Interface



# ESRI ArcGIS ArcMap Interface



The image shows the 'Slope Classification' dialog box in ArcMap. The dialog is titled 'Slope Classification' and has a standard Windows window border. It is divided into several sections:

- Input Spatial Extent:** This section has two radio buttons. The first, 'Add features interactively', is selected. Below it is a list box with several empty rows and a search icon. To the right of the list are icons for 'Add', 'Remove', 'Up', and 'Down'. The second radio button is 'Use features from:', followed by a dropdown menu and a folder icon.
- Input Elevation Dataset:** A dropdown menu showing 'SRTM 30m DEM'.
- Unit of Measure:** A dropdown menu showing 'Degree'.
- Z Factor:** A text input field containing '0.00003'.
- Slope Class List:** A text input field containing '5,10,20,30,40,50'.

At the bottom of the dialog are four buttons: 'OK', 'Cancel', 'Environments...', and 'Show Help >>'. The background of the slide is a blurred map of a geographic area with a purple rectangular selection box overlaid on it.

Four yellow callout boxes with blue text and arrowheads point to specific parts of the dialog:

- The top callout points to the 'Add features interactively' section and is labeled 'Geographic selection tool'.
- The second callout points to the 'Input Elevation Dataset' dropdown and is labeled 'Elevation data source'.
- The third callout points to the 'Slope Class List' text field and is labeled 'Model processing parameters'.
- The bottom callout points to the 'OK' button and is labeled 'Click "OK" to submit process'.

# ESRI ArcGIS-ArcMap Interface

Table of Contents

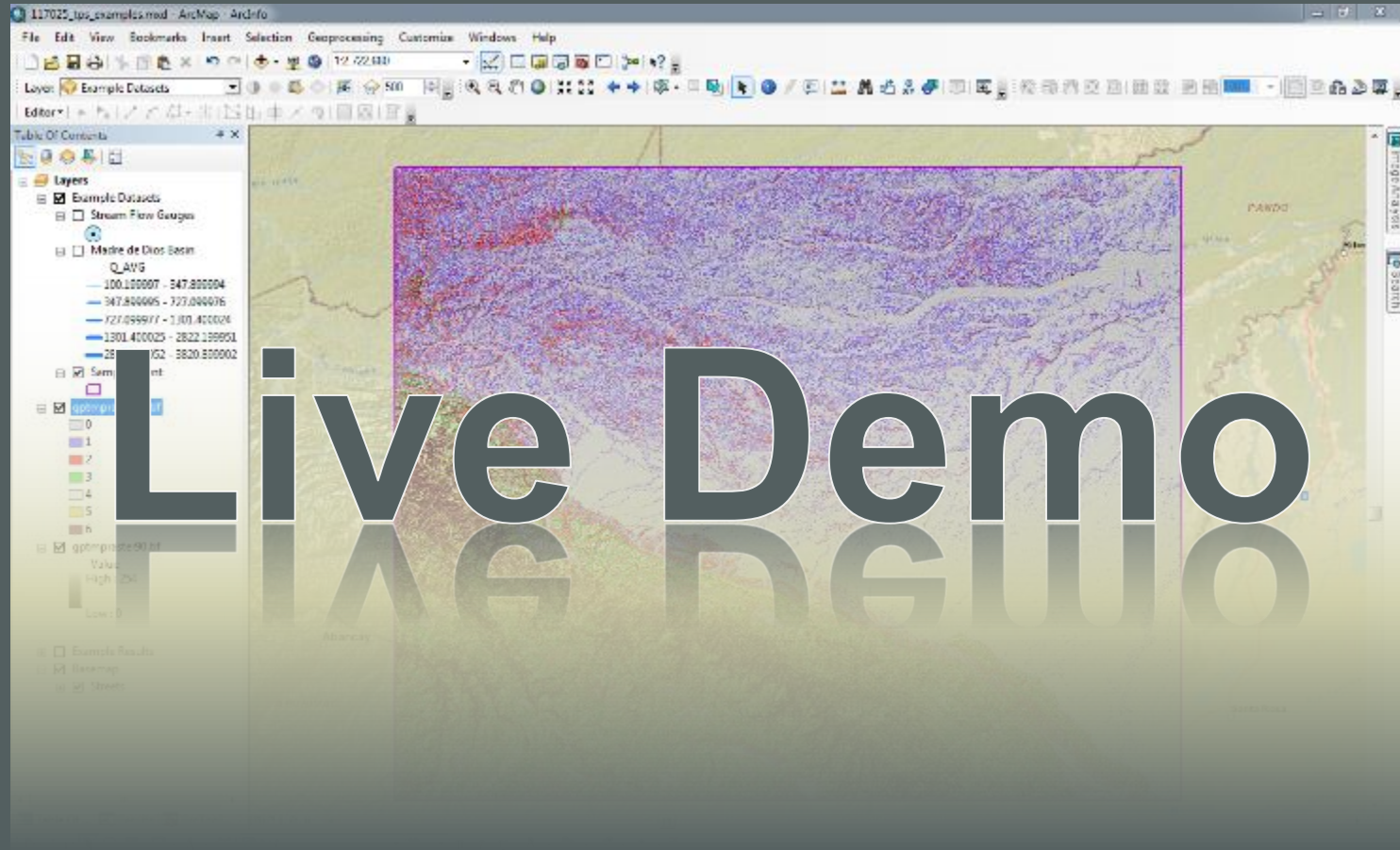
- Layers
  - Example Datasets
    - Stream Flow Gauges
    - Madre de Dios Basin
      - Q\_AVG
        - 100.199997 - 347.899994
        - 347.899995 - 727.099976
        - 727.099977 - 1301.400024
        - 1301.400025 - 2822.199951
        - 2822.199952 - 3820.899902
  - Sample Extent
  - gptmpraster89.tif
    - 0
    - 1
    - 2
    - 3
    - 4
    - 5
    - 6
  - Example Results
  - Basemap
  - Streets

Classified Slope product delivered to client from TPS

Unit of Measure  
Degree  
Z Factor  
0.00003  
Slope Class List  
0, 5, 10, 20, 30, 40, 50

0 1 2 3 4 5 6

# ESRI ArcGIS ArcMap Interface



Live Demo

# Service Request Scripting Interfaces

## JavaScript API

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## Python

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```



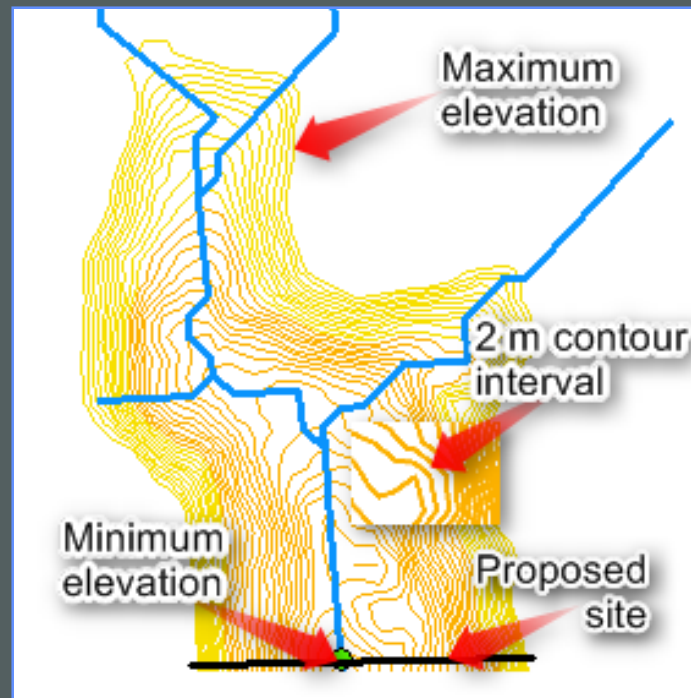
# ESRI ArcGIS ArcMap Interface

## Python Demo

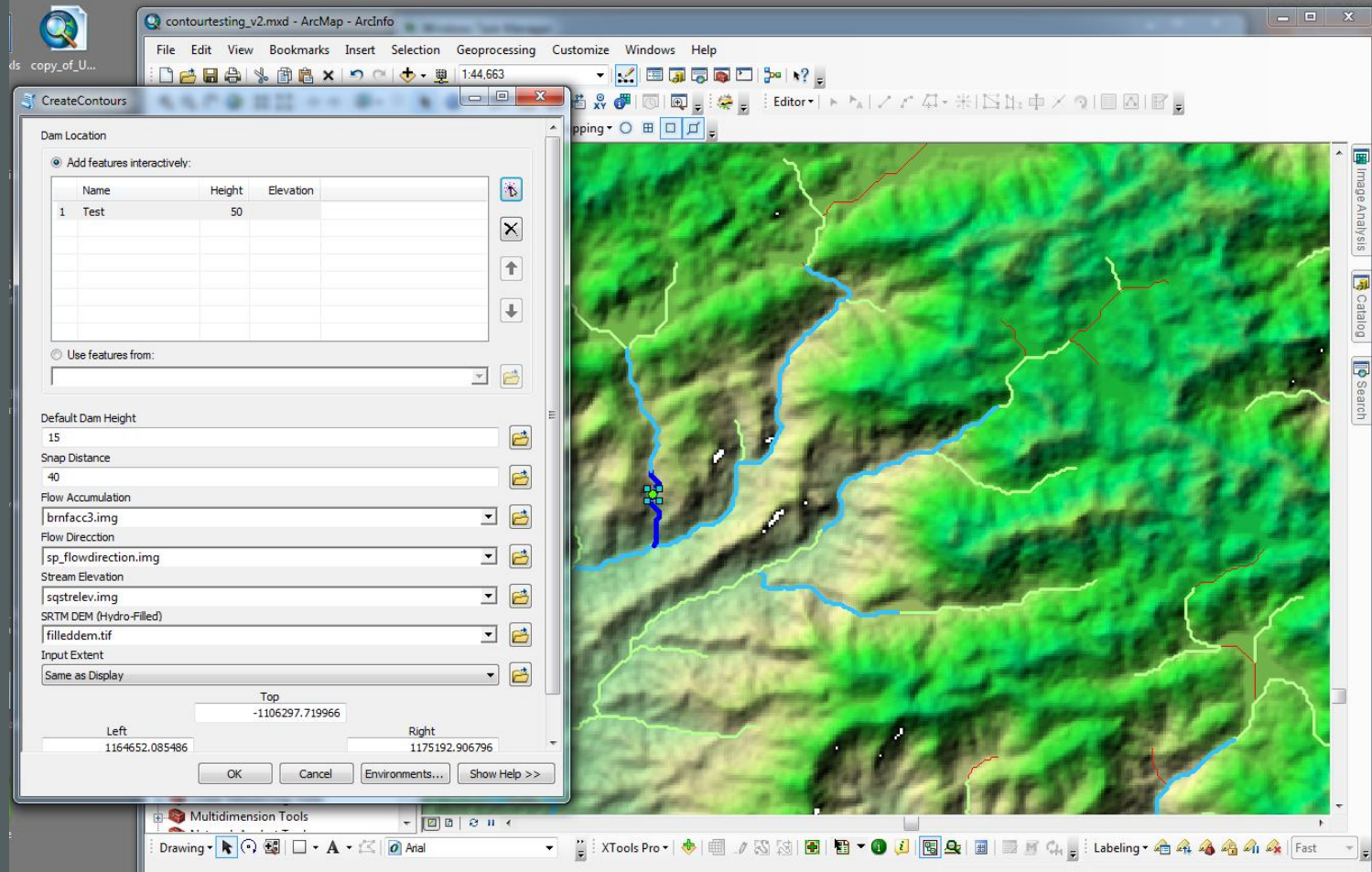
```
1 # Import arcpy, time
2 # Import FileDownload
3
4 # Add web processing service as a toolbox
5 tpsServer = "http://tps.geosur.info/arcgis/services/"
6 tpsNode1 = "Models/Spatial_ElevationDerivatives"
7 arcpy.ImportToolbox("No,No" % (tpsServer, tpsNode1))
8
9 # Create a FeatureSet Object to pass to the remote service
10 # This featureset will be a polygon layer which will be used to define the
11 # spatial extent
12 # to extract the requested derivative product
13 InFeatSet = arcpy.CreateObject("FeatureSet")
14
15 # Add and edit the feature class to the feature set object
16 InFeatSet.AddField("SLOPE", "DOUBLE")
17 InFeatSet.AddField("CLASS", "TEXT")
18 # Call an arcpy tool to get the web
19 # store the result in a FeatureSet object
20 arcpy.AddMessage("Extracting slope derivative...")
21
22 Slope_Class_List = "0,5,10,15,20,40,50"
23 resultObj = arcpy.SlopeClass_Spatial_ElevationDerivatives(InFeatSet,
24 "SLOPE IS AN UNCONSTRAINED" "SLOPE" - "0 0000" Slope_Class_List)
```

# Web Tool for Counter Level Creation

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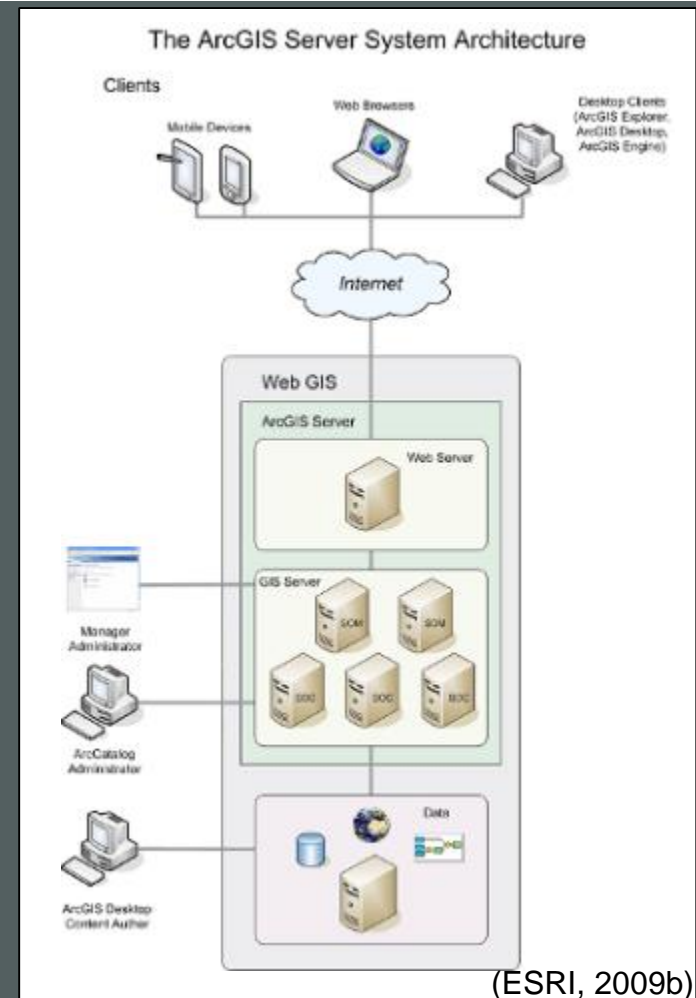


# Web Tool for Counter Level Creation

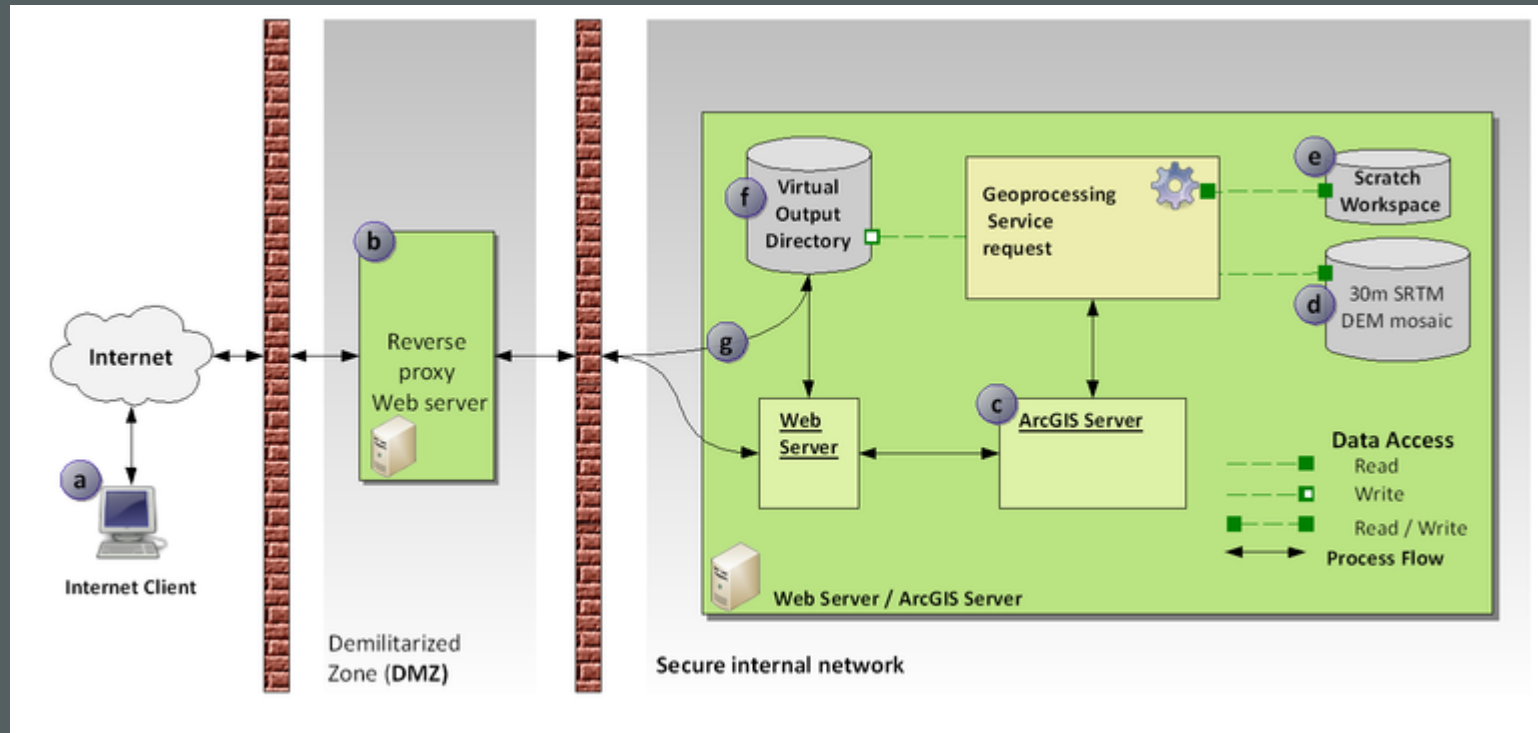


# GeoSUR ArcGIS Server Architecture

- **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

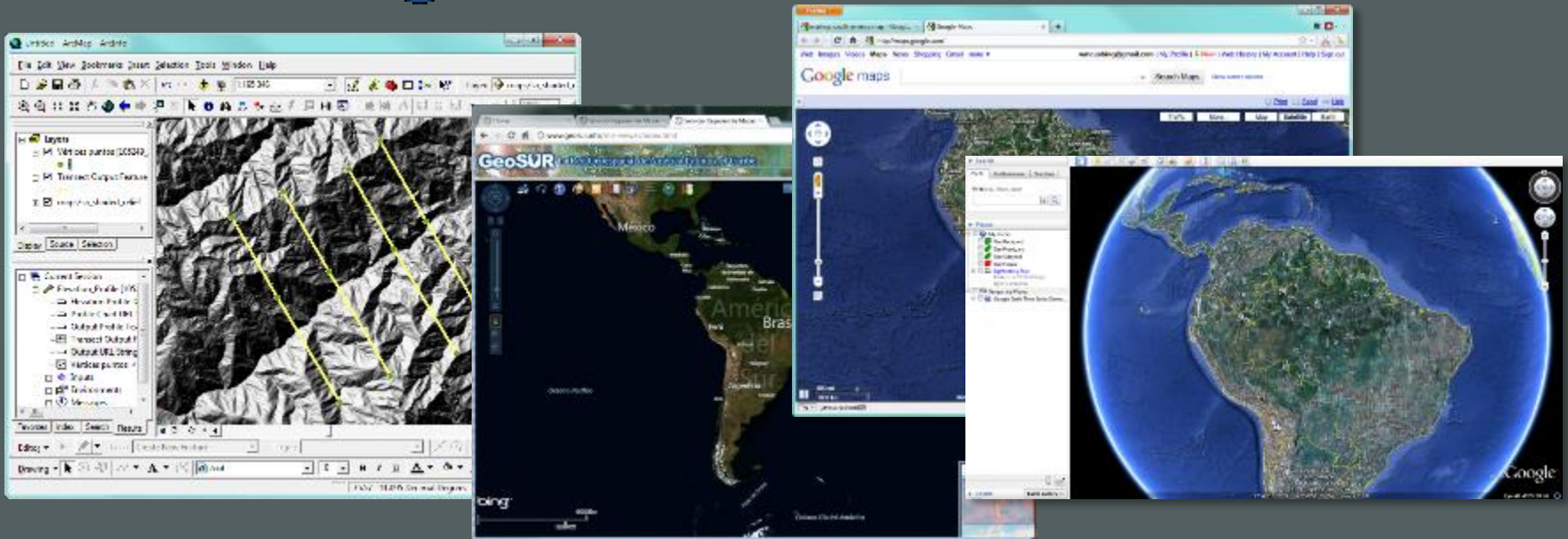


# User Community

## 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>

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