Introduction to Spatial Analysis and Spatial Modeling

1

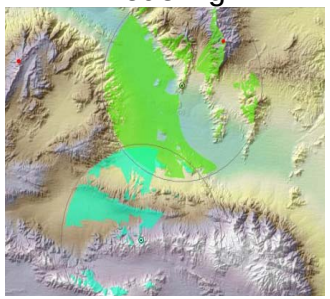
Benefits of raster GIS

- ArcGIS raster support
- The ArcGIS Spatial Analysis extention
  - The seven interfaces
  - Installation and licensing
- Exercise 1
  - Introduction to the spatial analyst interfaces

Benefits of raster GIS

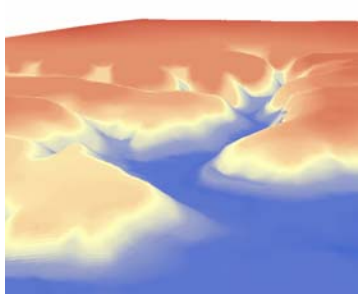
- Location-based data model (cells)
  - Better than features for many types of analyses
- Especially sued for
  - Surface creation and analysis
    - Elevation, rainfall, population
  - Location models
    - Best site for business, hospital
  - Distance measurement
    - Proximity, mobility, best path
  - Modeling movement
    - Flood inundation, fire spread

Modeling



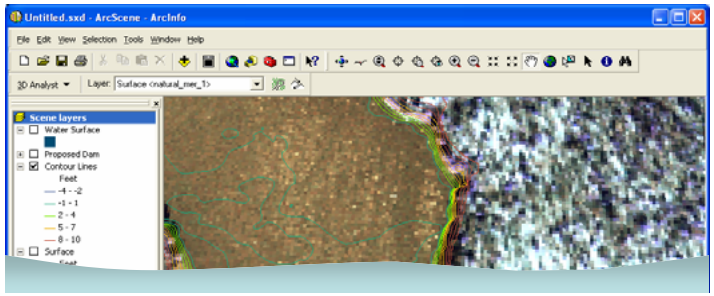
Distances

Surfaces



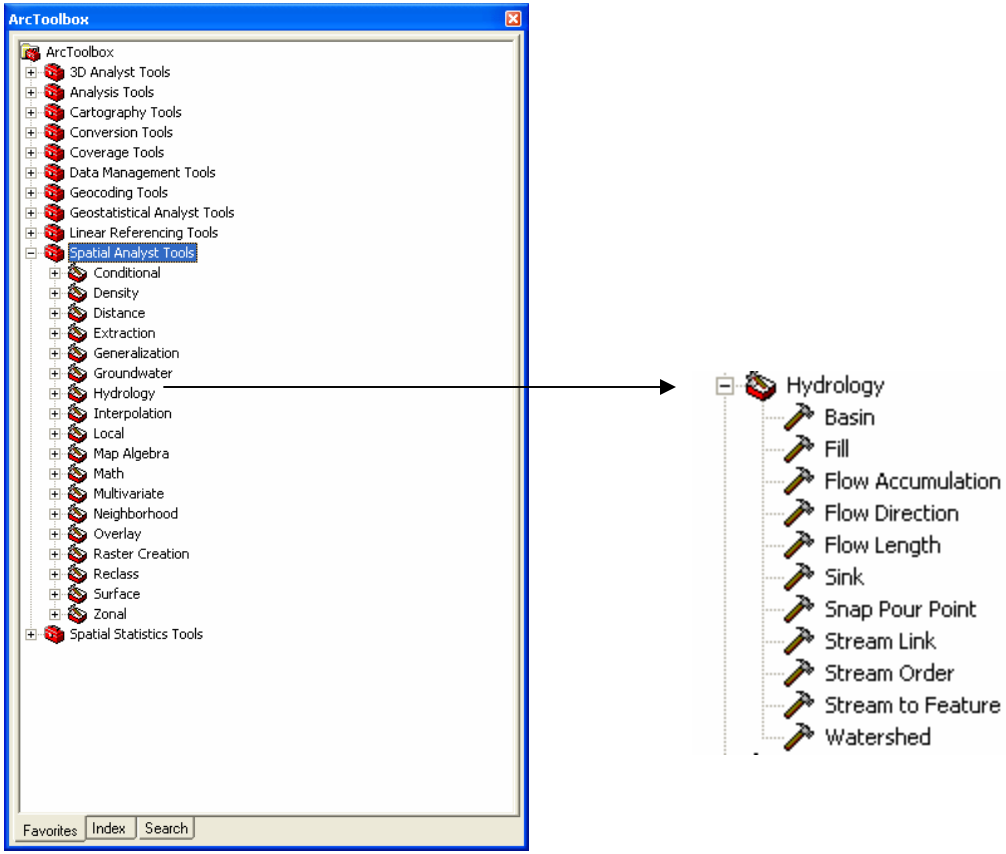
ArcGIS raster support

- ArcGIS has out-of-the-box raster support
  - Use with ArcMap
    - Draw, query, georeference
  - Manage with ArcCatalog
    - Copy, rename, delete,
  - Manipulate with ArcToolbox
    - Convert, project, merge, clip,
  - Store with a geodatabase
    - Raster datasets and catalogs
- Add Spatial Analyst for analysis

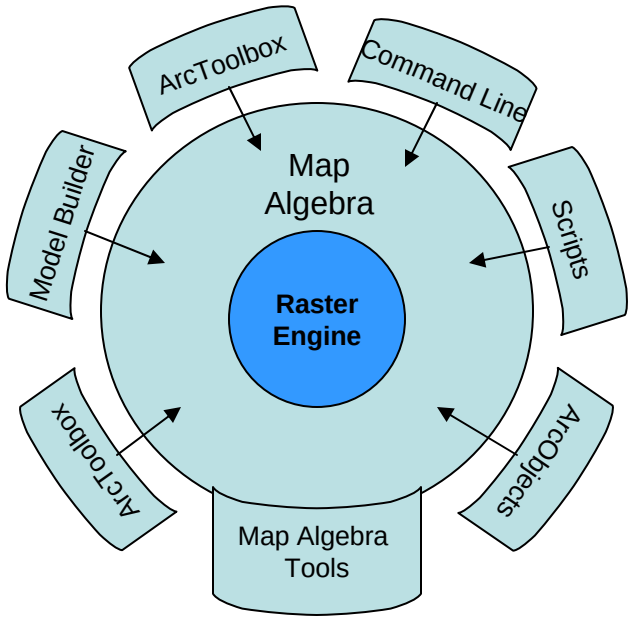


Spatial Analysis tools

- Over 100 tools organized into toolsets



Seven interfaces for Spatial Analyst

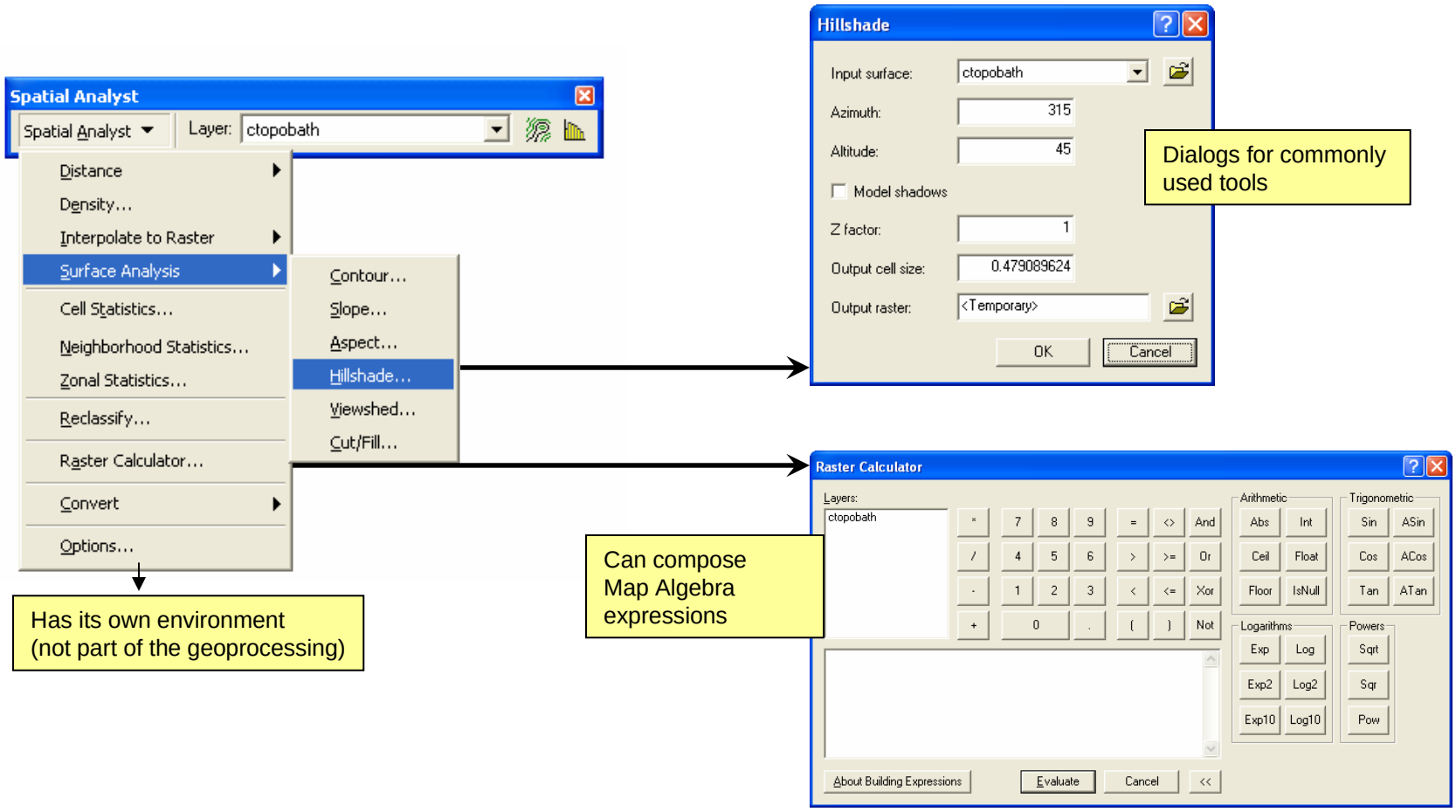


- 1. ArcToolbox
  - Dialogs for all tools
- 2. Command Line
  - Type commands
- 3. Model Builder
  - Visual modeling
- 4. Scripts
  - Write easy programs
- 5. Spatial Analyst Toolbar
  - Dialogs for common tools
- 6. ArcObjects
  - More programming power
- 7. Map Algebra Tools
  - For all interfaces

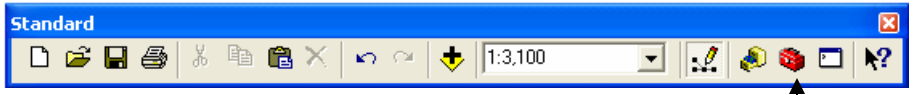
- Most become Map Algebra
- Evaluated by Raster Engine

•These are all part of the geoprocessing framework

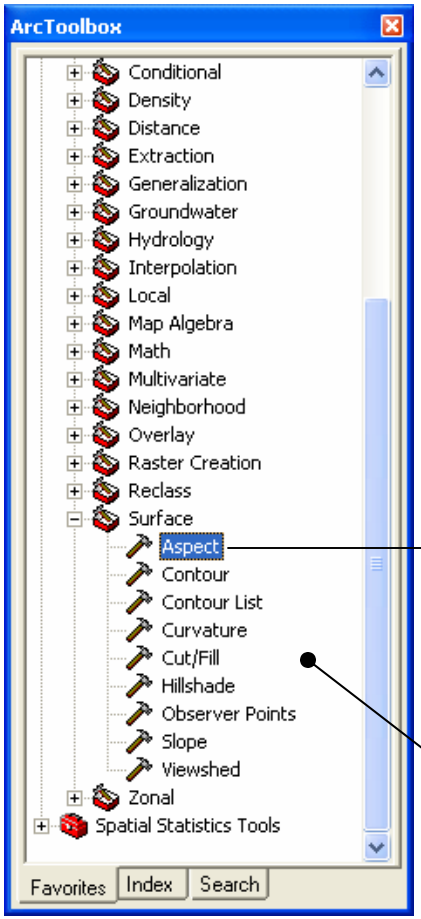
The Spatial Analyst toolbar

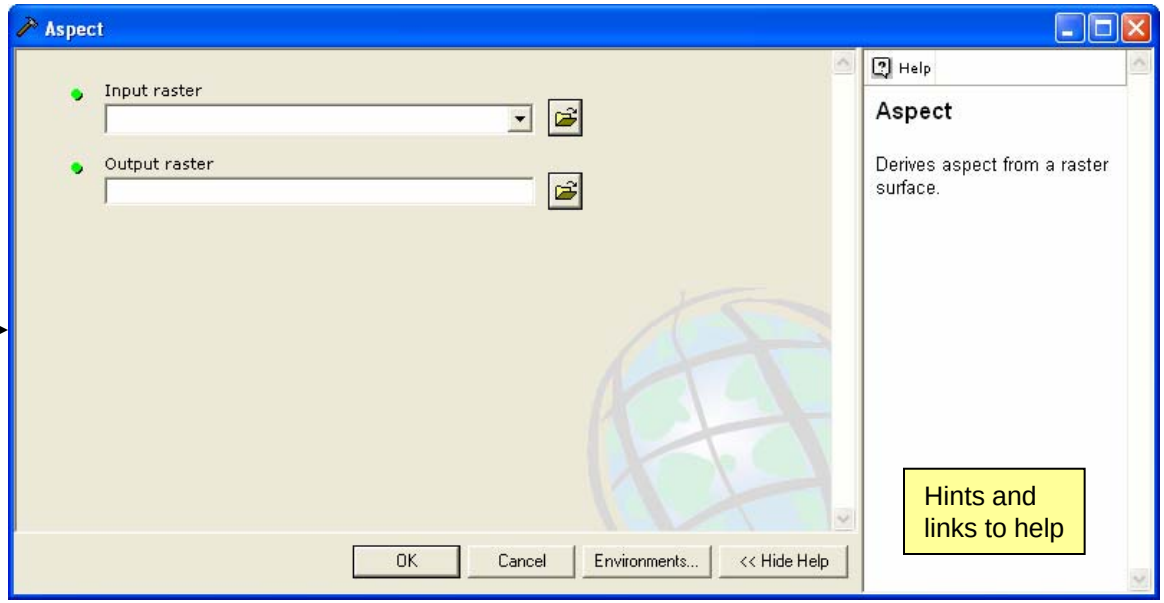


Spatial Analyst and ArcToolbox



Opens ArcToolbox

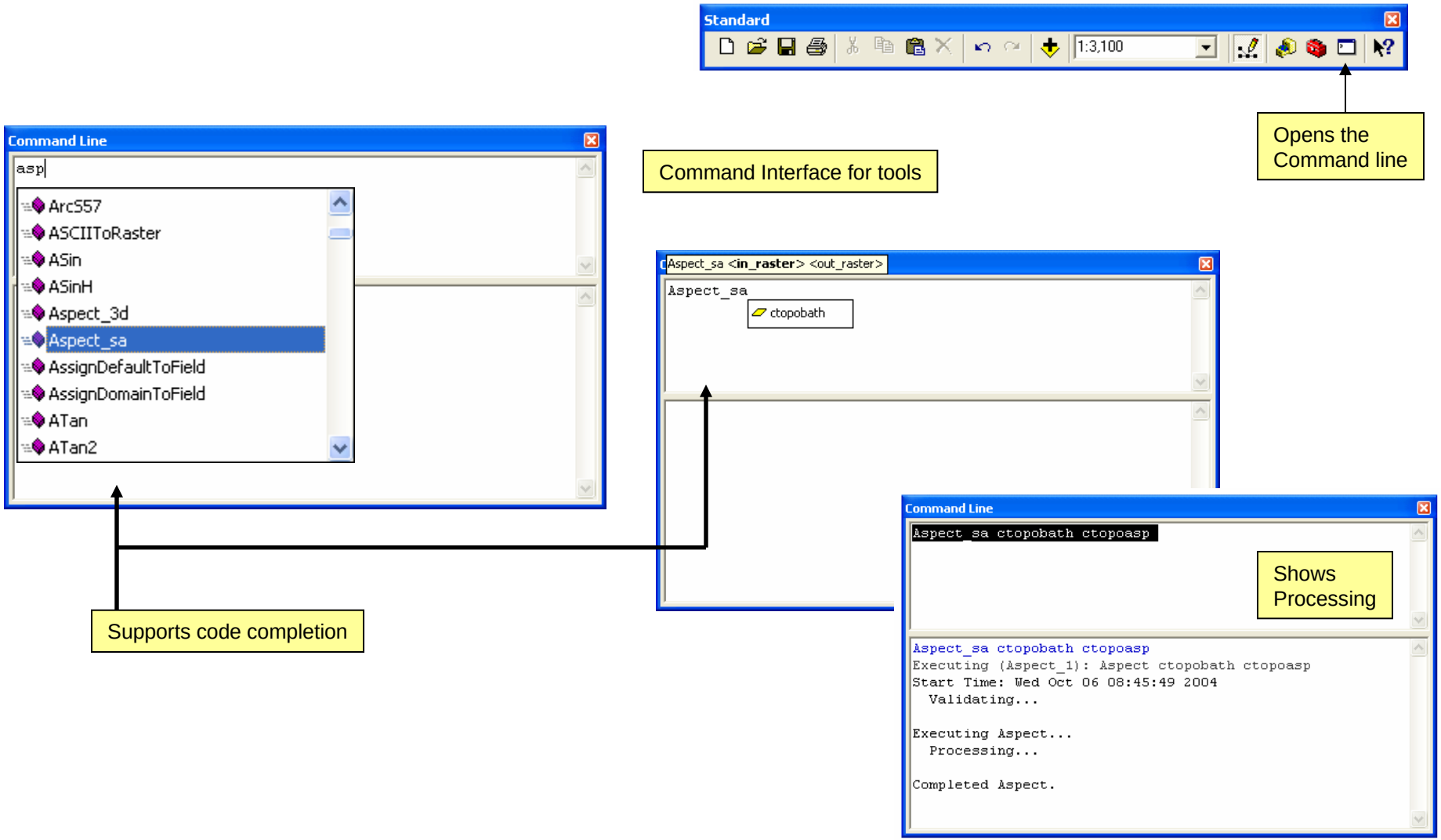




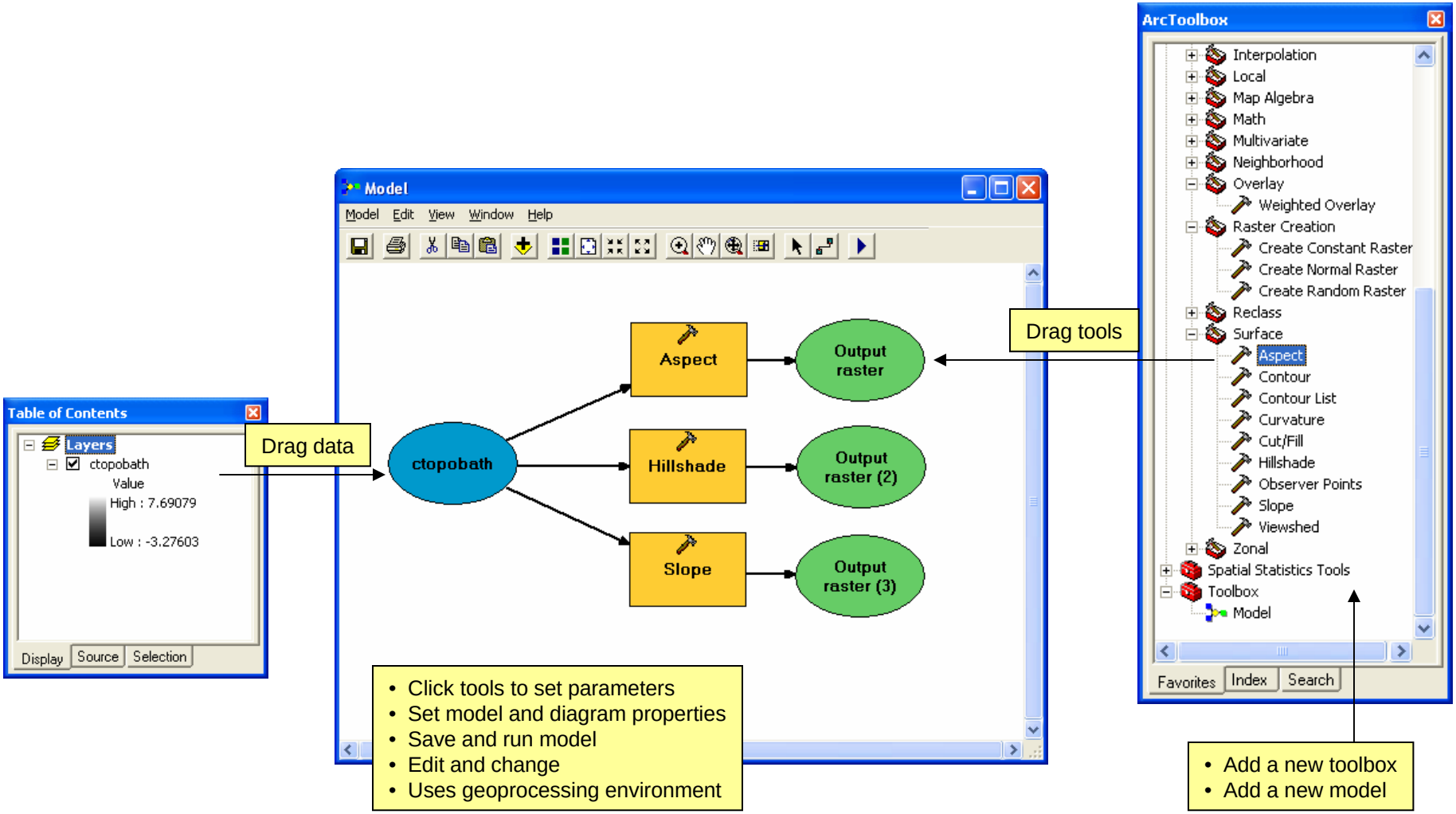
Hints and links to help

- Uses geoprocessing environments (right-click to set)
- Has Map Algebra tools

Spatial Analyst and Command Line

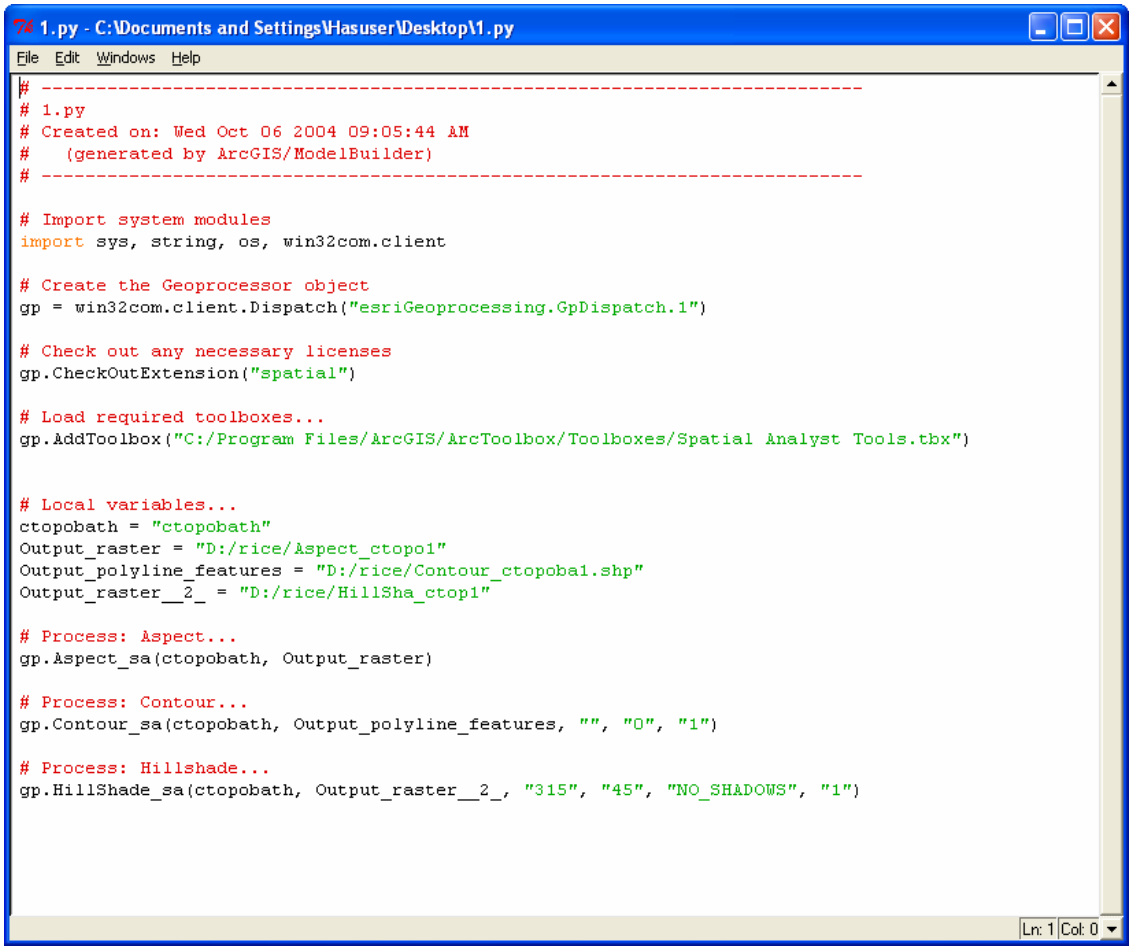


Spatial Analyst and Model Builder



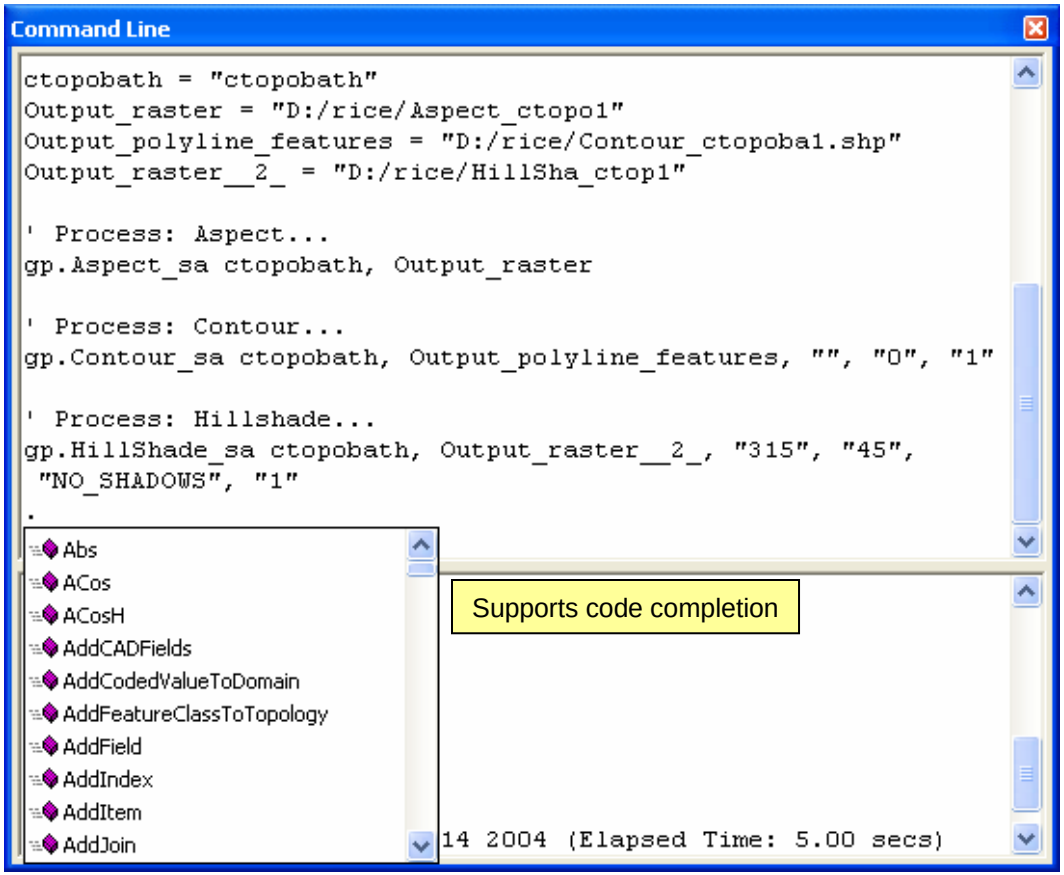
Spatial Analyst and scripts

- Many languages are supported (Python shown)
- Is object-oriented (But easy!)
- Uses geoprocessor tools, environments
- May add scripts to ArcToolbox
- May use scripts in models
- Has a Map Algebra tool



Spatial Analyst and ArcObjects

- Many languages are supported (VBA shown)
- Is object-oriented (Powerful, but a lot of classes to learn)
- Must set your environments
- Build stand-alone applications, or build tools, or ...?
- Has classes for Map Algebra



Spatial Analyst and Map Algebra

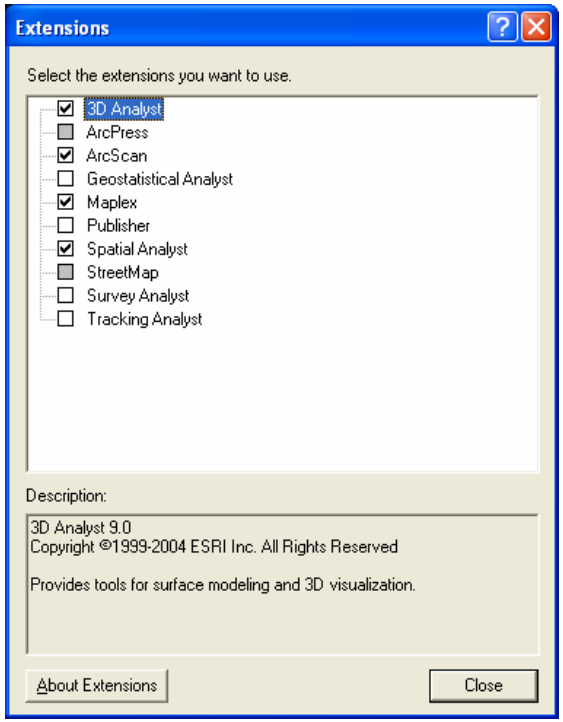
- An analysis language for raster data
  - Uses math-like expressions with operators and functions:

```
SmoothHill = Hillshade(FocalMean([Elevation) * 0.3048))
```

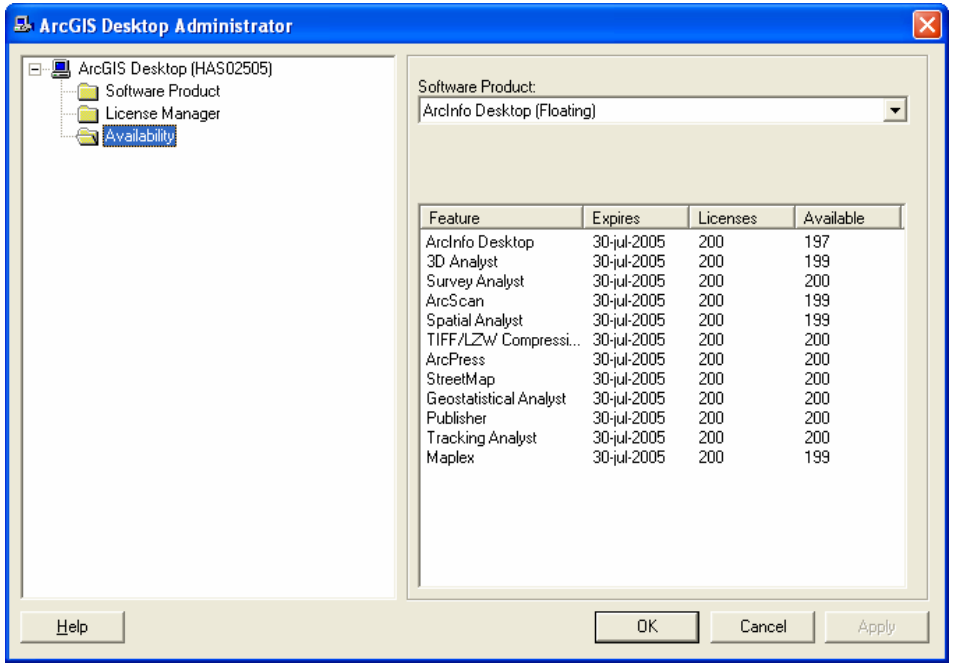
  - Can be more efficient than Spatial Analyst tools (one expression may use many functions and operators)

- Spatial Analyst tools and Map Algebra
  - Most tools implement Map Algebra functions and operators
    - Tools provide dialog and command line interfaces
    - Most tools implement a single function or operator (some implement many functions)
  - Tools exist for writing Map Algebra expressions

Managing the extension



Tools > Extensions
- Enable or disable extensions



Start> Programs > ArcGIS> Desktop Administrator
- Select software product
- Select license manager
- Check license availability

Resources for self study

- Online Help
  - For ArcGIS Desktop users and for developers
- Documentation
- ESRI Support Center
  - Software information
  - Knowledge Base
  - Downloads
  - User forums
  - Developer support and tools
- Virtual Campus courses
  - Self-learning modules

Exercise 1 overview

- Check the license in the Desktop Administrator
- Enable the extension in ArcMap
- Run a tool with the Spatial Analyst toolbar
- Run a tool with the ArcToolbox
- Run a tool with the Command Line window
- Build and run a model with the Model Builder
- Create and run a script and view its code
- Run and view a VBA program that uses ArcObjects
- Write and run a Map Algebra expression
- Install several ArcObjects-based utilities (you will use them in future exercises)