Planetary Geologic Mapping Python Toolbox

3RD PLANETARY DATA WORKSHOP

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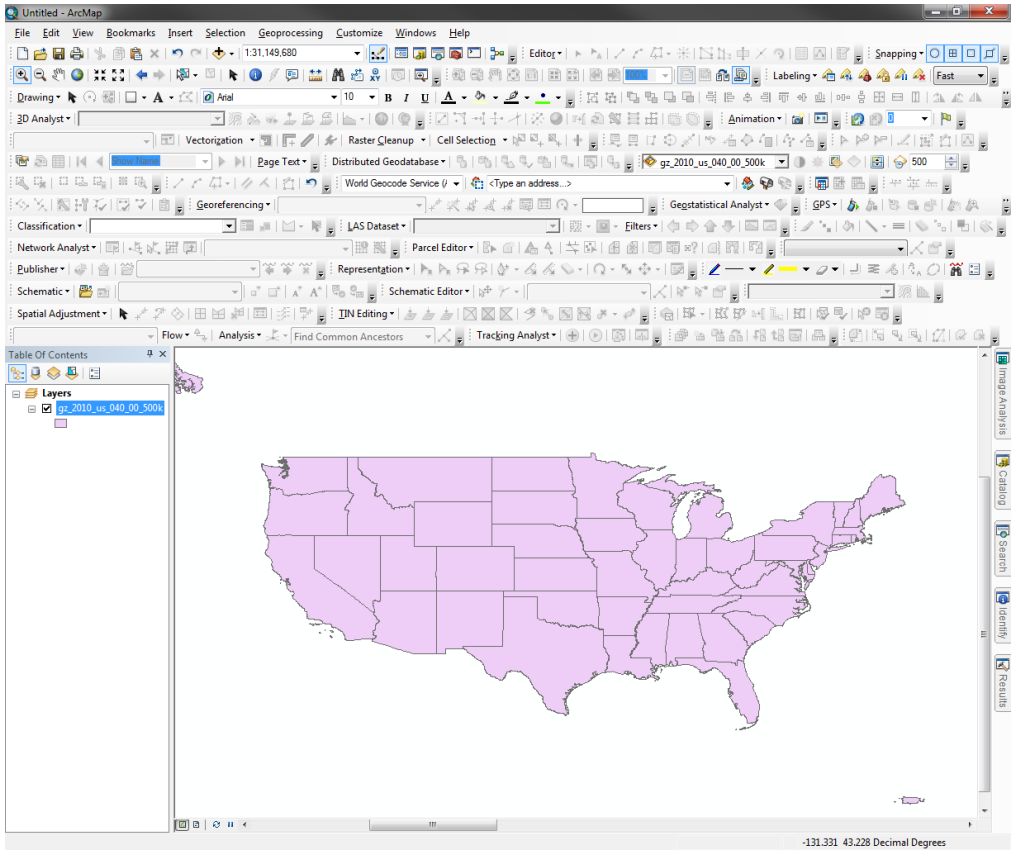
Background



Role of GIS tools

- Increased capabilities intended to reduce barriers to access and manipulate spatial data often increase complexity for intermittent users
- Spatial data and tools should 'just work'
- Support decision making and enable reproducible spatial analyses

Tools for general use

- Automate common spatial data management tasks
- Assist mappers with the identification and correction of GIS data errors
- Data exploration tools; not canned data solutions

Balancing Capability & Functionality

GIS tools provide powerful geoprocessing capabilities without the need to script custom solutions

- Minimal development to extend (ArcPy)

Many researchers develop ad-hoc models (ie, ModelBuilder) and scripts for single-use cases that can be of great benefit to the greater planetary mapping community

- Often lack flexibility to handle different workspace environments and data formats

Commercial applications emphasize usability/accessibility of data and tools, but this ultimately diminishes the users' requirement to understand how calculations are performed, both geographically and mathematically

Why Python Toolboxes?

Automate GIS workflows common to geologic mapping

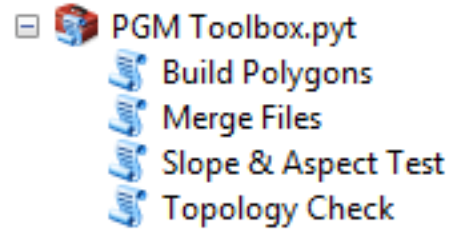
Minimal development time

- Especially when converted from ModelBuilder
- Executable from any location via ArcCatalog window

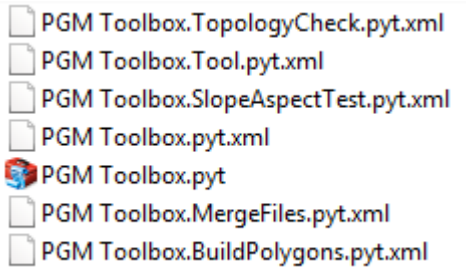
Easily shared

- Supports tool environment settings, licensing and documentation
- *ArcGIS Desktop 10.3+ ships with Python 2.7.8, Numpy 1.7.1, and MatPlotLib 1.3.0

ArcCatalog View:



File View:



What is a Python Toolbox?

*.pyt file with associated XML; written entirely in Python and works like standard geoprocessing tools in ArcMap

- Including GUI and Tool Help dialog

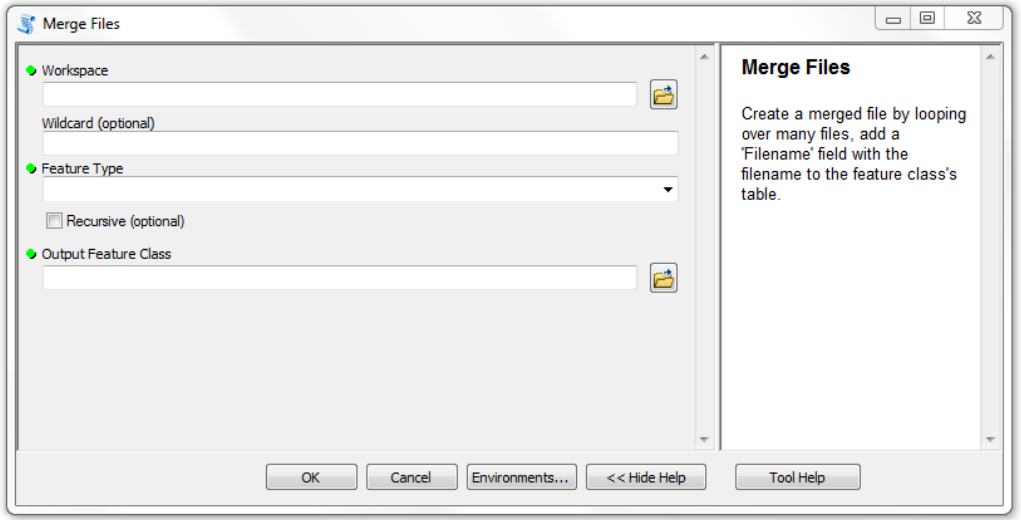
ArcMap aware

- Works with data and feature layers
- Can write messages to the Results window

Template available at:
http://desktop.arcgis.com/en/arcmap/latest/analyze/creating-tools/a-template-for-python-toolboxes.htm

```python
import arcpy


class Toolbox(object):
    def __init__(self):
        """Define the toolbox (the name of the toolbox is the name of the
        .pyt file)."""
        self.label = "Toolbox"
        self.alias = ""

        # List of tool classes associated with this toolbox
        self.tools = [Tool]


class Tool(object):
    def __init__(self):
        """Define the tool (tool name is the name of the class)."""
        self.label = "Tool"
        self.description = ""
        self.canRunInBackground = False

    def getParameterInfo(self):
        """Define parameter definitions"""
        params = None
        return params

    def isLicensed(self):
        """Set whether tool is licensed to execute."""
        return True

    def updateParameters(self, parameters):
        """Modify the values and properties of parameters before internal
        validation is performed.  This method is called whenever a parameter
        has been changed."""
        return

    def updateMessages(self, parameters):
        """Modify the messages created by internal validation for each tool
        parameter.  This method is called after internal validation."""
        return

    def execute(self, parameters, messages):
        """The source code of the tool."""
        return
```

Merge Files Tool



Able to search through sub-directories in a workspace

Filter files in a workspace with wildcard (*.shp)

Adds ‘Filename’ field populated with original file name

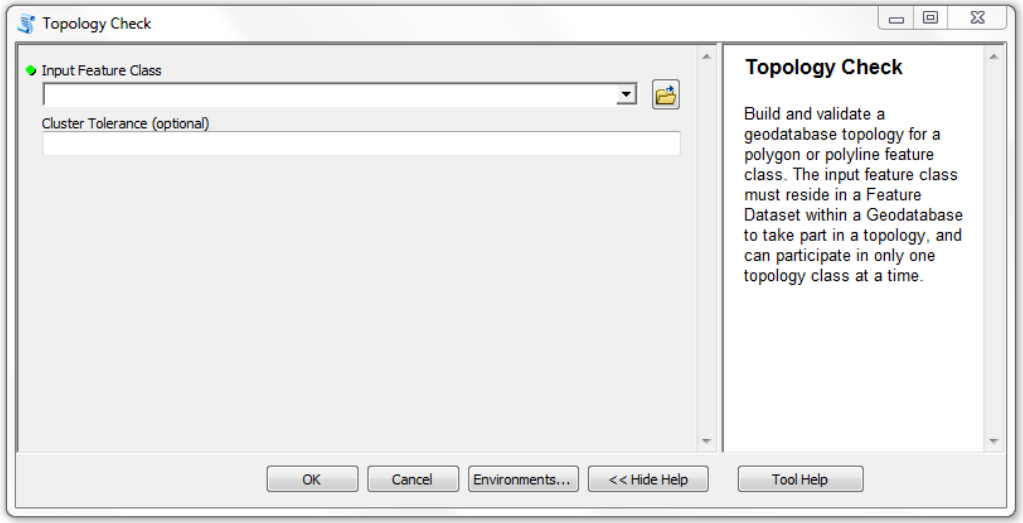
Topology Check Tool

Builds a topology class and tests against most common spatial relationships

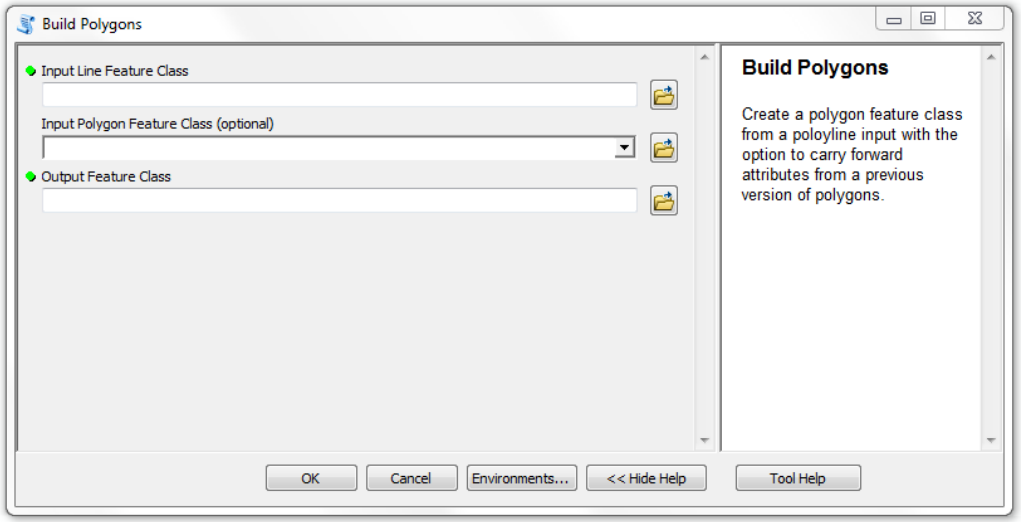
Polygon or line geometry types

- Must not have gaps, must not overlap
- Must not have dangles, must not have pseudo-nodes, must not self-overlap, must not intersect

NOTE: A feature class must be stored in a feature dataset to take part in a topology, and can be part of only one topology class at a time



Build Polygons Tool



Converts line contacts to polygon units with ‘Units’ field

When used with the latest units feature class all unit attributes are carried forward

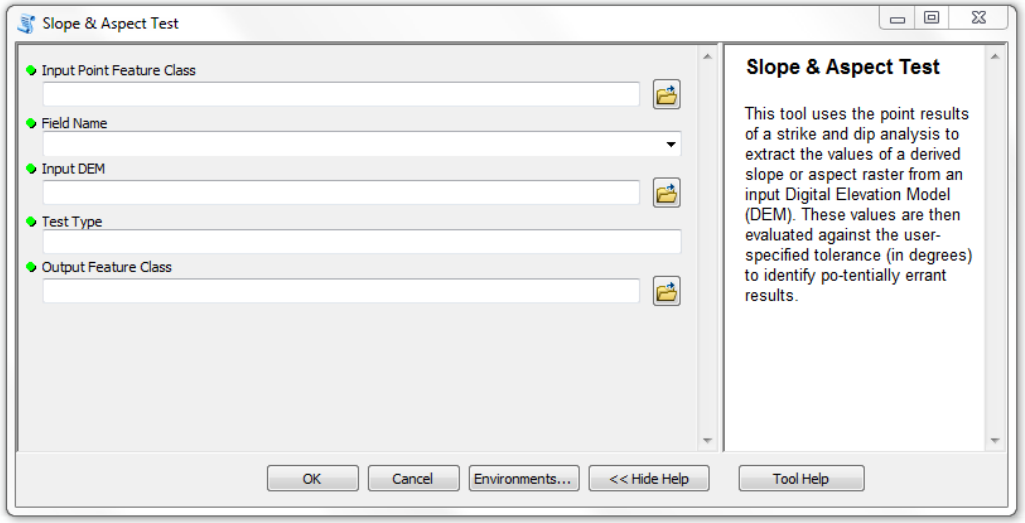
Designed to be used iteratively as corrections are made to contacts

Slope/Aspect Test Tool

Used to test a point feature class of strike/dip measurements against a DEM

Run one test at a time, specifying the field

Automatically deletes derived raster



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Available for download at: https://astrogeology.usgs.gov/facilities/mrctr/gis-tools

Contact for support or suggestions

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