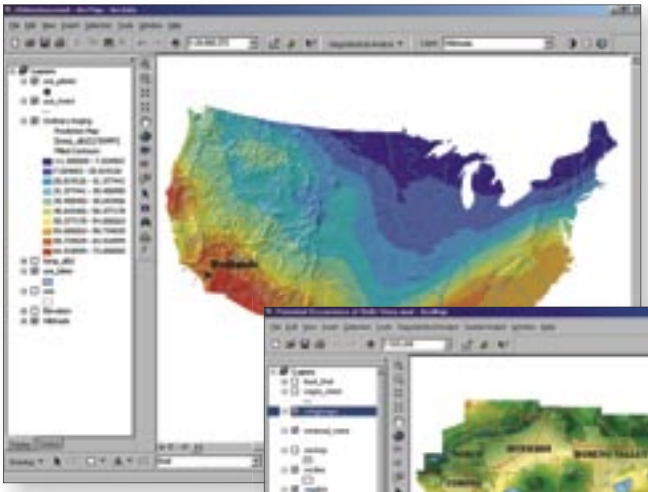
# ArcGIS® Geostatistical Analyst

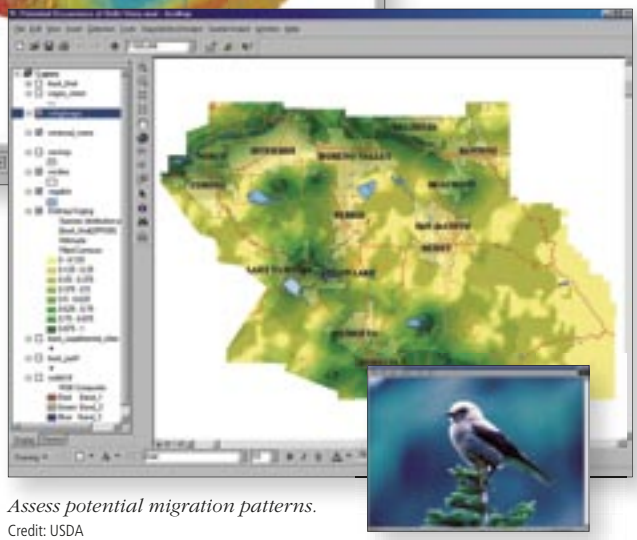
Statistical Tools and Models for Data Exploration, Modeling, and Probabilistic Mapping

# ArcGIS® Geostatistical Analyst: Statistical Tools and Models for Data Exploration, Modeling, and Probabilistic Mapping

ArcGIS® Geostatistical Analyst is an extension to the ArcGIS Desktop products (ArcView®, ArcEditor™, ArcInfo®) that provides a powerful suite of tools for spatial data exploration and surface generation using sophisticated statistical methods. ArcGIS Geostatistical Analyst allows you to create a surface from data measurements occurring over an area where collecting information for every possible location would be impossible. In addition, ArcGIS Geostatistical Analyst gives you the power to fully understand the qualitative and quantitative aspects of your data. By providing you with the freedom to predict and model spatial phenomena based on statistics and incorporating powerful exploration tools, ArcGIS Geostatistical Analyst effectively bridges the gap between geostatistics and geographic information system (GIS) analysis.



*Identify weather patterns.*
Credit: MSHCP

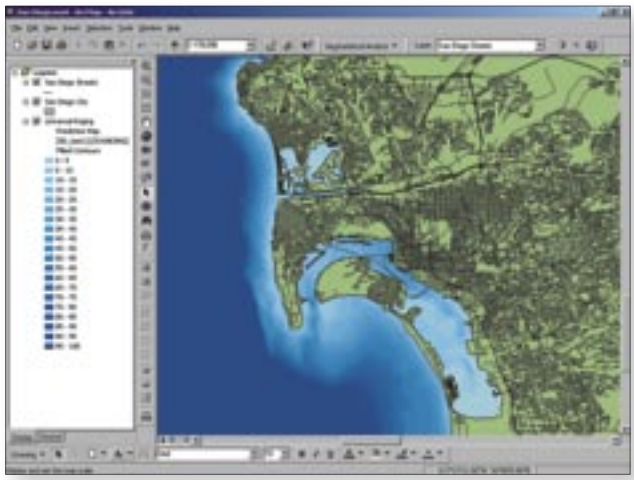


*Assess potential migration patterns.*
Credit: USDA

## ArcGIS Geostatistical Analyst Can Help Solve Complex Real-World Problems in Many Industries.

ArcGIS Geostatistical Analyst provides a cost-effective, logical solution for analyzing a variety of datasets that would otherwise cost an enormous amount of time and money to accomplish. From identifying variation in natural phenomena to assessing possible environmental risks, ArcGIS Geostatistical Analyst gives anyone with spatial data measurements the freedom to investigate, visualize, and create surfaces for advanced spatial analysis. Some of the fields that benefit from ArcGIS Geostatistical Analyst include

- Agriculture production
- Archaeology
- Environmental protection
- Exploration geology
- Forestry
- Health care
- Hydrology
- Meteorology
- Mining
- Real estate



*Examine water depths.*
Credit: NOAA

*"The inclusion of more spatial interpolative methods in ArcGIS is a huge feature. Now, to do powerful interpolations of data trends, ArcGIS users no longer have to deal with the preprocessing of data for export to another application."*

Daniel M. Petrecca
Senior Staff Hydrogeologist/GIS Specialist
Langan Engineering and Environmental Services, Inc.

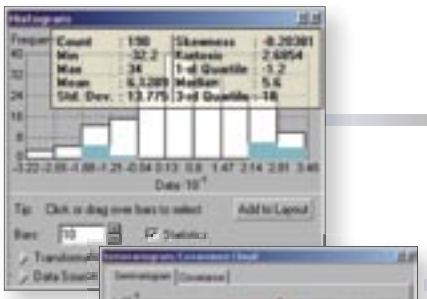
California data on cover courtesy of California Environmental Protection Agency Air Resources Board

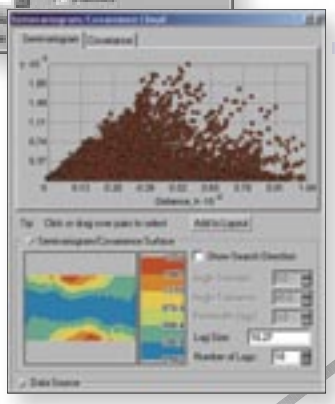
# Exploratory Spatial Data Analysis

ArcGIS Geostatistical Analyst provides exploratory spatial data analysis (ESDA) tools that help you better visualize and analyze your data using statistical methods. The ESDA environment consists of a series of tools, each allowing a view into the data. Each view is interconnected with all other views as well as with the ArcGIS ArcMap™ application. In addition, each view can be manipulated and explored, allowing different insights into the data such as the distribution of the data, global and local outliers, global trends, spatial autocorrelation, and covariation among multiple datasets.

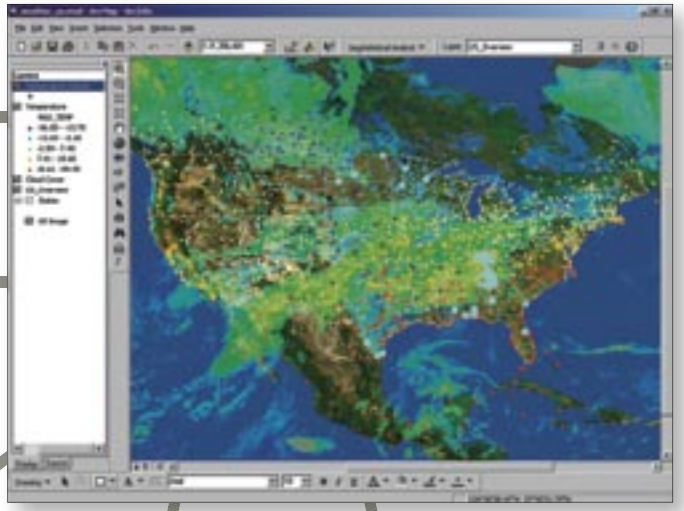
ESDA enables you to gain a deeper understanding of the phenomena you are investigating so you can make better decisions on issues related to your data.

*Examine distribution statistics.*



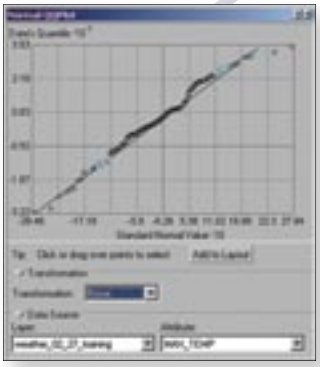


*Analyze spatial data distribution.*

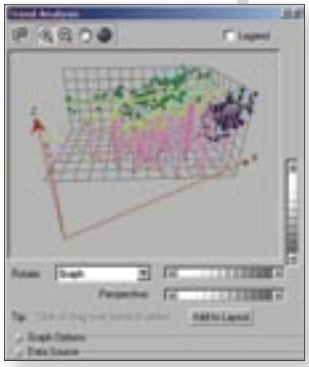


Credit: DTN

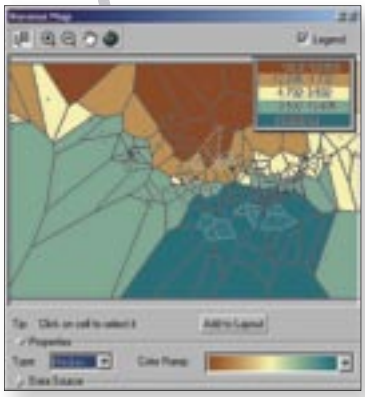
**Maximum Temperature Measurements**



*Compare data distributions.*



*Identify global trends.*

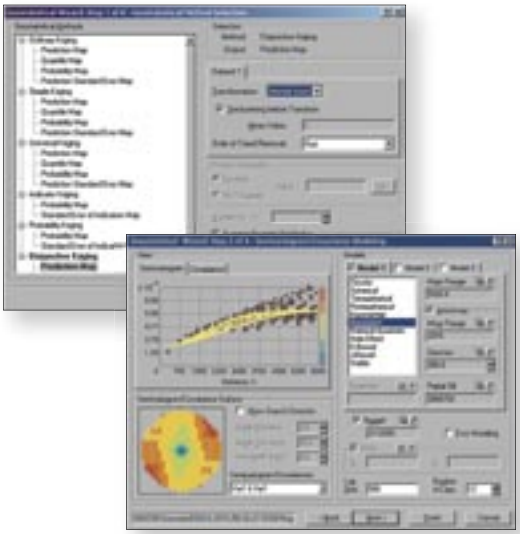


*Examine local data variability.*

**All of the ESDA graphs are dynamically linked to each other and the map.**

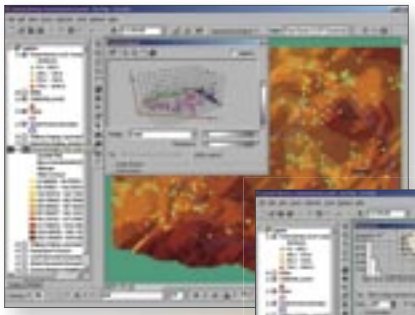
# Advanced Surface Creation with a Wizard Interface

ArcGIS Geostatistical Analyst provides you with a variety of interpolation methods for the creation of an optimal interpolated surface from your data. A friendly wizard helps you through the interpolation process. There are two main groupings of interpolation techniques: deterministic and geostatistical. Deterministic interpolation techniques are used for creating surfaces from measured points based on either the extent of similarity (e.g., inverse distance weighted) or the degree of smoothing (e.g., radial basis functions). Geostatistical interpolation techniques are based on statistics and are used for more advanced prediction surface modeling, which also includes error or uncertainty of predictions.

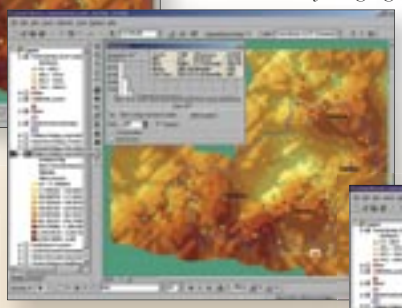


## Geostatistical

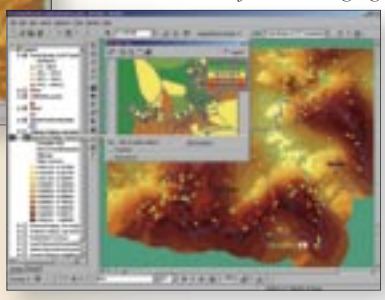
*Universal Kriging*



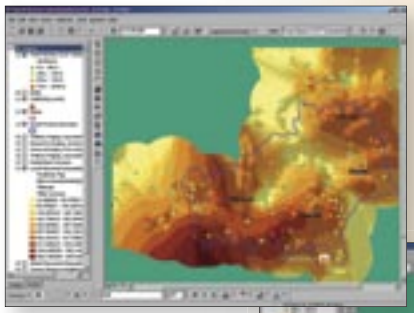
*Ordinary Kriging*



*Disjunctive Kriging*



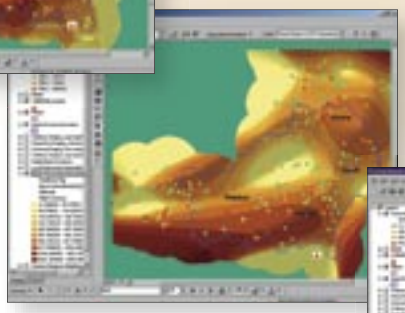
## Deterministic



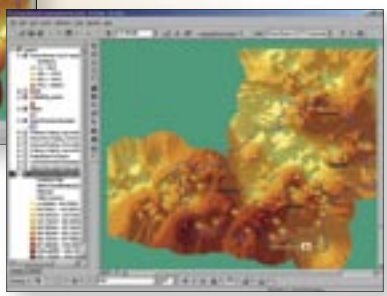
*Local Polynomial*

**Likelihood of Environmental Contamination**

Credit: BELRAD



*Global Polynomial*

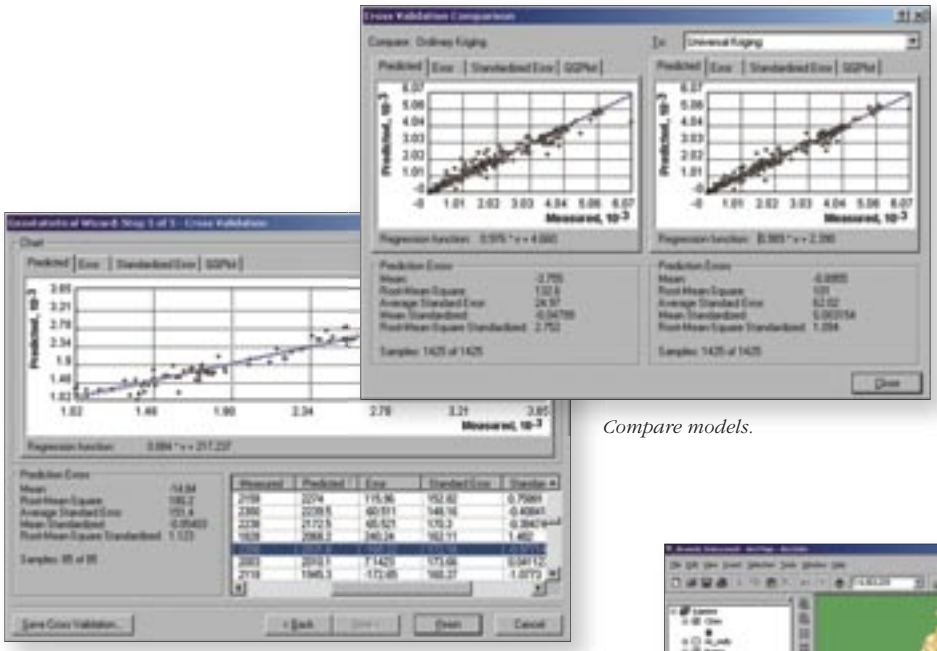


*Inverse Distance Weighted*

*"Using ArcGIS Geostatistical Analyst, I can refine the kriging equations and examine the effects of different parameters on the output surfaces. The ability to directly compare various output surfaces using semivariance/covariance graphs, predicted vs. measured, and Q-Q is invaluable. The many tools in ArcGIS Geostatistical Analyst allow me to determine which surface is the best interpolation of the data."*

Terri Arnold
Cartographer, GIS Specialist

# Diagnostics and Comparison of Prediction Models

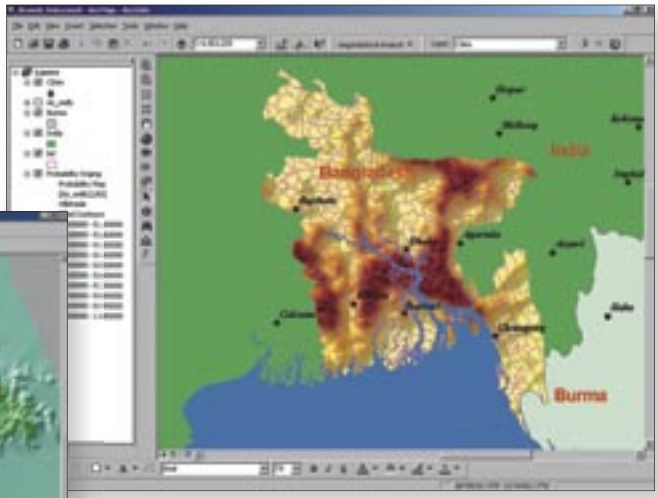


*Compare models.*

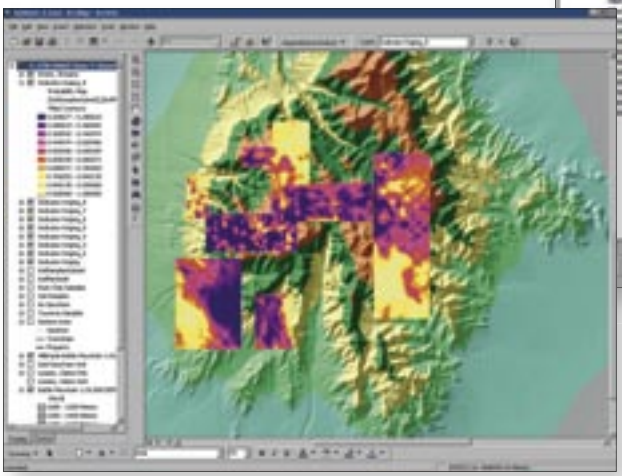
*Validate your predictions.*

In addition to maps of prediction uncertainties, ArcGIS Geostatistical Analyst provides validation and cross-validation tools that allow you to evaluate the model and predictions. The tools quantify the accuracy of the model; you can either accept the model and its parameters or you can change the model and refine the parameters to create a better surface.

You can also compare models after the surface is created to ensure the optimal model was chosen.




*Investigate the severity of aquifer contamination.*
Credit: BGS



*Locate mineral deposits.*

**For more information, visit ESRI's Web site at**
www.esri.com/geostatisticalanalyst.

**Credits**

| | |
|---|---|
| BELRAD | Radioceasium forest berry contamination data was provided by the Institute of Radiation Safety (BELRAD), Minsk, Belarus. |
| BGS | The Bangladesh water contamination data was provided by the Bristish Geological Survey and the Department of Public Health Engineering (Bangladesh), undertaking a project funded by the UK Department for International Development (DFID). |
| CEPA | Air quality data was provided by the California Environmental Protection Agency Air Resources Board. |
| DTN | Weather data was provided by DTN Weather Services LLC. |
| ISEU | Radioceasium soil contamination data was provided by the International Sakharov Environmental University, Minsk, Belarus. |
| MSHCP | Bird location data was provided by the Western Riverside County MSHCP. |
| NOAA | Bathymetric data was provided by the National Oceanic and Atmospheric Administration. |
| U of I | Agriculture data was provided by the University of Illinois. |
| USDA | Carpathian Mountains data was provided by the USDA Forest Service, Riverside, California. |

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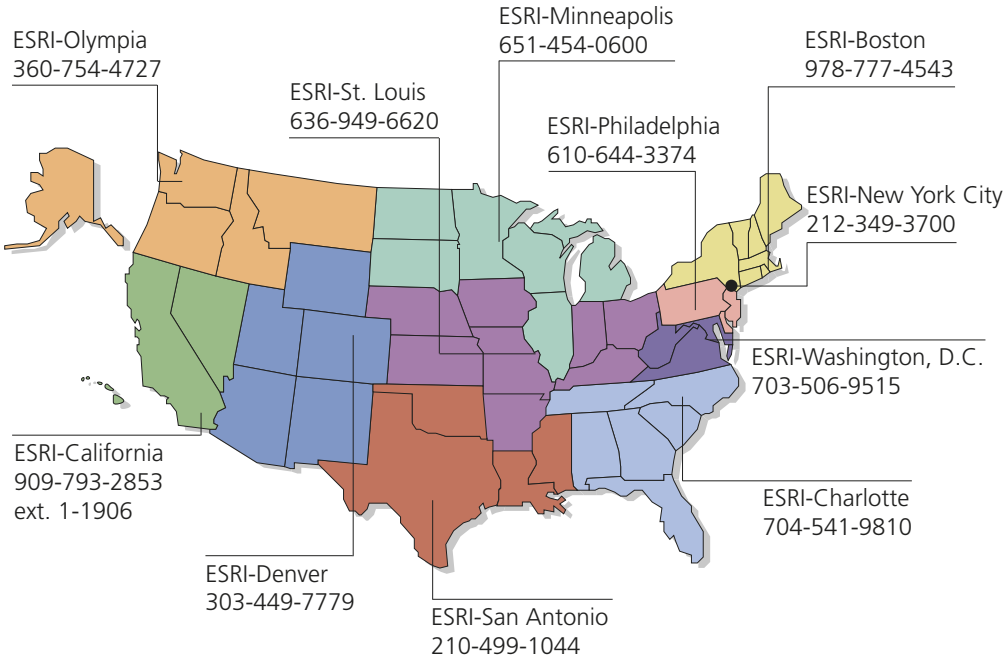


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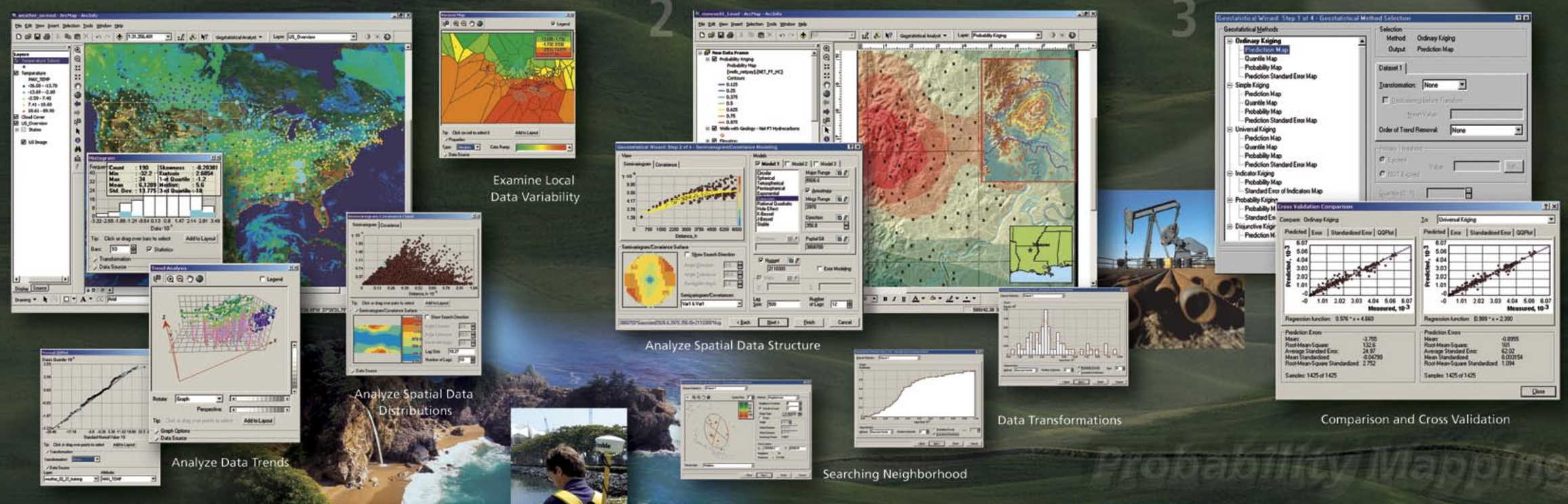


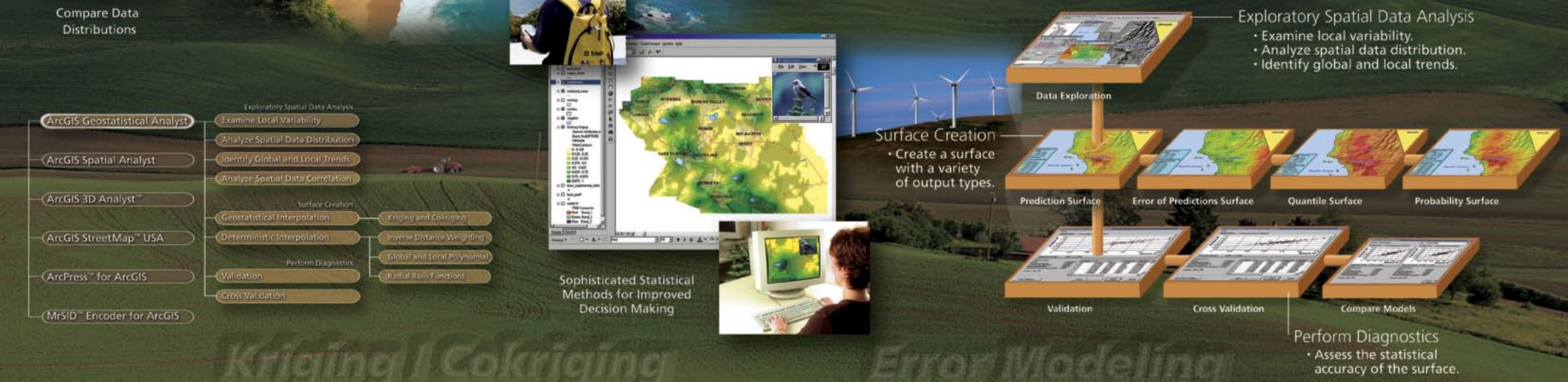


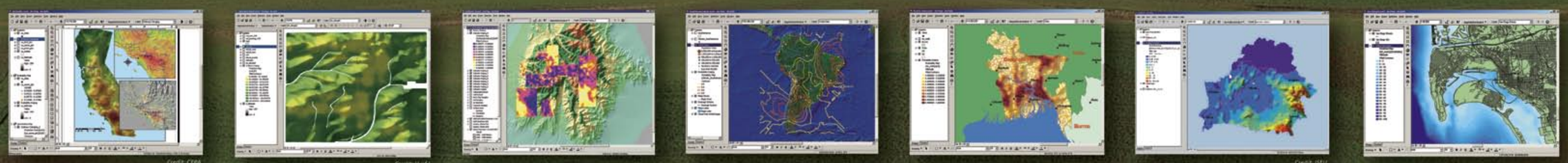

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## ArcGIS Geostatistical Analyst

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