

# STAUTO

## Spatio-Temporal Autocorrelation Analysis Program


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STAUTO is a program written in Turbo Pascal that calculates spatio-temporal autocorrelations and partial autocorrelations for data in a regular spatial lattice. Approximate (asymptotic) standard-normal (z) statistics for significance tests are produced as well. Relevant publications are given at the end of this document.

The program was originally written by **K. M. Reynolds** (U.S. Forest Service) and **L. V. Madden** (Ohio State University, USA) to run under DOS (in the late 1980s). **Laetitia Willocquet** (INRA, France) revised the program (in 2003) to run under Windows. Output is displayed on the monitor and is stored in a file (specified by the user) for later viewing or printing.

### Running the program:

Go to the directory (folder) with the program and data files, and simply run STAUTOv4 (e.g., double-clicking on STAUTOv4.EXE  when using Windows Explorer). One can set this up with a short-cut key for the Desktop (not done automatically).

You will be prompted for the name of the data file. An example (with 15 rows, 5 columns, and 9 times) is in EXAMPL.DAT. It is easiest if the data file is in the same directory as the program (then, you do not have to specify the full directory path).

**Format of data file:** *a stacked matrix of data points for each time.* For example, if the field lattice was a 6x7 rectangle of sampling units, where data were collected at five times, there would be 6\*5=30 rows of data, with seven values on each row. The first six rows (with seven data points per row) would hold the data for the first time; the next six rows (with seven points per row) would hold the data for the second time; and so on. There are no blank rows, and no labels for the row, column, or time. There can be no missing data.

Current limitation: *20 rows, 20 columns, and 20 times.*

You will be prompted for several pieces of information. There are defaults for all options, but you will *definitely need to specify the correct number of rows, columns, and times.* These choices stay in effect for multiple runs of the program. You might allow the default choices for other options, at least initially.

You can specify a **Title** for the data set and analysis.

Other key options:

**Proximity pattern:**

Rook:	down and across row comparison (simultaneously)
Bishop:	diagonal comparison
Queen:	down, across, and diagonal
Square:	Queen + filling in around (see Reynolds & Madden, 1988)
X:	across rows
Y:	down rows

**Spatial lag order:**

Number up to 7 (but program may not allow choice, if too large, relative to size of lattice).

**Temporal lag order:**

Number up to 5 (but could be less, depending on data size). *If one choses 0 for the temporal lag order, a purely spatial analysis at EACH time is obtained.*

**Asymptotic limit to data:**

Largest possible value in each sampling unit (say, for # diseased plants). Used in some transformations (e.g., logit).

**Weight selection:**

- 1) binary (standard default);
- 2) inverse lag order;
- 3) square of inverse lag
- 4) User supplied (somewhat experimental; some choices could cause a crash)  
(if #4, will be prompted later for values; one number for each spatial lag  
{starting at lag 0})

**Transformation selector:**

- 0) none
- 1) logistic (with asymptotic value for upper limit)
- 2) monomolecular
- 3) angular (arcsine, square-root)
- 4) natural log
- 5) square
- 6) square-root

**Flag for barrier effects** [False (0) or True (1)]

If true, you will be prompted after first menu for the barrier values (these are real values,  $\leq 1$ . All values do not work (some could cause program to *crash*). *One value for each column of data.*

**Flag for temporal differencing** (False or True)

**Flag for spatial differencing** (False or True)

**Original references:**

Reynolds, K. M., and L. V. Madden. 1988. Analysis of epidemics using spatio-temporal autocorrelation. *Phytopathology* 78:240-246.

Reynolds, K. M., L. V. Madden, and M. A. Ellis. 1988. Spatio-temporal analysis of epidemic development of leather rot of strawberry. *Phytopathology* 78:246-252.

Other articles have used the program since then.

**Disclaimer:**

*This program is made available for the convenience of the user. We make no guarantee that the output is correct in all cases.*