World Organisation for Animal Health

GF-TADs Foot and Mouth Disease Risk Assessment Training Workshop

19 - 21 September 2023 Johannesburg, South Africa

agriculture, land reform & rural development

Department:
Agriculture, Land Reform and Rural Development
REPUBLIC OF SOUTH AFRICA

BMZ Federal Ministry for Economic Cooperation and Development

Spatial cluster determination and evaluation of clusters

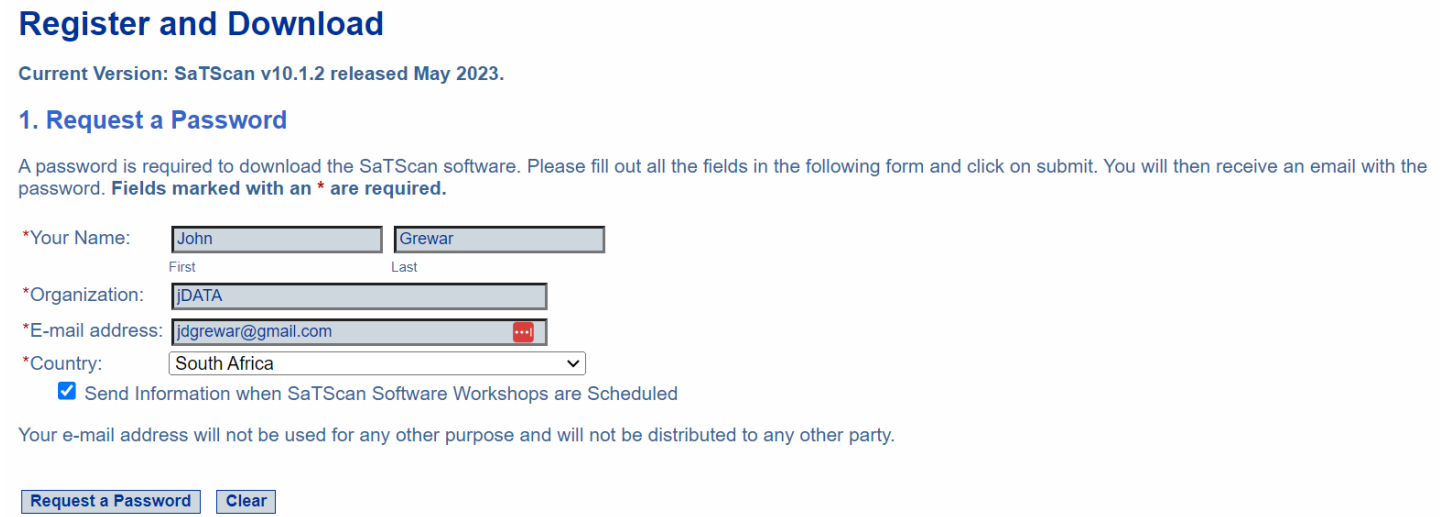
Practical

SaTScan™

Software for the spatial, temporal, and space-time scan statistics

Download and Install

- https://www.satscan.org/
- https://www.satscan.org/download.html



Register and Download

Current Version: SaTScan v10.1.2 released May 2023.

1. Request a Password

A password is required to download the SaTScan software. Please fill out all the fields in the following form and click on submit. You will then receive an email with the password. **Fields marked with an * are required.**

*Your Name: John (First) Grewar (Last)

*Organization: jDATA

*E-mail address: jdgrewar@gmail.com

*Country: South Africa

Send Information when SaTScan Software Workshops are Scheduled

Your e-mail address will not be used for any other purpose and will not be distributed to any other party.

Request a Password | Clear

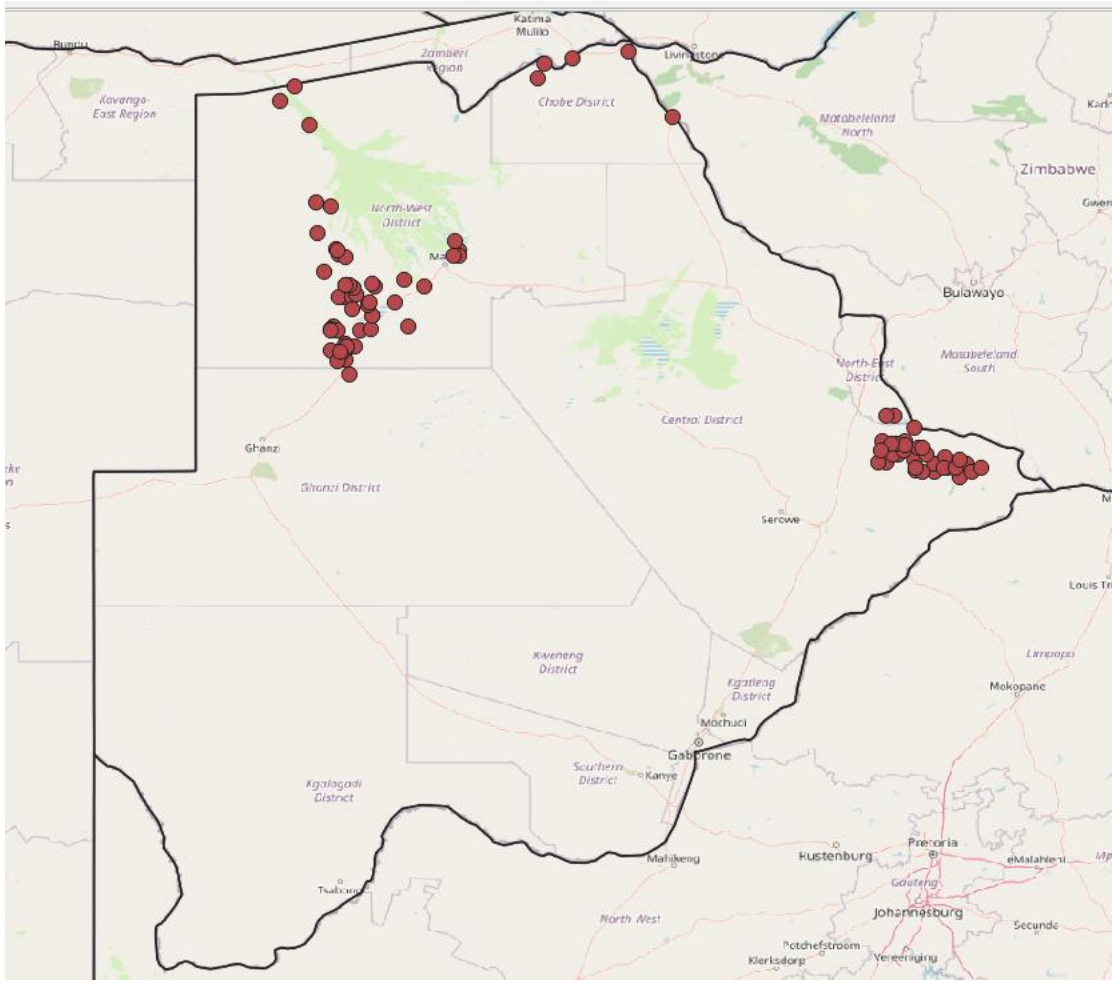
Download and follow the prompts

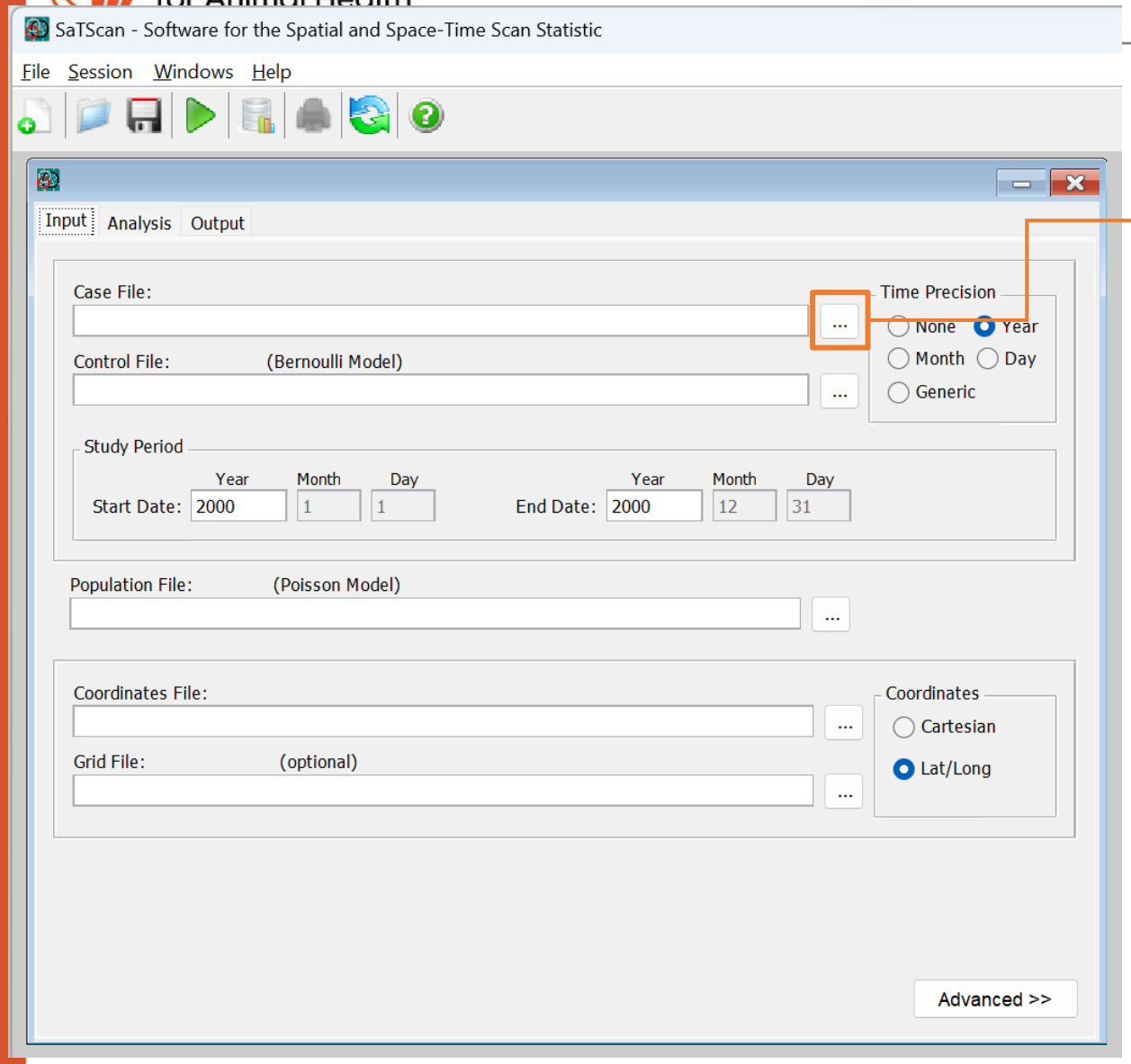
SaTScan - Basics

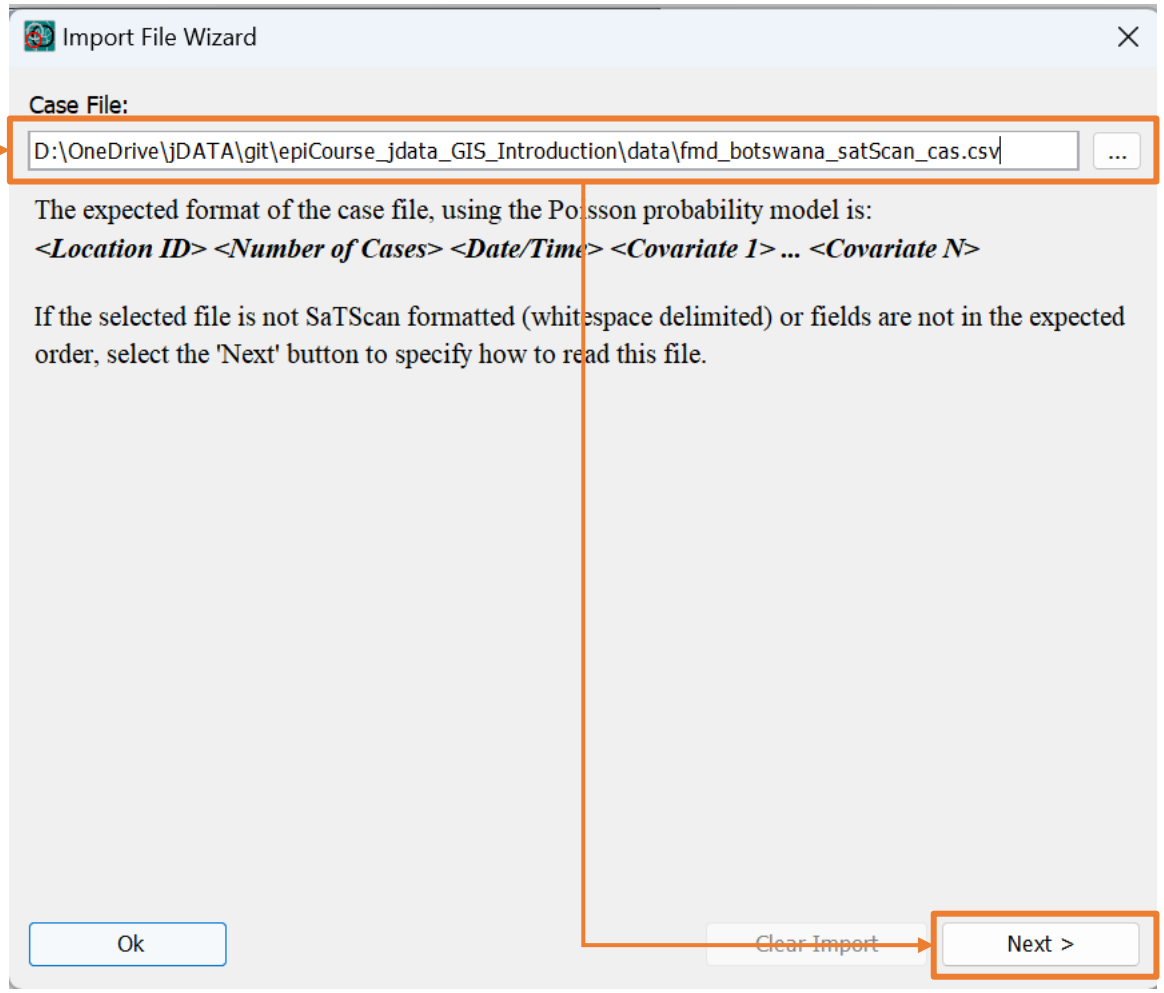
- Poisson-based model
  - where the number of events in a geographical area is Poisson-distributed, according to a known underlying population at risk
- Bernoulli model
  - with 0/1 event data such as cases and controls
- space-time permutation model
  - using only case data
- an ordinal model
  - for ordered categorical data
- exponential model
  - survival time data with or without censored variables
- normal model
  - for other types of continuous data

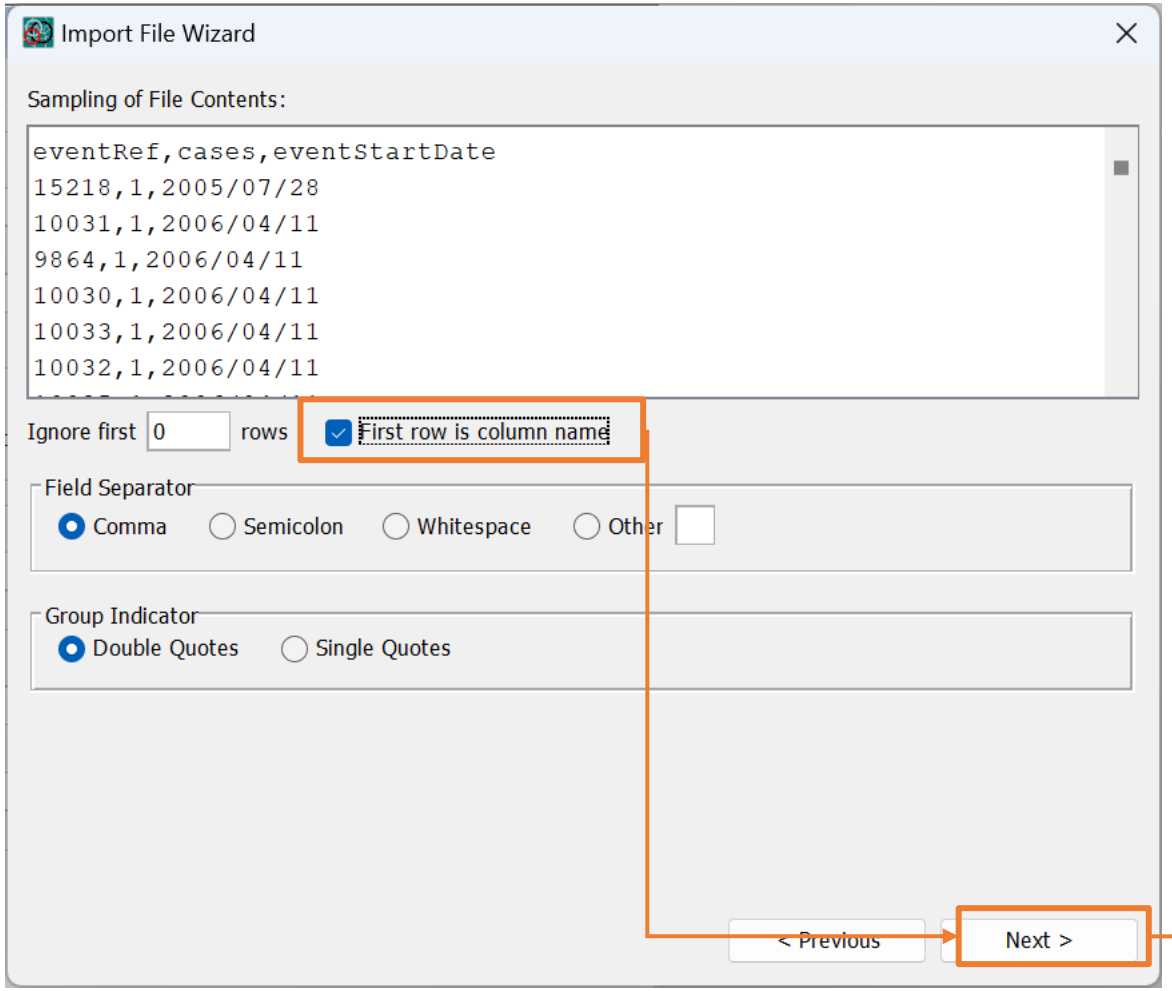
Example – FMD outbreaks reported to WOAH - Botswana

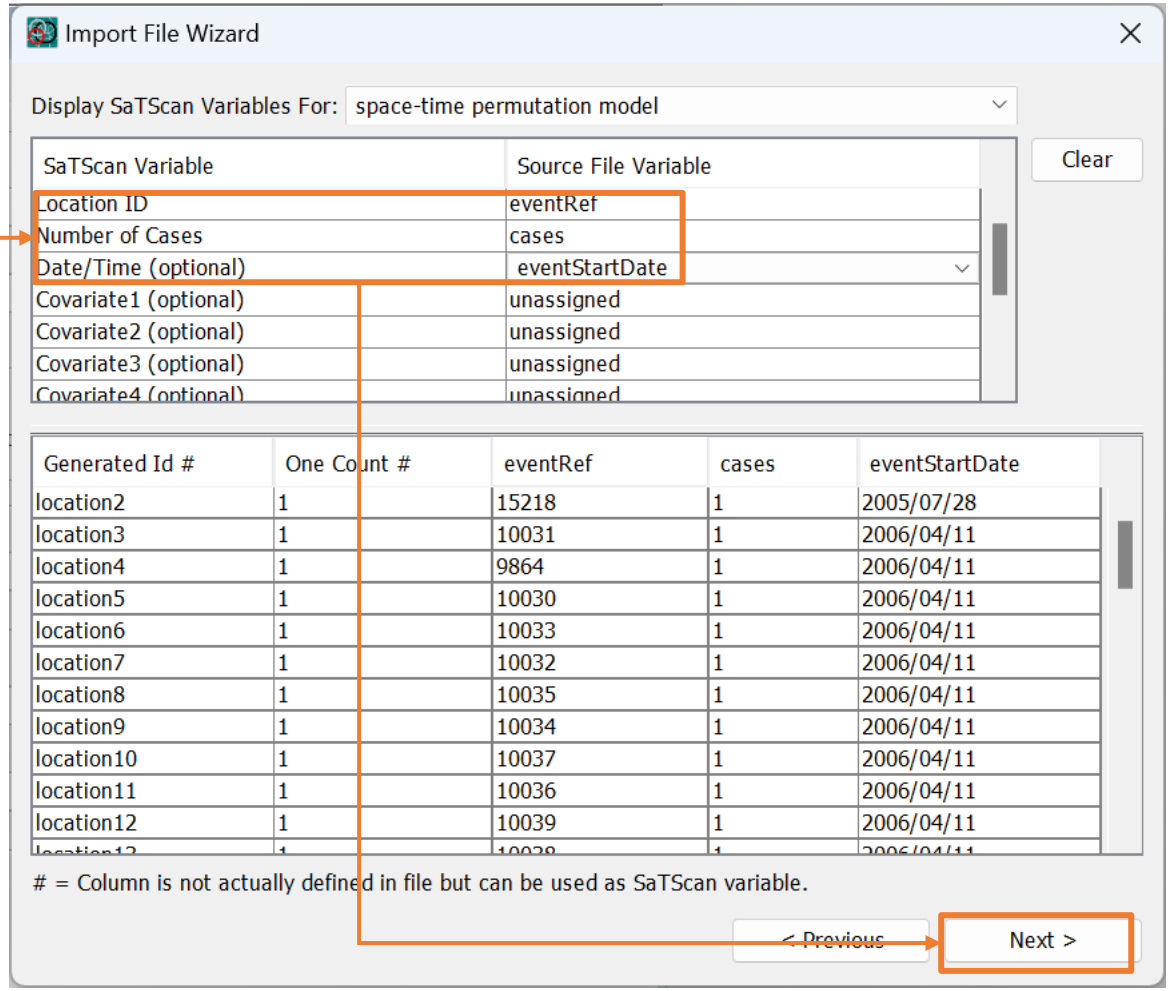
- 2005 – 2020
- Cattle only
- Each outbreak location per line of data
- Case totals not included – evaluation of clusters at outbreak level
- Case only data – space-time permutation model

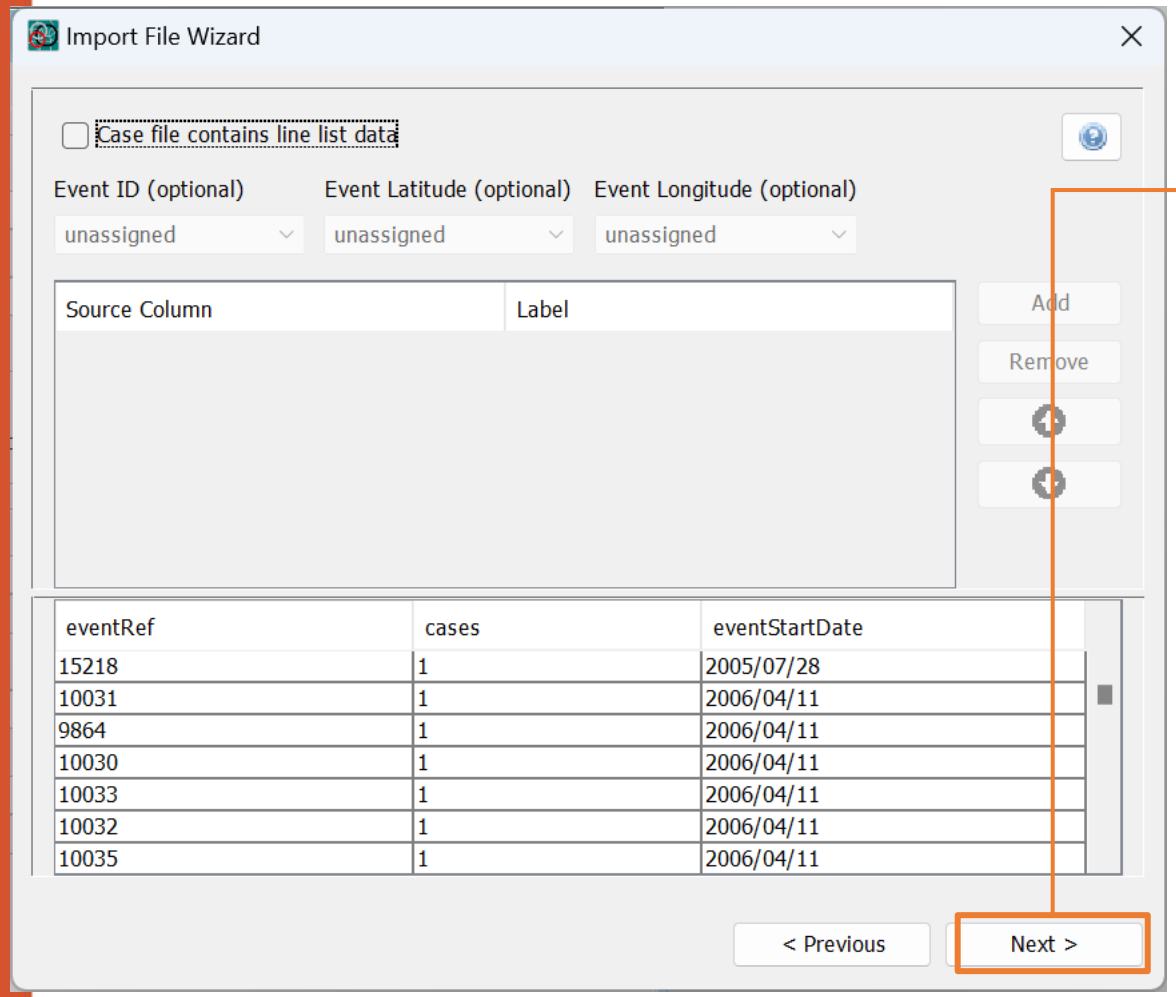


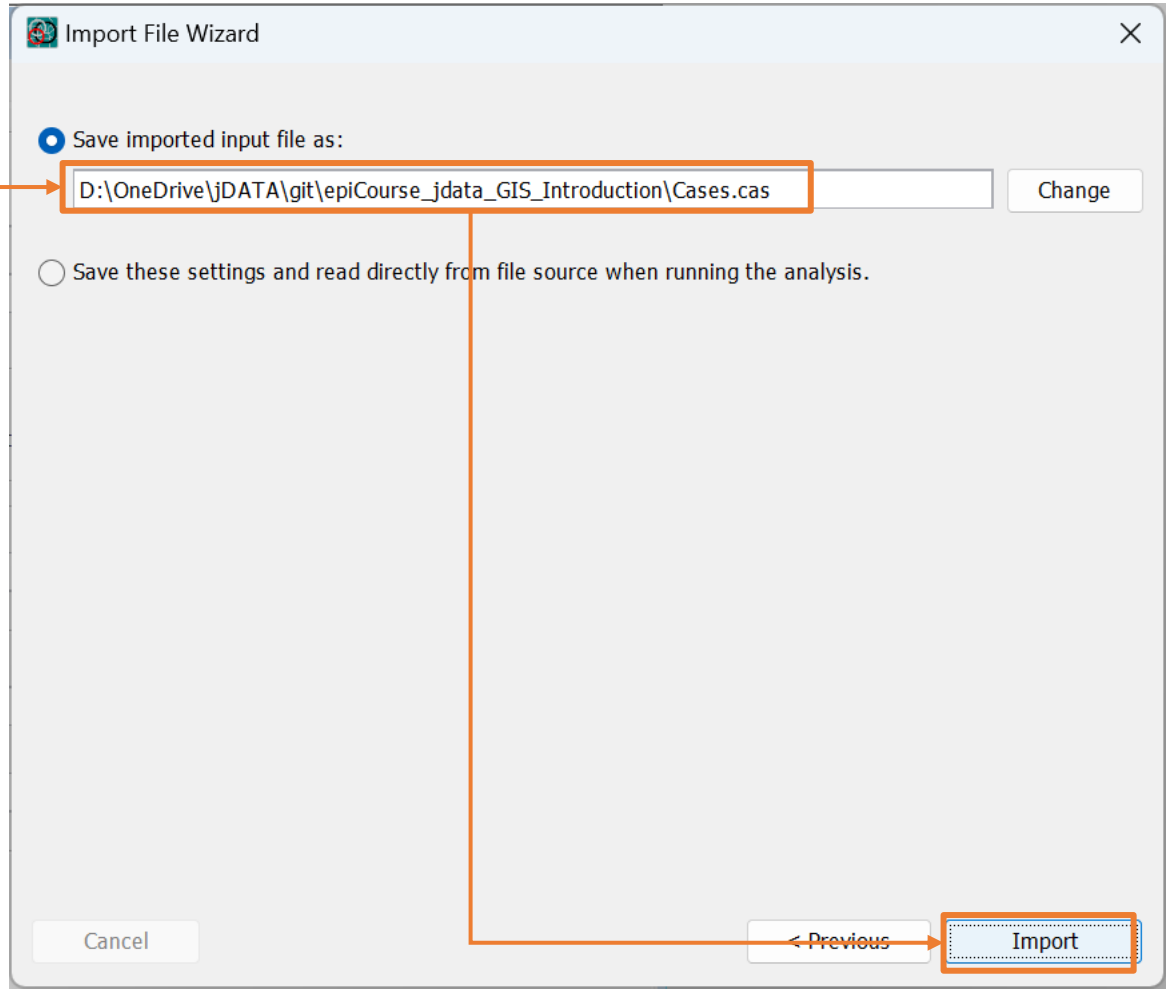

SaTScan - Software for the Spatial and Space-Time Scan Statistic
File Session Windows Help
Input Analysis Output
Case File:
Control File: (Bernoulli Model)
Time Precision
None Year
Month Day
Generic
Study Period
Year Month Day
Start Date: 2000 1 1
End Date: 2000 12 31
Population File: (Poisson Model)
Coordinates File:
Grid File: (optional)
Coordinates
Cartesian
Lat/Long
Advanced >>

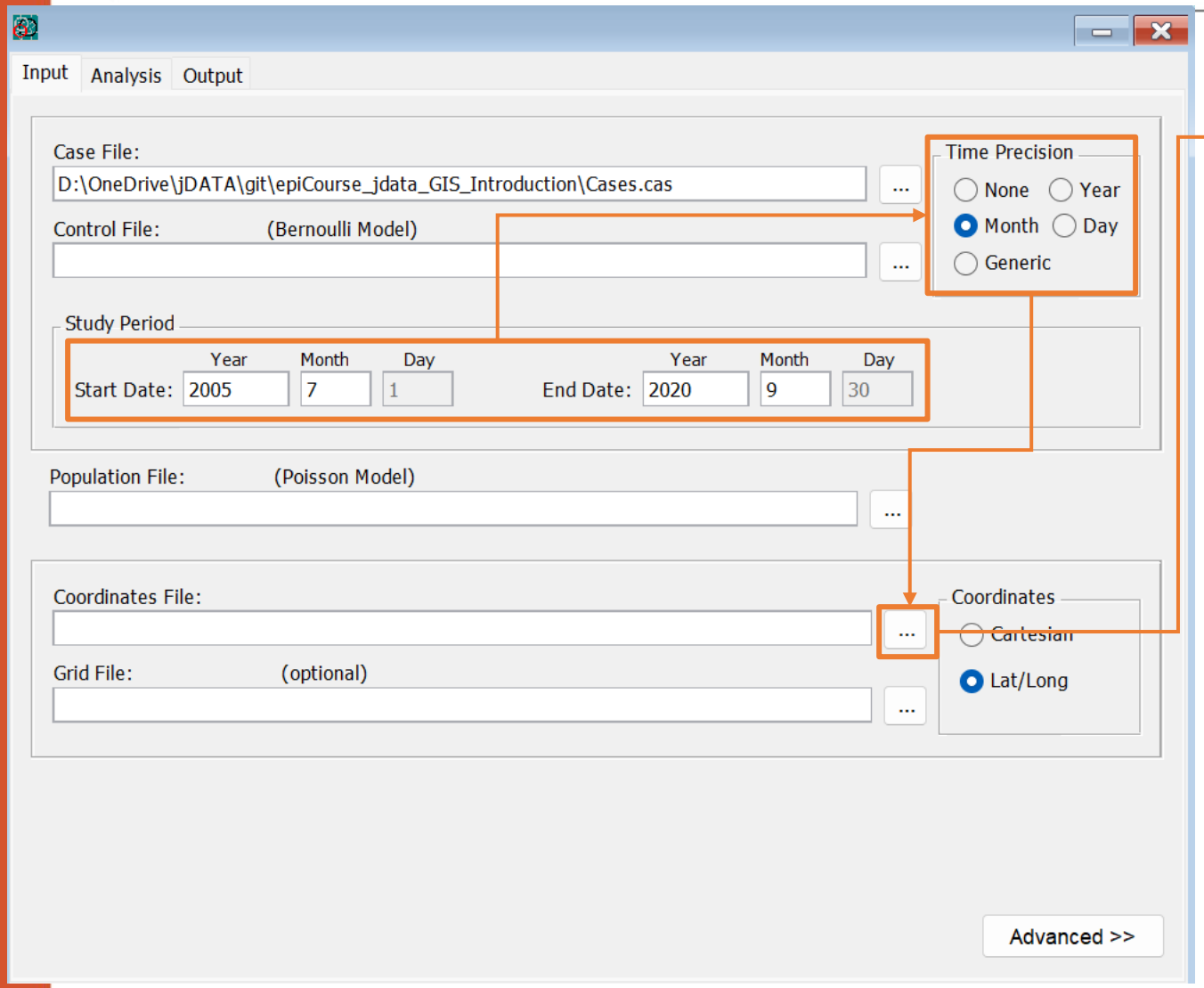

Import File Wizard
Case File:
D:\OneDrive\jDATA\git\epiCourse_jdata_GIS_Introduction\data\fmd_botswana_satScan_cas.csv
The expected format of the case file, using the Poisson probability model is:
<Location ID> <Number of Cases> <Date/Time> <Covariate 1> ... <Covariate N>
If the selected file is not SaTScan formatted (whitespace delimited) or fields are not in the expected order, select the 'Next' button to specify how to read this file.
Ok
Clear Import
Next >

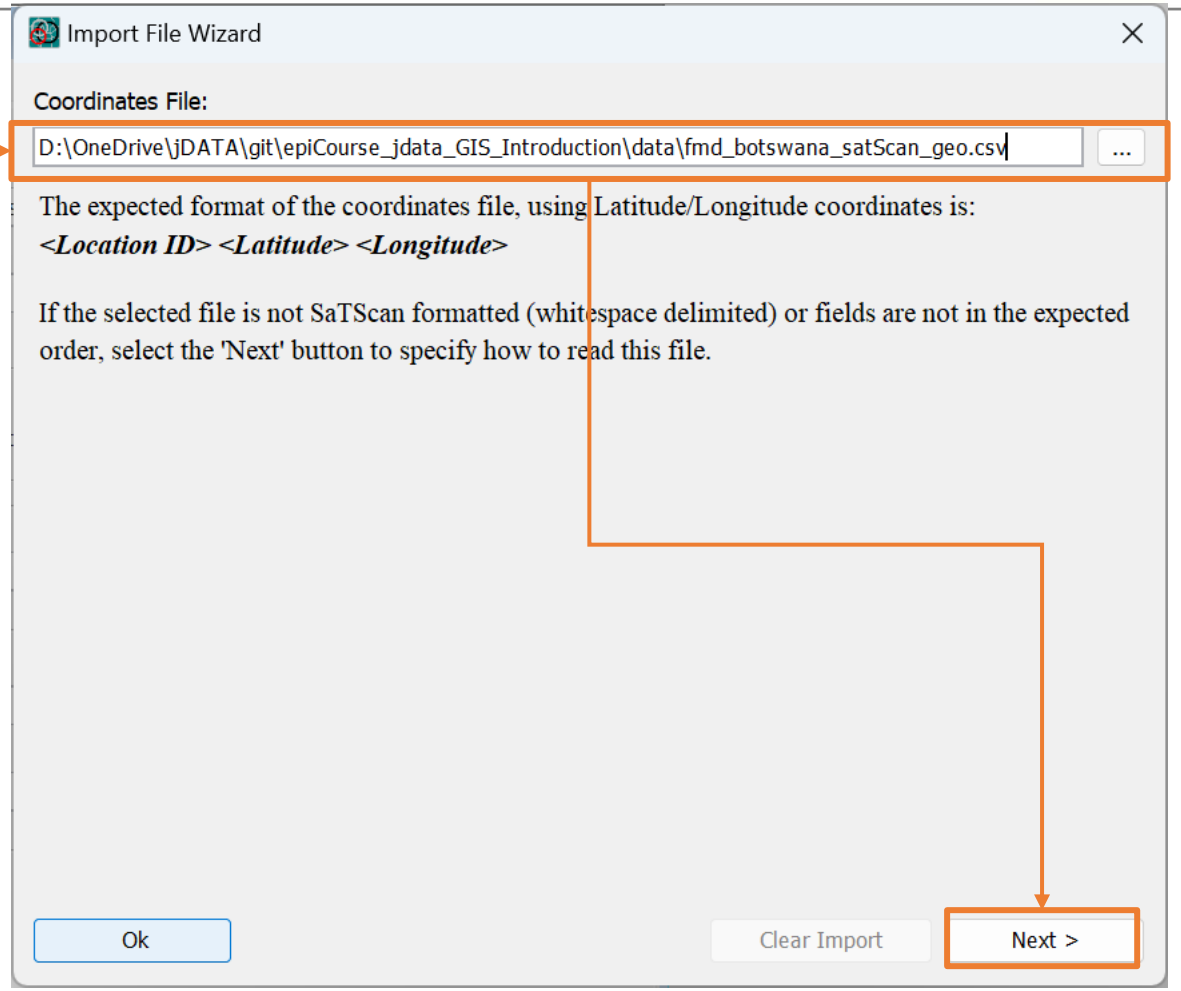

Import File Wizard
Sampling of File Contents:
eventRef,cases,eventStartDate
15218,1,2005/07/28
10031,1,2006/04/11
9864,1,2006/04/11
10030,1,2006/04/11
10033,1,2006/04/11
10032,1,2006/04/11
Ignore first 0 rows
First row is column name
Field Separator
Comma
Semicolon
Whitespace
Other
Group Indicator
Double Quotes
Single Quotes
< Previous
Next >

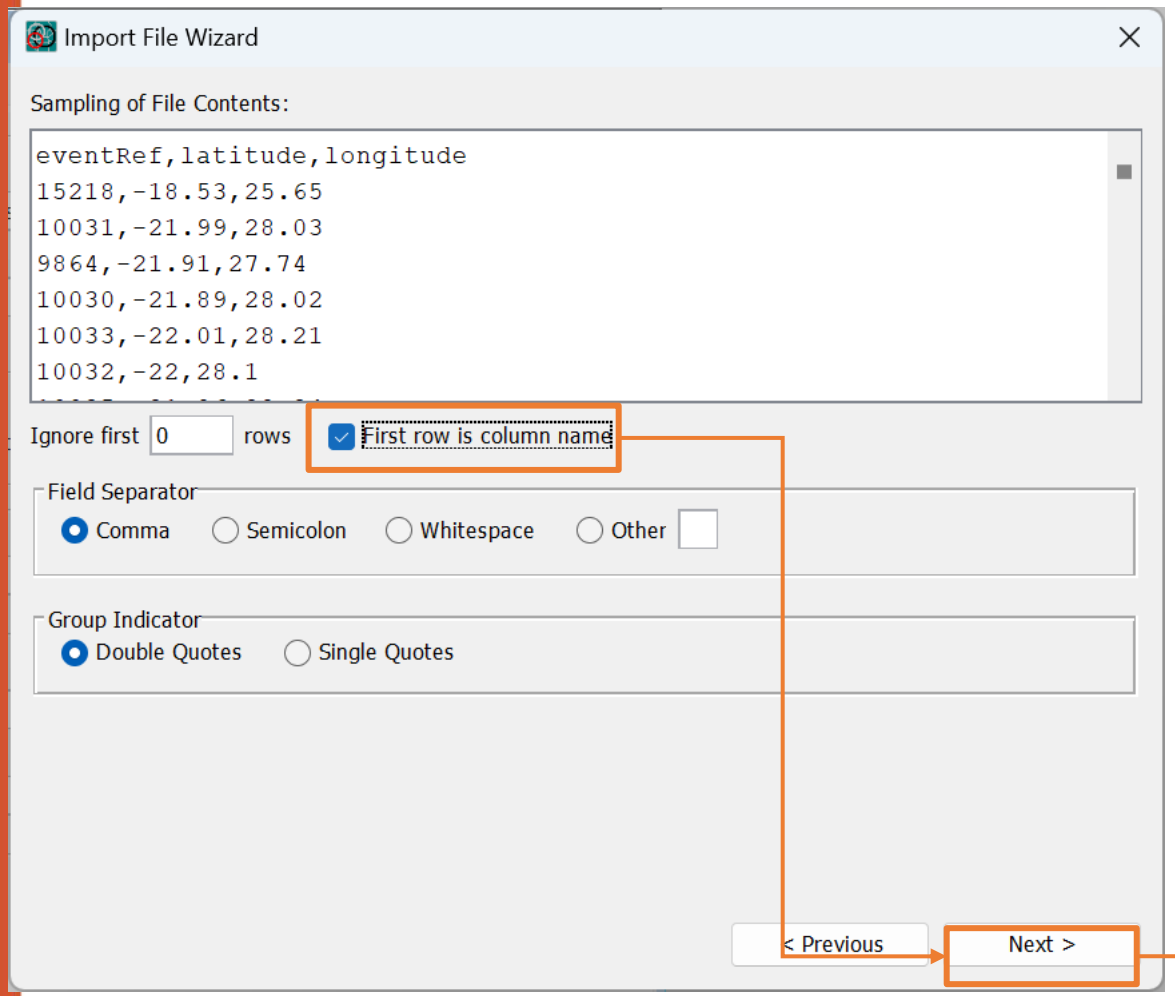

Import File Wizard
Display SaTScan Variables For: space-time permutation model
Clear
SaTScan Variable
Source File Variable
Location ID
eventRef
Number of Cases
cases
Date/Time (optional)
eventStartDate
Covariate1 (optional)
unassigned
Covariate2 (optional)
unassigned
Covariate3 (optional)
unassigned
Covariate4 (optional)
unassigned
Generated Id #
One Count #
eventRef
cases
eventStartDate
location2 1 15218 1 2005/07/28
location3 1 10031 1 2006/04/11
location4 1 9864 1 2006/04/11
location5 1 10030 1 2006/04/11
location6 1 10033 1 2006/04/11
location7 1 10032 1 2006/04/11
location8 1 10035 1 2006/04/11
location9 1 10034 1 2006/04/11
location10 1 10037 1 2006/04/11
location11 1 10036 1 2006/04/11
location12 1 10039 1 2006/04/11
= Column is not actually defined in file but can be used as SaTScan variable.
< Previous
Next >

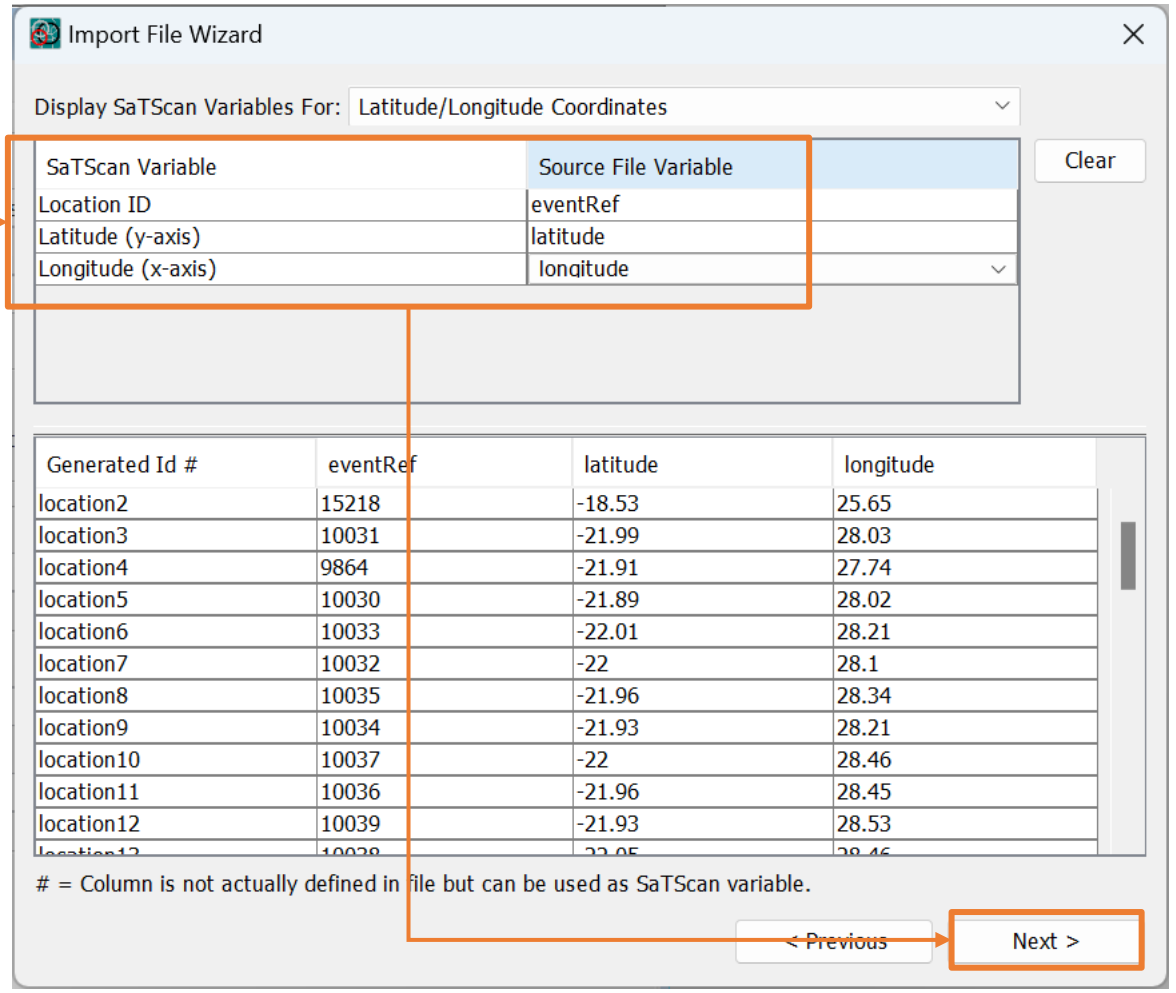

Import File Wizard
Case file contains line list data
Event ID (optional)
Event Latitude (optional)
Event Longitude (optional)
unassigned
unassigned
unassigned
Source Column
Label
Add
Remove
eventRef
cases
eventStartDate
15218 1 2005/07/28
10031 1 2006/04/11
9864 1 2006/04/11
10030 1 2006/04/11
10033 1 2006/04/11
10032 1 2006/04/11
10035 1 2006/04/11
< Previous
Next >

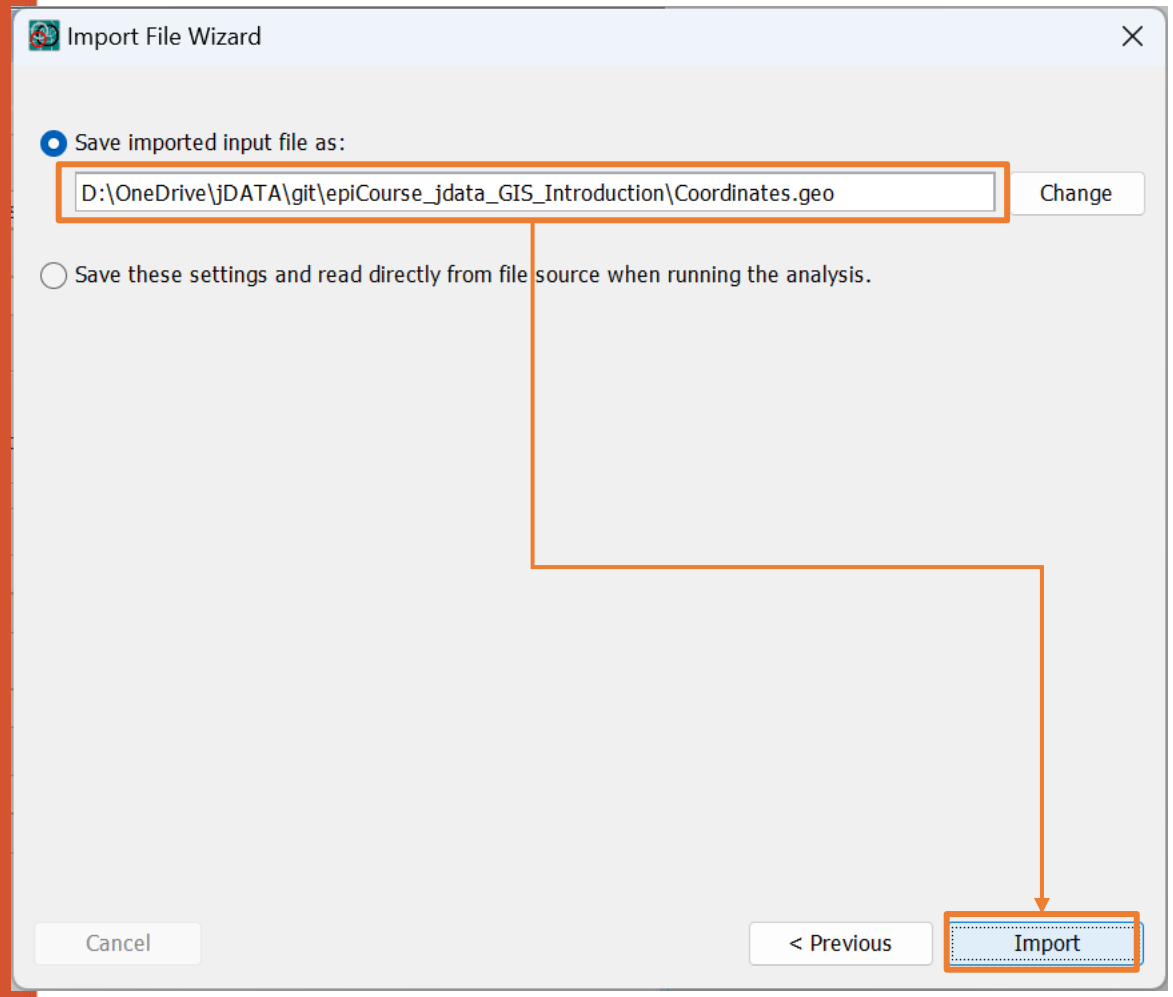

Import File Wizard
Save imported input file as:
D:\OneDrive\jDATA\git\epiCourse_jdata_GIS_Introduction\Cases.cas
Change
Save these settings and read directly from file source when running the analysis.
Cancel
< Previous
Import

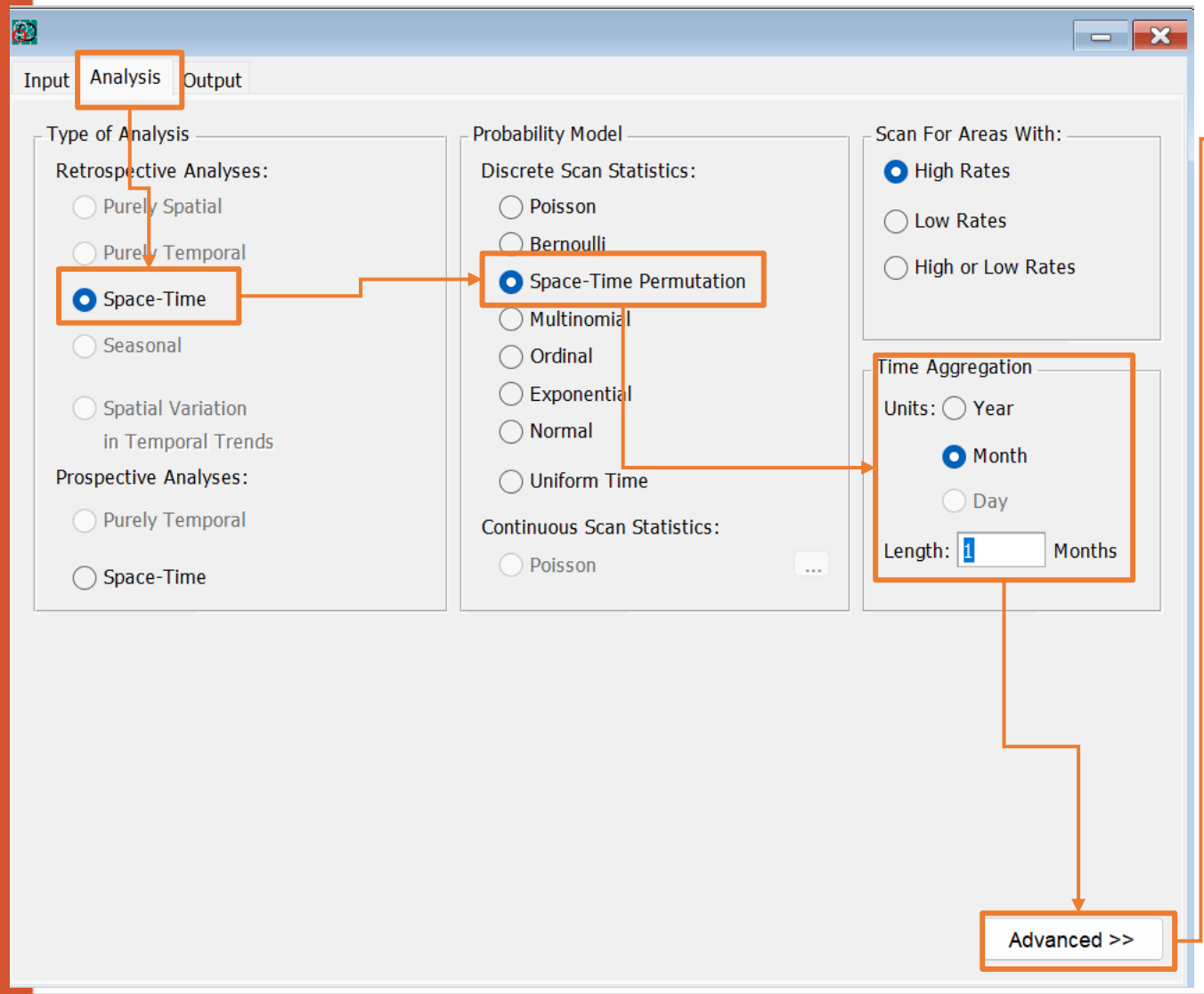

Input
Analysis
Output
Case File:
D:\OneDrive\jDATA\git\epiCourse_jdata_GIS_Introduction\Cases.cas
Control File: (Bernoulli Model)
Time Precision
None
Year
Month
Day
Generic
Study Period
Year
Month
Day
Start Date: 2005 7 1
End Date: 2020 9 30
Population File: (Poisson Model)
Coordinates File:
Coordinates
Cartesian
Lat/Long
Grid File: (optional)
Advanced >>

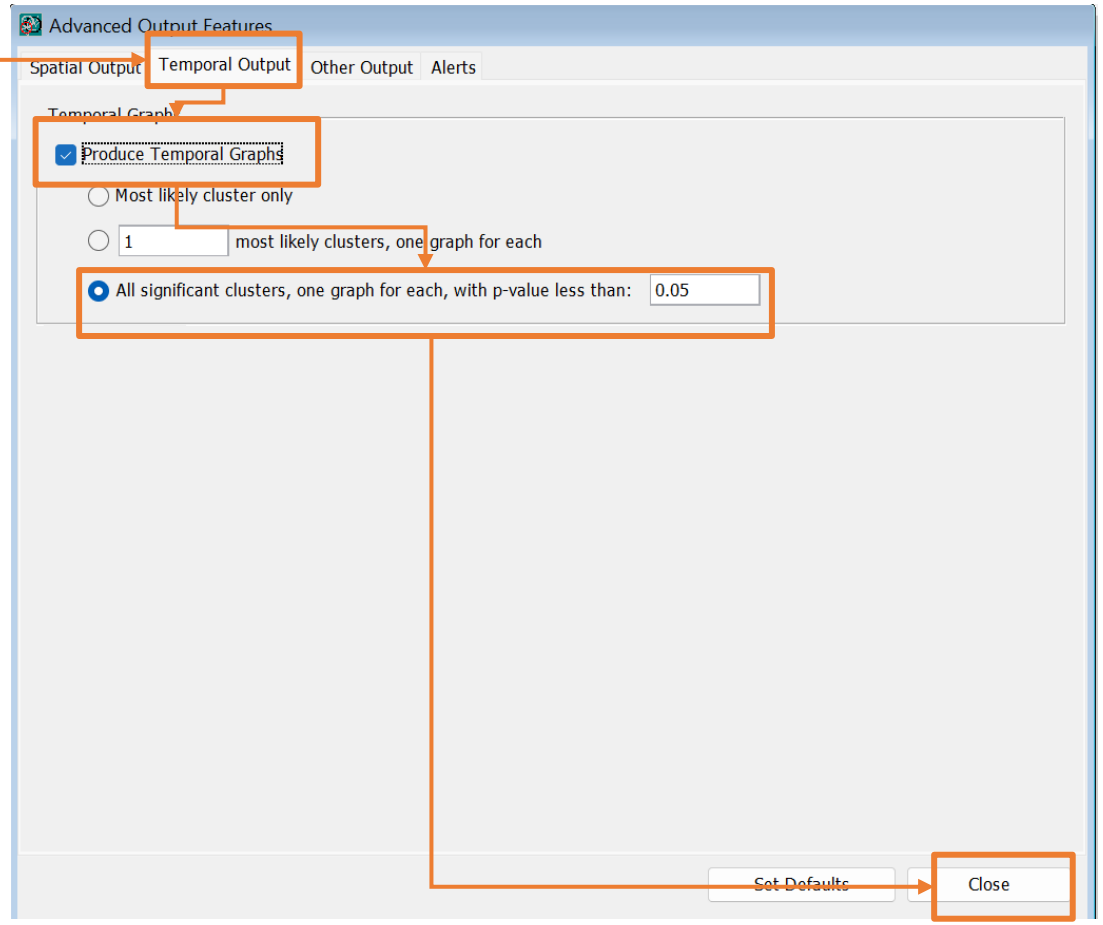

Import File Wizard
Coordinates File:
D:\OneDrive\jDATA\git\epiCourse_jdata_GIS_Introduction\data\fmd_botswana_satScan_geo.csv
The expected format of the coordinates file, using Latitude/Longitude coordinates is:
<Location ID> <Latitude> <Longitude>
If the selected file is not SaTScan formatted (whitespace delimited) or fields are not in the expected order, select the 'Next' button to specify how to read this file.
Ok
Clear Import
Next >

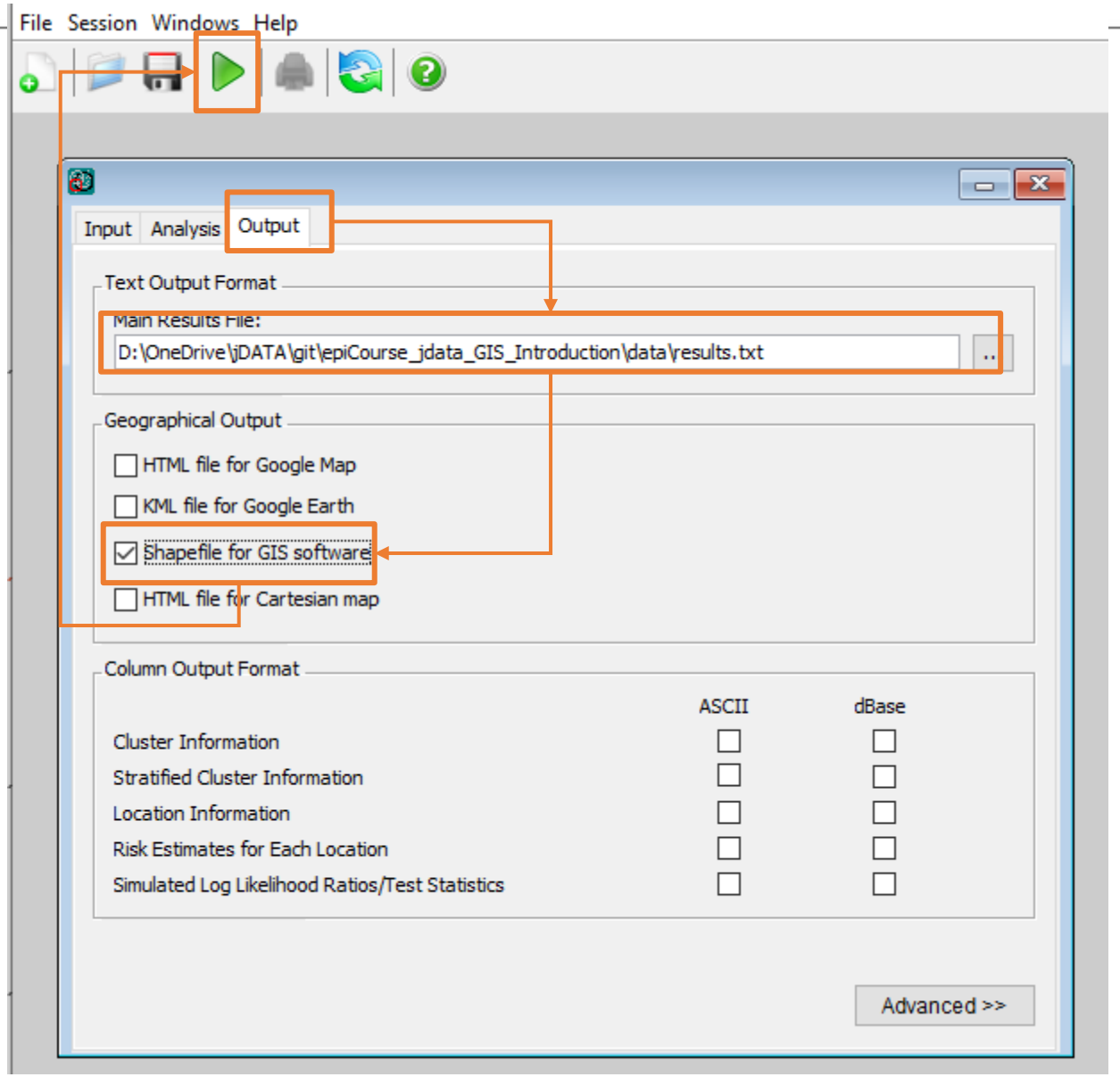

Import File Wizard
Sampling of File Contents:
eventRef,latitude,longitude
15218,-18.53,25.65
10031,-21.99,28.03
9864,-21.91,27.74
10030,-21.89,28.02
10033,-22.01,28.21
10032,-22,28.1
Ignore first 0 rows
First row is column name
Field Separator
Comma
Semicolon
Whitespace
Other
Group Indicator
Double Quotes
Single Quotes
< Previous
Next >


Import File Wizard
Display SaTScan Variables For: Latitude/Longitude Coordinates
SaTScan Variable
Source File Variable
Location ID
eventRef
Latitude (y-axis)
latitude
Longitude (x-axis)
longitude
Clear
Generated Id #
eventRef
latitude
longitude
location2 15218 -18.53 25.65
location3 10031 -21.99 28.03
location4 9864 -21.91 27.74
location5 10030 -21.89 28.02
location6 10033 -22.01 28.21
location7 10032 -22 28.1
location8 10035 -21.96 28.34
location9 10034 -21.93 28.21
location10 10037 -22 28.46
location11 10036 -21.96 28.45
location12 10039 -21.93 28.53
= Column is not actually defined in file but can be used as SaTScan variable.
< Previous
Next >

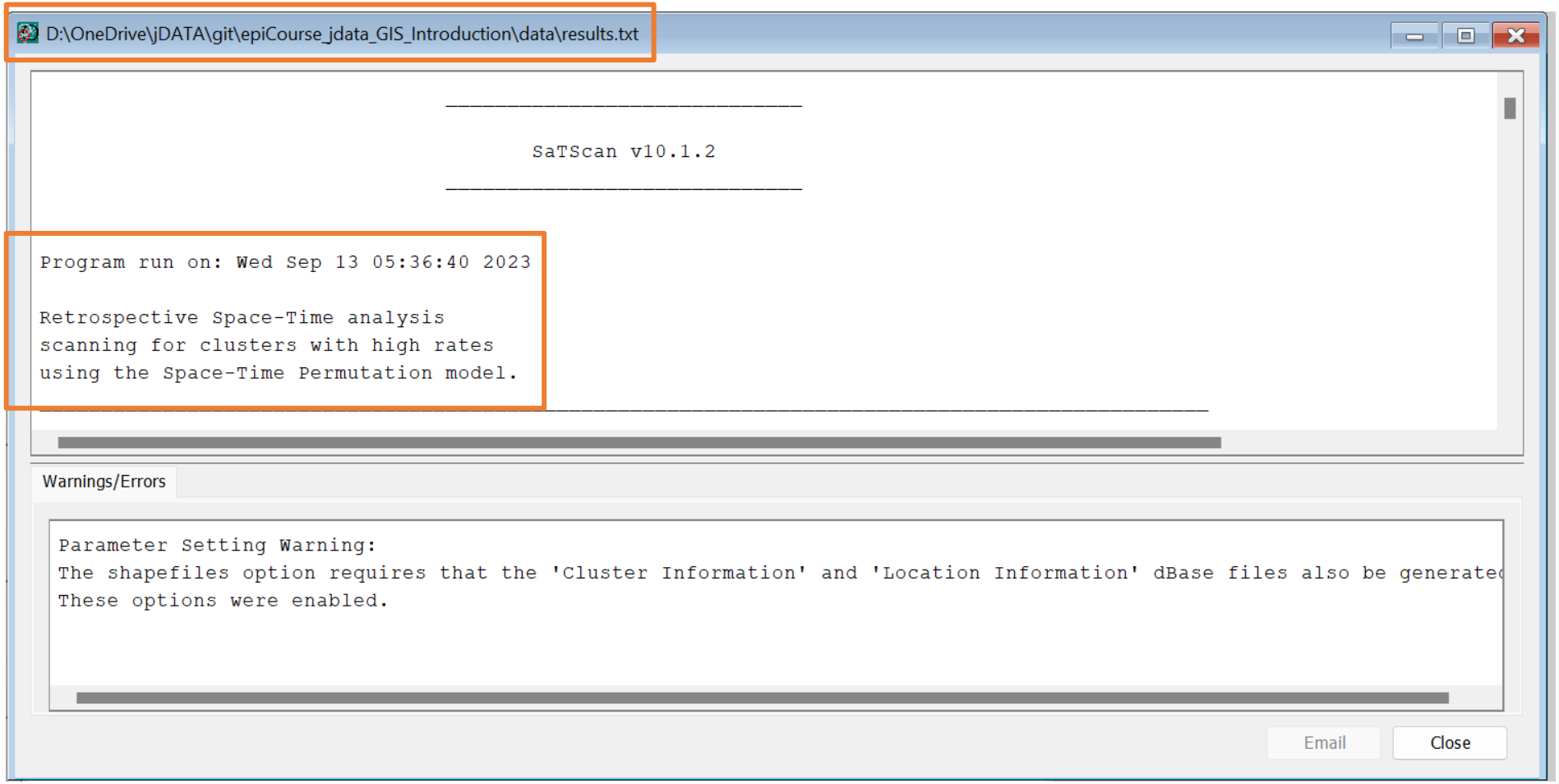

Import File Wizard
Save imported input file as:
D:\OneDrive\jDATA\git\epiCourse_jdata_GIS_Introduction\Coordinates.geo
Change
Save these settings and read directly from file source when running the analysis.
Cancel
< Previous
Import


Input
Analysis
Output
Type of Analysis
Retrospective Analyses:
Purely Spatial
Purely Temporal
Space-Time
Seasonal
Spatial Variation in Temporal Trends
Prospective Analyses:
Purely Temporal
Space-Time
Probability Model
Discrete Scan Statistics:
Poisson
Bernoulli
Space-Time Permutation
Multinomial
Ordinal
Exponential
Normal
Uniform Time
Continuous Scan Statistics:
Poisson
Scan For Areas With:
High Rates
Low Rates
High or Low Rates
Time Aggregation
Units: Year
Month
Day
Length: 1 Months
Advanced >>


Advanced Output Features
Spatial Output
Temporal Output
Other Output
Alerts
Temporal Graph
Produce Temporal Graphs
Most likely cluster only
1 most likely clusters, one graph for each
All significant clusters, one graph for each, with p-value less than: 0.05
Set Defaults
Close


File Session Windows Help
Input Analysis Output
Text Output Format
Main Results File:
D:\OneDrive\jDATA\git\epiCourse_jdata_GIS_Introduction\data\results.txt
Geographical Output
HTML file for Google Map
KML file for Google Earth
Shapefile for GIS software
HTML file for Cartesian map
Column Output Format
ASCII
dBase
Cluster Information
Stratified Cluster Information
Location Information
Risk Estimates for Each Location
Simulated Log Likelihood Ratios/Test Statistics
Advanced >>

The output file

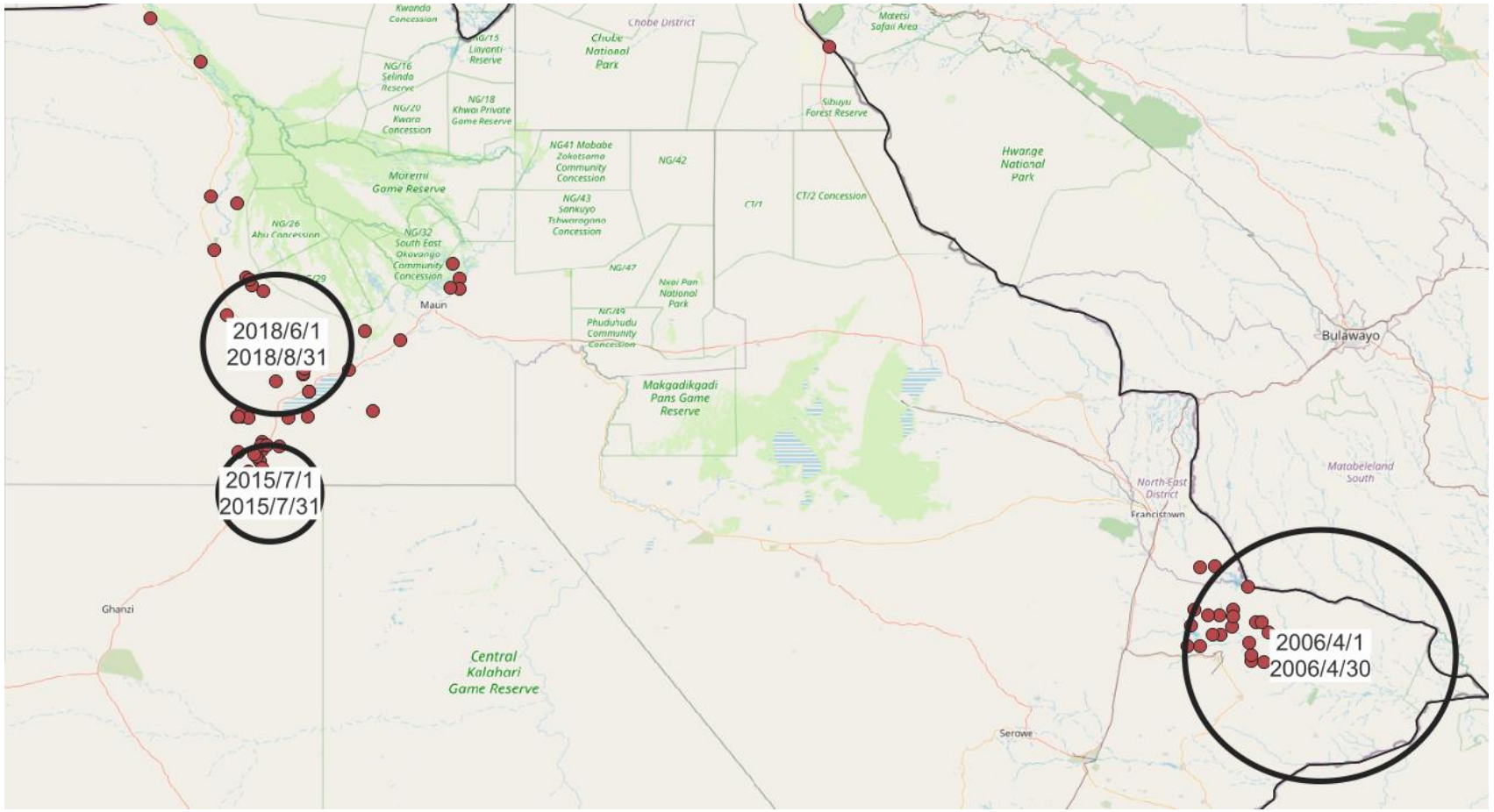


The output file

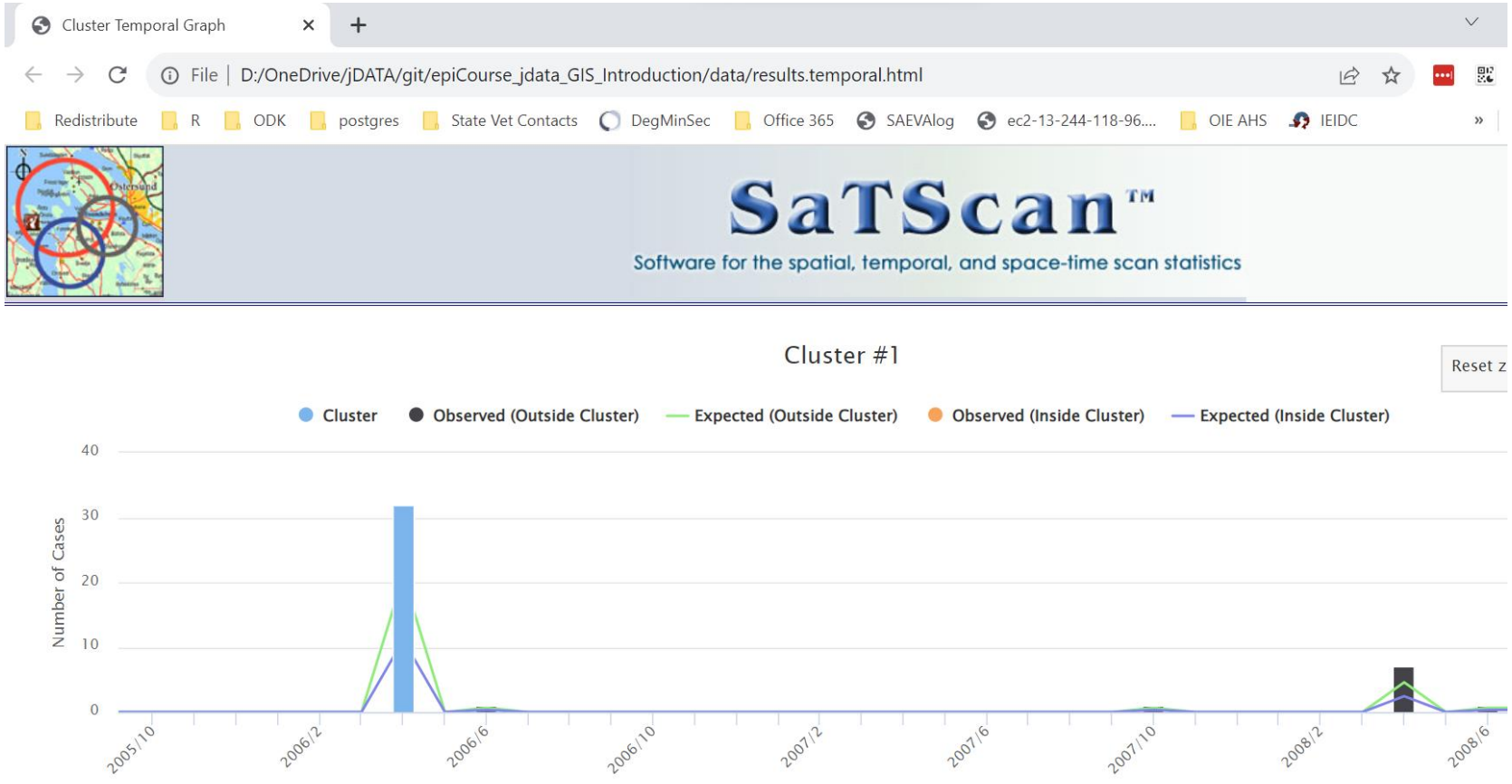
D:\OneDrive\jDATA\git\epiCourse_jdata_GIS_Introduction\data\results.txt

```
SUMMARY OF DATA

Study period.....................: 2005/7/1 to 2020/9/30
Number of locations..............: 93
Total number of cases............: 95

CLUSTERS DETECTED

1.Location IDs included.: 10024, 9871, 10036, 10037, 10035, 10048, 10038, 10039, 9875, 9874,
                          10040, 10034, 10033, 10041, 9877, 10032, 10047, 10042, 10031, 10030,
                          9873, 10029, 10028, 10046, 9872, 1000019988, 10045, 9876, 10027,
                          9864, 10043, 10049, 10044
  Coordinates / radius..: (21.960000 S, 28.420000 E) / 78.73 km
  Time frame............: 2006/4/1 to 2006/4/30
  Number of cases.......: 32
  Expected cases........: 11.12
  Observed / expected...: 2.88
  Test statistic........: 15.798750
  P-value...............: 0.000000018
```

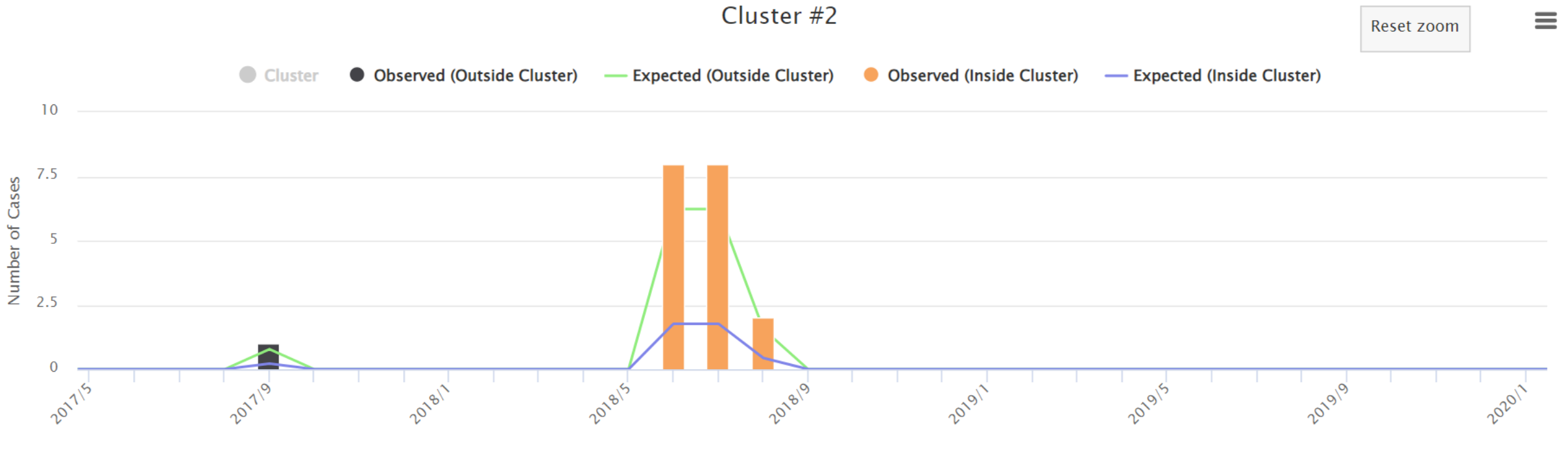
Mapping the shapefile outputs



Temporal outputs



Temporal outputs – specific clusters



Q&A and Practice