

Discussion of S4 Classes/Methods for Spatiotemporal Data

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Overview

- ▶ No current tools for spatiotemporal data in R
- ▶ A proposal for some infrastructure
- ▶ Independent of data storage/statistical models
- ▶ Will greatly speed programming with spt data in R
- ▶ In progress

Methods (1)

- ▶ plot (several implementations)
- ▶ show (several implementations)
- ▶ easy import/export of the data (eg direct access to EPA's air explorer into R with one command specifying pollutant, spatial range, temporal range)
- ▶ `subset(spt, spatial=c((new min lat), (new min long), (new max lat), (new max long)))` to return a new, smaller spatiotemporal object
- ▶ `subset(spt, time=c(time.start, time.stop))` to return a new, smaller spatiotemporal object
- ▶ subsets together over space and time
- ▶ join objects

Methods (2)

- ▶ `apply`
 - ▶ convert time period (eg $f(hours) \rightarrow$ daily data)
 - ▶ apply a function to time intervals (aggregate over hour, day, month, etc)
 - ▶ apply a function to spatial locations at a given time (eg kriging)
- ▶ `range(spt, "time")` to return the time range
- ▶ `range(spt, "space")` to return the spatial bounding box
- ▶ `dist(spt, "space")` to return a distance matrix between unique spatial points
- ▶ `dist(spt, "time")` to return a distance matrix between unique times
- ▶ `coords(spt)` to return the (unique) spatial coordinates
- ▶ `dates(spt)` to return the unique date times

Example `plot(spt, ''spatial'')`

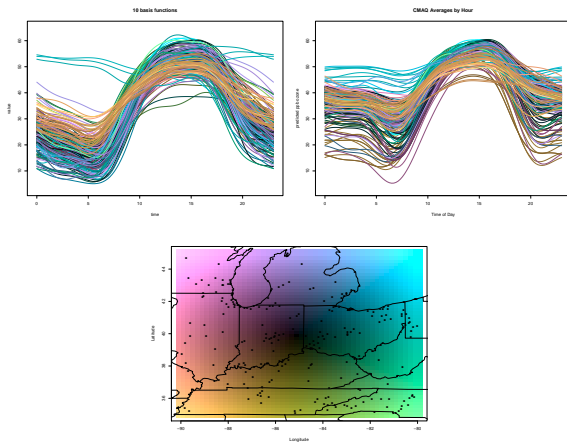


Figure: Upper left: DFT of average ozone values (ppm) for each hour during the day for the 2005 ozone season; upper right: DFT of average CMAQ values for each hour during the 2005 ozone season; Bottom: legend, color in top plots indicates location of the corresponding station on the plot below

Classes

Spatiotemporal class contains:

- ▶ stSpace class (uses the Spatial class from sp library)
- ▶ stTime class (uses timeDate class)
- ▶ stDataFrame class (the multivariate data)
- ▶ stMetadata (for info on units, contact info, url to data, date that data set was created, author)

Technical Details

- ▶ Learning about tools for R development
- ▶ Unit testing (RUnit)
- ▶ Class/method file/organization thoughts
- ▶ Vignette in progress
- ▶ Use of RCurl to post/get form data on web
- ▶ Will provide any code/docs to those interested
- ▶ Rforge
- ▶ Subversion setup on multiple platforms

Call for Volunteers

- ▶ Need help to make it robust and suitable for distribution
- ▶ Specifically, finalizing design and writing classes
- ▶ Created as an R-forge project (spt)
- ▶ Contact me or sign up at the R-forge project

For More Information

- ▶ `http://spt.r-forge.r-project.org/`
- ▶ `http://www.isds.duke.edu/~jbc30/SpatioTemporal/`
- ▶ **About to commit first pre-alpha version**
- ▶ **Once committed, to try:**
- ▶ `install.packages("spt",
 repos="http://R-Forge.R-project.org")`