

**GOOD MORNING!**

# Hello, my name is Paul Griffiths

- I am trained in physical chemistry. Adjunct lecturer in atmospheric science.
- I've been in atmospheric science since 2000
  - 2000-2008 Laboratory studies of **aerosols**, ice particles, **chemistry**
  - 2008-2012 **Modelling** studies of **cloud processes**
  - 2012-2017 **Modelling** studies of atmospheric chemistry
- Before that I worked in molecular physics
- My research interests are in
  - Global **chemistry-climate** models, specifically
  - **VOC oxidation and ozone**: biogenic emissions, climate and air quality; nitrates
  - **Methane** budget; **geoengineering**
  - **Halogens**: TRANSCOM inter-comparison; BLOWSEA sea-ice project

# Introduction to atmospheric chemistry

- Training is in two parts



- First part 0930 - 1030

- Basic points about air quality



- Set up first air quality 'box' model - hands-on part!



- Coffee break 1030 - 1100



- Second part 1100 - 1200

- In-depth on ozone formation



- Ozone production over the course of a day



# **INSTALLATION OF SOFTWARE**

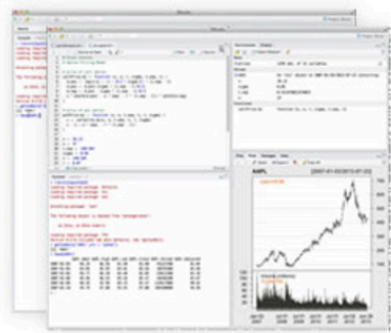
# Download RStudio

Installation Notes-EdGCM 4.0 x EdGCM » Download x R Download RStudio – RStudio x

Secure https://www.rstudio.com/products/rstudio/download/ ☆

RStudio®

[rstudio::conf](#) [Products](#) [Resources](#) [Pricing](#) [About Us](#) [Blogs](#) [Q](#)



## Choose Your Version of RStudio

RStudio is a set of integrated tools designed to help you be more productive with R. It includes a console, syntax-highlighting editor that supports direct code execution, and a variety of robust tools for plotting, viewing history, debugging and managing your workspace. [Learn More about RStudio features.](#)

|                              | RStudio Desktop<br>Open Source License | RStudio Desktop<br>Commercial License | RStudio Server<br>Open Source License | RStudio Server Pro<br>Commercial License | RStudio Server Pro +<br>RStudio Connect<br>Commercial License |
|------------------------------|--|---------------------------------------|---------------------------------------|--|---|
|                              | FREE                                   | \$995 per year                        | FREE                                  | \$9,995 per year                         | \$29,995 per<br>year  |
| Integrated<br>Tools for R    | ●                                      | ●                                     | ●                                     | ●  | ●   |
| Priority<br>Support          |  | ●                                     |                                       | ●  | ●   |
| Access via<br>Web<br>Browser |  |                                       | ●                                     | ●  | ●   |

# Download RStudio

## RStudio Desktop 1.0.143 — [Release Notes](#)

RStudio requires R 2.11.1+. If you don't already have R, download it [here](#).

## Installers for Supported Platforms

| Installers   | Size    | Date       | MD5                               |
|--|---------|------------|-----------------------------------|
| <a href="#">RStudio 1.0.143 - Windows Vista/7/8/10</a>                         | 81.9 MB | 2017-04-19 | 76bb84296b9202759b3eb1de555a2231  |
| <a href="#">RStudio 1.0.143 - Mac OS X 10.6+ (64-bit)</a>                      | 71.2 MB | 2017-04-19 | c7f1ed865428b225b202fd1b431954b4  |
| <a href="#">RStudio 1.0.143 - Ubuntu 12.04-15.10/Debian 8 (32-bit)</a>         | 85.5 MB | 2017-04-19 | 21ca14bffcfdc1a2361ead2d763d0313d |
| <a href="#">RStudio 1.0.143 - Ubuntu 12.04-15.10/Debian 8 (64-bit)</a>         | 92.1 MB | 2017-04-19 | 75761eae209158d8415d562b3771fbec  |
| <a href="#">RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit)</a> | 84.7 MB | 2017-04-19 | 2c356d4ee50667ad4042ee196afb3c53  |
| <a href="#">RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit)</a> | 85.7 MB | 2017-04-19 | 7ab5fc240351debe491c6c5a7acb6068  |

## Zip/Tarballs

| Zip/tar archives   | Size     | Date       | MD5                              |
|--|----------|------------|----------------------------------|
| <a href="#">RStudio 1.0.143 - Windows Vista/7/8/10</a>                         | 117.6 MB | 2017-04-19 | 24ae8674ba0cc0c5310c8172f2e5f12e |
| <a href="#">RStudio 1.0.143 - Ubuntu 12.04-15.10/Debian 8 (32-bit)</a>         | 86.2 MB  | 2017-04-19 | c4444d8159463b8e7a950ba4fe7150e0 |
| <a href="#">RStudio 1.0.143 - Ubuntu 12.04-15.10/Debian 8 (64-bit)</a>         | 93.2 MB  | 2017-04-19 | c92ecfdb80432a6532c823a22630918b |
| <a href="#">RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit)</a> | 85.4 MB  | 2017-04-19 | 197280b1c10edae0bacf898a14d9a58f |
| <a href="#">RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit)</a> | 86.6 MB  | 2017-04-19 | 04afcc818259577c188097955336cae2 |

## Source Code

A tarball containing source code for RStudio v1.0.143 can be downloaded from [here](#)

# Download RStudio

**RStudio Desktop 1.0.143** — [Release Notes](#)

RStudio requires R 2.11.1+. If you don't already have R, download it [here](#).

## Installers for Supported Platforms

| Installers   | Size    | Date       | MD5                               |
|--|---------|------------|-----------------------------------|
| <a href="#">RStudio 1.0.143 - Windows Vista/7/8/10</a>                         | 81.9 MB | 2017-04-19 | 76bb84296b9202759b3eb1de555a2231  |
| <a href="#">RStudio 1.0.143 - Mac OS X 10.6+ (64-bit)</a>                      | 71.2 MB | 2017-04-19 | c7f1ed865428b225b202fd1b431954b4  |
| <a href="#">RStudio 1.0.143 - Ubuntu 12.04-15.10/Debian 8 (32-bit)</a>         | 85.5 MB | 2017-04-19 | 21ca14bffcfdc1a2361ead2d763d0313d |
| <a href="#">RStudio 1.0.143 - Ubuntu 12.04-15.10/Debian 8 (64-bit)</a>         | 92.1 MB | 2017-04-19 | 75761eae209158d8415d562b3771fbec  |
| <a href="#">RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit)</a> | 84.7 MB | 2017-04-19 | 2c356d4ee50667ad4042ee196afb3c53  |
| <a href="#">RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit)</a> | 85.7 MB | 2017-04-19 | 7ab5fc240351debe491c6c5a7acb6068  |

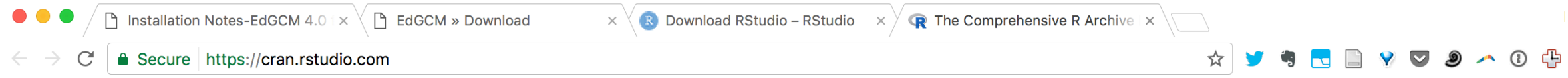
## Zip/Tarballs

| Zip/tar archives   | Size     | Date       | MD5                              |
|--|----------|------------|----------------------------------|
| <a href="#">RStudio 1.0.143 - Windows Vista/7/8/10</a>                         | 117.6 MB | 2017-04-19 | 24ae8674ba0cc0c5310c8172f2e5f12e |
| <a href="#">RStudio 1.0.143 - Ubuntu 12.04-15.10/Debian 8 (32-bit)</a>         | 86.2 MB  | 2017-04-19 | c4444d8159463b8e7a950ba4fe7150e0 |
| <a href="#">RStudio 1.0.143 - Ubuntu 12.04-15.10/Debian 8 (64-bit)</a>         | 93.2 MB  | 2017-04-19 | c92ecfdb80432a6532c823a22630918b |
| <a href="#">RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit)</a> | 85.4 MB  | 2017-04-19 | 197280b1c10edae0bacf898a14d9a58f |
| <a href="#">RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit)</a> | 86.6 MB  | 2017-04-19 | 04afcc818259577c188097955336cae2 |

## Source Code

A tarball containing source code for RStudio v1.0.143 can be downloaded from [here](#)

# Download R



CRAN  
[Mirrors](#)  
[What's new?](#)  
[Task Views](#)  
[Search](#)

About R  
[R Homepage](#)  
[The R Journal](#)

Software  
[R Sources](#)  
[R Binaries](#)  
[Packages](#)  
[Other](#)

Documentation  
[Manuals](#)  
[FAQs](#)  
[Contributed](#)

## The Comprehensive R Archive Network

### Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

### Source Code for all Platforms

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (Friday 2017-06-30, Single Candle) [R-3.4.1.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#)

### Questions About R

- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

What are R and CRAN?

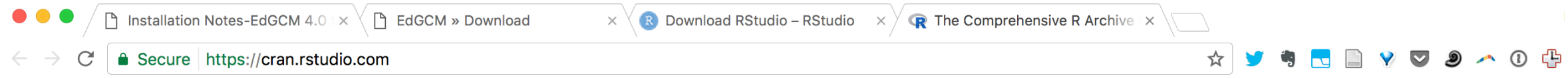
R is 'GNU S', a freely available language and environment for statistical computing and graphics which provides a wide variety of statistical and graphical techniques: linear and nonlinear modelling, statistical tests, time series analysis, classification, clustering, etc. Please consult the [R project homepage](#) for further information.

CRAN is a network of ftp and web servers around the world that store identical, up-to-date, versions of code and documentation for R. Please use the CRAN [mirror](#) nearest to you to minimize network load.

Submitting to CRAN



# Download R



CRAN  
[Mirrors](#)  
[What's new?](#)  
[Task Views](#)  
[Search](#)

About R  
[R Homepage](#)  
[The R Journal](#)

Software  
[R Sources](#)  
[R Binaries](#)  
[Packages](#)  
[Other](#)

Documentation  
[Manuals](#)  
[FAQs](#)  
[Contributed](#)

## The Comprehensive R Archive Network

### Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

### Source Code for all Platforms

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (Friday 2017-06-30, Single Candle) [R-3.4.1.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#)

### Questions About R

- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

What are R and CRAN?

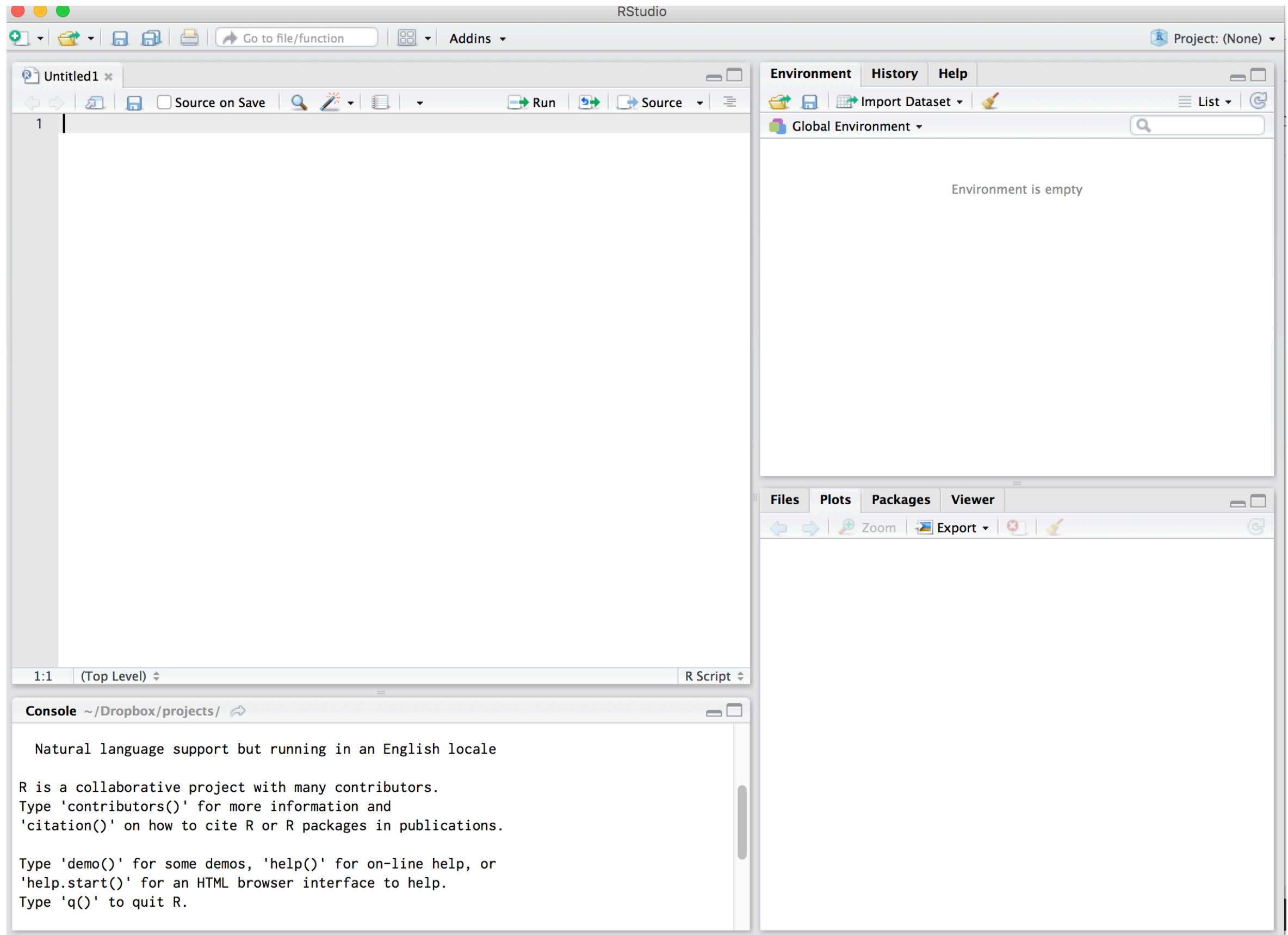
R is 'GNU S', a freely available language and environment for statistical computing and graphics which provides a wide variety of statistical and graphical techniques: linear and nonlinear modelling, statistical tests, time series analysis, classification, clustering, etc. Please consult the [R project homepage](#) for further information.

CRAN is a network of ftp and web servers around the world that store identical, up-to-date, versions of code and documentation for R. Please use the CRAN [mirror](#) nearest to you to minimize network load.

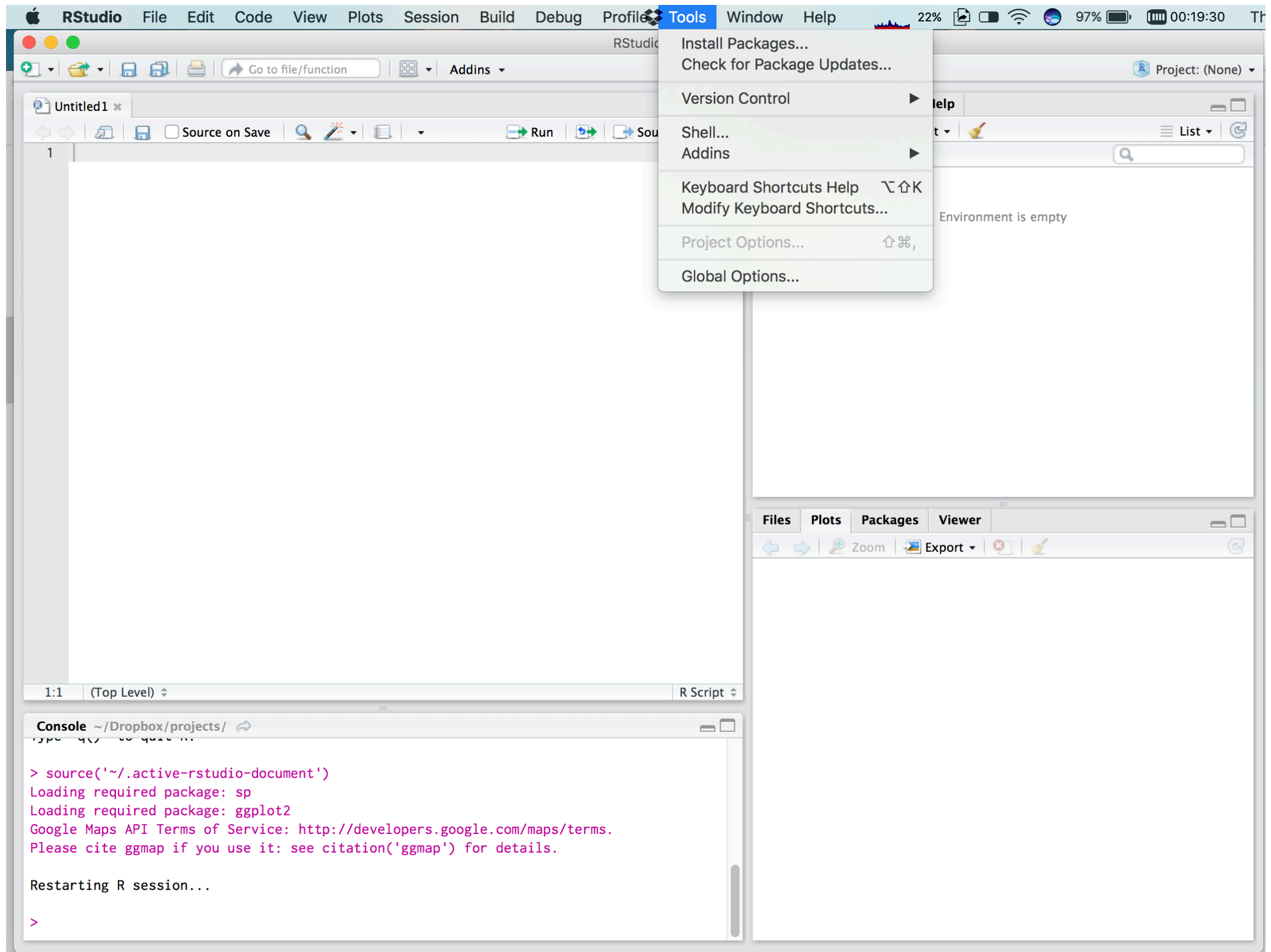
Submitting to CRAN

- Install R
- Then install RStudio
- Open RStudio

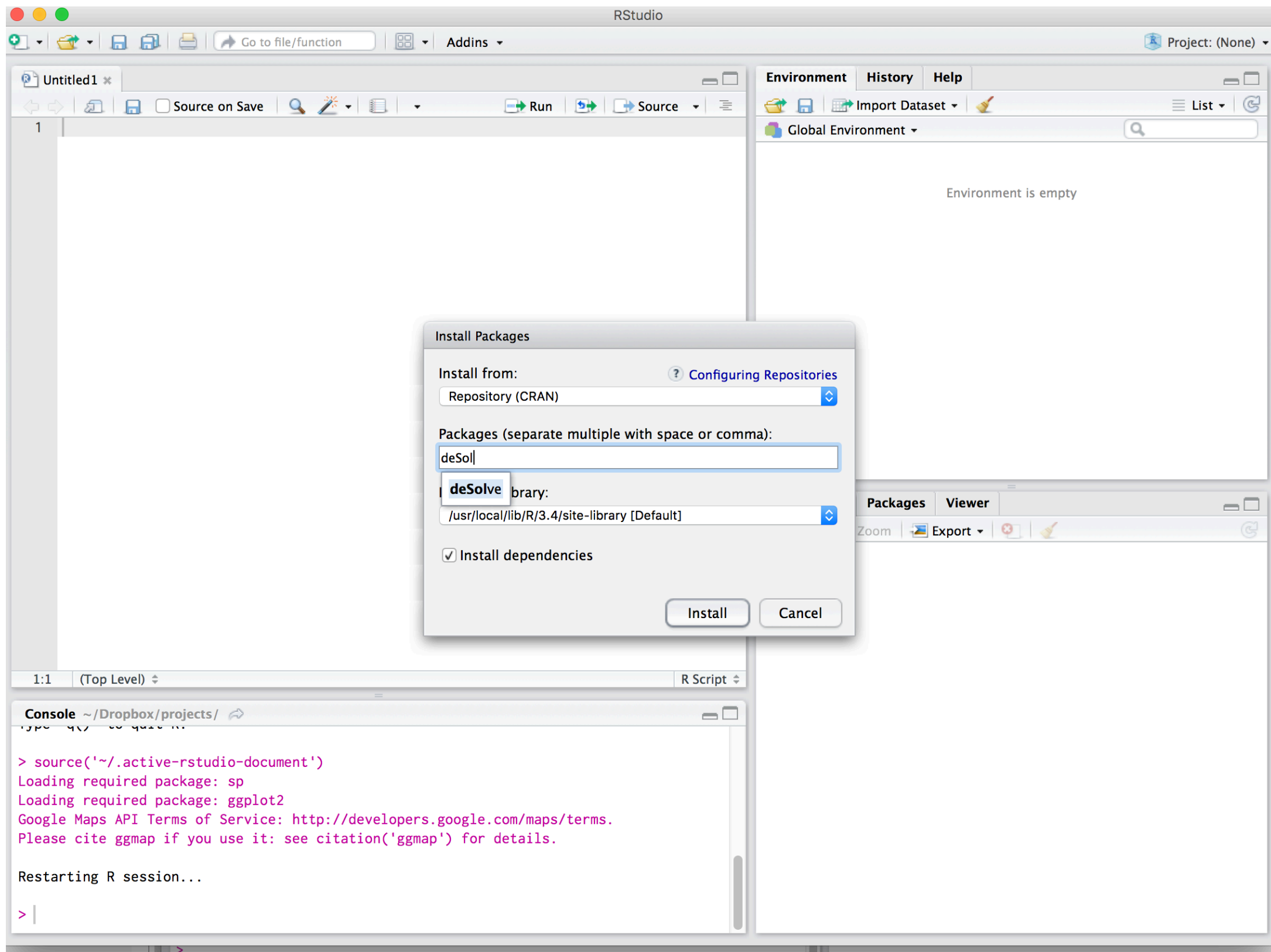
# RStudio on startup



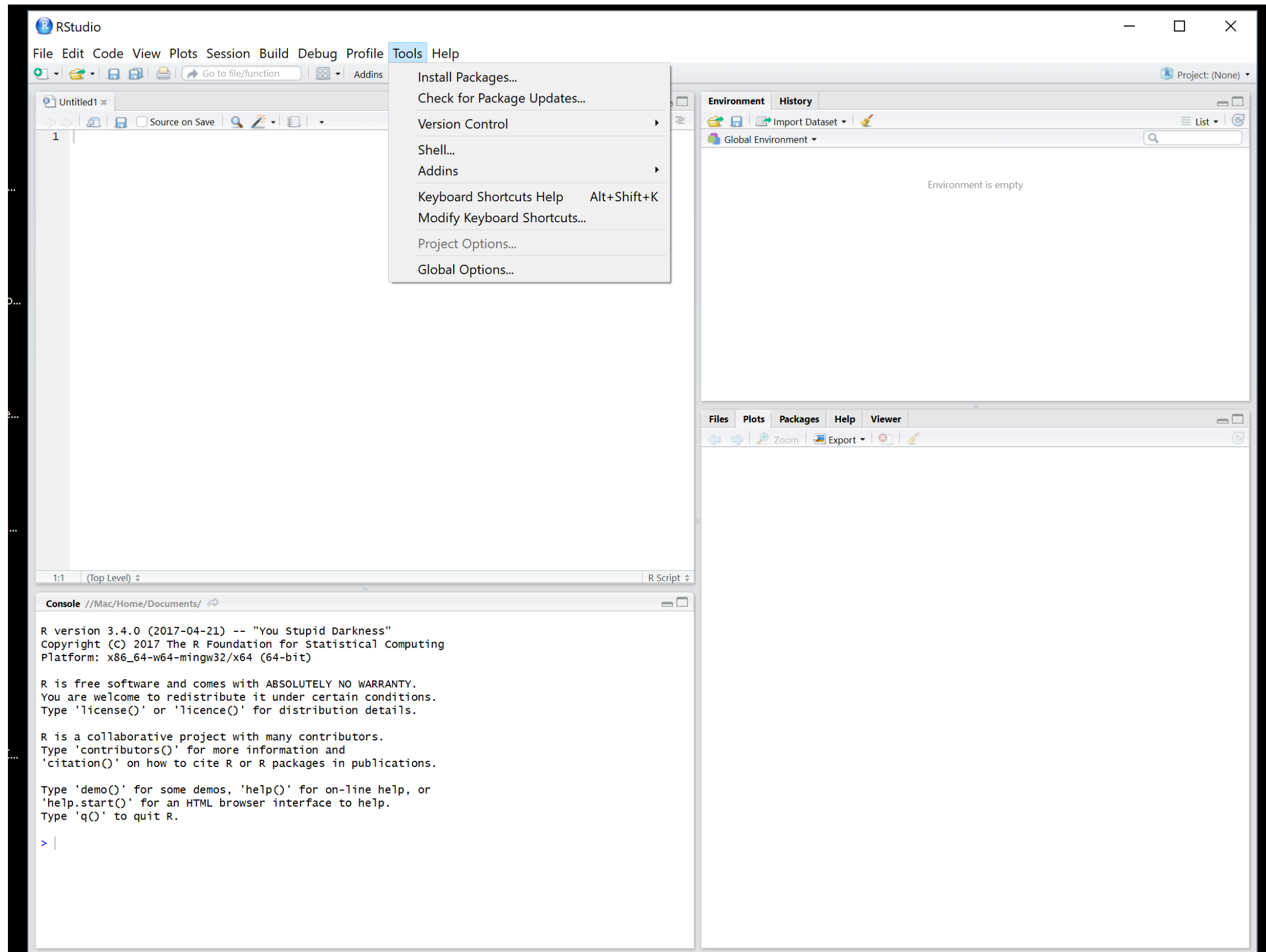
# Install deSolve package



# Install deSolve package



# Windows looks the same



# Windows looks the same

