

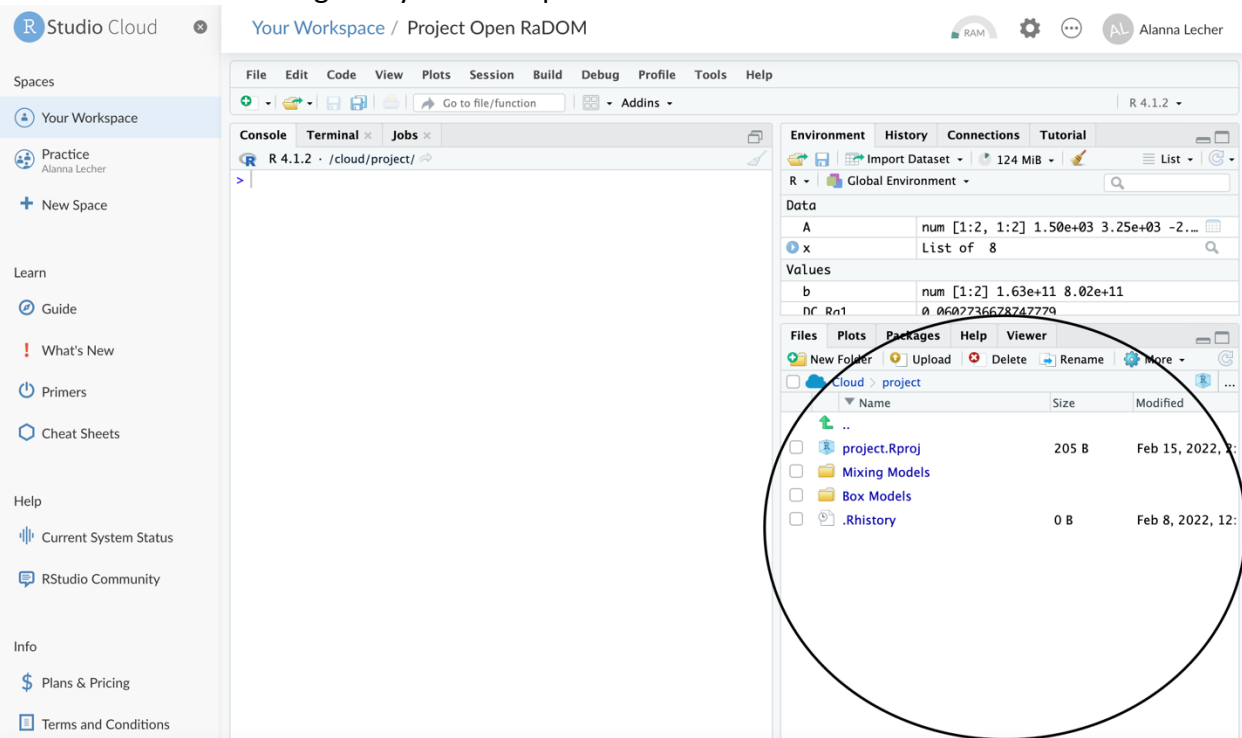
Project Open RaDOM

Visual Instructions

The easiest way to run the models if you have never used R before is to use workspace I created in RStudio Online.

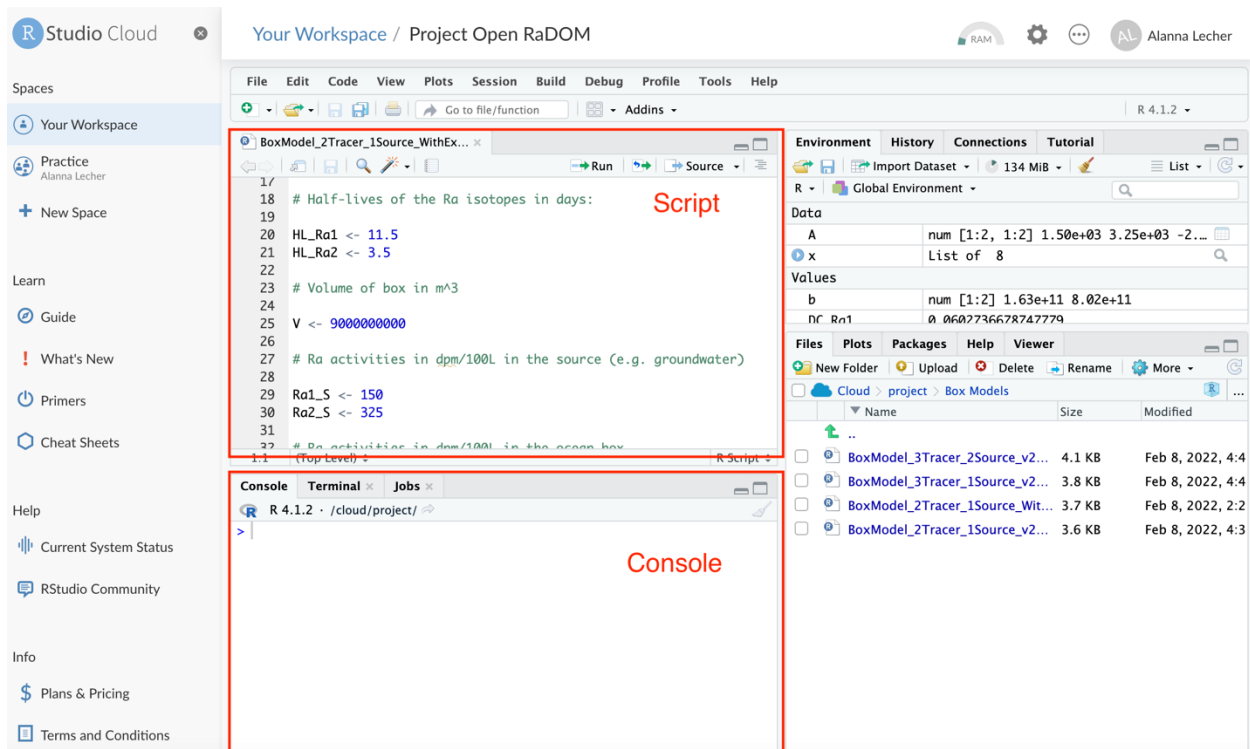
1. Go to the [Project RaDOM workspace](#). You will be asked to create an account. The free version is sufficient for these models.
2. This creates a temporary copy of the original workspace, that you can edit and modify without changing the original workspace. So, don't worry about messing the original documents up. You can't from this workspace. You will be prompted at the top so save a copy of this workspace. You may want to do that if you plan to use these models more than once.

3. Look at the bottom right of your workspace. You will see a folders area:

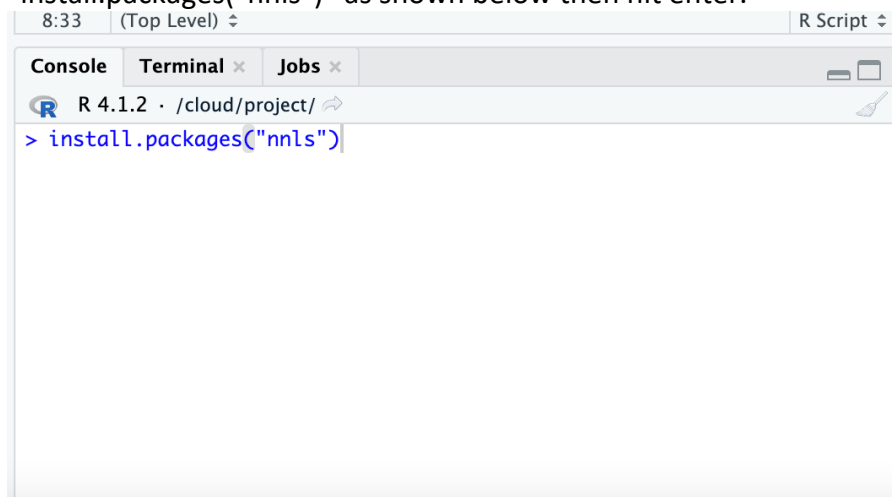


This is where all of the scripts are housed that are available in Project RaDOM. Scripts are packets of code. In this tutorial you will run the 2 tracer, 1 source box model script with example data. Double click on the box model folder to open it. It will contain the box model scripts listed on the Project Open RaDOM website.

4. Find the script named "BoxModel_2Tracer_1Source_WithExampleData.R" and click on it. This will open up the script in a new window in the upper left. Below it is the console, where the results will be output.



5. The first thing you need to do is install the nnls package. You only need to do this once. It will then work with every other script you use in this workspace. In the console type as “install.packages(“nnls”)” as shown below then hit enter.



A bunch of text will load in the console indicating the package is being installed.

6. Look at the script. Every line that begins with a # is a note explaining what that code does or a instructions on how to use it. Look through the top part of the script. You will see instructions on what to edit to adapt the model to your data. Examples of these input areas is highlighted below. This model is preloaded with data to test it, but other scripts in Project Open RaDOM do not have data.

The screenshot displays the RStudio interface with the following components:

- Script Editor:** Contains an R script for a box model simulation. The script includes comments and variable assignments. Red boxes highlight the following values:
 - Line 20: `HL_Ra1 <- 11.5`
 - Line 21: `HL_Ra2 <- 3.5`
 - Line 25: `V <- 9000000000`
 - Line 29: `Ra1_S <- 150`
 - Line 30: `Ra2_S <- 325`
- Console:** Shows the command `> install.packages("nnls")` being executed.
- Environment Pane:** Displays the current data and values:

Variable	Value
A	num [1:2, 1:2] 1..
x	List of 8
b	num [1:2] 1.63e+1
NC_Ra1	0.060273667874777

There is a note in the script telling you where to stop editing. Editing below this note may prevent the model from functioning correctly. If you wish to add more sources or unknown terms you can edit below that line, but to run the model as is only edit where instructed.

7. To run the model with the example data click “Source” above the script. “Source” will run the entire script “Run” will only run one line of code.

Your Workspace / Project Open RaDOM

RAM

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function

Addins

BoxModel_2Tracer_1Source_WithEx... x

Run Source

```
27 # Ra activities in dpm/100L in the source (e.g. groundwater)
28
29 Ra1_S <- 150
30 Ra2_S <- 325
31
32 # Ra activities in dpm/100L in the ocean box
33
34 Ra1_B <- 30
35 Ra2_B <- 45
36
37 # Ra offshore activities in dpm/100L
38
39 Ra1_0 <- 5
40 Ra2_0 <- 3
41
42
```

8:33 (Top Level) R Script

Console Terminal Jobs

R 4.1.2 · /cloud/project/

```
> install.packages("nnls")
```

Environment History Connections

Global Environment

Data

A	num [1:2, 1:2]	1.50e
x	List of	8

Values

b	num [1:2]	1.63e+11
NC Ra1		0 0607736678747779

Files Plots Packages Help Viewer

New Folder Upload Delete

Cloud > project > Box Models

Name

- ..
- BoxModel_3Tracer_2Source_v2...
- BoxModel_3Tracer_1Source_v2...
- BoxModel_2Tracer_1Source_Wit...
- BoxModel_2Tracer_1Source_v2...

8. The model will run and the results will print in the console.

The screenshot displays the RStudio interface with the following components:

- Source Editor:** Contains an R script for a box model simulation. The script defines Ra activities for source, ocean box, and offshore regions, and sets initial conditions for Ra1 and Ra2 in both source and ocean boxes.
- Environment:** Shows the current environment with variables A, x, b, and nC_Ra1. The variable x is a list of 8 elements.
- Files:** Lists the project files, including BoxModel_3Tracer_2Source_v2..., BoxModel_3Tracer_1Source_v2..., BoxModel_2Tracer_1Source_Wit..., and BoxModel_2Tracer_1Source_v2...
- Console:** Displays the output of the R script execution, showing the SGD flux, residence time, and residual sum of squares.

R Script Content:

```

27 # Ra activities in dpm/100L in the source (e.g. groundwater)
28
29 Ra1_S <- 150
30 Ra2_S <- 325
31
32 # Ra activities in dpm/100L in the ocean box
33
34 Ra1_B <- 30
35 Ra2_B <- 45
36
37 # Ra offshore activities in dpm/100L
38
39 Ra1_0 <- 5
40 Ra2_0 <- 3
41
42

```

Environment Variables:

Variable	Class	Value
A	num [1:2, 1:2]	1.50e+03 3.2
x	List of 8	
b	num [1:2]	1.63e+11 8.02e+11
nC_Ra1		0 0602736678747779

Console Output:

```

> source("/cloud/project/Box Models/BoxModel_2Tracer_1Source_WithExampleData.R")
[1] "SGD flux in m^3/day = 598822804.210455"
[1] "residence time in days = 3.30389601389787"
[1] "residual sum of squares = 0"
>

```

9. Adapt the input values to your data and run the model!