LaMEM short course

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Needed softwares

- VS Code

https://code.visualstudio.com/download

- Julia

https://julialang.org/downloads/

- Paraview

https://www.paraview.org/download/

- (Co-pilot) - takes a few days for activation, very useful

https://docs.github.com/en/copilot/managing-copilot/managing-copilot-as-an-individual-subscriber/managing-your-github-copilot-pro-subscription/getting-free-access-to-copilot-pro-as-a-student-teacher-or-maintainer

WSL - Windows install

- We won't use windows…
- First install WSL (Windows Subsystem for Linux)

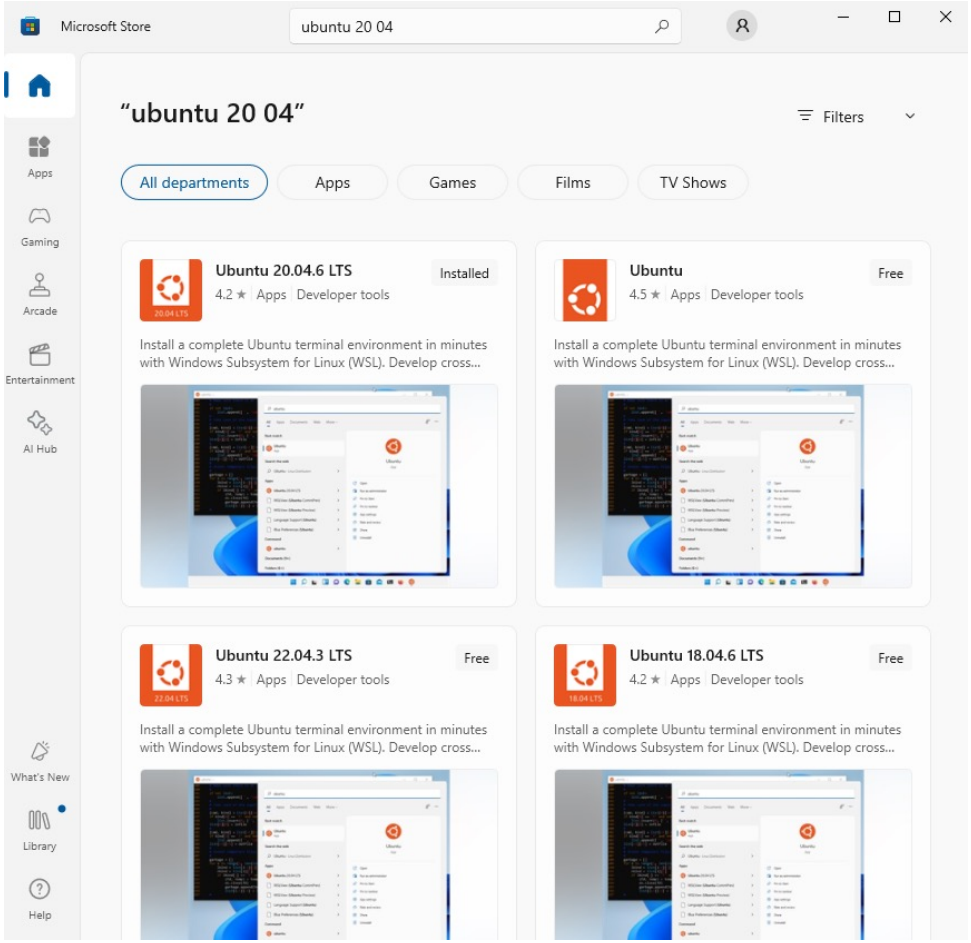
option 1: Microsoft Store
(option 2: PowerShell)

- *Linux/mac users can skip to slide 10*

option 1

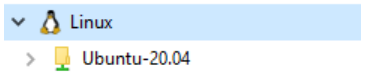
WSL - Windows install

(linux/mac users can skip to slide 8)



- Open Microsoft store (start-up menu)
- Look for Ubuntu 20 04
- Install Ubuntu 20 04
- **Restart computer**
- A terminal will open and ask for setting up a Linux username and password to your Ubuntu

- A new folder in the explorer should appear:



(option 2) WSL - Windows install

Prerequisites

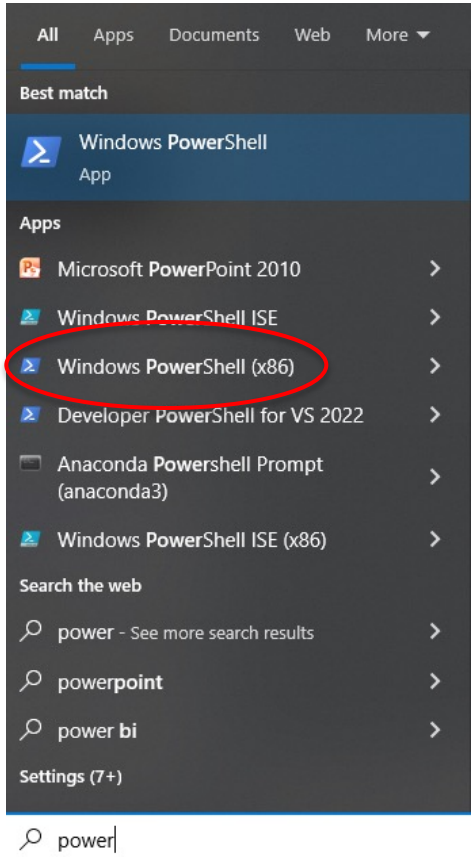
You must be running Windows 10 version 2004 and higher (Build 19041 and higher) or Windows 11 to use the commands below. If you are on earlier versions please see the manual install page.

Install WSL command

You can now install everything you need to run WSL with a single command. Open PowerShell or Windows Command Prompt in **administrator** mode by right-clicking and selecting "Run as administrator", enter the wsl --install command, then restart your machine.

PowerShell Copy

```
wsl --install
```



https://learn.microsoft.com/en-us/windows/wsl/install

(option 2) WSL - Windows install

To install WSL2 on Windows using PowerShell, follow these steps:

1. Open PowerShell as Administrator.

2. Run the following command to enable the WSL feature:
dism.exe /online /enable-feature /featurename:Microsoft-Windows-Subsystem-Linux /all /norestart

3. Enable the Virtual Machine Platform feature:
dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart

4. Set WSL2 as the default version:
wsl --set-default-version 2

5. Download and install the Linux kernel update package:
wsl.exe –install

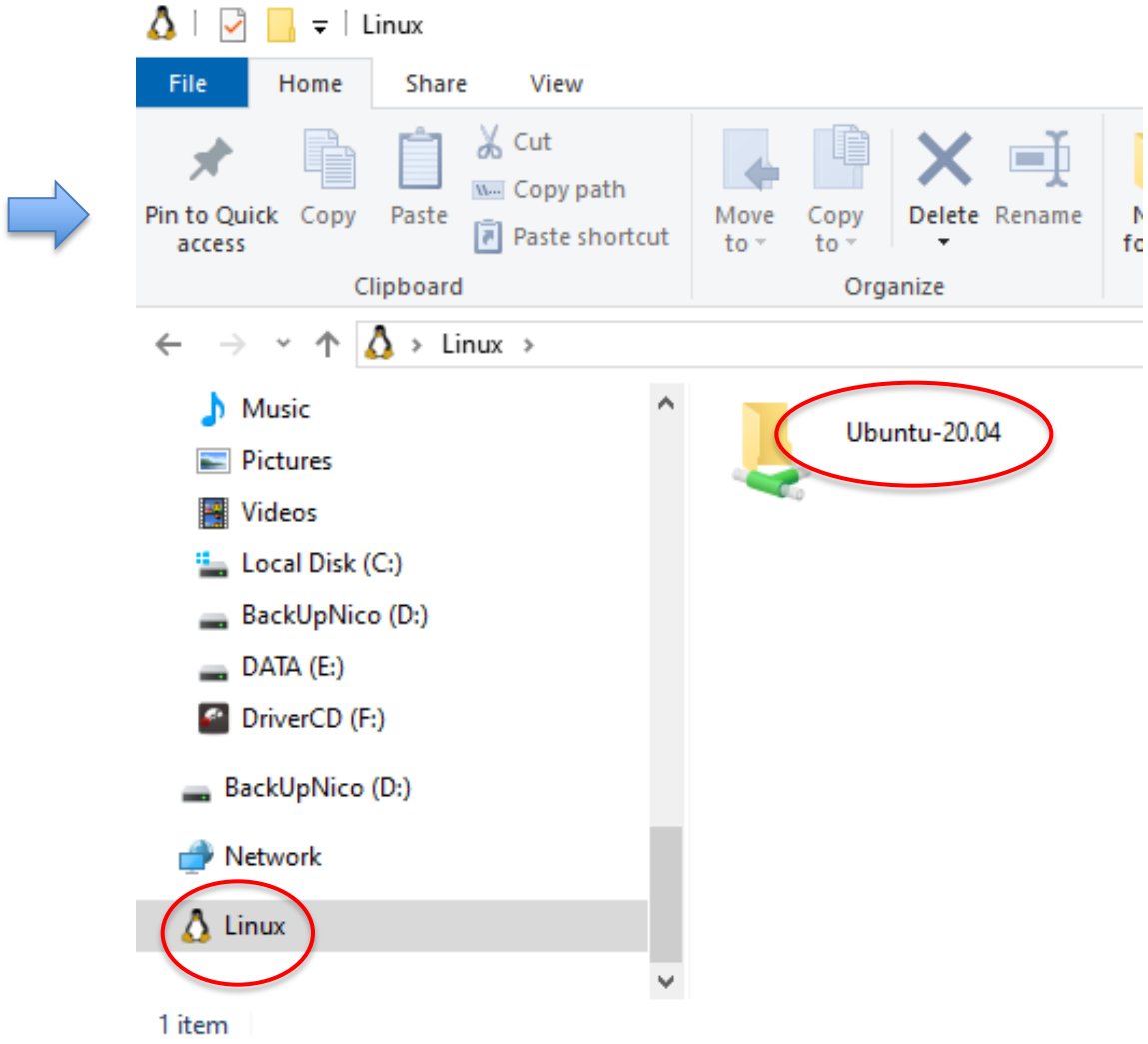
6. To install Ubuntu 20.04 on WSL2, follow these steps. First run the following command to list available distributions:
wsl --list --online

7. Install Ubuntu 20.04 by running:
wsl --install -d Ubuntu-20.04

8. Once the installation is complete, launch Ubuntu 20.04 from the Start menu and complete the initial setup. Note that username and password need to be provided for the linux

(option 2) WSL - Windows install

Once installed, the Linux folder can be easily accessed in the bottom left of the explorer



WSL - Debug

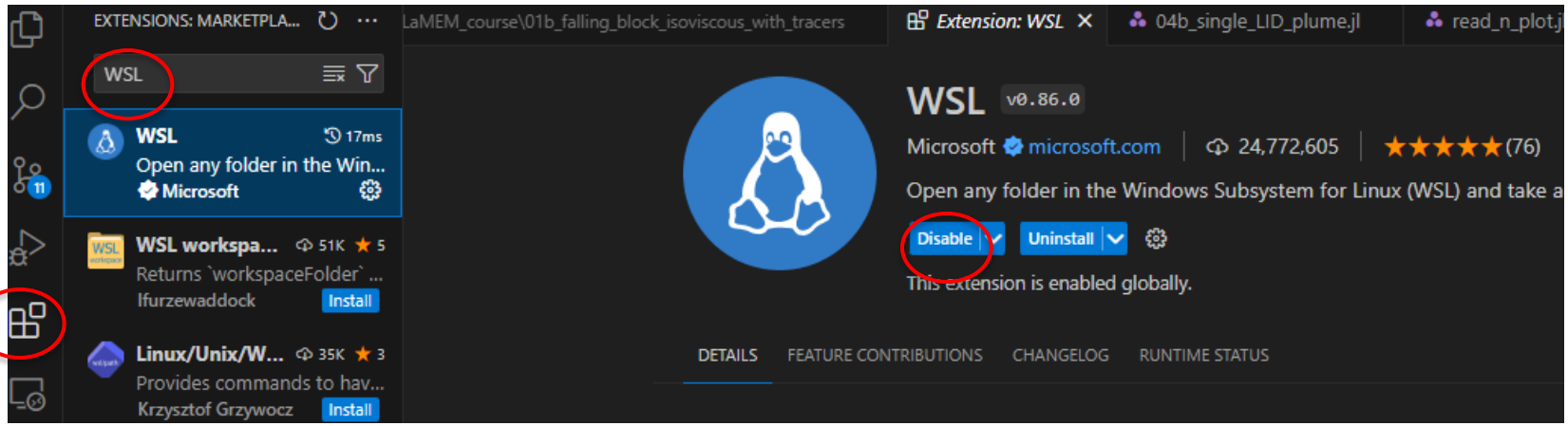
Search → Windows Features

Activate:

VM
Hyper-v
Sub system

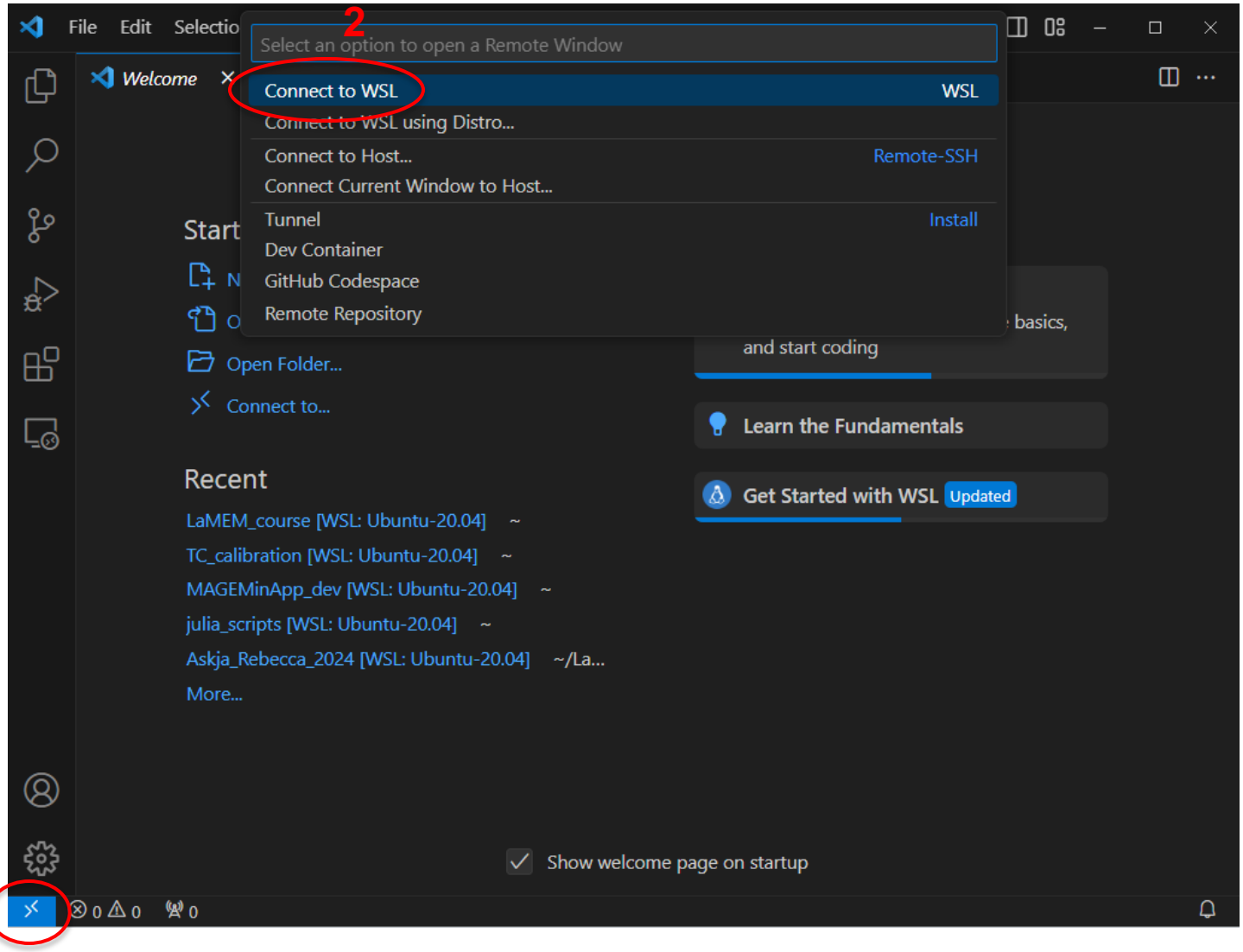
Setup VS-Code for WSL (Windows users)

- Add WSL plugin

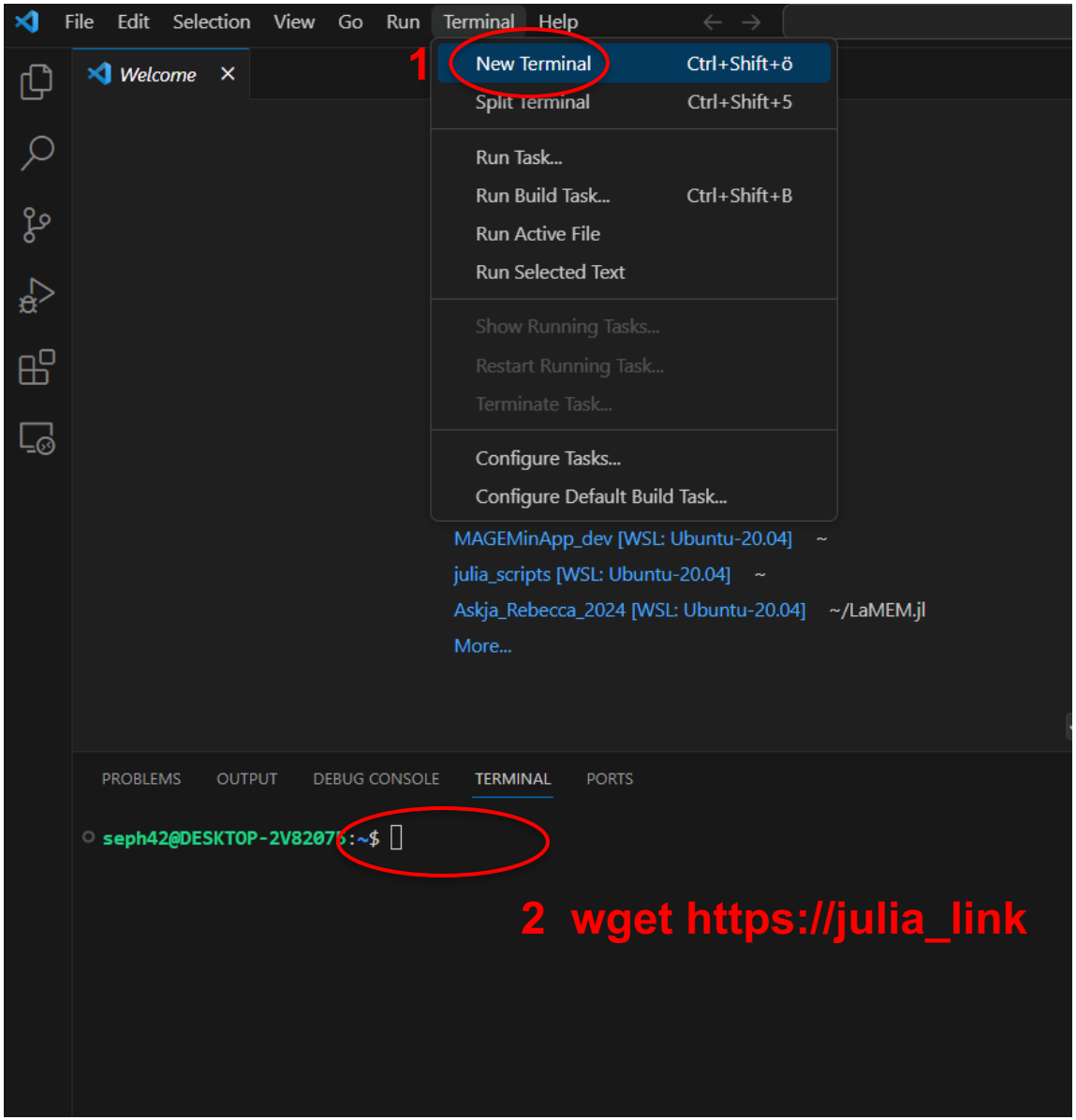


This operation allow to have linux working directly through vscode as a terminal

Connect VS-Code to WSL (Windows users)



Connect VS-Code to WSL (Windows users)



Linux / Mac

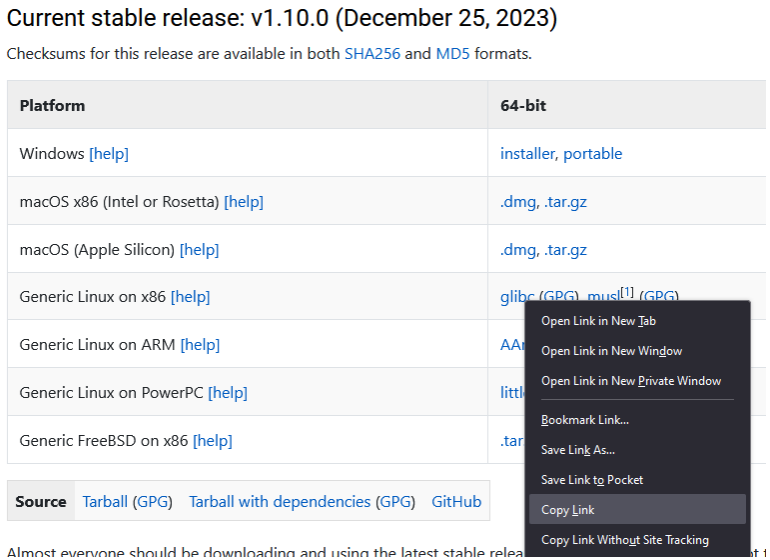
- Julia

```
curl -fsSL https://install.julialang.org | sh
```

https://julialang.org/downloads/

- Download Julia 1.10 (64 bits)

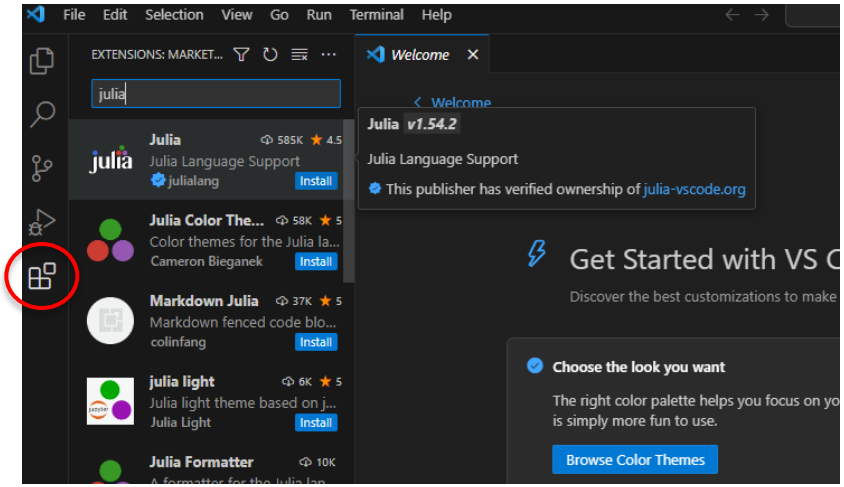
wget http://full_link_(...)



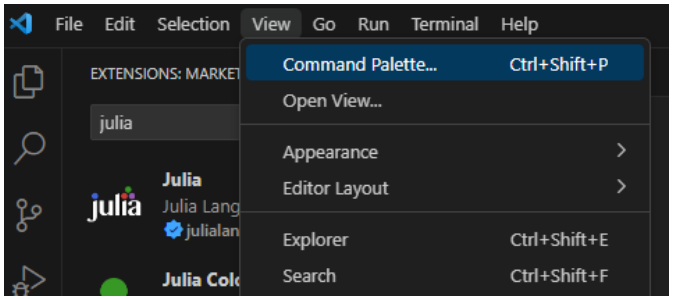
Setting up Julia working environment

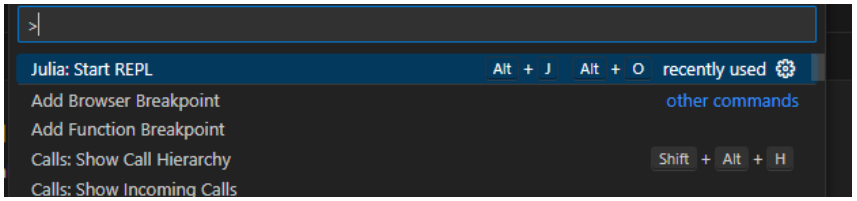
Setup VS-Code for Julia

- Add Julia plugin



- Start Julia REPL (terminal)



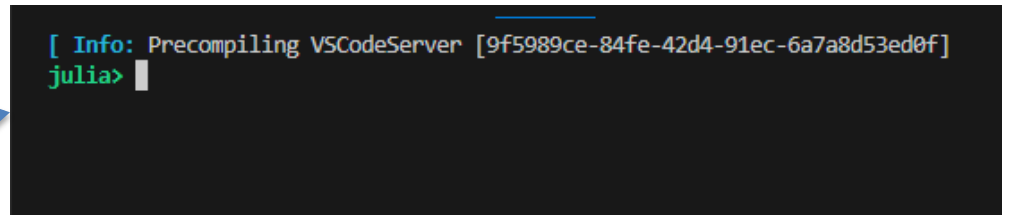


Julia REPL (read-eval-print loop)

→ Terminal or prompt pasting

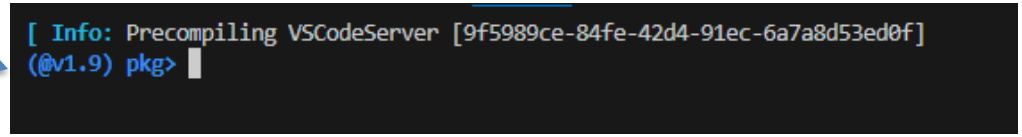
- Julia terminal

  computation space, execute scripts…



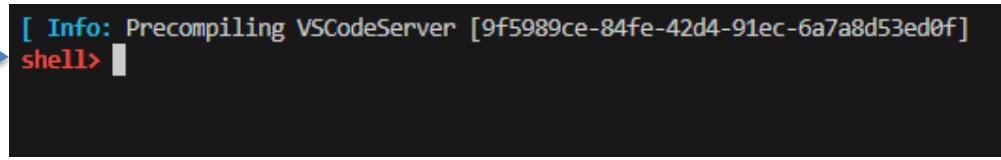
-] package manager

  add/update packages



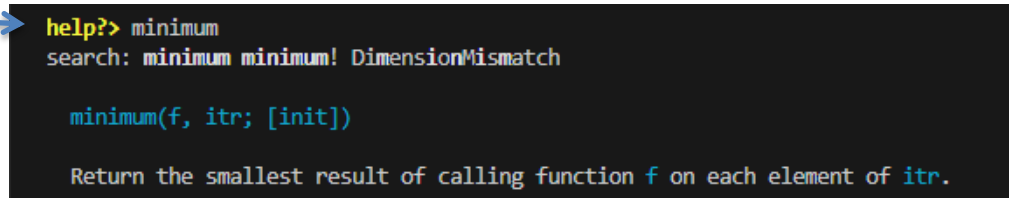
- ; shell

  Changing directories



- ? help

  provide help with functions



- Backspace

  back to julia terminal

Note that on Windows the shell is bugged,
navigate through directory using terminal → cd("path"), pwd()

Add LaMEM.jl (Julia wrapper)

-] add LaMEM

```
[ Info: Precompiling VSCodeServer [9f5989ce-84fe-42d4-91ec-6a7a8d53ed0f]
(@v1.9) pkg> add LaMEM
```

```
    Installed XML2_jll ──────────────── v2.11.5+0
    Installed GeoInterface ──────────── v1.3.2
    Installed GeophysicalModelGenerator ─ v0.5.5
   Downloaded artifact: XML2
     Updating `C:\Users\Seph\.julia\environments\v1.9\Project.toml`
      ...
```

- Test LaMEM

(takes several minutes)

```
(@v1.9) pkg> test LaMEM
```

```
Test Summary: | Pass  Total     Time
run LaMEM     |    6      6  1m20.8s
Test Summary:     | Pass  Total  Time
read LaMEM output |   10     10  4.6s
No partitioning file required for 1 core model setup
Test Summary:                  | Pass  Total  Time
run lamem mode save grid test |    2      2  0.3s
     Testing LaMEM tests passed

(@v1.9) pkg>
```

All tests should pass!

Add other packages

] add GeophysicalModelGenerator

] add GeoParams

] add GMT

] add PlotlyJS

- Creates 3D input for LaMEM
- Set of tools
- Import topography
- Plotting routine

Add other packages in a local environment

- For phase diagrams

Create a MAGEMinApp directory

```
mkdir MAGEMinApp
cd MAGEMinApp
julia
julia> ]
pkg> activate .
add MAGEMinApp
```

- For landscape evolution

Create a FastScape directory

```
mkdir FastScape
cd FastScape
julia
julia> ]
pkg> activate .
add
https://github.com/boriskaus/FastScape.jl
```

Note:
- Every time you want to use FastScape (if you closed the Julia terminal) you need to open a terminal, change path to FastScape then execute Step 2.

Setup overview

Visual Studio Code

- Terminal: launch Julia, change directory…
  - File → open folder
  - Shell → cd ../
- Create modify scripts, input files for LaMEM/FastScape (*.jl)
  - File → new file → save as *.jl
- Perform simulations

Windows users

WSL – Ubuntu

Access through shortcut:
Explorer right click on Ubuntu → home/name or root
Send shortcut to Desktop

- Visualize simulation results