

Tutorial of Running WHIPS through AWS

Step 0: Assumed knowledge for running WHIPS

Some abbreviations for this tutorial (listed in their appeared order in this tutorial):

WHIPS: Wisconsin Horizontal Interpolation Program for Satellite

AWS: Amazon Web Services

EC2: Elastic Compute Cloud

AMIs: Amazon Machine Images

ssh: Secure Shell

OMI: Ozone Monitoring Instrument

CMAQ: The Community Multiscale Air Quality Modeling System

NCL: NCAR command language

We expect the user to have some experience with Linux/Unix system

We expect the user to have some basic knowledge in Python

We do not need the user to have previous experience with AWS

Step 1: Creating an account

Visit Amazon Web Services (<https://aws.amazon.com/>) and create a personal account.

When creating account, you might need to enter credit card information, but there are 12 months of free tier.

Step 2: Changing regions

On the top right panel just right to your username is the region button. Click this button and choose the region to be “N. Virginia”.

Step 3: Searching for the WHIPS environment

On the top left, select “Services”, then click EC2 (Elastic Compute Cloud) under “Compute” section.

On the left margin, under “Images”, click AMIs (Amazon Machine Images).

Select “Public images”, and search for “ami-61629a1c”.

Step 4: Launching images

Select the image you found from step 3 and click “Launch”.

Select the instance type based on your specific needs. For this tutorial, you could choose the default instance “t2.micro” which is included in your 12 months free tier.

Click the “Review and Launch” button at the bottom (which will skip the following steps: configure instance, add storage, add tags, configure security group) will directly lead you to the review step.

Click “Launch”.

Step 5: Select/create login keys

To ssh login AWS, you do not need password, instead you need a “.pem” file as your login key.

If you already have a key, choose “Choose an existing key pair”, and select the key you created before. (If this is your second time launching AWS instance within one region, you do not need to create a new key, you can use the one you created before.). Then, you can skip to the last line of Step 5.

If you do not have a key prior, then choose “Create a new key pair”, and give a name to your key.

Click “Download Key Pair”, you would need to change this file extension to “.pem” rather than other forms of file (e.g. “.txt”).

Click “Launch Instance”

Step 6: Login to your instance

Click the bottom to view the instance you just launched.

Select this instance and click “Connect”.

Open a terminal window and locate to your key file directory.

```
>> chmod 400 KeyName.pem
```

```
>> ssh -i “KeyName.pem” ubuntu@(followed by your public DNS)
```

You copy the example that appears on the AWS website, but need to change “root” to “ubuntu”.

Step 7: Running WHIPS

Within this image, we provided one day of Formaldehyde (HCHO) data for continental U.S. in 2015-07-01 from OMI in Corner_Files and HCHO_input directories.

We also provided a runscript in this instance. This runscript is written in Python and will call WHIPS to oversample HCHO in 2015-07-01 to a 246×396 grid (same grid as CMAQ).

You could change the start day, end day, and projections in the runscript.py to fit your specific need. For this tutorial, you could leave the runscript as it is.

WHIPS is installed on Anaconda environment in this instance, you need to activate WHIPS environment prior to run it.

```
>> source activate whipsenv
```

```
>> python runscript.py
```

For t2.micro machine, it takes roughly 6-7 minutes to oversample one day. The output file will be stored in HCHO_output. We also provided the sample output file in Sample_output in case you want to compare if WHIPS run correctly on your AWS account.

If you want to run NCL to process output data, you have to deactivate WHIPS environment and activate NCL environment.

```
>> source deactivate
```

```
>> source activate nclenv
```

Step 8: Closing instance

After you finished running WHIPS exit from ssh, go back to the AWS website within viewing your instances.

Right click your running instance, choose “Image State”, and you could either choose “Stop” or “Terminate”.

If you choose “Stop”, the data on your instance will be stored, and you can right click this instance again and choose “Start” to restart your instance. For non-free-tier instance types, “Stop” option will cost less than if you left the instance running.

If you choose “Terminate”, the previous data on your instance will be deleted. This option won't charge you extra money.

Step 9: Running WHIPS on your own projects

At this step, you are familiar of running WHIPS on AWS. You can choose a faster and larger storage AWS server to fit your own needs, and download level 2 data on the AWS server. Then you could choose either using command-line interface, text input file or runsript to oversample your level 2 satellite products.