Guide to using Lagranto WRF

Download Lagranto for WRF from [this website](#) by clicking "trunk" and then "Download" above. Then move the tar file to whatever system/directory you would like to work in. You can then untar the file with the command:

```
tar -xvf lagranto.wrf-trunk.r25.tar.gz   (or whatever the latest version is)
```

Now, cd into the new directory. You should see a file called "install.csh". We'll need to make a few changes to this directory. Change the following lines so they look like this:

```
set path_devel = "${PWD}/"
set path_sync  = "${PWD}/"
setenv FORTRAN ifort
```

Also, delete this entire section:

```
# Init netCDF library depending on the Fortran compiler
if ( "${FORTRAN}" == "pgf90" ) then
  module load netcdf/4.2.1-pgf90

else if ( "${FORTRAN}" == "gfortran" ) then
  module load gfortran
  module load netcdf/4.3.2

else if ( "${FORTRAN}" == "ifort" ) then
  module load ifort/10.1.017
  module load netcdf/4.1.1-ifort

else
  echo "Fortran Compiler ${FORTRAN} not supported... Exit"
  exit 1

endif
```

You also need to load in a few modules. Load them like so:

```
module load ncarenv; module load ncarcompilers;  module load
intel; module load netcdf
```

At this point you can run the install script with the following command:

```
./install.csh all
```

```
#
# Gary set up a "lagranto_aliases.csh" file, which changes
# what is written below
#
```

Now navigate to ./lagranto_wrf/caltra. Open the file caltra.sh and modify the 8th line like so:

```
set LAGRANTO = [your working directory]/lagranto_wrf
```

Open ./lagranto_wrf/goodies/wrfmap.sh and make the same modification:

```
set LAGRANTO = [your working directory]/lagranto_wrf
```

Make a working directory within the Lagranto directory and move into it. This is where we will run Lagranto from. We need to make the wrfmap.nc file so Lagranto knows what grid our wrfout files are on. Create it with this command using any of your wrfout files:

```
../goodies/wrfmap.sh  -create   [wrfoutfile name]
```

The last thing you need is a file called "startf.ll" or "startf.xy" containing the trajectory start location/locations. If you have just a few starting positions you can type them in manually with the format: [start longitude], [start_latitude], [height_agl in m], with each position on a new line. For instance:

```
-78.638, 35.779, 10
```
<mark>*note: make sure there isn't an empty line at the end of your startf file! It will make lagranto crash!</mark>

If you want to make a matrix of many positions, you can use a python script. See an example script (wrf_grid_startf.ipynb) on [github](#).

Make a working directory, and use bash script run_lagranto.sh on [github](#) to run Lagranto. You'll need to change the user settings section. This bash script will link a set out wrf output files into your working directory, and run the caltra program. If you are using x/y starting positions, no changes are needed. If you are using lat/lon start positions, they first need to be converted to x/y. Uncomment the following section to convert them:

```
echo "**** Convert lat/lon starting coordinates to x/y *****"
#../goodies/wrfmap.sh -ll2xy startf.ll startf.xy
```

After you run trajectories, the lagranto package is very useful for creating visualizations. An example code using the lagranto package can be found on github (lagranto_trajectory_plot.ipynb).