# Welcome to the 2022 Online HYSPLIT Workshop (DAY 2 of 4)

The broadcast is scheduled to start at:
09:00 Eastern Daylight Time (EDT) = 13:00 UTC

NOAA Air Resources Laboratory
June 14-17, 2022

*These slides are available as a handout in the Go-to-Webinar interface, and will soon be posted on the Workshop Web Page*

1. Welcome
2. Agenda
3. Go-to-Webinar Interface
4. Asking Questions
5. Screen Considerations
6. Recordings
7. Installation
8. Working with the Tutorial
9. Different Ways to Work with HYSPLIT

**... And then, on to the course!**

HYSPLIT AIR RESOURCES LAB

**Workshop guidance**

**and resources posted at**

**Workshop Web Page**

**https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php**

***We will update this page each day to include any new materials or links that are relevant to the Workshop***

https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php

**Workshop Logistics**

**Webinar Links.** Unique sign-in URL's was emailed to each confirmed participant during the week before the W
and should not be shared.

**Handouts, Notes, and Recordings.** Videos of each day's on-line sessions are being created for review by part
online participation difficult. Processing of the videos to make them viewable takes significant time. When the vi
link. When you click on one of these links, you should be able to view the video directly. To download a video re
the video area and right click the mouse. Choose the "Save As" menu.

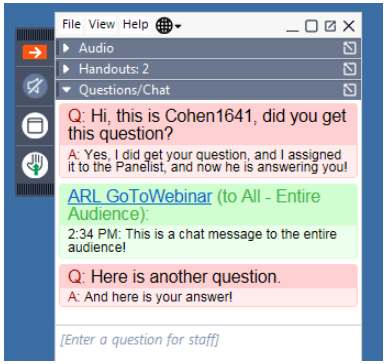
- **Installation Day (Mon, June 13)**
  - Installation day introduction
  - Workshop video recording installation day (MP4, 266 MB) and unfinished transcript (TEXT, 49 KB). The t
    inaccurate captions. See the above paragraph on how to download the video file.
- **Workshop Day 1 (Tue, June 14)**
  - Day 1 handout (PDF, 4.7 MB).
  - Trajectory equation (PDF, 0.2 MB).
  - Day 1 wrap-up (PDF, 5.1 MB) without animations. Day 1 wrap-up (PPTX, 9.2 MB) with animations.
  - Workshop video recording for day 1 (MP4, 984 MB) and unfinished transcript (TEXT, 213 KB). The transc
    captions. See the above on how to download the video file.
- **Workshop Day 2 (Wed, June 15)**
  - Day 2 handout will be posted here.
  - Workshop day 2 video recording and transcript will be posted here when they become available.

# 2022 HYSPLIT Workshop Schedule

*Subject to change, depending on the progression of the course and at the discretion of the instructors*

| UTC | Eastern Daylight Time | Monday June 13, 2022 | Tuesday June 14, 2022 | Wednesday June 15, 2022 | Thursday June 16, 2021 | Friday June 17, 2021 |
|---|---|---|---|---|---|---|
| 13:00 - 14:00 | 9:00 - 10:00 | *OPTIONAL** 1a. Installing HYSPLIT on Windows PC | Introduction | Introduction | Introduction | Introduction |
| | | Break | 3. Gridded Meteorological Data Files | 7. Air Concentration calculations | 11. Pollutant transformations and deposition (continued) | 15. Radioactive pollutants and dose |
| 14:00 - 15:00 | 10:00 - 11:00 | *OPTIONAL** 1b. Installing HYSPLIT on MAC | Break | | Break | |
| | | Break | 4. Trajectory Calculations | Break | 12. Air Concentration Uncertainty | Break |
| 15:00 - 16:00 | 11:00 - 12:00 | *One-on-one virtual installation sessions, by appointment* | | 8. Configuring the CAPTEX simulation | | 16. Volcanic eruptions with gravitational settling |
| 16:00 - 17:00 | 12:00 - 13:00 | *One-on-one virtual installation sessions, by appointment* | Break | Break | Break | Break |
| 17:00 - 18:00 | 13:00 - 14:00 | *One-on-one virtual installation sessions, by appointment* | 5. Trajectory Options | 9. Air concentration parameter sensitivity | 13. Source Attribution Methods | 17. Custom Simulations |
| 18:00 - 19:00 | 14:00 - 15:00 | *One-on-one virtual installation sessions, by appointment* | Break | | | Break |
| | | | 6. Trajectory Statistics | | Break | Final Questions and Course Wrap-Up |
| 19:00 - 20:00 | 15:00 - 16:00 | *One-on-one virtual installation sessions, by appointment* | | Break | 14a. Wildfire Smoke | |
| | | | Day 1 Wrap-Up | 10. Alternate display options | 14b. Dust Storms | |
| **20:00 - 21:00** | **16:00 - 17:00** | *One-on-one virtual installation sessions, by appointment* | | **11. Pollutant transformations and deposition** | Day 3 Wrap Up | |
| | | | | Day 2 Wrap Up | | |

# Asking Questions

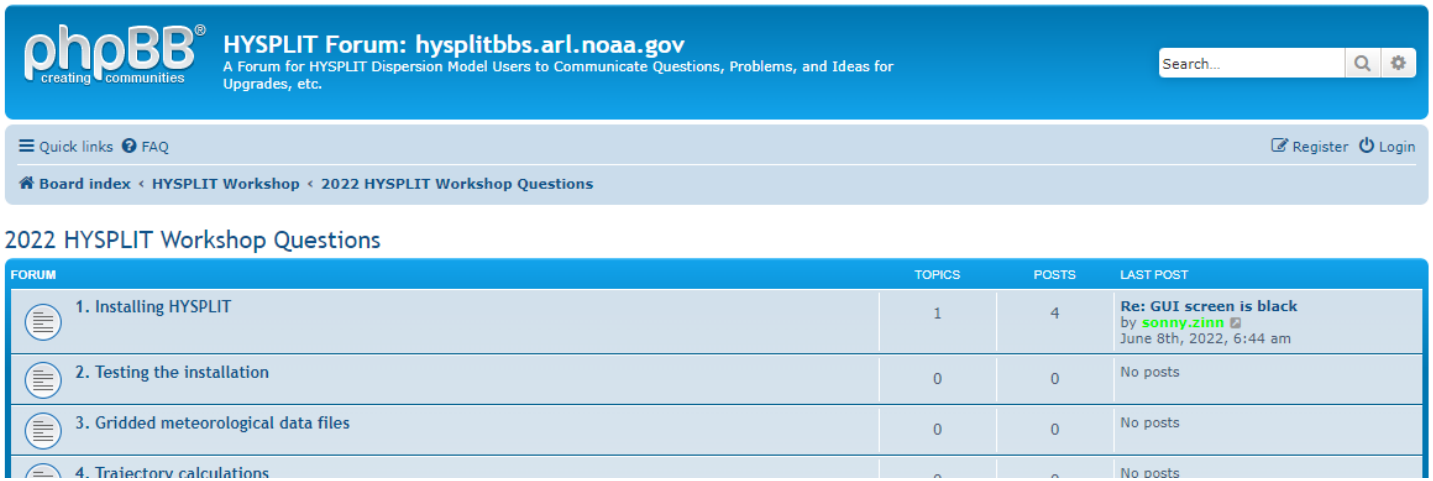



- Ask general or logistical questions about the Webinar or Go-to-Webinar in the Control Panel that was just discussed

*...if viewing a recording, can ask general questions by emailing* **`arl.webmaster@noaa.gov`**

- Ask questions about HYSPLIT and the Tutorial in the HYSPLIT Forum

https://hysplitbbs.arl.noaa.gov/viewforum.php?f=76



# Quick Recap of Logistics

- **General questions:**
  - use Go-to-Webinar Question box and we will do our best to answer
  - We are not using the "raise hand" feature for questions
- **Detailed questions, e.g., about the model:**
  - use the HYSPLIT Forum
  - if haven't already, "register" in upper right corner of Forum web page
- **Handouts:**
  - Other documents – e.g., this presentation – provided as Handouts in Go-to-Webinar and also on the Workshop Web Page
- **Recordings:**
  - Each day's recording will be posted to the Workshop Web Page as soon as it is ready, generally 4-8 hours after the day's session ends.
- **If not installed, or if get too far behind:**
  - Perfectly ok to view one or more sessions as "demonstrations" and then go back and do the sessions on your own. The Tutorial is designed to be done on one's own in self-paced environment.

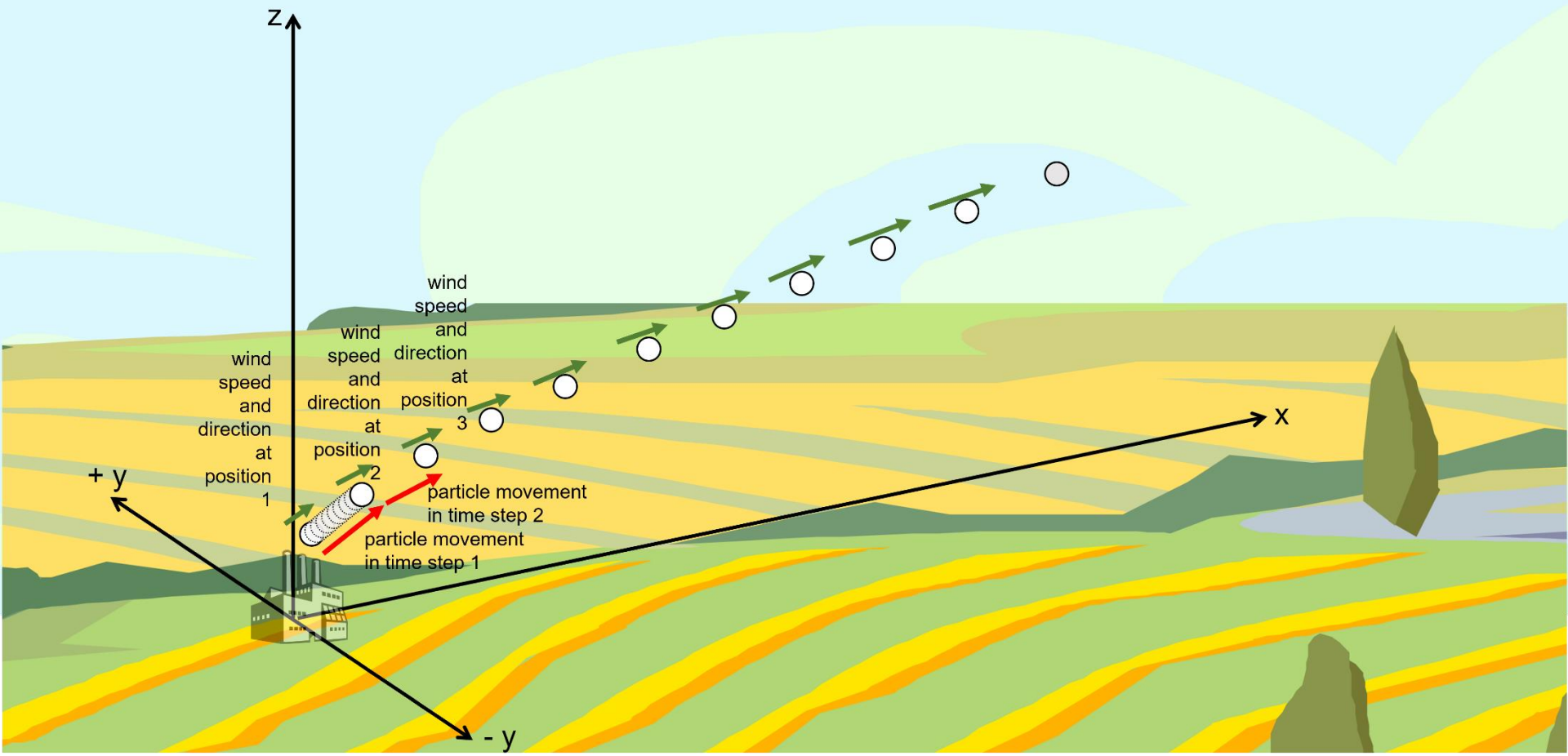
# Two different kinds of HYSPLIT simulations

- **Trajectory**
  - Center-line of a plume -- an oversimplification, but can provide very useful information
  - Can go forward or backward
  - Does not factor in any deposition or chemistry

- **Concentration - Dispersion**
  - The full 3D transport and dispersion of a plume
  - Includes transport by wind, but also <u>dispersion</u> around center line
  - Gives air concentrations downwind -- (e.g., can compare with public health thresholds)
  - Can include chemistry and wet and dry atmospheric deposition

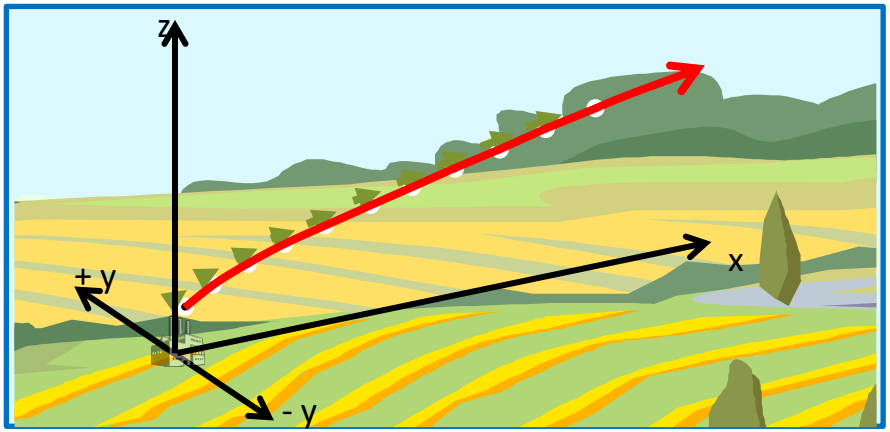
©The COMET Program

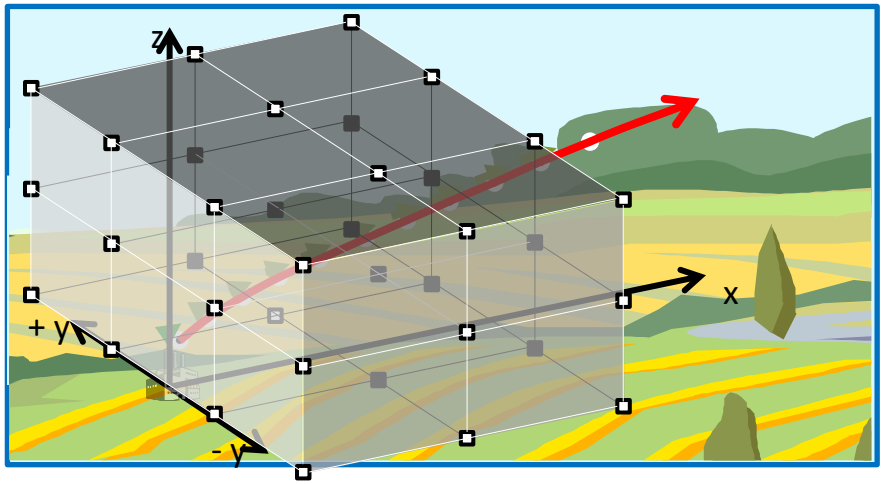
At its core, the HYSPLIT model just transports "particles" as they are blown along by the wind



# Met Data for HYSPLIT

- HYSPLIT is driven by gridded meteorological data, required as an "input"
  - Data must be supplied in ARL Packed Format
  - Conversion programs exist to convert most met model output data to ARL Packed Format
  - There is also an inline version of HYSPLIT embedded within the WRF meteorological model
- NOAA has several forecast and reanalysis datasets in HYSPLIT format
  - CONUS+ grids (e.g., 3 km HRRR; 12 km NAM)
  - CONUS+ 27km WRF reanalysis
  - Global grids (e.g., 0.25 deg GFS)
- HYSPLIT interpolates spatially and temporally to estimate meteorological variables at any given point in the simulation domain
- Can have multiple meteorological grids during the same simulation (e.g., local, regional and global), and HYSPLIT will use the finest grid at any location
- Ability to treat complex terrain? Largely depends on resolution / capability of meteorological model output used to drive HYSPLIT



**Meteorological Data Grid(s) - *Required***

- **These are the outputs from a meteorological model**
  - e.g. a weather forecasting model
  - wind speed & direction and other met data on a 3-D grid
- **Data sets differ based on**
  - What model was used to generate them
  - The horizontal grid spacing
  - The vertical grid spacing
  - The temporal resolution (e.g., data every hour)
- **HYSPLIT *must* have these data to run**
  - Data must be in "HYSPLIT format" (binary, ...)
  - ARL provides datasets for download (most from NOAA weather models)
  - HYSPLIT needs the filename and location on your computer
  - File must include the area and times that you are doing your run in
    - If a particle goes off the met data grid, it is terminated
    - If there are missing times, the model "crashes"
  - Can have multiple met files (e.g., several 1-day files for a multi-day simulation)
- **Uncertainties**
  - Weather model uncertainties (e.g., wind direction and speed not exactly right)
  - HYSPLIT *interpolates* between grid points (in space and time) to estimate the wind speed and direction at the *actual location* of a particle

# Agenda – Day 2

| UTC | EDT | Agenda Item |
|---|---|---|
| 13:00 – 13:15 | 09:00 – 09:15 | Introduction to Day 2 |
| 13:15 – 14:45 | 09:15 – 10:45 | 7. Air Concentration Calculations |
| 14:45 – 15:00 | 10:45 – 11:00 | Break |
| 15:00 – 16:30 | 11:00 – 12:30 | 8. Configuring the CAPTEX simulation |
| 16:30 – 17:30 | 12:30 – 13:30 | Break |
| 17:30 – 19:00 | 13:30 – 15:00 | 9. Air Concentration Parameter Sensitivity |
| 19:00 – 19:15 | 15:00 – 15:15 | Break |
| 19:15 – 20:00 | 15:15 – 16:00 | 10. Alternate Display Options |
| 20:00 – 20:45 | 16:00 – 16:45 | 11. Pollutant Transformations and deposition *(start this section if time permits)* |
| 20:45 – 21:00 | 16:45 – 17:00 | Day 2 Wrap-up / Questions |

Note: all times are approximate

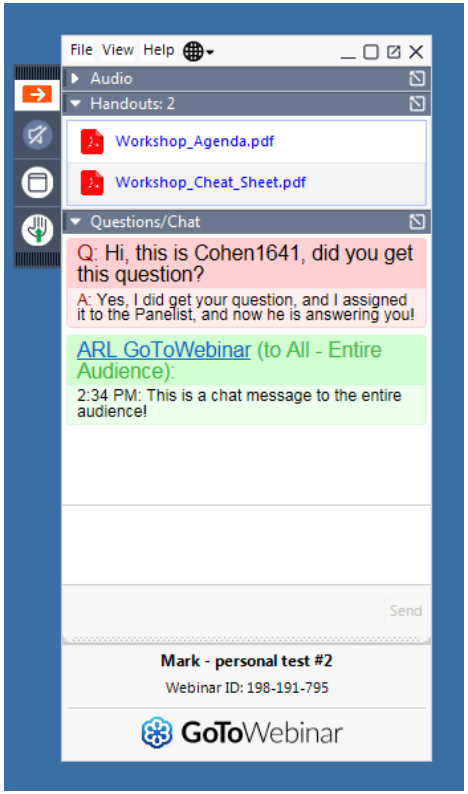
# Some of the more detailed introduction slides from the 1st day of the Workshop

# Using the Go-to-Webinar Interface

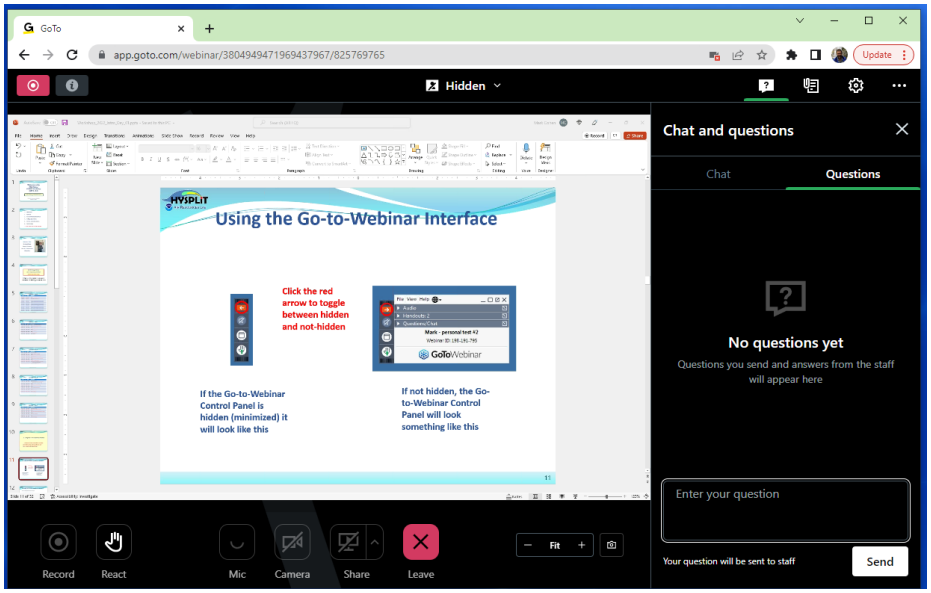
***...relevant if you are live-streaming the Workshop, but not if you are just viewing a recording...***

# Using the Go-to-Webinar Interface

## With the Go-to-Webinar Desktop Application




## Or can join through an internet browser (Google Chrome or Microsoft Edge)




https://support.goto.com/webinar/help/how-do-i-join-a-webinar-from-the-instant-join-app

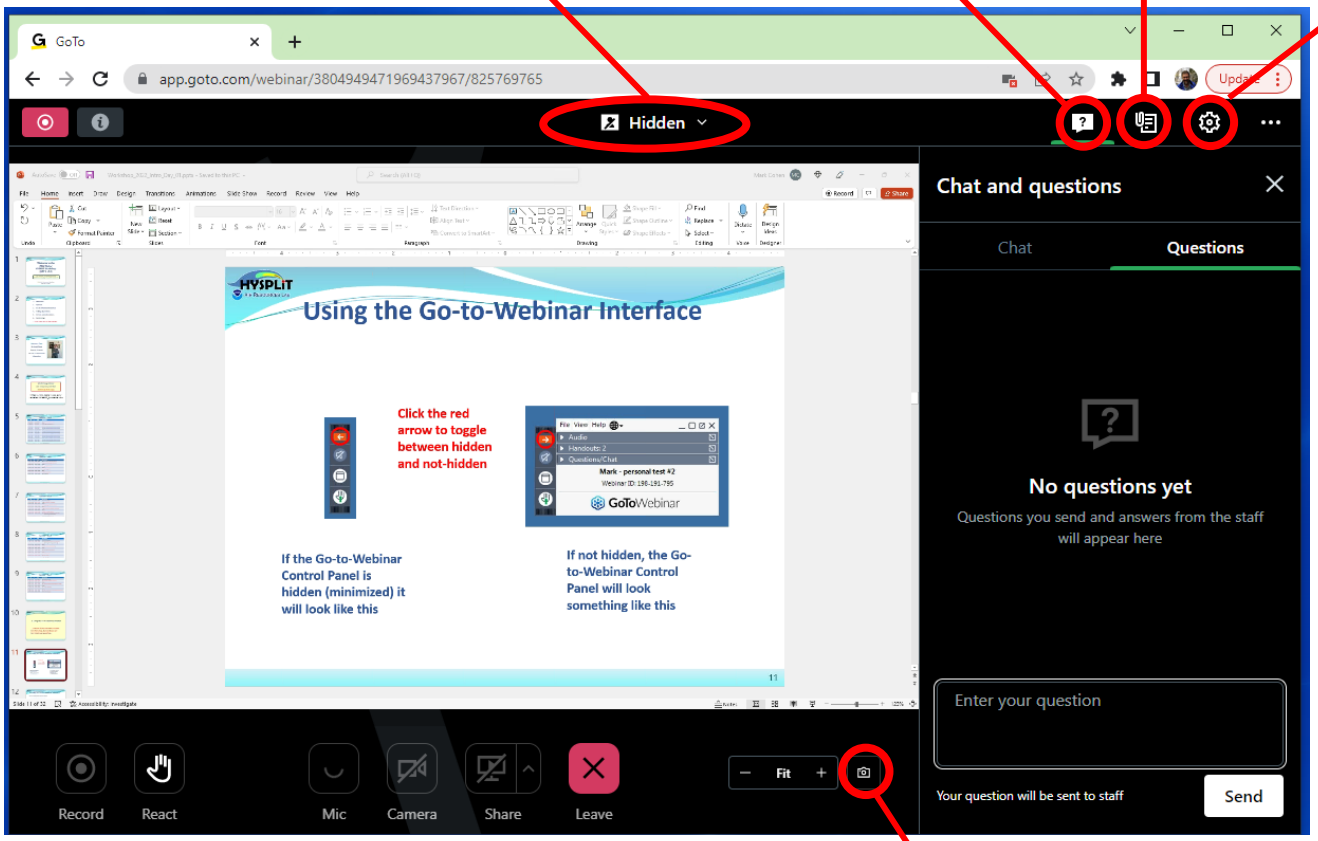
# Using the Go-to-Webinar Browser Interface

Toggle presenting team's webcam view to create more room on your screen

Materials, e.g., handouts

Questions

Settings




Take a screenshot

# Using the Go-to-Webinar Browser Interface

**https://support.goto.com/webinar/help/how-do-i-join-a-webinar-from-the-instant-join-app**

1. Make sure you meet the browser requirements.
    - Linux or Google Chrome OS
    - Microsoft Edge (most recent 3 versions)
    - Google Chrome (most recent 3 versions)

2. Go back to the confirmation email or You're Registered! page.
    - Copy the join links.
    - If you have the confirmation email open, right-click Join Webinar then select Copy Hyperlink.
    - If you are on the You're Registered! page, right-click join this webinar then select Copy link address.

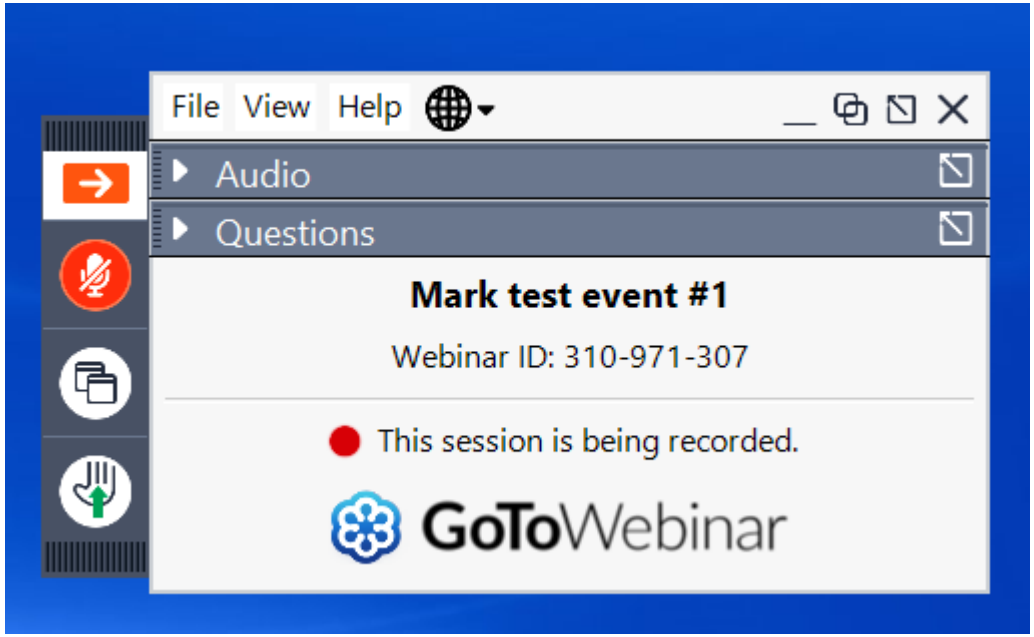
3. In a Google Chrome or Microsoft Edge browser, paste the join link.

    At the end of the URL, type in **?clientType=html5** then press Enter.

    The Join link will look similar to
    https://global.gotowebinar.com/join/2057328506534099723/930505186?clientType=html5.
    This link is not a real webinar but an example…

# Using the Go-to-Webinar Desktop App Interface

**Click the red arrow to toggle between hidden and not-hidden**



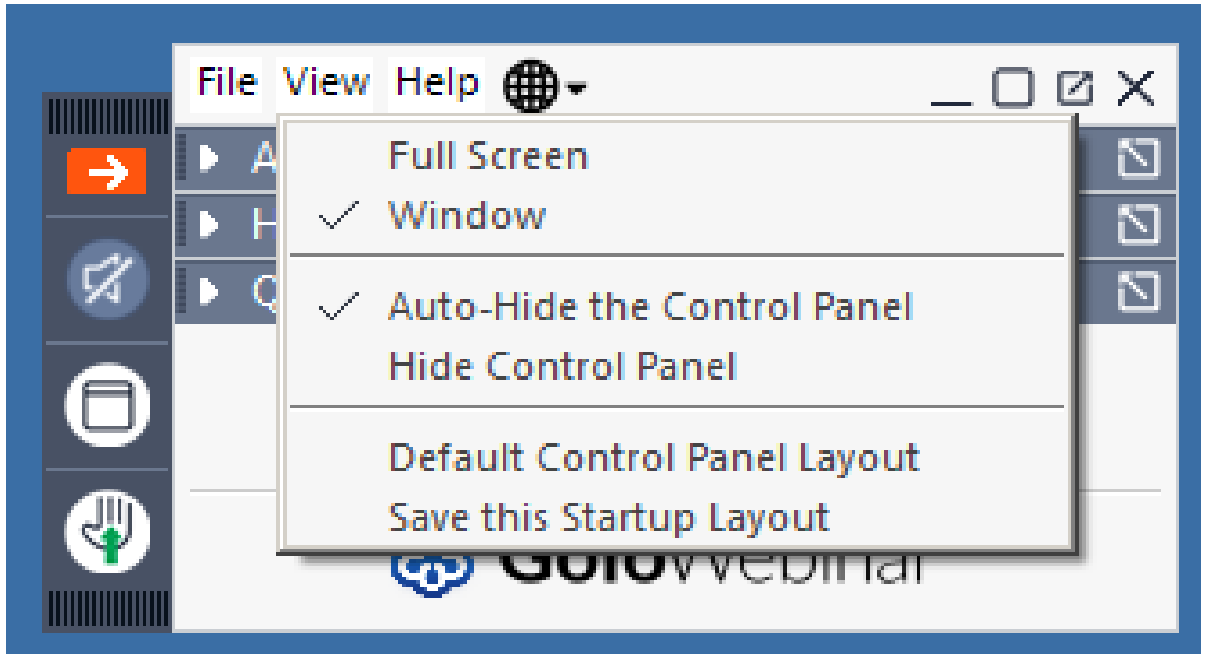

**If the Go-to-Webinar Control Panel is hidden (minimized) it will look like this**

**If not hidden, the Go-to-Webinar Control Panel will look something like this**

# Using the Go-to-Webinar Desktop App Interface

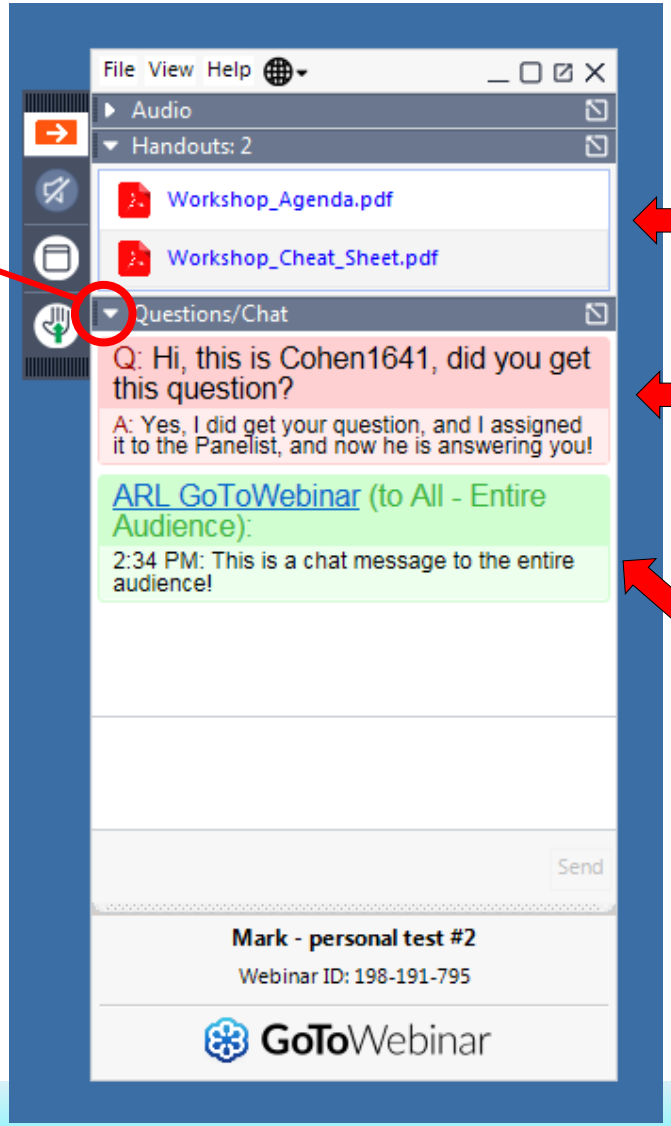
**Use the View drop-down menu, for example:**

- ✓ **to autohide control panel or not**
- ✓ **to restore the basic default layout if something disappears**



# Using the Go-to-Webinar Desktop App Interface

By toggling the little triangle by each Control Panel section, you can expand it or contract it

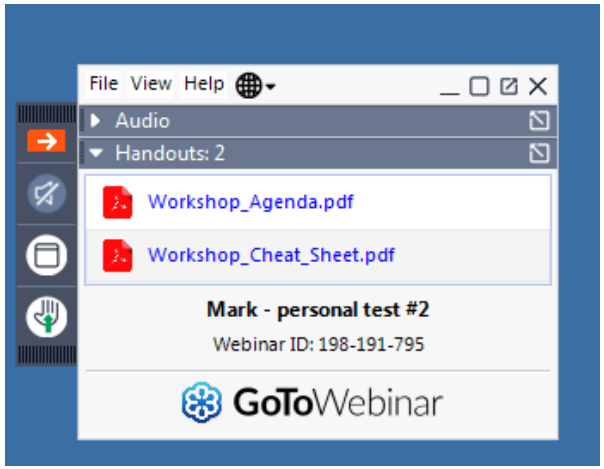


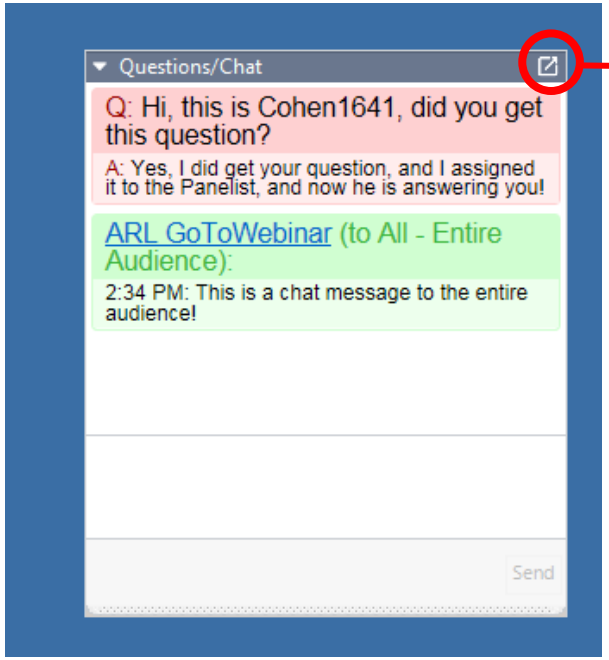

We will put important handouts in this section

When you ask questions of the staff, your questions and answers will be shown in this section

Or when the staff sends the audience a message, you will also see it here

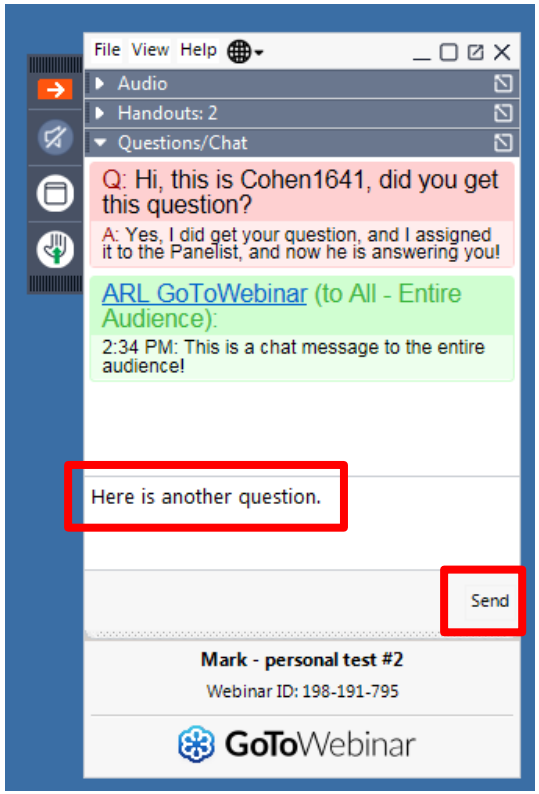
# Using the Go-to-Webinar Desktop App Interface

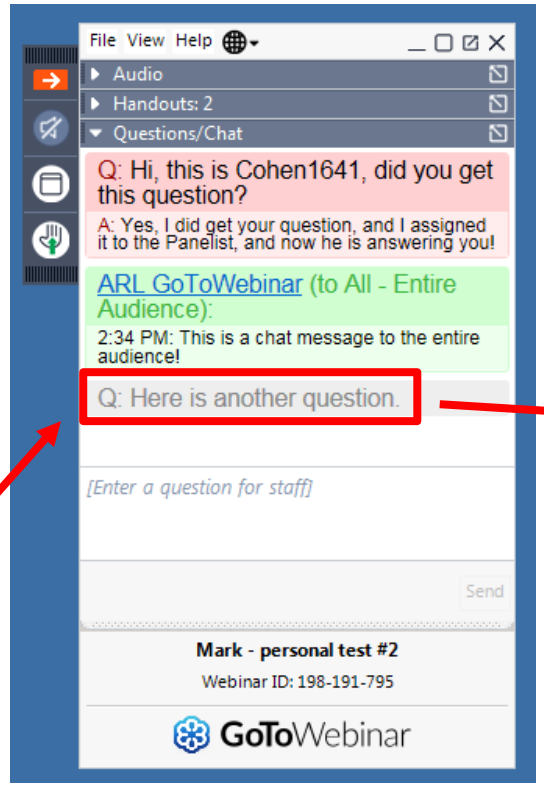


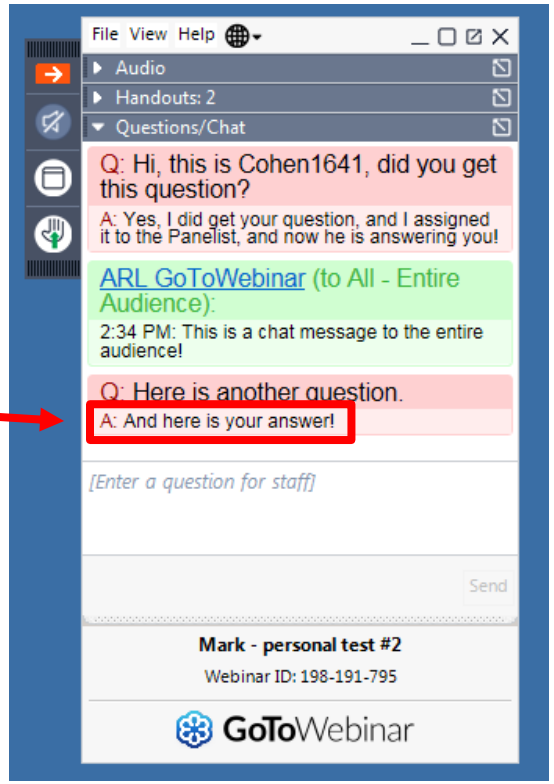




**By toggling the little box in the upper right-hand corner of a given section, you can undock it or redock it**

# Using the Go-to-Webinar Desktop App Interface



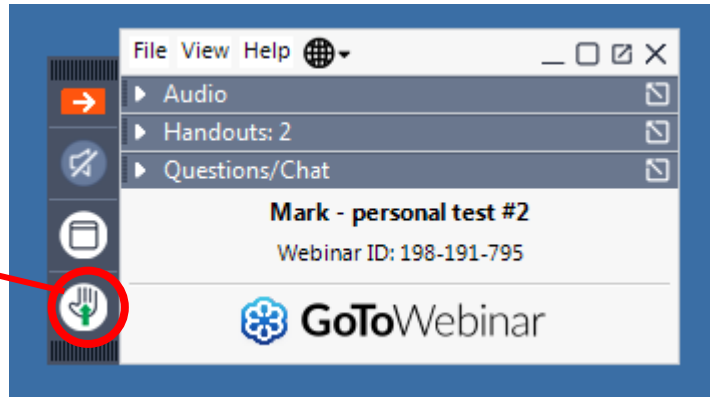

**To ask a question, you type in the empty box, and then hit "send"**

**The question you asked should then show up in *your* Control Panel**

**When we answer it, the answer will show up in *your* Control Panel**

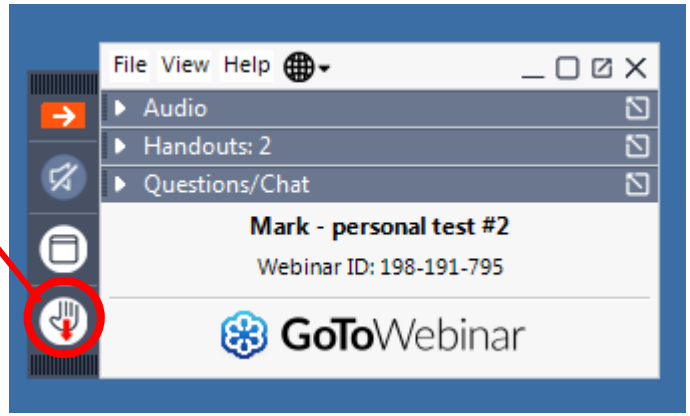
# Using the Go-to-Webinar Desktop App Interface

**Sometimes we will ask for a show of hands on a particular question. You click the little hand icon to raise your hand**




**To lower your hand, you click again on the same icon.**

*Normally, after we get the answers, we will automatically lower everyone's hand*

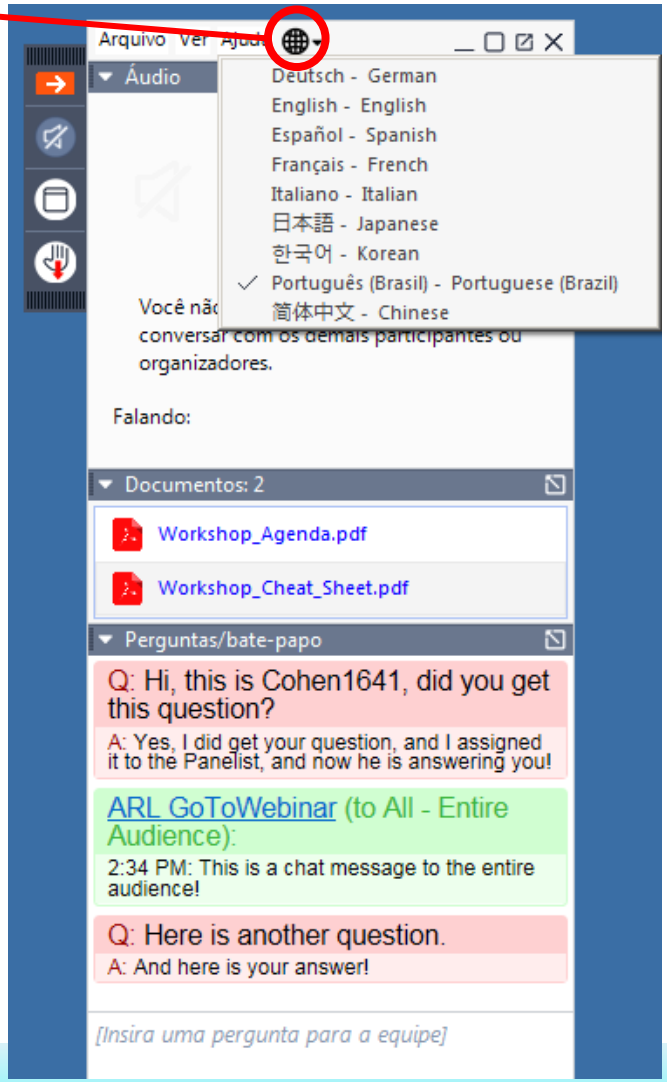



***You are in listen-only mode, so you don't raise your hand to <u>ask</u> a question.***

# Using the Go-to-Webinar Desktop App Interface

You can click on the "globe" icon to change the language of the Control Panel.

Although Questions and Answers will be in English



# Asking Questions

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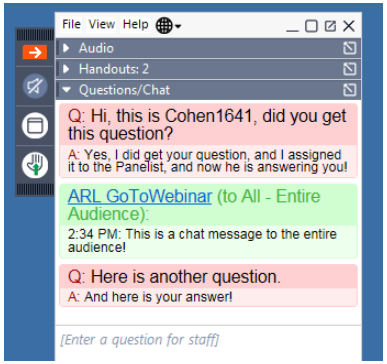


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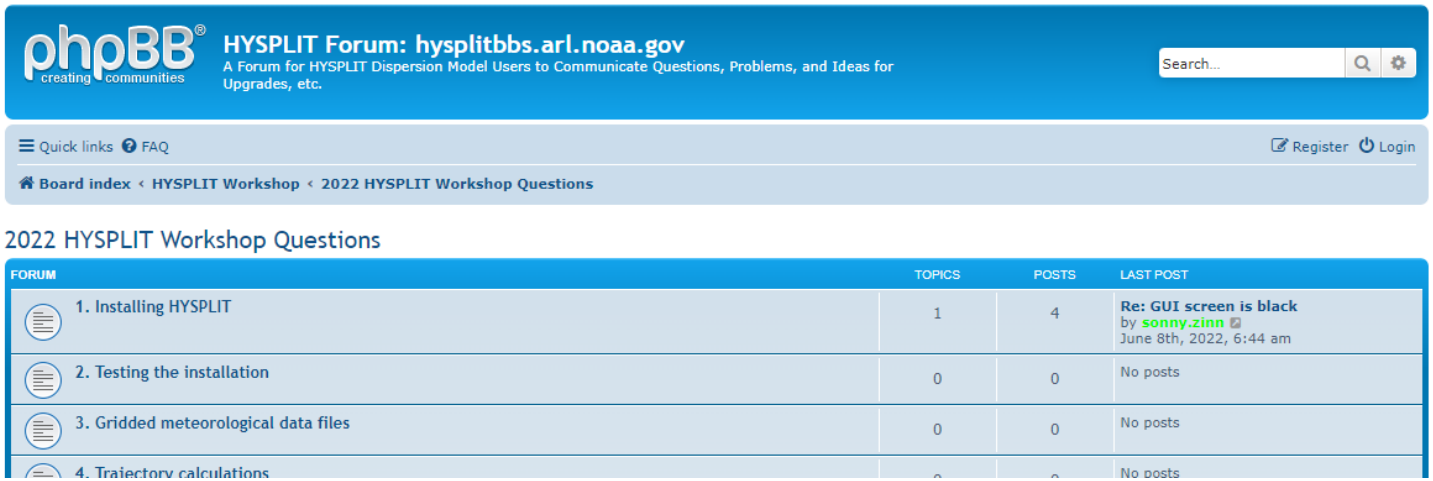
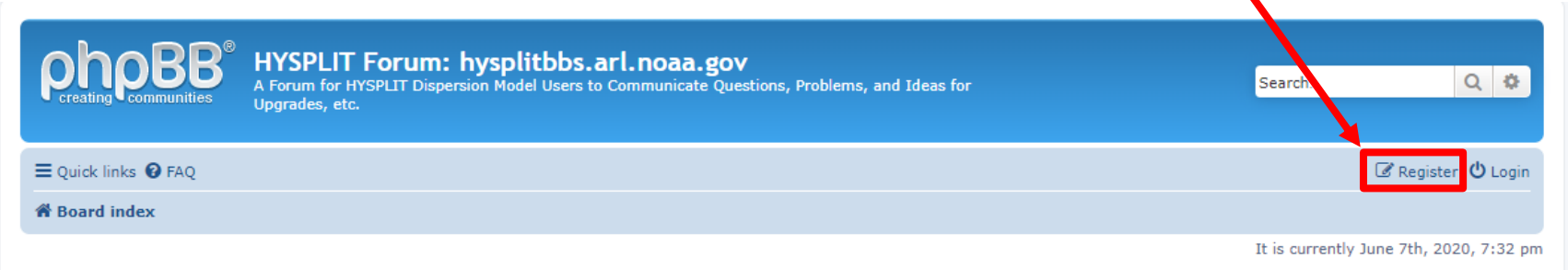


# Asking Questions

**If you have not already registered for the HYSPLIT Forum, you can do so easily by clicking on the "Register" icon at https://hysplitbbs.arl.noaa.gov/**



# Asking Questions


- Registration process asks you to place a series of cities either in the
  - United States of America
  - Other Countries

- Think of the biggest most important version of the city…

- E.g., even though there is a “Rome” in the U.S. and a “Paris” in the U.S., the correct answer is that they are in “Other Countries”

- One ambiguous one is “San Jose”, and for this purpose, identify it as being in the “United States of America” *(even though it is also the Capital of Costa Rica)*

# Asking Questions

phpBB creating communities

**HYSPLIT Forum: hysplitbbs.arl.noaa.gov**

A Forum for HYSPLIT Dispersion Model Users to Communicate Questions, Problems, and Ideas for Upgrades, etc.

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Board index

It is currently June 18th, 2020, 6:36 pm

Last visit was: June 16th, 2020, 10:13 am

Mark forums read

| HYSPLIT | TOPICS | POSTS | LAST POST |
|---|---|---|---|
| **Users**<br>General questions and postings pertaining to the use of HYSPLIT regardless of the platform. For platform specific questions, use the HYSPLIT Platform forums. | 190 | 715 | **Re: Meteorological Data**<br>by barbara.stunder<br>May 26th, 2020, 8:52 am |
| **Developers**<br>Questions and postings pertaining to the development of HYSPLIT, feature enhancements, and HYSPLIT internals. HYSPLIT source code and algorithms are discussed here. | 19 | 70 | **Trying to Recreate This image**<br>by munleyj<br>May 11th, 2020, 9:48 am |
| **Bugs**<br>Post any defects you find in the HYSPLIT software here. The HYSPLIT Developers carefully monitor this list and will work diligently to repair any reported problems. When posting a bug report, please specify both the HYSPLIT version and operating system you are using. | 42 | 145 | **Re: question about DATEM form...**<br>by lida<br>May 18th, 2020, 9:37 pm |
| **Announce**<br>Announcements pertaining to HYSPLIT, training materials, dispersion related jobs or research positions, or related software. This list is moderated and will not be used for any discussion. | 25 | 47 | **Re: TAPPAS**<br>by alicec<br>January 27th, 2020, 12:26 pm |

⋮

| | | | |
|---|---|---|---|
| in the atmosphere. This section is also to facilitate collaborations between researchers involved in chemical transport and dispersion. | | | January 22nd, 2020, 3:56 am |
| **Radiological**<br>Post questions, comments and links to research (research papers, web sites, etc) involving HYSPLIT and radiological nuclides. This section is also to facilitate collaborations between researchers involved in radiological nuclide transport and dispersion. | 12 | 38 | **Re: Fukushima Calculation**<br>by ariel.stein<br>September 20th, 2018, 9:25 am |
| **Cluster Analysis**<br>Topics about the trajectory clustering program for HYSPLIT. | 31 | 133 | **Re: Generate cluster trajecto...**<br>by barbara.stunder<br>August 26th, 2019, 7:35 am |

| FORUM | TOPICS | POSTS | LAST POST |
|---|---|---|---|
| **HYSPLIT Workshop** | 17 | 34 | ? **Re: Moderator test**<br>by alicec<br>June 12th, 2020, 11:30 am |

# Asking Questions

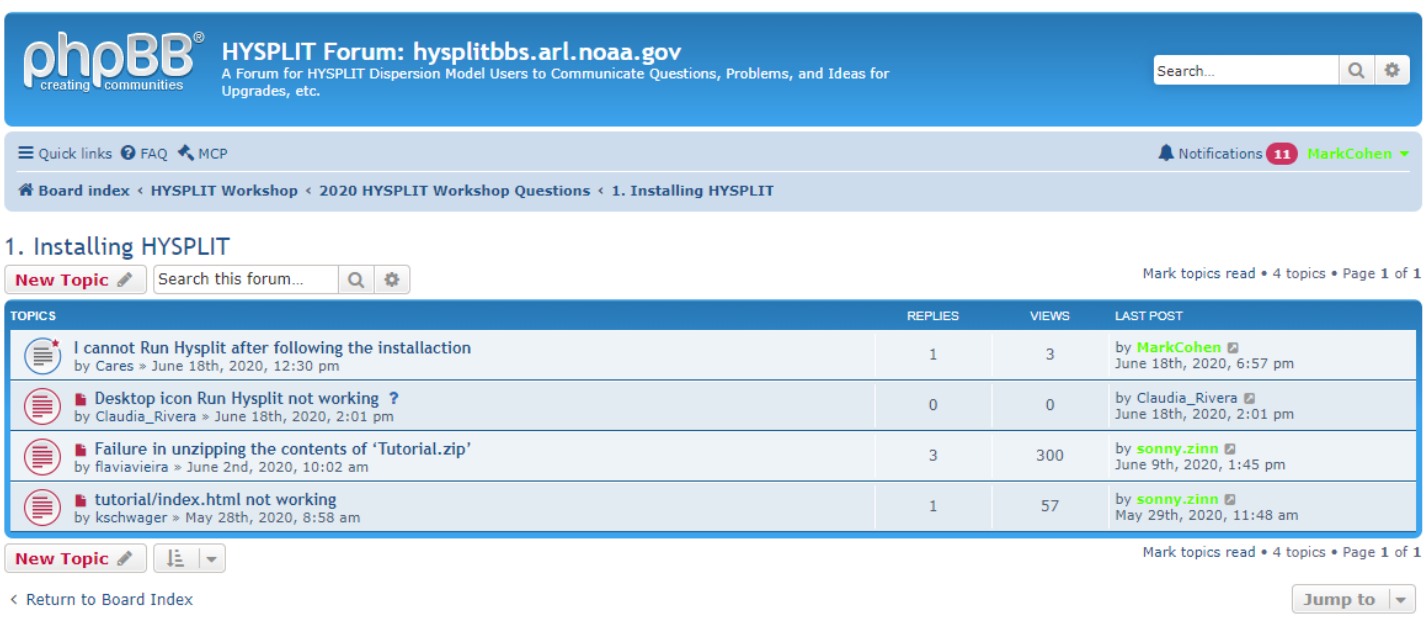
# Asking Questions

https://hysplitbbs.arl.noaa.gov/viewforum.php?f=57


**You can post your question in the appropriate section, based on where in the Tutorial your question refers to.**

# Asking Questions

**You can look to see if there already is a similar question, and if not, you can create a New Topic**



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Board index ‹ HYSPLIT Workshop ‹ 2020 HYSPLIT Workshop Questions ‹ 1. Installing HYSPLIT

## 1. Installing HYSPLIT

POST A NEW TOPIC

Subject:

B I U Normal

Add your question text in this box.

Please avoid putting any links in your post.

Do not start any line with two dashes "--"

Smilies

BBCode is *ON*
[img] is *ON*
[flash] is *OFF*
[url] is *ON*
Smilies are *ON*

Save draft | Preview | Submit

Options | Attachments | Poll creation

- [ ] Disable BBCode
- [ ] Disable smilies
- [ ] Do not automatically parse URLs
- [x] Attach a signature (signatures can be altered via the UCP)
- [ ] Notify me when a reply is posted
- [ ] Lock topic

Board index

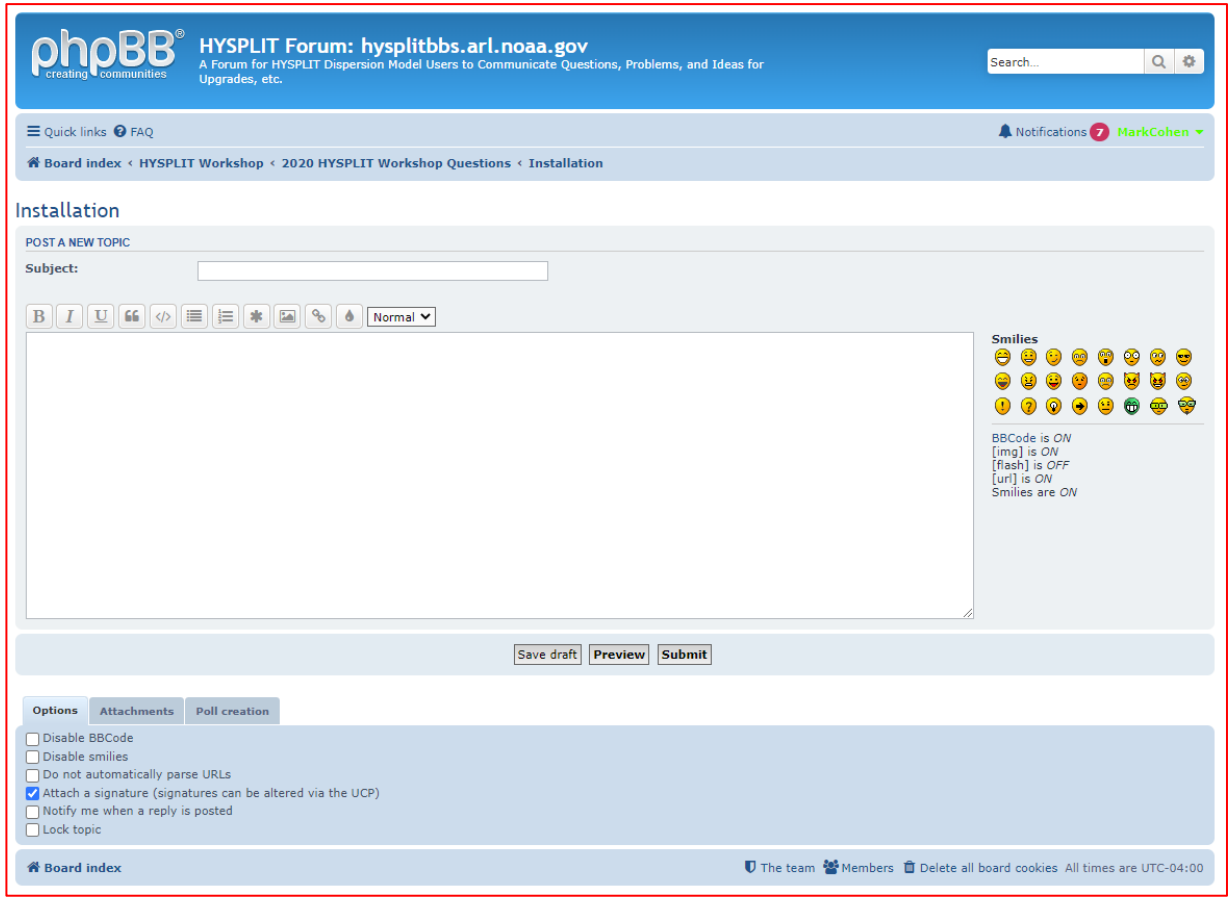
The team Members Delete all board cookies All times are UTC-04:00

you can add attachments, e.g., one or more screen shots, and/or a CONTROL file and/or a SETUP.CFG file

Once you submit your post, it can be approved and then answered by ARL staff

# Asking Questions

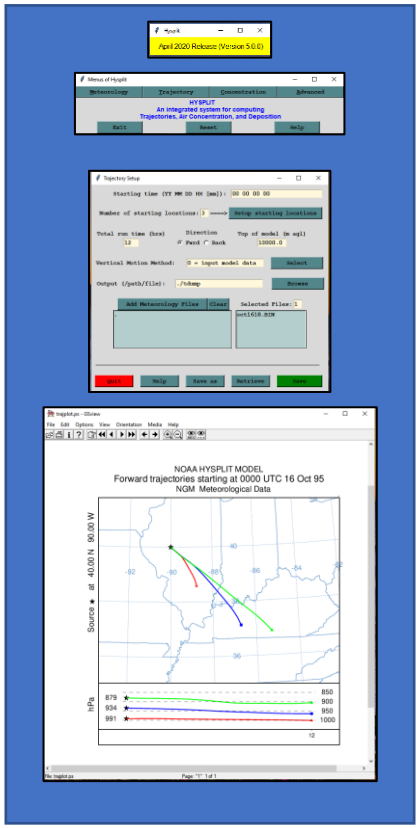
- You can ask more detailed questions, e.g., can attach screen shots
- We can provide more detailed answers
- There can be an exchange back and forth, if needed
- Can see other questions – in case you have a similar question
- We can give you a link to the answer to a similar question
- Accessible to people just viewing the recordings



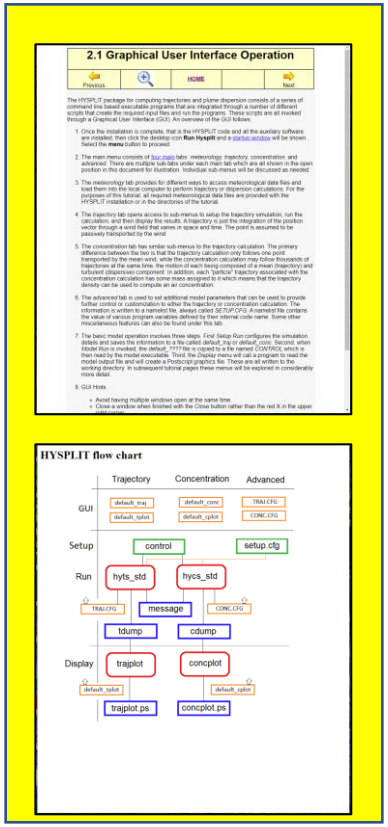
# Screen Considerations

# Screen Considerations

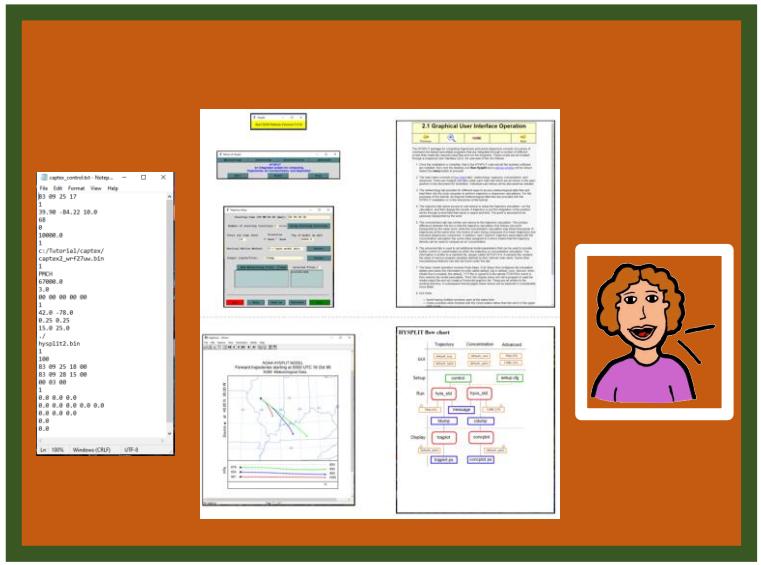
**Screen area devoted to your *own* hands-on HYSPLIT modeling**




**Screen area devoted to your *own* viewing of Tutorial**




**Screen area devoted to viewing the Webinar**



*We recommend that a 2nd screen be used, if this is possible, e.g., to display the Workshop Webinar video. In this way, the participant can carry out their hands-on HYSPLIT work, in conjunction with the Workshop, and still conveniently view the ongoing, associated instructions.*

# Recordings

# Recordings

Access recordings from the Workshop Web Page:
https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php

- Recordings of each day's on-line sessions are being created, *but processing takes significant time* (~4 to 8+ hours *after* a day's session ends)

- Workshop Web Page – once the video is posted on our site, the corresponding item in the list below will turn into a link you can click to view

**Workshop Logistics**

**Handouts, Notes, and Recordings.** Videos of each day's on-line sessions are being created for review by participants, e.g., for those in time zones that would make online participation difficult. Processing of the videos to make them viewable takes significant time. When the video is posted, the corresponding entry below will become a link. When you click on one of these links, you should be able to view the video directly. To download a video recording, start playing it. Then place your mouse anywhere in the video area and right click the mouse. Choose the "Save As" menu.

•**Installation Day (Mon, June 13)**

- Installation day introduction
- Workshop video recording installation day and unfinished transcript. The transcript is machine-generated and it may contain inaccurate captions. See the above paragraph on how to download the video file.

# Installation

# Installation

From the Workshop Web Page:
https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php

**Key Steps to Take *Before* the Workshop**

1. Download the primary course materials - Tutorial.zip - and unzip the conte
consistent with preconfigured input files, but placing the file elsewhere is a
the Home directory. On any operating system, if unzipping to a different di
HYSPLIT system use the space as a file name delimiter.

2. Navigate to the Tutorial directory and open Index.html in a browser windo
screenshot at right.

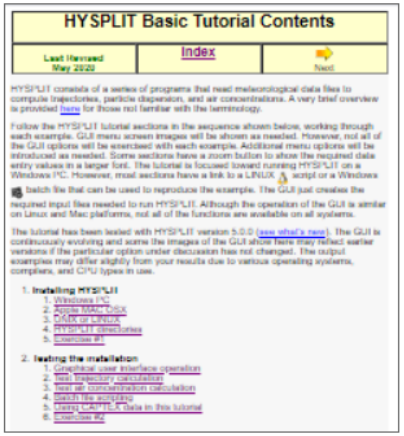
3. Click on the link in section `1. Installing HYSPLIT` to the instructions for you
MAC OSX, or UNIX-LINUX) and follow the instructions there to install HYS
computer. As described in the Installation instructions, graphical utilities sh
for Windows installations, Tcl/Tk, and ImageMagick should be installed pri
   - For Windows users only: Two legacy executables included in versions
   were found to have an issue. They are txt2dbf.exe and dbf2txt.exe. Th

# From the Workshop Web Page: https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php

**Key Steps to Take *Before* the Workshop**

1. Download the primary course materials - Tutorial.zip - and unzip the contents. For Windows users, unzipping to `c:\Tutorial` is recommended, to be most fully consistent with preconfigured input files, but placing the file elsewhere is also possible, e.g., `c:\users\your_name\Tutorial`. For MAC users, the file can be unzipped to the Home directory. On any operating system, if unzipping to a different directory name, avoid directories with embedded spaces because many programs in the HYSPLIT system use the space as a file name delimiter.

2. Navigate to the Tutorial directory and open Index.html in a browser window. You should see something like the screenshot at right.




3. Click on the link in section `1. Installing HYSPLIT` to the instructions for your operating system (Windows PC, Apple MAC OSX, or UNIX-LINUX) and follow the instructions there to install HYSPLIT and associated software on your computer. As described in the Installation instructions, graphical utilities should be installed prior to HYSPLIT. E.g., for Windows installations, Tcl/Tk, and ImageMagick should be installed prior to installing HYSPLIT.
   - For Windows users only: Two legacy executables included in versions 5.2.0 and 5.2.1 (and earlier releases) were found to have an issue. They are txt2dbf.exe and dbf2txt.exe. They create and check DBF files for Geographic Information System (GIS). Please download and unzip the dbf_util.zip file and place the executables in the hysplit exec directory to overwrite the existing.

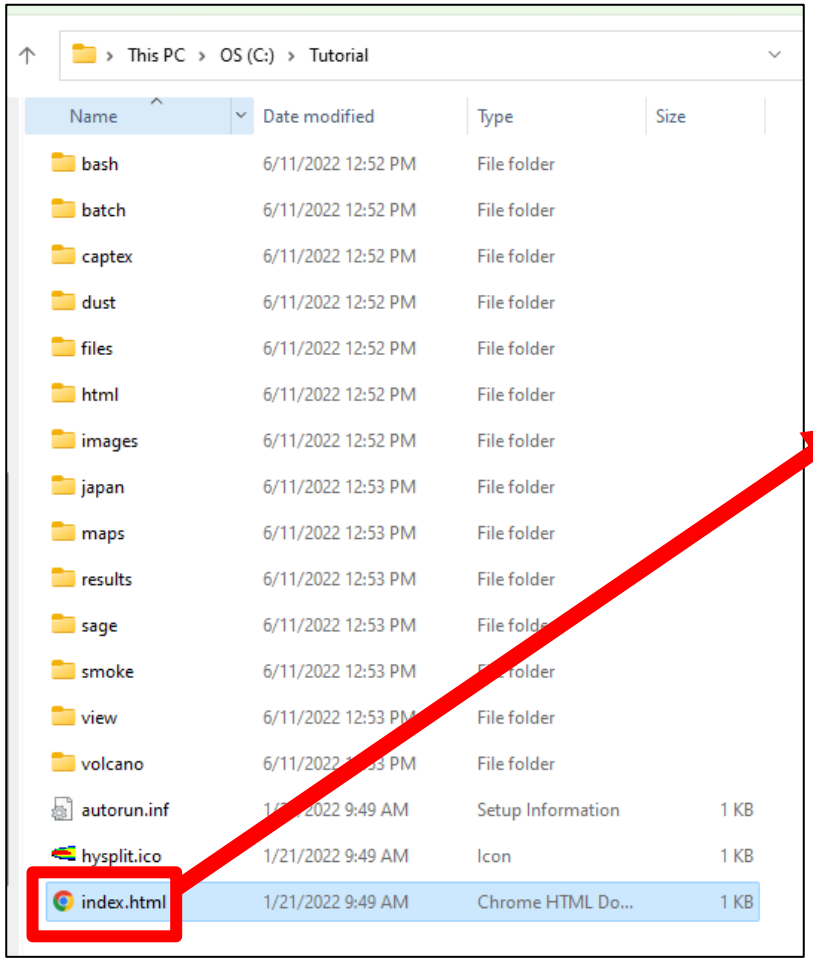
4. Installation may require administrative privileges, and we urge you to work with your IT colleagues to successfully complete this installation process if necessary. The Workshop is intended to be hands-on, i.e., the participants will be following along and will be carrying out the steps in the Tutorial themselves.
   - Due to the large number of participants, it will be difficult for us to provide significant installation help *once the Workshop starts*. We will try to answer questions, but installation issues can be difficult to efficiently resolve remotely. Thus, we strongly encourage all participants to make every effort to complete the installation before the Workshop starts.
   - If you encounter any installation issues *prior to the Workshop*, please post your questions **[Forum > 2022 HYSPLIT Workshop Questions > Installation]**, and we will assist you. A separate registration is required to post to the Forum (see item 6 below).
   - For all remaining installation issues, we will attempt to provide assistance by appointment on Monday June 13, between the hours of 11 AM and 5 PM Eastern Daylight Time. To make an appointment, please use our web application for scheduling at https://apps.arl.noaa.gov/pickurtm. Your email address used for the workshop registration will be required.

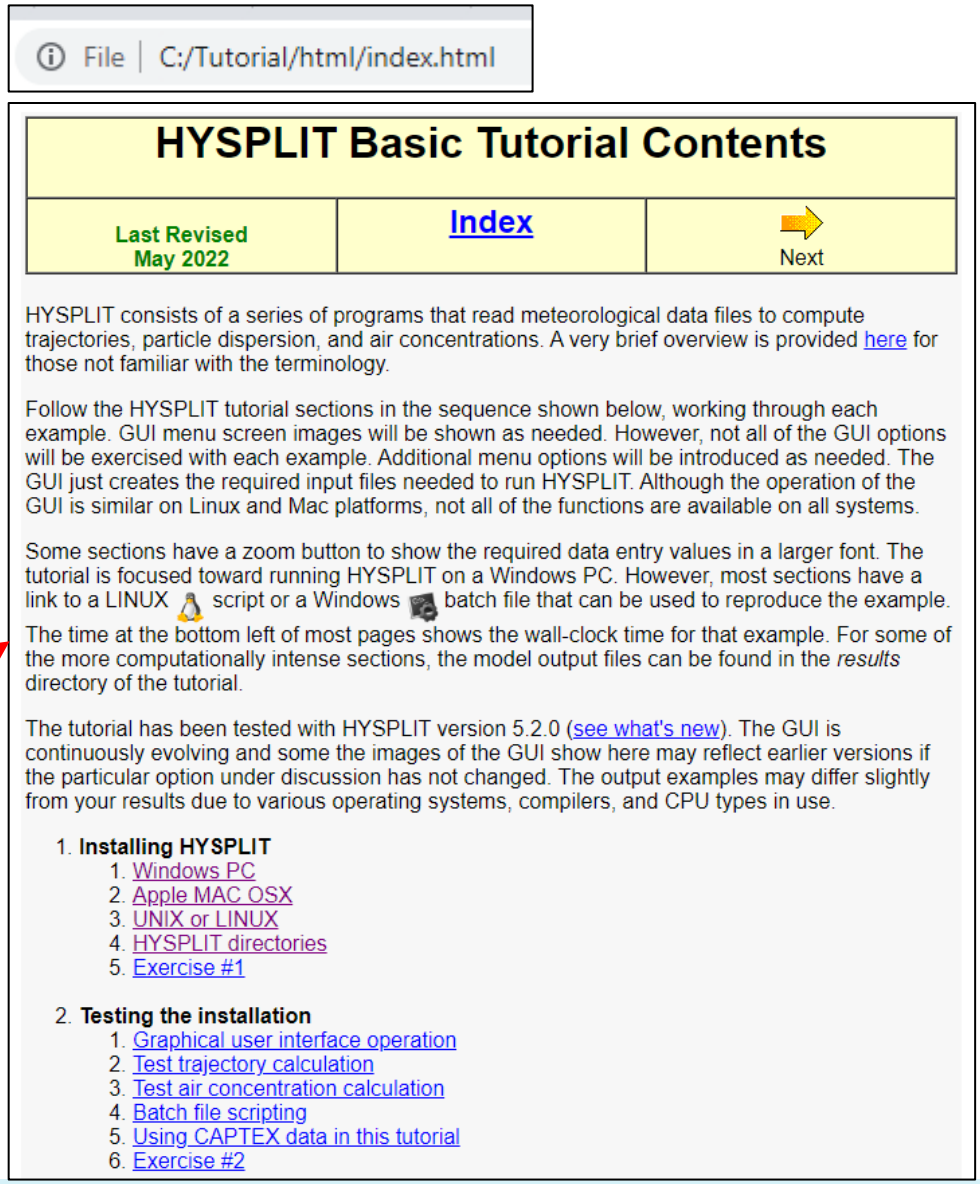
5. If possible, try "test" the installation by following instructions in section 2 of the Tutorial, "Test trajectory calculation" and "Test air concentration calculation". If you can successfully reproduce the steps outlined in these sections on your computer, the installation process has most likely been successful.

6. If you are not already registered for the HYSPLIT Forum, create a free account at https://hysplitbbs.arl.noaa.gov/, by clicking on the Register link near the top right of the page. Questions before the Workshop, e.g., about installation, can be posted here. *The Forum will also be the primary way that participants will be able to ask questions during the Workshop itself.*

## 2. Double-click or "open" `index.html` in Tutorial main directory to open the Tutorial in a browser.

## 1. Download and unzip Tutorial.zip to somewhere on your computer



# 1.1 Windows PC HYSPLIT Install



The public-unregistered or registered versions of HYSPLIT should be downloaded as noted below. The installation contains all the executables, documentation, and some test meteorological data. Starting with HYSPLIT v5.2.0, the graphical user interface only requires Tcl/Tk because the Postscript graphics have been replaced by Scalable Vector Graphics (SVG) which can be displayed through any browser. Ghostscript and Ghostview are no longer needed. ImageMagick should also be installed if SVG is to be conveted to other formats. Other optional programs such as Google Earth and ArcExplorer may be installed if desired. Each software component must be downloaded from its own vendor or distributor web page, unless noted below. For some programs, selections exist for either a 32-bit or 64-bit download. HYSPLIT is provided only for a 64-bit OS. If you are unsure of which system is installed on your computer, check the control panel system tab for the operating system.

1. Tcl/Tk Graphical User Interface

   Version 8.5 or later is required.

   A Tcl/Tk script interpreter is required to run the HYSPLIT GUI. Further, various computations can be automated through the use of Tcl scripts. The standard HYSPLIT installation includes all the GUI scripts, but the Tcl/Tk interpreter is not part of the distribution. You can download and compile the source code, use one of the precompiled binaries available from the Tcl/Tk web site, or download and unzip the ARL compiled version (tcl.zip) to a directory on your computer (C:\tcl for example) which will contain the Windows executable (tcl\bin\wish86t.exe). For other versions, install the software to the suggested default directory prior to installing HYSPLIT.

   - ARL pre-compiled Tcl/Tk 8.6 executable
   - Tcl/Tk Developers Home Page

2. ImageMagick File Converter

   Tested versions include up to 7.0.7.

   The GUI has a built in link that permits the conversion of the SVG output to most other

# 1.2 Apple MAC OSX HYSPLIT install

| Previous | | HOME | | Next |
|---|---|---|---|---|

The HYSPLIT Mac installation is similar to a Windows PC. Starting with HYSPLIT v5.2.0, the graphical user interface only requires Tcl/Tk because the Postscript graphics have been replaced by Scalable Vector Graphics (SVG) which can be displayed through any browser.

1. Tcl/Tk Graphical User Interface

   Version 8.5 or later is required.

   Although not required to run HYSPLIT, a GUI composed of multiple Tcl/Tk scripts is provided with HYSPLIT. The model can also be run using a command line interface. However, it is easier for novice users to use the Tcl/Tk interface. The HYSPLIT installation includes all the GUI scripts, but the Tcl/Tk interpreter is not part of the distribution. Most Unix / Linux operating system distributions, as well as Mac OS X, include Tcl/Tk. If not already installed, you can download Tcl/Tk from the Tcl/Tk web site. Install the software to the suggested default directory prior to installing HYSPLIT.

   - Tcl/Tk Home Page

2. ImageMagick Converter

   Tested versions include up to 7.0.7.

   The capability to convert SVG to other graphical formats is enabled within the GUI through ImageMagick. However, on MAC systems the *Preview* function can also be used to export

# 1.3 UNIX - LINUX HYSPLIT install

| Previous | | HOME | | Next |
|---|---|---|---|---|

Like the Windows and Mac distributions, pre-compiled LINUX distributions come with all executables. However, for installation on a UNIX or some LINUX systems, the code must be compiled locally. See the HYSPLIT web page for more information about how to obtain either LINUX version. The remainder of this section discusses (1) how to install a pre-compiled LINUX distribution and (2) how to obtain and compile the source code from the repository.

## Installing pre-compiled Linux distribution

1. Similar to all pre-compiled versions, Windows, Mac, and LINUX, the prerequisite software should be installed prior to installing HYSPLIT. The graphical user interface requires Tcl/Tk version 8.5 or later. The default graphical format for HYSPLIT is now SVG, which can be viewed using any browser. The GUI and tutorial scripts search for the installation location of ***Firefox***. You may need to change the browser if Firefox is not found on your system.

2. SVG can be converted to other formats using ImageMagick. If not already available on your system, they may be easily installed using **yum**, **apt**, or **brew**. For some systems, just entering one of the commands, for instance **wish** for Tcl, or **convert** for ImageMagick will prompt the system to download and install the required libraries and software.

3. A pre-compiled LINUX distribution is a compressed tarball named **hysplit.vX.Y.Z_OS.tar.gz** where X.Y.Z and OS denote a HYSPLIT version and an operating system, respectively

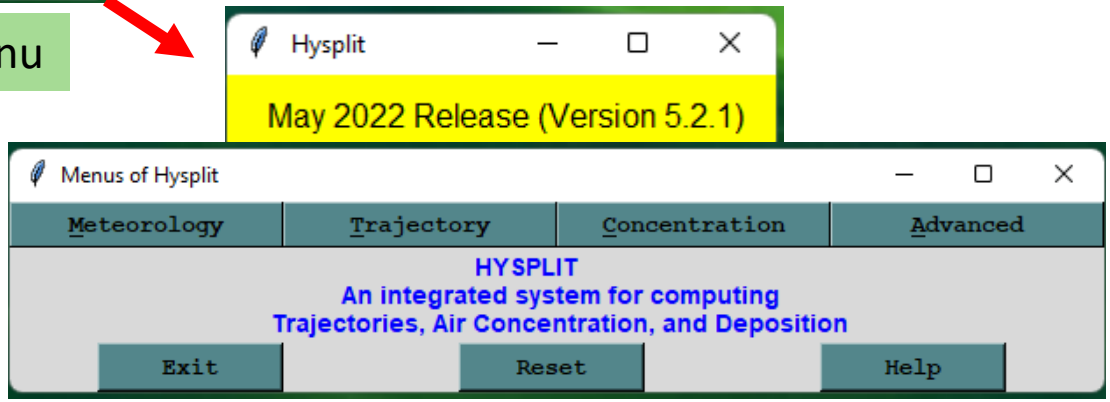
| | | Windows | MacOS | Linux |
|---|---|---|---|---|
| | **Tutorial** | Download and unzip Tutorial.zip | | |
| Graphical Utilities | **Tcl/Tk**<br>** Required to run Graphical User Interface (GUI) | ➢ Install from Tcl/Tk website<br>➢ Or -- Download pre-compiled executable from ARL website | Already installed on most MacOS systems | Already installed on most Linux systems |
| | ***ImageMagick*** | *Optional – can do almost everything in Workshop except create animation or convert graphics to other formats* | | |
| | ***Python*** | *Optional – not required for Workshop* | | |
| | **HYSPLIT** | ➢ Download and run self-extracting executable<br>➢ Or -- Download and unzip model files | ➢ Download hysplit_v5.2.1.dmg and then run Install_hysplit.app | ➢ Precompiled executables<br>➢ Or -- Compile locally |

# What does a successful installation look like?

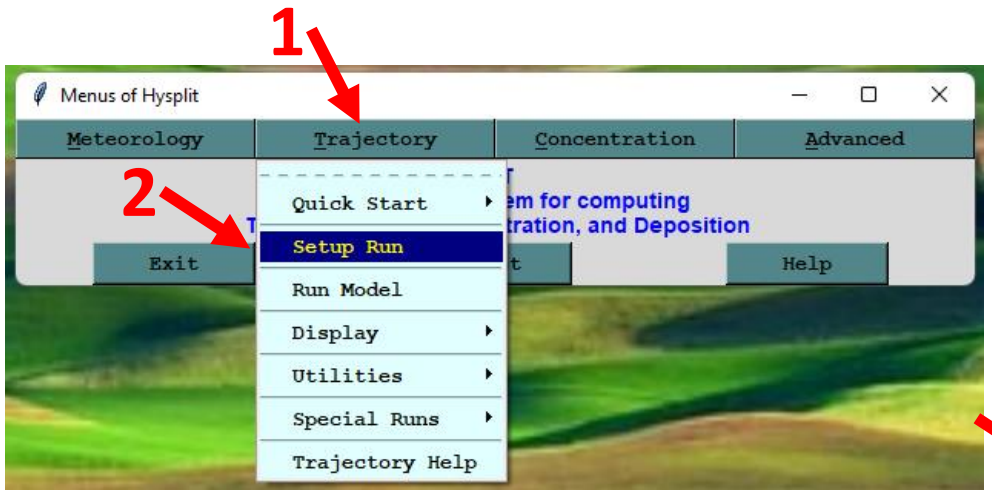


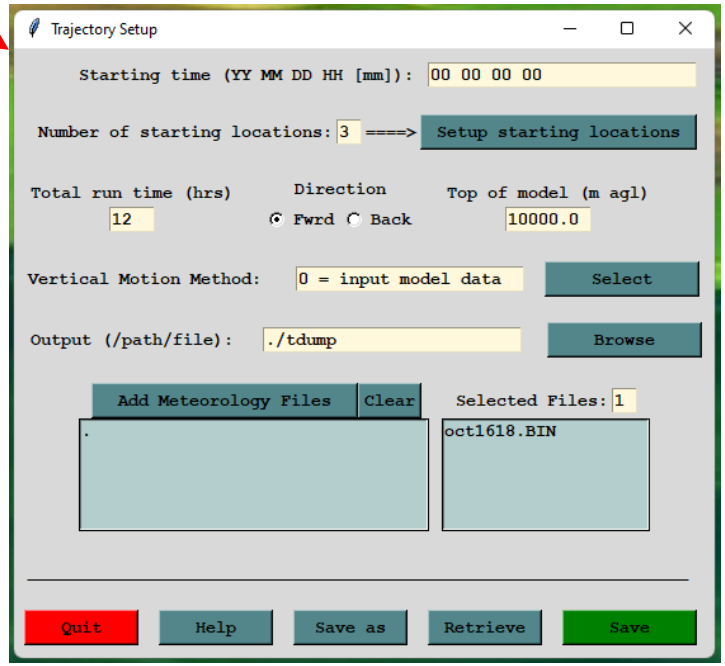
Menu

Sometimes this “yellow” window is behind the “Menus of Hysplit” window



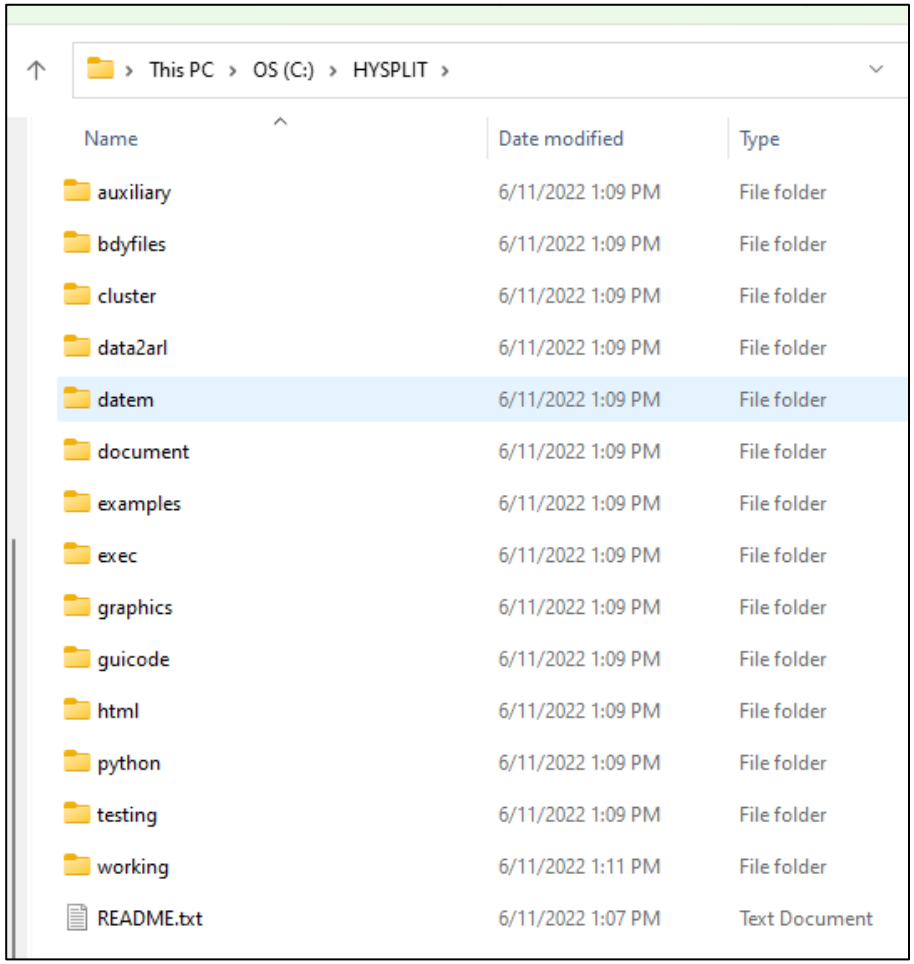
# What does a successful installation look like?

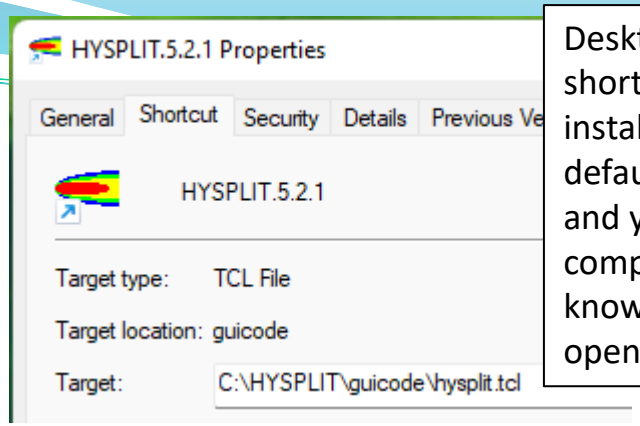


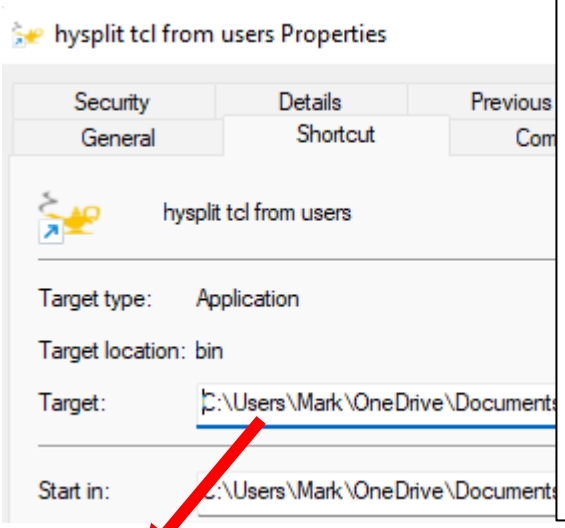

If you are getting these types of things on your screen, then you have likely installed HYSPLIT successfully, and, that Tcl/Tk interpreter has been installed and is working properly on your computer.

# What does a successful installation look like?




Desktop shortcut if TCL installed in default location and your computer knows how to open *.tcl files.



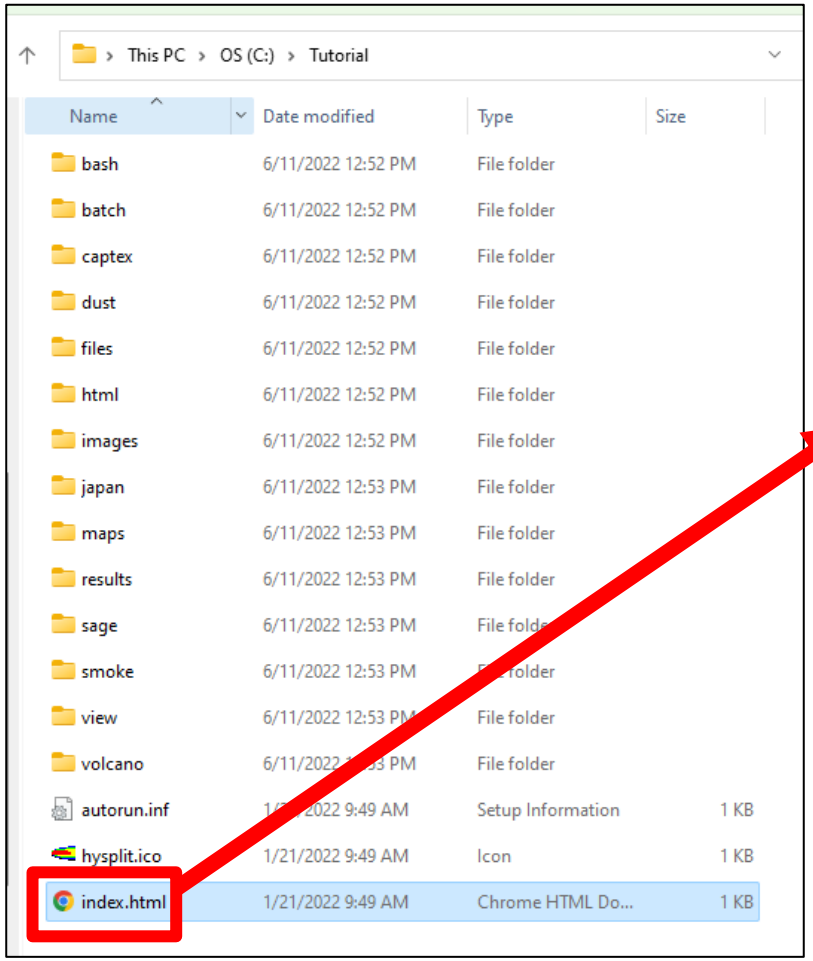

Desktop shortcut if you downloaded pre-compiled TCL executable and placed it in a directory of your choosing (in this example, it was in my Users directory)

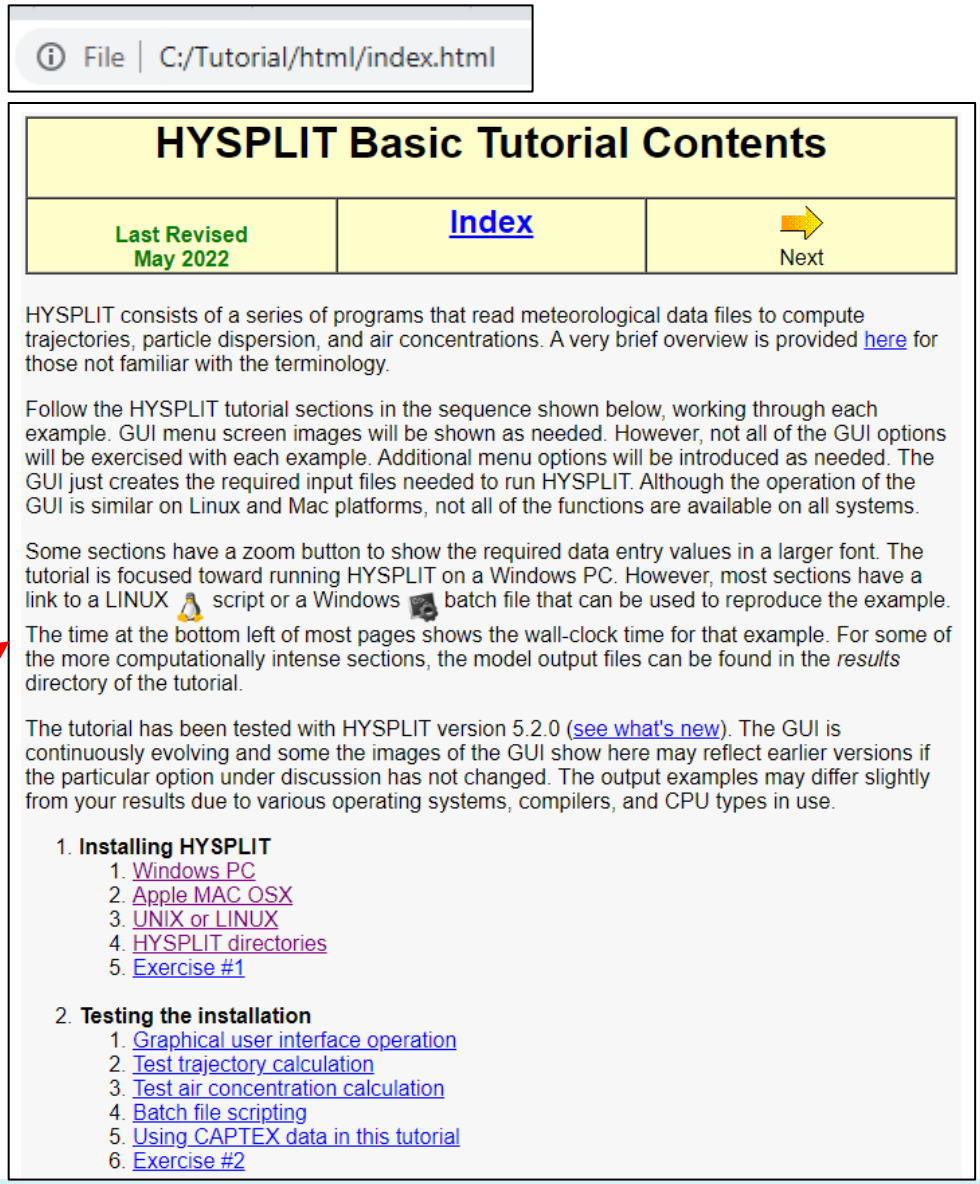
Target: C:\Users\Mark\OneDrive\Documents\tcl\tcl\bin\wish86t.exe C:\hysplit\guicode\hysplit.tcl

# Working with the Tutorial

## 2. Double-click or "open" `index.html` in Tutorial main directory to open the Tutorial in a browser.

## 1. Download and unzip Tutorial.zip to somewhere on your computer



3. **Gridded Meteorological Data Files**
    1. Tutorial meteorological data
    2. FTP Meteorological data
    3. Convert meteorological data
    4. Meteorological data servers
    5. User entered meteorological data
    6. Exercise #3

4. **Trajectory calculati**
    1. The trajectory c
    2. The trajectory e
    3. Estimating mixe
    4. Mixed layer traj
    5. Computational
    6. Meteorology tra
    7. Absolute trajec
    8. Exercise #4

5. **Trajectory options**
    1. Trajectory verti
    2. Trajectory flow
    3. Trajectories an
    4. Multiple trajecto
    5. Multiple trajecto
    6. Meteorological
    7. Exercise #5

6. **Trajectory statistics**
    1. Frequency anal
    2. Cluster analysis

# 3.1 Tutorial Meteorological Data

Previous | HOME | Next

Most of the CAPTEX example calculations in the following tutorial sections use one or more of the eight meteorological data files provided in the Tutorial\captex directory. Additional meteorological files are provided for the *Customized Concentration Simulations* section at the end of this Tutorial in their own directories (Japan, Smoke, Dust, Sage). All meteorological files contain the data (u,v component wind speeds, temperature, and several other variables) on a regular grid at multiple levels and time periods. These files are already in a format that can be read by HYSPLIT directly. Converting data in other formats for use by HYSPLIT will be discussed in the next section. There are several programs available through the GUI that can be used to examine the contents of the meteorological data files.

If the tutorial contents have been downloaded, then all the meteorological data files are provided. If the tutorial is being run through the web, these files need to be downloaded. Insure that the data transfer is binary.

1. To start, select the *Meteorology / Display Data / Grid Domain* menu tab to open the grid domain menu and set the file name to each of the meteorological files to see the spatial domain covered:
    - Weather Research Forecast Model (27 km) UW version: captex2_wrf27uw.bin
    - Weather Research Forecast Model (27 km): captex2_wrf27mc.bin
    - Weather Research Forecast Model (27 km): captex2_wrf27.bin

HYSPLIT AIR RESOURCES LAB

## 3.1 Tutorial Meteorological Data

Previous | HOME | Next

Most of the CAPTEX example calculations in the following tutorial sections use one or more of the eight meteorological data files provided in the Tutorial\captex directory. Additional meteorological files are provided for the *Customized Concentration* in their own directories (Japan, Smoke, Dust, Sage) component wind speeds, temperature, and several levels and time periods. These files are already in a Converting data in other formats for use by HYSPLI are several programs available through the GUI tha meteorological data files.

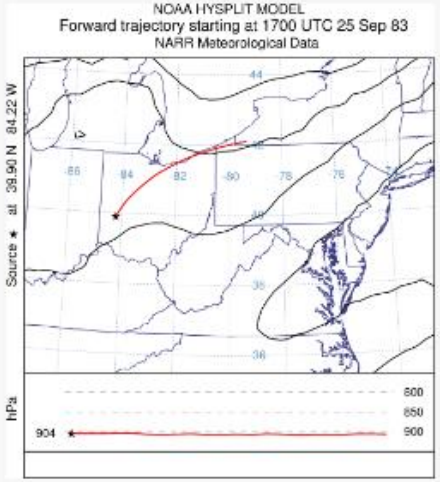
If the tutorial contents have been downloaded, then If the tutorial is being run through the web, these file transfer is binary.

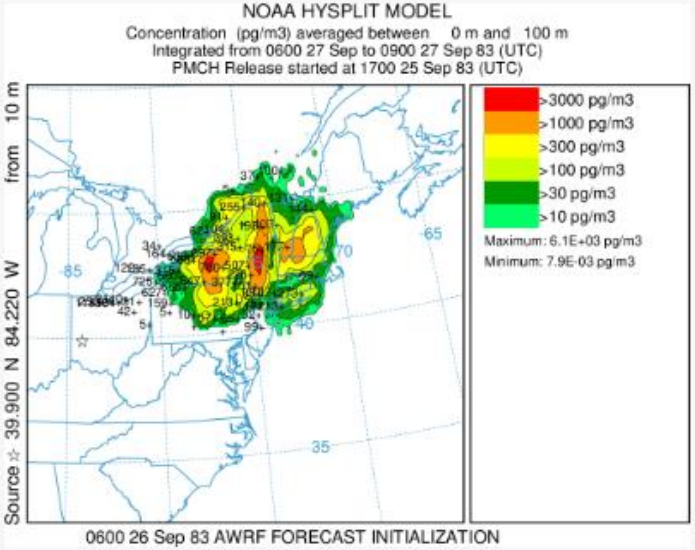
1. To start, select the *Meteorology / Display Data* domain menu and set the file name to each of domain covered:
   - Weather Research Forecast Model (27 k
   - Weather Research Forecast Model (27 k
   - Weather Research Forecast Model (27 k

On each Tutorial page, when you click on the "+" sign (or the magnifying glass) you can see more information

And the links on the page also show you images or data relevant to this section of the Tutorial

## Gridded Meteorological Data

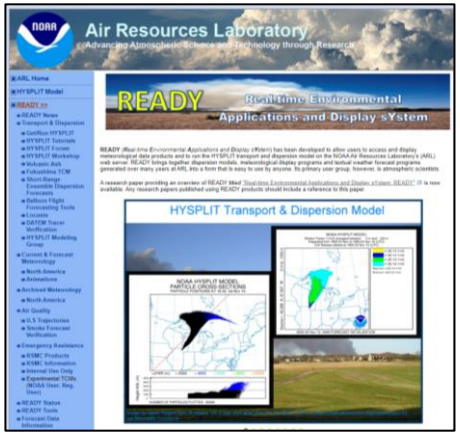


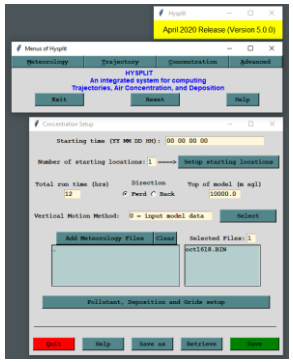

- A file contains data for one or more time periods
- Each time period consists of two types of fixed-length records
  - The header record: information about the grids and variables
  - The data records: are one per variable and level

# Different Ways of Working with HYSPLIT

# Different Ways to Use HYSPLIT




1. **Online - READY Website:** `https://www.ready.noaa.gov/index.php`
   - Specialized applications (e.g., Volcanoes, Fires, Locusts, ...)
   - Researcher access; public access
   - Can use met data directly on our servers, without downloading it
2. **Download model (free) and run on your local computer using the Graphical User Interface (GUI)**
   - This Workshop deals almost exclusively with the GUI
   - Menu driven, context sensitive help, integrated applications
   - Can generally do more with the GUI than you can online, as we have imposed some limitations due to computational resource constraints
   - Download (free) forecast and archive met data to run HYSPLIT



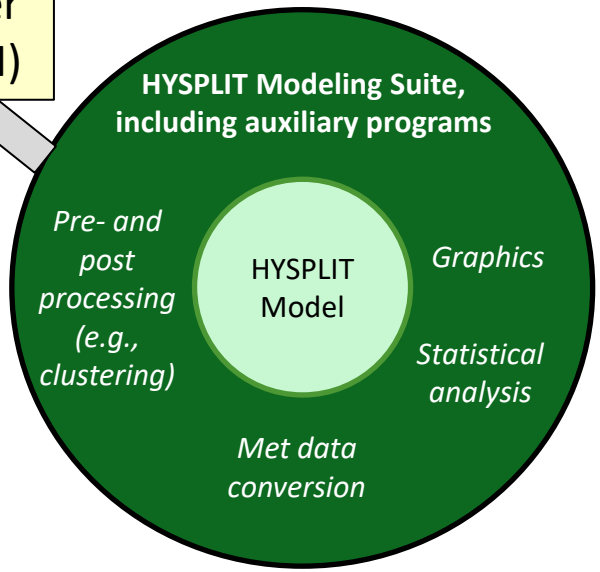

3. **Use the same model you downloaded to run on your local computer using the Command Line (terminal) and scripts**
   - At a basic level, a script is just a series of command line entries
   - More features available from command line / scripts than in GUI
   - Re-do runs by re-running a script; easy to change parameters
   - And you have a record of exactly what you did.
   - *But the GUI is a great way to learn how to use HYSPLIT.* Most experienced users will use the GUI when trying something new, and only try a script once they understand what is happening in the GUI.


```
echo "$syr $smo $sda $shr     " >CONTROL
echo "1                       ">>CONTROL
echo "$olat $olon $olvl       ">>CONTROL
echo "$run                    ">>CONTROL
echo "0                       ">>CONTROL
echo "$ztop                   ">>CONTROL
echo "1                       ">>CONTROL
echo "$MET/                   ">>CONTROL
echo "$data                   ">>CONTROL
echo "$OUT/                   ">>CONTROL
echo "tdump                   ">>CONTROL
```

Workshop

Tutorial

Graphical User Interface (GUI)




Running HYSPLIT and auxiliary programs from the command line & scripts

Public, on-line READY system

Other public, on-line systems, e.g., new Locust Forecasting system

Proprietary, on-line systems used by National Weather Service and other emergency response agencies & applications (nuclear, volcano, chemicals)