

2022 Online HYSPLIT Workshop Wrap-Up

Workshop Web Page:

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

NOAA Air Resources Laboratory
June 14-17, 2022

2022 HYSPLIT Workshop Schedule

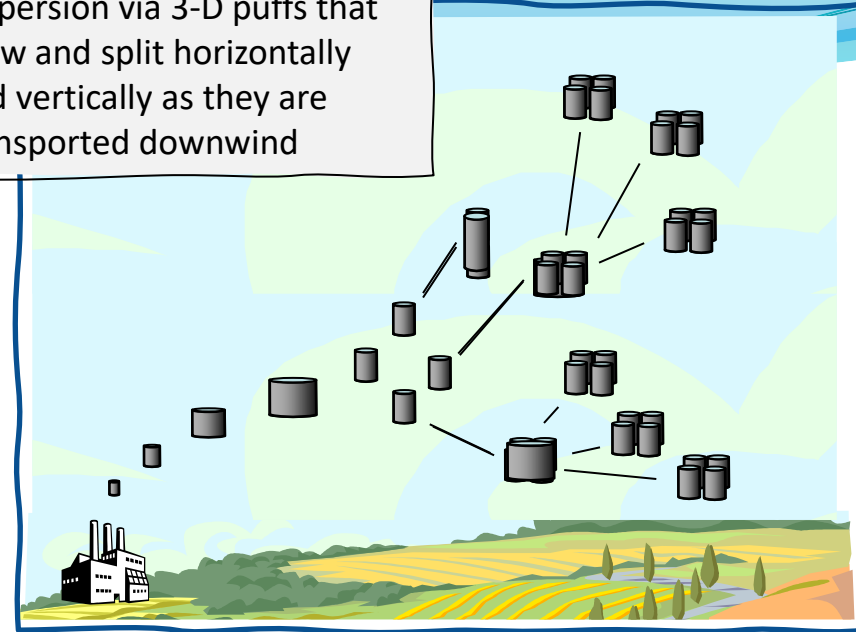
Subject to change, depending on the progression of the course and at the discretion of the instructors

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	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	<i>One-on-one virtual installation sessions, by appointment</i>		8. Configuring the CAPTEX simulation		16. Volcanic eruptions with gravitational settling
16:00 - 17:00	12:00 - 13:00	<i>One-on-one virtual installation sessions, by appointment</i>	Break		Break	
17:00 - 18:00	13:00 - 14:00	<i>One-on-one virtual installation sessions, by appointment</i>	5. Trajectory Options	Break	13. Source Attribution Methods	17. Custom Simulations
18:00 - 19:00	14:00 - 15:00	<i>One-on-one virtual installation sessions, by appointment</i>	Break	9. Air concentration parameter sensitivity		
19:00 - 20:00	15:00 - 16:00	<i>One-on-one virtual installation sessions, by appointment</i>	6. Trajectory Statistics	Break	14a. Wildfire Smoke	Final Questions and Course Wrap-Up
			Day 1 Wrap-Up	10. Alternate display options		
20:00 - 21:00	16:00 - 17:00	<i>One-on-one virtual installation sessions, by appointment</i>		Day 2 Wrap Up	Day 3 Wrap Up	

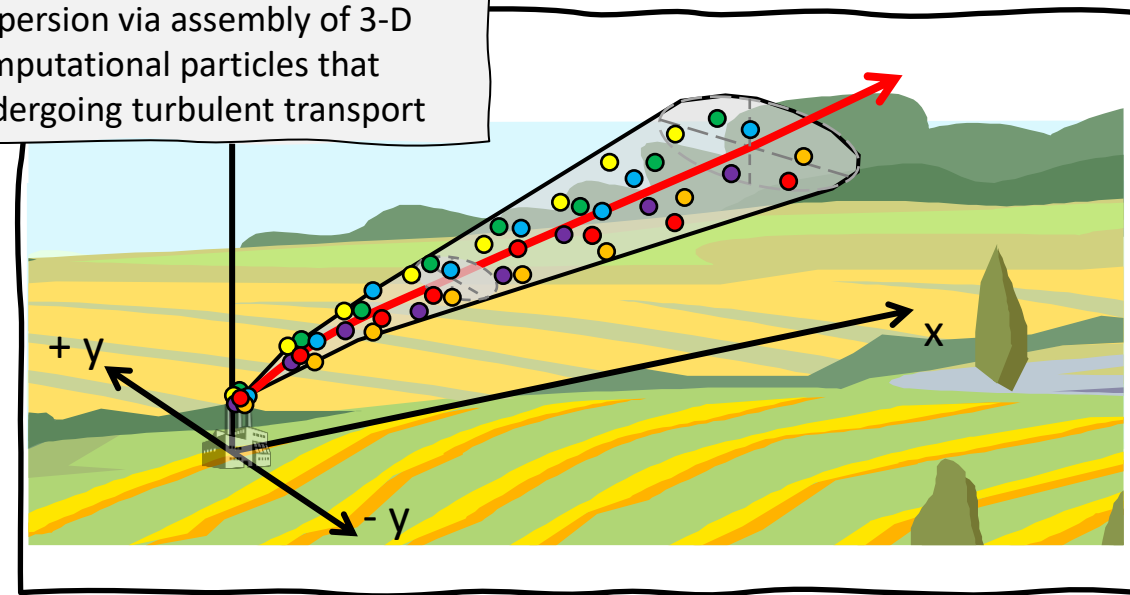
HYSPLIT Model

- **Continuous development** at NOAA Air Resources Laboratory (ARL) for more than 40 years
- ARL HYSPLIT **modeling group** (~10 scientists)
- **Trajectories and Dispersion**
- **Forward and Backward**
- **3-D Dispersion (generally > ~1 km):**
 - Puffs (top-hat or Gaussian)
 - “Particles” (i.e., computational points)
 - Eulerian grid
- **Dry and Wet deposition**
- **Chemical and Radiological Transformations**
- **Simulation Modes:**
 - Run online ([READY](#))
 - [Download](#) – run via Graphical User Interface
 - [Download](#) – run via command line and scripts
 - Windows, Mac, Linux
- **Users:**
 - Emergency response & science at NOAA
 - Emergency response & science - other agencies (e.g., MACCS)
 - Scientific community: e.g., [Stein et al. 2015](#) ~ 3000 citations

Dispersion via 3-D puffs that grow and split horizontally and vertically as they are transported downwind

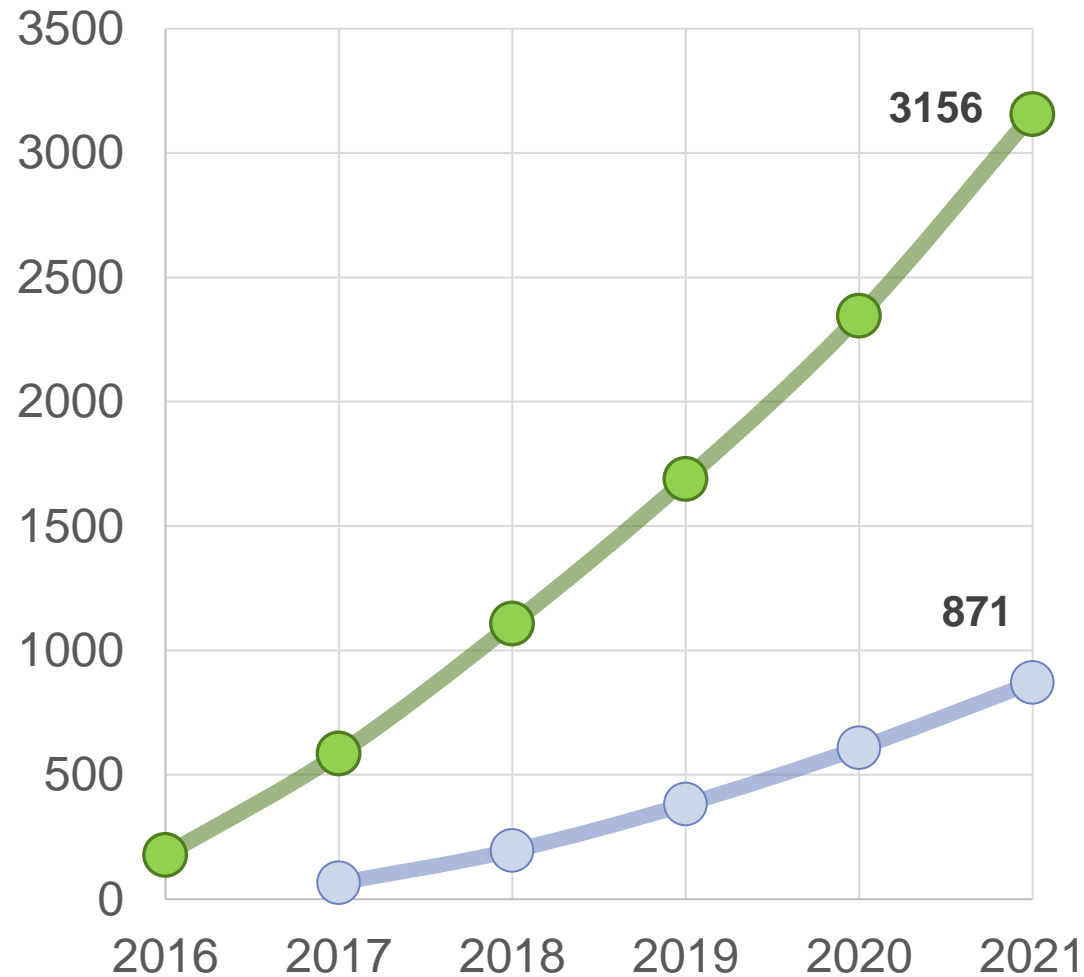


Dispersion via assembly of 3-D computational particles that undergoing turbulent transport



Extensive use of HYSPLIT by the research community

Cumulative
of
Citations
in Google
Scholar



A. Stein, R. Draxler, G. Rolph, B. Stunder, M. Cohen, and F. Ngan (2015). NOAA's HYSPLIT Atmospheric Transport and Dispersion Modeling System. *Bulletin of the American Meteorological Society*, 96: 2059
doi: 10.1175/BAMS-D-14-00110.1

G. Rolph, A. Stein, and B. Stunder (2017). Real-time Environmental Applications and Display sYstem: READY. *Envr. Modelling and Software* 95: 210 doi: 10.1016/j.envsoft.2017.06.025

+ ~80 other publications by ARL ATD group scientists from 2016-2021

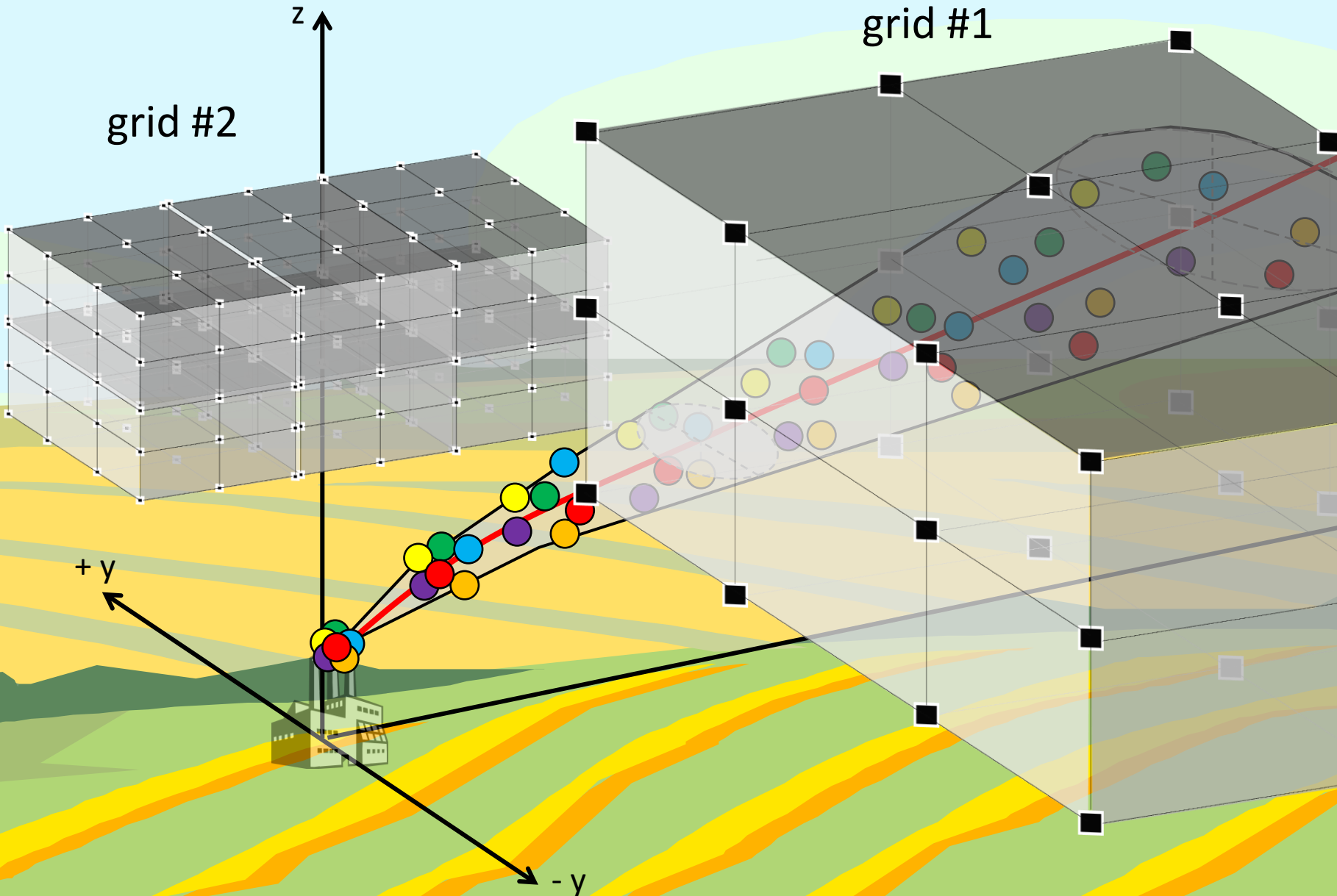


HYSPLIT Resolution Overview

- HYSPLIT is driven by **gridded meteorological data**, generally supplied as an “input”
 - This gridded met data will have a temporal and spatial resolution that will affect the accuracy of the transport and dispersion simulation
 - HYSPLIT interpolates in time and space between met model data grid points to try to estimate the met data at any location/time in the simulation domain
- HYSPLIT simulations will have one or more **concentration grids** that are specified by the user
 - These conc grids each have their own user-defined temporal, horizontal, and vertical resolution
 - Resolution of the conc grids are independent and completely separate from the resolution of the met data grids
 - Note – the same concentration grids are also used to track deposition
- **Minimum time step in HYSPLIT is 1 minute**
 - this governs transport & dispersion; deposition; and concentration outputs
 - 3 m/sec wind → 180 meters in 1 minute
 - Interpolation routine in output algorithm fills in space between starting and ending position to avoid leap-frogging over concentration grid squares
 - But, no met data finer than 1 minute is used
 - In most cases, we do not have met data with temporal resolution of less than 1 minute... (*exception: HYSPLIT in-line with WRF*)

▪ **We are considering decreasing the minimum time step down to 1 second**; this may offer some advantages for very near-field simulations

HYSPLIT Resolution: Concentration Grids



You can define more than one grid, each with its own specifications.

Depending on where the grid is and which way the wind is blowing during the simulation, you might not get any computational point particles in the grid, and all concentrations in the grid will be zero.

If a grid has very fine spacing, you might need to increase the number of computational point particles released in the simulation.

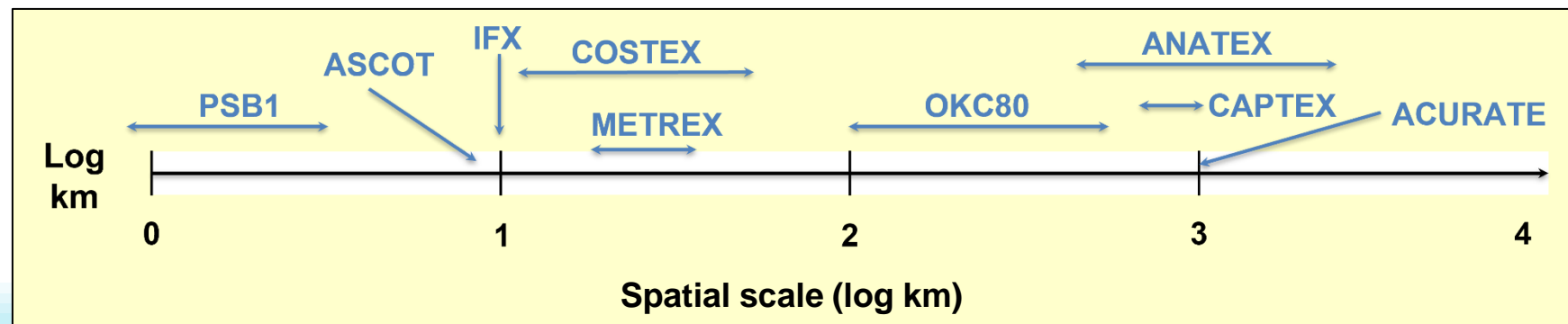
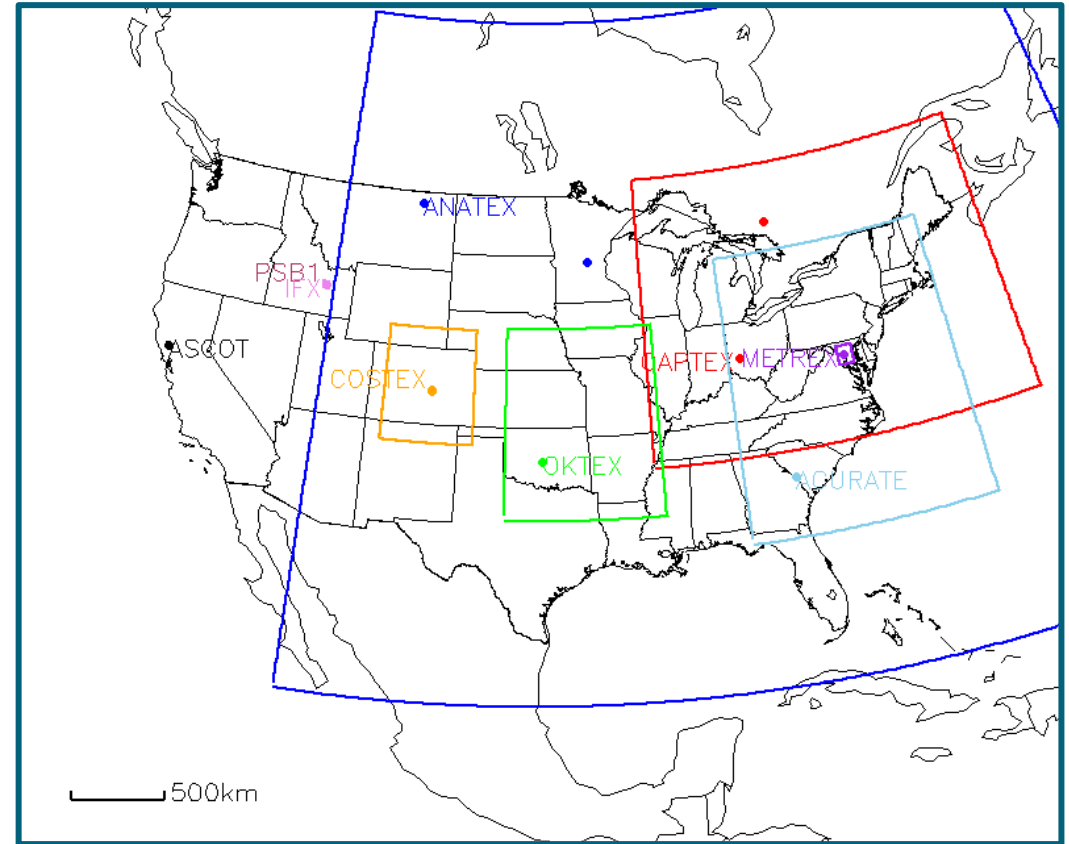
The particles are “discrete” and if there are too few of them, you aren’t really representing the continuous plume, and you can get very blotchy results.

HYSPLIT Model Evaluation + Improvement with Tracers

- Intentional Tracers

- Past tracer experiments → DATEM system

Experiments	Range (km)	Range (log km)
ACURATE	1000	3.0
ANATEX	500-2800	2.7-3.4
CAPTEX	800-1000	2.9-3.0
OKC80	100-600	2.0-2.8
METREX	20-30	1.3-1.5
COSTEX	10-50	1-1.7
IFX	10	1
ASCOT	10	1
PSB1	0.2-3.2	-0.7-0.5



Model physics – selected recent updates

- **Random numbers – turbulence treatments**
 - (2019) - Changed how turbulent velocity is initialized. New namelist variable VINIT = 1 (default) initializes turbulent velocity by drawing from distribution; VINIT = 0 initializes turbulent velocity to zero
- **Random numbers – non dispersion procedures**
 - (2020) new KRAND options for more user control over initial seeds for random number generation
- **Model vertical structures**
 - (2020) - Increased compatibility with WRF hybrid vertical coordinate system
 - (2021) - More user control over model vertical levels
- **Buoyancy-driven plume-rise algorithms**
 - Existing: Briggs (based on point source observations)
 - (2020) - New for wildfires: Sofiev
 - (2022) - Upcoming for wildfires: Freitas
- **Dust emissions**
 - (2022) – Upcoming: FENGSHA algorithm

Model features – selected recent updates

- **more functionality for polar concentration grids**
 - (2018) - Now works with puffs as well as particles
- **HYSPTTEST program**
 - (2019) - Pre-processing program to test inputs and configuration to diagnose common errors
- **Center-of-Mass Trajectory option**
 - (2020) - Trajectory created based on center-of-mass of emitted computational particles (CMTFN)
- **Python post-processing graphics programs**
 - (2020) - Python versions have increased functionality, e.g., different map backgrounds, zooming features
- **SVG graphics outputs – as an alternative to postscript**
 - (2021) - Workaround for increasingly difficult Ghostscript / Ghostview compatibility issues
- **Density estimation via Gaussian Mixture Models**
 - (2020) Crawford, A: The Use of Gaussian Mixture Models with Atmospheric Lagrangian Particle Dispersion Models for Density Estimation and Feature Identification. *Atmosphere* **11**:1369. doi:10.3390/atmos11121369

The NOAA Air Resources Laboratory recently had its 5-year science review

<https://www.arl.noaa.gov/about/lab-reviews/2022-lab-review/2022-arl-review-topic-presentations/>



The screenshot shows the NOAA Air Resources Laboratory website. On the left is the NOAA logo. To its right, the text reads "Air Resources Laboratory" in a large, bold font, followed by "Investigating processes in the Earth's Boundary Layer" in a smaller, italicized font. Below this is a navigation menu with links for "Home", "About", "News & Publications", "Research", and "HYSPLIT". The main content area features a section titled "2022 ARL Research Presentations" with a paragraph of text: "For optimal viewing within YouTube, please select the 'HD' or 1080 Format under settings. English captions are available via the YouTube settings menu. A PDF is also available. If you do not need captions, you may view the mp4 file using the Movie link on the right." To the right of this text is a vertical list of links: "2022 Lab Review", "2022 Lab Review Age", and "2022 Topic Presenta".

<https://www.arl.noaa.gov/about/lab-reviews/2022-lab-review/2022-ar1-review-topic-presentations/>

Atmospheric Transport and Dispersion Theme Overview, Mark Cohen [PDF](#)

[YouTube Playlist for Atmospheric Transport and Dispersion](#)

Nuclear Applications and Emergency Response	Tianfeng Chai	PDF	Movie
Wildfire Applications and Emergency Response	HyunCheol Kim	PDF	Movie
Volcano Applications and Emergency Response	Alice Crawford	PDF	Movie
Chemical Applications and Emergency Response	Sonny Zinn	PDF	Movie
Model Evaluation / Improvement with Tracers	Fantine Ngan	PDF	Movie
Source Estimation using Inversions	Chris Loughner	PDF	Movie

- **CONTROL file:** Look at this file if you are having a problem – sometimes you can see obvious errors
- **GUI:** When you are using the GUI, most input and output files will be in `hysplit\working\`
- **Scripts:** usually create a new working directory, e.g., `hysplit\working_nuclear\`
- **Met File(s):** Correct directory and name; encompass time & spatial domain of your desired simulation
- **Ascii text:** [CONTROL](#), [SETUP.CFG](#), [MESSAGE](#), [TDUMP files](#) (trajectory output files), scripts
- **Binary:** [Met data files](#), [CDUMP files](#) (concentration output files)
- **Options:** Not all available from GUI; can type executable name from command line to see options
- **Met data archives:** <https://www.ready.noaa.gov/archives.php>
- **Many other HYSPLIT programs** in the HYSPLIT exec directory (e.g., met data analysis programs); some are available in the GUI, but not all
- **Graphics:** HYSPLIT has some graphical capabilities – including some new Python and SVG graphics – but you can also display your model outputs using other graphics platforms (Google Earth, GIS, Python, Matlab...)
- **Numerical Experiments:**
 - Do you have enough particles in your simulation? Increase the number and see if your answers change. Keep increasing until the answers level off. The finer the grid you use, the more particles you need.
 - Do the same simulation with different met data sets to evaluate sensitivity to met data uncertainties
 - And you can do other sensitivity tests for other parameters

HYSPLIT Documentation and Learning Resources

- [HYSPLIT Tutorial](#): detailed instructions on using the GUI + example scripts; can be run online or downloaded to local computer
- The GUI is a great way to learn HYSPLIT
 - even experienced users use it when trying something new
 - can create a run in the GUI, and then look at associated input/output files to tell you how to create a script to do similar simulations
 - you can do some relatively complicated procedures (e.g., trajectory clustering)
- HYSPLIT Users Guide: [online](#) (and also in hysplit/documents directory)
- Download HYSPLIT and other resources: <https://www.ready.noaa.gov/HYSPLIT.php>
- [HYSPLIT Cheat Sheet](#)
- Model Overview: <https://www.arl.noaa.gov/hysplit/hysplit/>
- Equations: https://www.arl.noaa.gov/wp_arl/wp-content/uploads/documents/reports/arl-224.pdf
- HYSPLIT Forum: <https://hysplitbbs.arl.noaa.gov/>
- HYSPLIT FAQ's: <https://www.arl.noaa.gov/hysplit/hysplit-frequently-asked-questions-faqs/>
- Recent HYSPLIT Training Workshop: https://www.ready.noaa.gov/register/HYSPLIT_hyagenda.php
- Stein et al., 2015: NOAA's HYSPLIT atmospheric transport and dispersion modeling system, *Bull. Amer. Meteor. Soc.*, **96**, 2059-2077, <http://dx.doi.org/10.1175/BAMS-D-14-00110.1>
- Rolph et al., 2017: Real-time Environmental Applications and Display sYstem: READY. *Environmental Modelling & Software*, **95**, 210-228, <https://doi.org/10.1016/j.envsoft.2017.06.025>

**Workshop guidance
and resources posted at
[Workshop Web Page](#)**

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

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

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

▶ **Workshop Day 3 (Thr, June 16)**

The exec/statmain executable in HYSPLIT v5.2.1 does not work correctly. Please update it by downloading statmain to your HYSPLIT exec directory.

- ▶ Windows users - [fix_win10.zip \(zip, 0.5 MB\)](#). Three executable files (including txt2dbf.exe and dbf2txt.exe) in the HYSPLIT v5.2.1 distribution for Windows are found to be defective.
- ▶ macOS users - [fix_macOS.zip \(zip, 0.3 MB\)](#).
- ▶ Ubuntu 20.04 users - [fix_UbuntuOS20.04.zip \(zip, 29 KB\)](#).
- ▶ Red Hat Enterprise Linux 8 / CentOS 8 users - [fix_RHEL8.5.zip \(zip, 29 KB\)](#).
- ▶ Red Hat Enterprise Linux 7 / CentOS 7 users - [fix_CentOS7.9.zip \(zip, 28 KB\)](#).
- ▶ [Day 3 handout \(pdf, 1.0 MB\)](#).
- ▶ [Day 3 wrap-up \(pdf, 1.3 MB\)](#) or [Day 3 wrap-up \(pptx, 1.0 MB\)](#).
- ▶ [Transformation and deposition slides \(pdf, 1.1 MB\)](#).
- ▶ [HYSPLIT Simulation Parameters for ALOHA Chemicals \(pdf, 7.8 MB\)](#).
- ▶ [Wildfire applications \(pdf, 0.8 MB\)](#).
- ▶ [Source attribution methods \(pdf, 1.2 MB\)](#).
- ▶ [Workshop video recording for day 3 \(mp4, 1.4 GB\)](#) and [unfinished transcript \(txt, 228 KB\)](#). The transcript is in the same directory as the video file. See the above on how to download the video file.

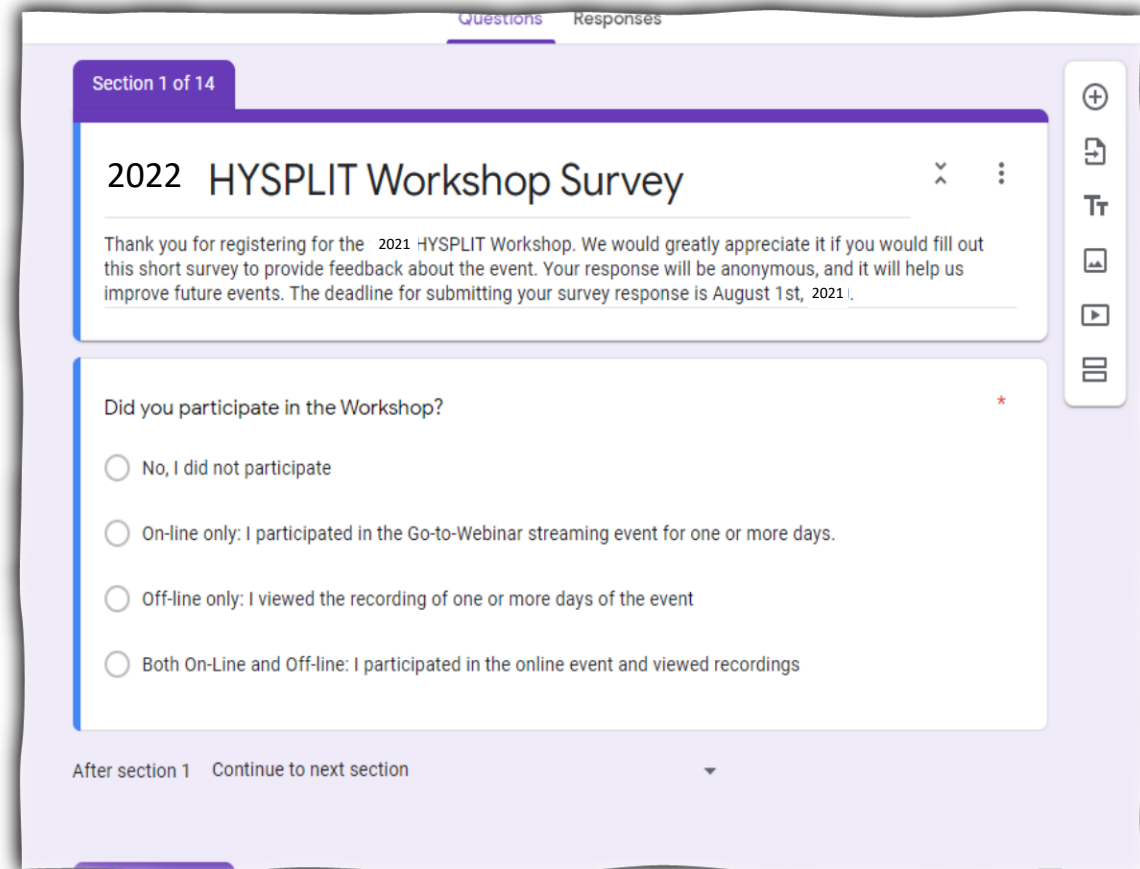
Course Certificates

- ❑ Course certificates will be made available to all participants
- ❑ You will receive an email (probably next week) asking if you would like a certificate and letting you know how to obtain it



Course Survey

- ❑ We will be sending out a course survey soon, and we hope you will return it
- ❑ It can be anonymous, or you can provide your name – it is up to you
- ❑ We will really appreciate hearing your feedback, about what went well and what we can try to improve.




The screenshot shows a survey interface with a purple header and a white content area. At the top, there are tabs for "Questions" and "Responses". Below the header, it says "Section 1 of 14". The main title is "2022 HYSPLIT Workshop Survey". Below the title is a paragraph of text: "Thank you for registering for the 2021 HYSPLIT Workshop. We would greatly appreciate it if you would fill out this short survey to provide feedback about the event. Your response will be anonymous, and it will help us improve future events. The deadline for submitting your survey response is August 1st, 2021." Below this is a question: "Did you participate in the Workshop?" with a red asterisk indicating it is required. There are four radio button options: "No, I did not participate", "On-line only: I participated in the Go-to-Webinar streaming event for one or more days.", "Off-line only: I viewed the recording of one or more days of the event", and "Both On-Line and Off-line: I participated in the online event and viewed recordings". At the bottom, there is a navigation bar with "After section 1" and "Continue to next section".

HYSPLIT Forum



<https://hysplitbbs.arl.noaa.gov/index.php>

- ❑ Please feel free to continue to ask any questions that you have in the HYSPLIT Forum.
- ❑ You can ask them in the 2022 Workshop section of the Forum, or you can ask them in another section of the Forum if it seems more relevant.
- ❑ Wherever you ask the question, we will try to answer it.



















The screenshot shows the top navigation bar of the HYSPLIT Forum. It includes the phpBB logo with the tagline 'creating communities', the forum name 'HYSPLIT Forum: hysplitbbs.arl.noaa.gov', and a search bar. Below the header, there are links for 'Quick links', 'FAQ', 'Register', and 'Login', along with a 'Board index' link.

It is currently June 17th, 2022, 1:10 pm

HYSPLIT	TOPICS	POSTS	LAST POST
 Users General questions and postings pertaining to the use of HYSPLIT regardless of the platform. For platform specific questions, use the HYSPLIT Platform forums.	244	844	Re: Opening meteorological fi... by sandrababyale  June 15th, 2022, 1:47 pm
 Developers Questions and postings pertaining to the development of HYSPLIT, feature enhancements, and HYSPLIT internals. HYSPLIT source code and algorithms are discussed here.	26	87	Re: Output new meteo variable... by christopher.loughner  July 22nd, 2021, 2:08 pm
 Bugs 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.	50	172	Error creating INFILE for clu... by lgratz  June 9th, 2022, 4:47 pm
 Announce 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	49	Re: GDAS1 archive file gdas1... by sonny.zinn  August 27th, 2020, 11:08 am
 General Comments Post any praises for the work of the HYSPLIT Developers and the products they make available to the public or any helpful criticisms so that we can do a better job of providing quality products.	24	68	Re: equations by sonny.zinn  January 27th, 2022, 10:46 am
 Trajectory Model Topics about the HYSPLIT trajectory model.	247	742	Impact of the HYSPLIT model t... by michael_wrf  May 31st, 2022, 7:27 am
 Dispersion Model Topics about the HYSPLIT dispersion model.	209	863	Re: One record vs. two record... by alicec  June 17th, 2022, 8:56 am
 User Applications Post user applications of the HYSPLIT trajectory or dispersion model.	5	11	Re: Application of HYSPLIT fo... by MarkCohen  February 17th, 2022, 6:45 pm















HYSPLIT Forum

<https://hysplitbbs.arl.noaa.gov/index.php>

HYSPLIT PLATFORM SPECIFIC		TOPICS	POSTS	LAST POST
	HYSPLIT for PCs Post any questions or comments regarding the Desktop PC version of HYSPLIT. This includes the model execution, GUIs, results, or graphics. Be sure to include the operating system you are using (Windows XP, Windows Vista, Windows 7, Windows 8, etc.).	150	503	How to run daily ensembles by dominichr1  May 24th, 2022, 9:57 am
	HYSPLIT for Mac OS X Post any questions or comments regarding the Mac OS X version of HYSPLIT. This includes the model execution, GUIs, results, or graphics. Be sure to mention the version of OS you are using.	13	87	Re: Hysplit installation by dmoranz  June 17th, 2022, 10:42 am
	HYSPLIT for LINUX Post any questions or comments regarding the LINUX version of HYSPLIT. This includes the model execution, GUIs, results, or graphics. Be sure to mention the version of LINUX you are using.	74	321	Re: How to run hysplit on lin... by Fantine  March 1st, 2022, 11:20 am
	HYSPLIT on the READY Server	12	14	Re: Best meteorological data ... by alicec  April 20th, 2022, 5:38 pm
METEOROLOGICAL DATA		TOPICS	POSTS	LAST POST
	General questions on meteorological data needed for HYSPLIT	125	420	Re: Use of a customized netcd... by Fantine  June 10th, 2022, 11:30 am
	Conversion programs Post questions and find resources to convert meteorological data into a format HYSPLIT can read.	108	453	arw2arl--custom made ncfile--... by faruk  April 30th, 2022, 1:50 pm
	Repositories of HYSPLIT formatted data Post links to publicly available repositories of HYSPLIT formatted meteorological data. Include links to documentation describing the data coverage area, time period, and variables within the data set.	22	65	Re: Corrupt Hysplit format HR... by sonny.zinn  April 1st, 2022, 10:21 am
	MeteoInfo Software	52	120	Plot trajectories on 3D earth by yaqiang  January 6th, 2022, 2:31 am

HYSPLIT Forum









<https://hysplitbbs.arl.noaa.gov/index.php>

HYSPLIT RESEARCH		TOPICS	POSTS	LAST POST
	Volcanic Ash Post questions, comments and links to research (research papers, web sites, etc) involving HYSPLIT and volcanic ash. This section is also to facilitate collaborations between researchers involved in volcanic ash transport and dispersion.	9	16	I saw a program on TV that st... by sonny.zinn  July 22nd, 2021, 1:28 pm
	Wildfire Smoke Post questions, comments and links to research (research papers, web sites, etc) involving HYSPLIT and wildfire smoke. This section is also to facilitate collaborations between researchers involved in smoke transport and dispersion.	5	9	Wildfire Smoke SplitR Dispers... by cs7vs  July 22nd, 2021, 10:24 am
	Dust Post questions, comments and links to research (research papers, web sites, etc) involving HYSPLIT and atmospheric dust. This section is also to facilitate collaborations between researchers involved in dust transport and dispersion.	20	58	Re: Transport of Saharan Dust... by murphy3  June 21st, 2021, 2:14 pm
	Chemicals Post questions, comments and links to research (research papers, web sites, etc) involving HYSPLIT and chemicals in the atmosphere. This section is also to facilitate collaborations between researchers involved in chemical transport and dispersion.	9	24	Re: Kz diffusivity by gws  May 18th, 2021, 6:18 pm
	Radiological 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.	14	44	Re: Differences between resul... by fppiguet  November 10th, 2020, 5:50 pm
	Cluster Analysis Topics about the trajectory clustering program for HYSPLIT.	37	162	Re: Program code to cluster a... by alicec  October 5th, 2021, 9:01 am
FORUM		TOPICS	POSTS	LAST POST
	HYSPLIT Workshop	192	733	Re: EMITIMES character limits by Fantine  June 17th, 2022, 12:15 pm

HYSPLIT Forum

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HYSPLIT Workshop

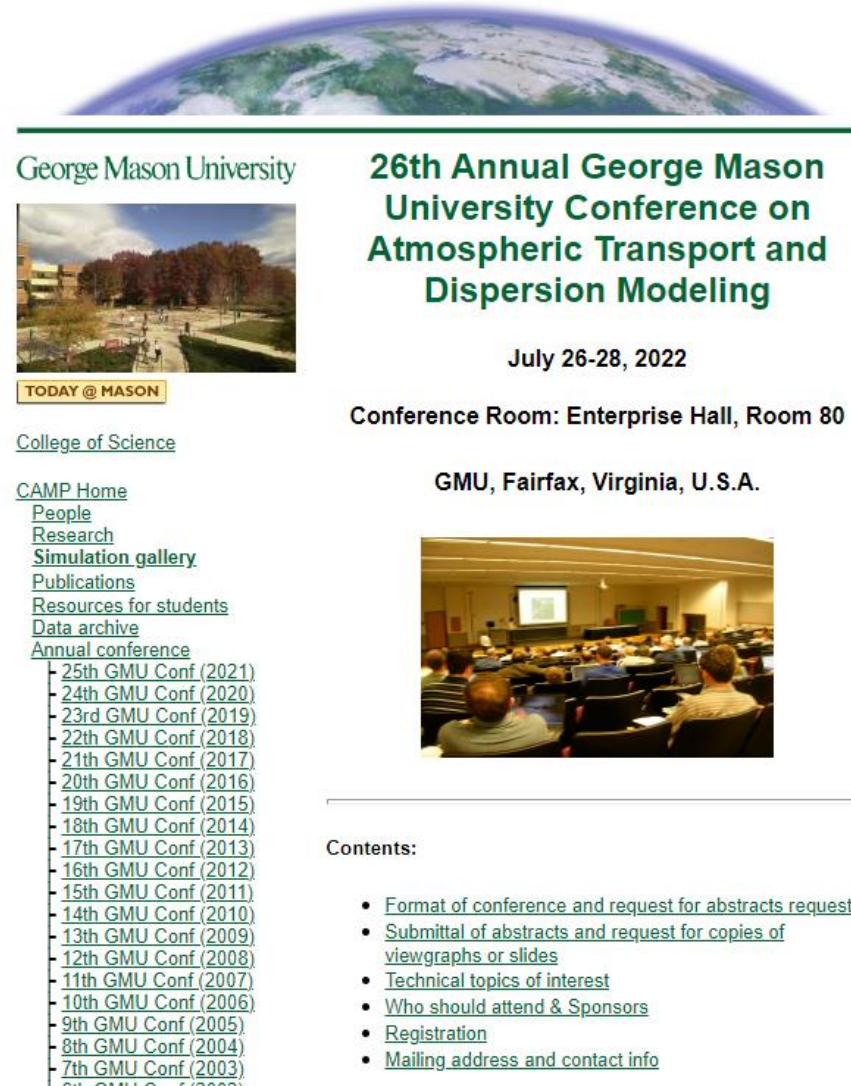
FORUM	TOPICS	POSTS	LAST POST
 2022 HYSPLIT Workshop Questions	27	92	Creating a consistent CONUS g... by dmv_fsf  June 17th, 2022, 1:16 pm
 2021 HYSPLIT Workshop Questions	59	234	Re: daily concentration conto... by davidglenn  August 11th, 2021, 11:25 am
 2020 HYSPLIT Workshop Questions Questions from the 2020 Online HYSPLIT Workshop.	88	349	Re: ImageMagick version - up ... by nobella  April 14th, 2021, 12:22 am
 2019 HYSPLIT Workshop Questions During the four weeks of the 2019 HYSPLIT Workshop, users will be able to post questions on the week's topics to this Forum and model developers will try to answer them as soon as possible.	3	5	Re: Depositions calculated wi... by ariel.stein  June 17th, 2019, 3:58 pm

<http://camp.cos.gmu.edu/26th-announcement.html>

The 26th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling will be held on July 26-28, 2022.

The deadline for submitting abstracts is **July 16, 2022**. Please send your abstracts to Joe Chang (gmu.atd.conference@gmail.com) and Zafer Boybeyi (zboybeyi@gmu.edu).

If there are enough HYSPLIT-related abstracts submitted, there will be special section on HYSPLIT applications



The screenshot shows the conference announcement page. At the top is a globe image. Below it, the text reads: "George Mason University 26th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling July 26-28, 2022 Conference Room: Enterprise Hall, Room 80 GMU, Fairfax, Virginia, U.S.A." There is a photo of a lecture hall. On the left side, there is a navigation menu with links: "College of Science", "CAMP Home", "People", "Research", "Simulation gallery", "Publications", "Resources for students", "Data archive", "Annual conference". Under "Annual conference", there is a list of links for previous years from 2003 to 2021. On the right side, under "Contents:", there is a list of links: "Format of conference and request for abstracts request", "Submittal of abstracts and request for copies of viewgraphs or slides", "Technical topics of interest", "Who should attend & Sponsors", "Registration", "Mailing address and contact info".

**Thanks for your
participation and
for your interest
in HYSPLIT!**