

Weather Forecast Office use of HYSPLIT



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ARL Research to Application

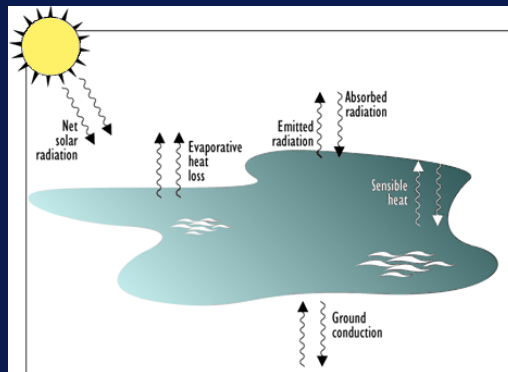
- ARL supports the 122 local NWS Weather Forecast Offices (WFOs) with the development of HYSPLIT atmospheric dispersion products to assist them with their decision support role in the local community.
- A web-based HYSPLIT system was developed through a cooperative effort with the National Ocean Service's (NOS) Office of Response and Restoration (OR&R), developers of the CAMEO/ALOHA software suite, and the NWS.
- This system allows WFOs to model the release of hazardous chemicals to the atmosphere by combining the strengths of both the ALOHA and HYSPLIT models.



ALOHA Background



Tank



Puddle



Gas Pipeline

- Areal Locations of Hazardous Atmospheres (ALOHA) is one of five software programs that make up the CAMEO software suite used to plan for and respond to chemical emergencies
- Designed for short-duration (< 60 min), short-range (< 10 km) incidents (no account for changes in wind direction/speed)
- Its strength is its multiple time-dependent chemical source models (tank, puddle, gas pipeline, and direct release to the atmosphere)
- Used by thousands of first responders around the world

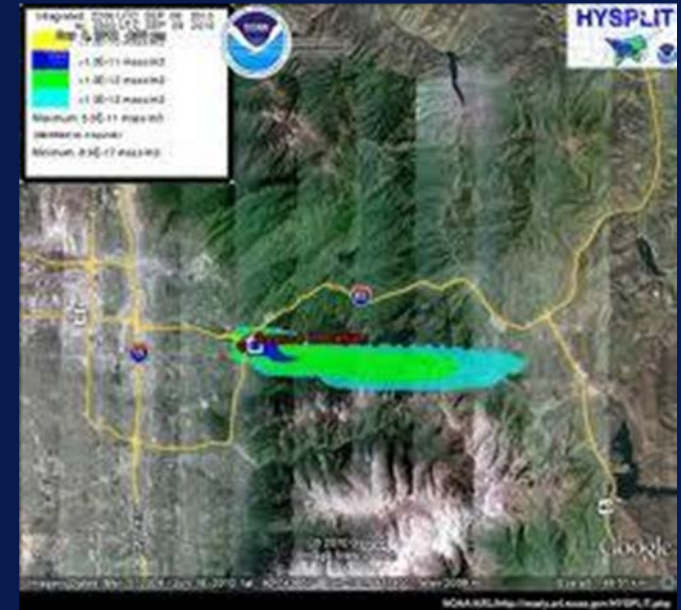
HYSPLIT Integration with ALOHA

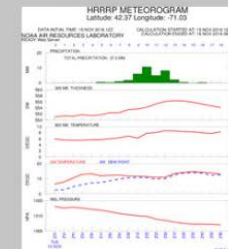
- WFO enters information on the chemical being released provided by the local emergency responder.
- ALOHA estimates how the chemical cloud escapes from the source over time.
- Linking ALOHA with HYSPLIT, driven by high-resolution NWP data, meets WFO requirements of farther-downwind dispersion predictions compared to that using the constant wind in ALOHA alone.
- Output product shows a map of “Level of Concern” contours familiar to emergency managers.
- Training provided to the WFOs through video conferencing and the development of COMET study modules (University Corporation for Atmospheric Research).



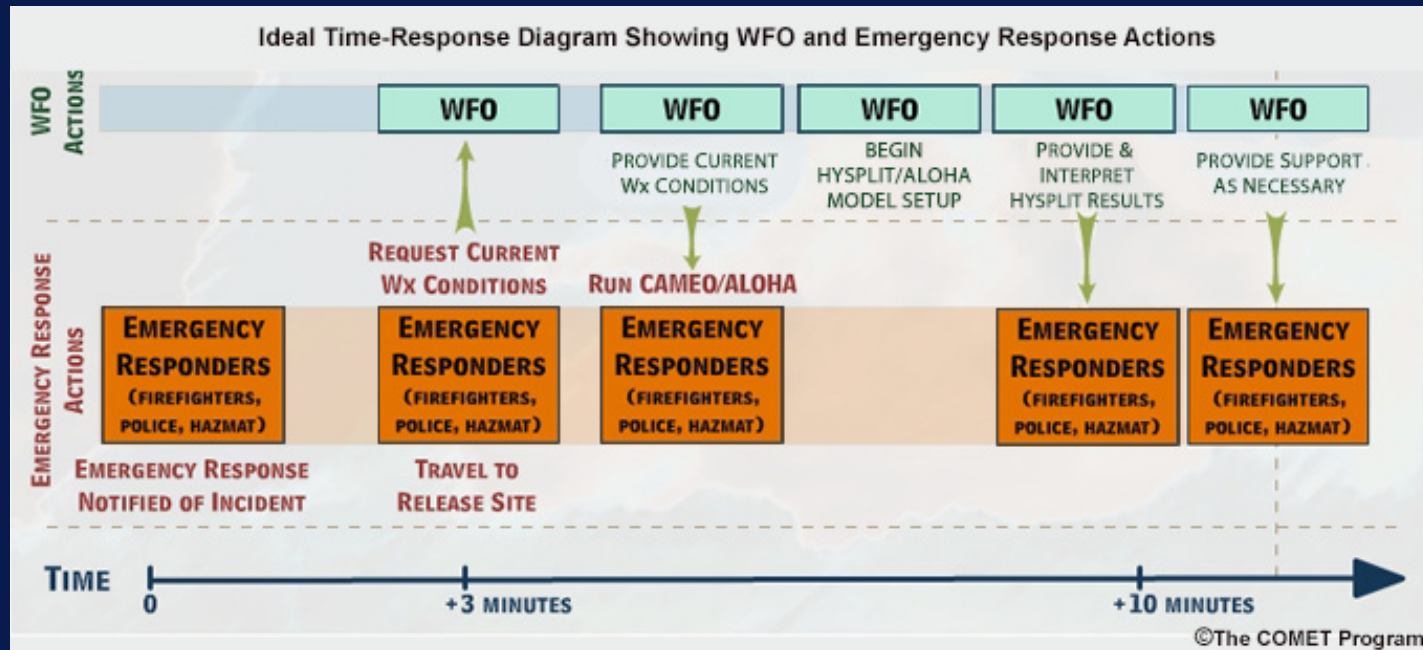
The more information you can provide to us, the better

- Who is asking for the run?
- Where (Lat/Long helpful)?
- When did it start?
- What chemicals/gas ?
- Cylinder, piping, rail car, etc. ?
- How much has leaked?
- How Long?
- Format – Google Earth or Google Maps?





Emergency Assistance - Response Timeline



Wildfires

Chemical Accidents



Industrial Fires

Having the right information is key

Plume Rise in Light Winds with Neutral Stability



©The COMET Program

Plume Rise in Strong Winds with Neutral Stability



©The COMET Program



Can help determine the level of state/local officials response, such as if evacuations or shelter in place is needed

HYSPLIT Transport & Dispersion Model

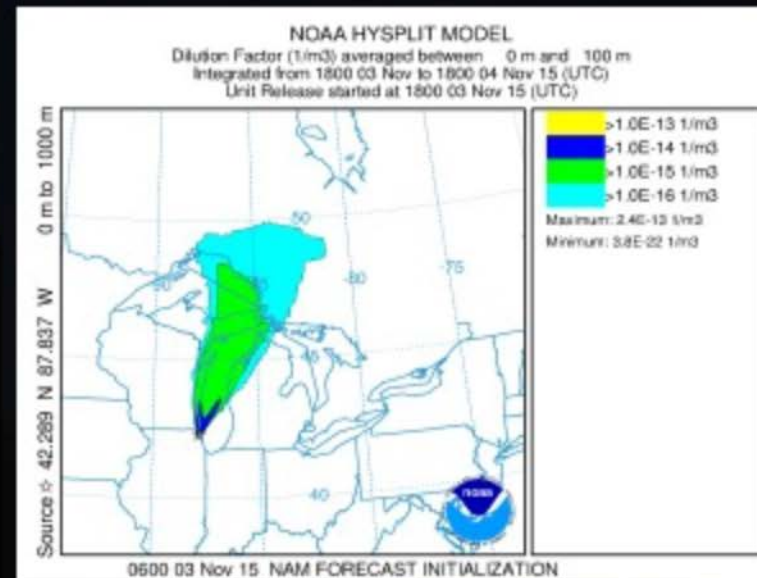
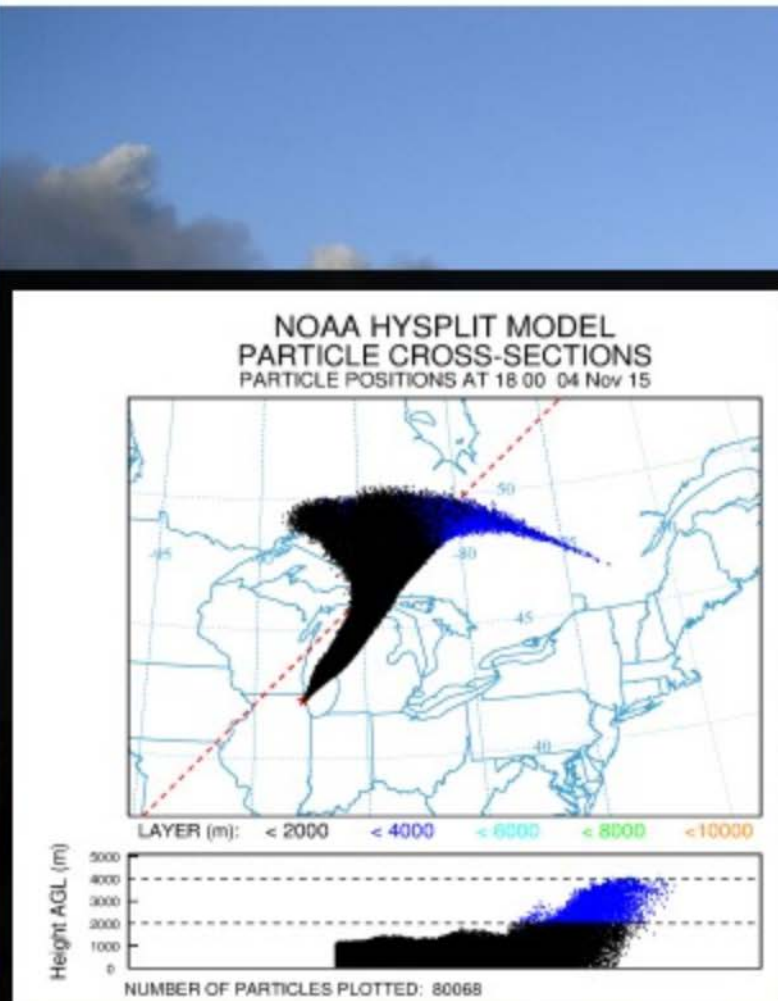
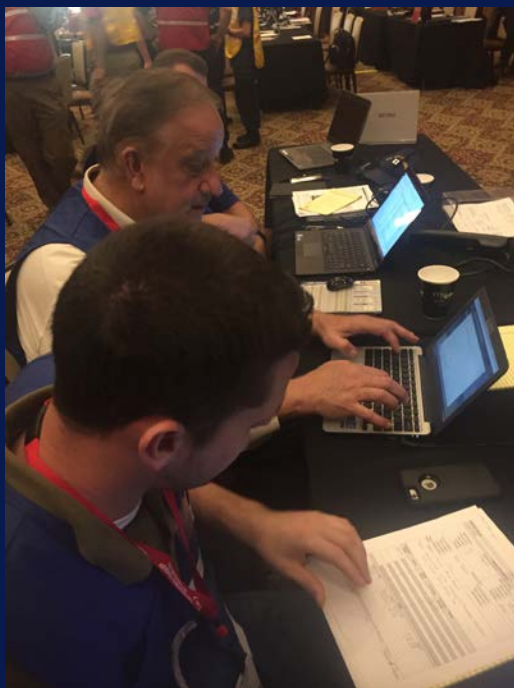


Image by Jason Rogers from St Albans, UK (Clear skies apart from the home!) [CC BY 2.0 (<http://creativecommons.org/licenses/by/2.0/>)], via Wikimedia Commons

On-site Support

- When requested, NWS forecasters can be deployed outside of the office to provide onsite support/exercises.



Phillips 66 Oil Spill Exercise
in Lake Charles, LA



Super Bowl 2018
Minneapolis, MN



Waste Isolation
Pilot Plant (WIPP)
"New Dawn" FSE
Midland, TX

HYSPLIT runs can be made for high profile events

Recently Supported Major Events

- Final Four Basketball Event – San Antonio, TX this weekend
- Natural gas leak from well near Houston, TX - March 14, 2018
- Scrapyard fire near Portland, OR - March 12, 2018
- Super Bowl - February 4, 2018
- NYC New Year's Eve in NYC - December 31, 2017
- Chlorine railcar release near Woodlands, WV - August 27, 2016
- October 2015 - World Series
- September 2015 - Papal Visit to USA

IDSS – HAZMAT Incident

Woodlands, WV:

- A chlorine gas leak occurred at the Axial Chemical Plant at approximately 9:00 a.m. Saturday, August 27.
- Two injuries were reported.
- Residents were evacuated within 2-3 miles of the plant.

WFO Pittsburgh:

- Provided a HYSPLIT run for the emergency manager.
- Phone briefing for the emergency manager about HYSPLIT results, observations and potential impacts from the morning inversion.



Credit: WTRF Television

Superior Refinery Fire - Wisconsin

NWS talked with the Duluth PD representative during a conference call after the event. He said that the NWS was very helpful with the event, especially the forecast of the winds and smoke plume. The city of Superior fire department has a the capability to run dispersion models for certain chemicals, but not for smoke dispersion.



EVACUATION NOTICE – REFINERY FIRE

- Smoke plume from fire is tracking south-southeast
- As of 1:50 PM:
Evacuation Notice for...
 - 3 MILE ALL DIRECTIONS AND
 - 10 MILES SOUTH OF REFINERY

Shelter available at

- Four Corners Elementary
4465 East County Road B
- UW Superior
- Stay Tuned to local media for updates

**PLEASE STAY AWAY FROM FIRE
TO ALLOW EMERGENCY CREWS
TO WORK!**



NATIONAL WEATHER SERVICE DULUTH, MN

weather.gov/duluth



Published on: 04/26/2018 at 1:59PM

Model Inputs for Hypothetical Event

The forecaster selects the appropriate release characteristics through the release characteristics through

Chemical > Release Type

Release Type

Chemical Name: AMMONIA

Molecular Weight: 17.0 g/mol

Ambient Boiling Point: -28.7 °F (-33.7 °C)

Freezing Point: -107.9 °F (-77.7 °C)

AMMONIA is a gas at ambient temperature and pressure.

If you don't know (choose the Default)

If you know more about its ambient conditions, enter them below.

Choose Your Release Type

☐ Tank Opening

☐ Pipeline

☐ Gas Release

☐ Dispersion

Tank Description

Enter basic settings about the tank.

Tank Type and Dimensions

Shape of Opening: circle

Opening Size: More

Mass of Release

Enter information about the mass of release.

Mass of Release

Specify by:

☐ Liquid Level

☐ Gas Pressure

☐ Dispersion

Version: 1.0

ALOHA de Atmosphere

Web site: Atmosphere

US Government main portal: USA.gov

ALOHA Source Strength Summary

Source Strength Summary

- Release scenario is a flammable chemical that escaped from a tank as an aerosol.
- Total amount released was 140274 pounds (63627 kilograms).
- Maximum average sustained release rate was 36039 pounds/minute (16347 kilograms/minute), averaged over a minute or more.
- Release duration was 6 minutes.

This information summarizes key scenario details and ALOHA source strength calculations. Additional details about your scenario are displayed below.

[Continue to HYSPLIT Output >](#)

Chemical Data

Chemical Name: **AMMONIA**

Molecular Weight: 17.0 g/mol

AEGL-1: 30 ppm	AEGL-2: 160 ppm	AEGL-3: 1100 ppm
ERPG-1: 25 ppm	ERPG-2: 150 ppm	ERPG-3: 750 ppm
PAC-1: 30 ppm	PAC-2: 160 ppm	PAC-3: 1100 ppm
IDLH: 300 ppm	LEL: 150000 ppm	UEL: 280000 ppm

Ambient Boiling Point: -28.7 °F (-33.7 °C)

Freezing Point: -107.9 °F (-77.7 °C)

Vapor Pressure at Ambient Temperature: greater than 1 atm

Ambient Saturation Concentration: 1,000,000 ppm or 100.0%



[Go to CAMEO Chemicals Datasheet](#)

Weather and Location Data

Meteorology Forecast File: NAMHUS

Meteorology Forecast Cycle: 06 UTC / May 5, 2016

Release Start Time: 02:00 PM (EDT) / May 05, 2016 (1800 UTC / May 05, 2016)

Release Location: (Lat: 38.847800; Lon: -77.039200)

The following information was extracted from the forecast file at the release start time in order to run ALOHA:

Wind: 10.0 miles per hour (4.5 meters per second) from NE

Ambient Air Temperature: 62.5 °F (17.0 °C)

Cloud Cover: 10 tenths

Stability Class: A

Tank Description

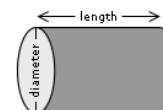
Tank Type: horizontal cylinder

Tank Diameter: 9.7 feet (calculated)

Tank Length: 60 feet

Tank Volume: 33500 gallons

Chemical Storage Temperature Inside of Tank: ambient air temperature (62.5 °F)





Model results showing Acute Exposure Guideline Levels (AEGLs) for Ammonia

HYSPLIT MODEL RESULTS FOR JOB NUMBER 25395

Thu May 5 11:45:58 UTC 2016
The model and graphics are now complete.
Finished generating graphics for job 25395.
adding: VMSDIST.25395 (deflated 31%)
adding: SETUP.25395 (deflated 14%)

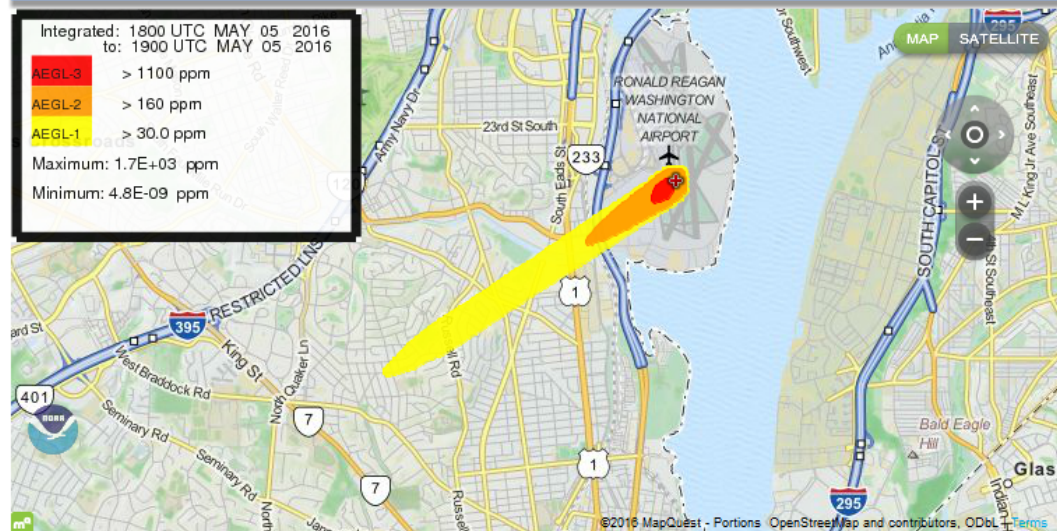
Model Status:

☒ Legend

Integrated: 1800 UTC MAY 05 2016
to: 1900 UTC MAY 05 2016

AEGL-3 > 1100 ppm
AEGL-2 > 160 ppm
AEGL-1 > 30.0 ppm
Maximum: 1.7E+03 ppm
Minimum: 4.8E-09 ppm

☐ Ring Options ☐ Plume Options



Metadata

Concentration

POI Off

Open KMZ

MORE RESULTS

Click on text link or dropdown menu
to view images in a new window.

GIF Plots

PDF Plots

Google Earth

Flash Maps

Primary Concentration Grid

.gif

.pdf

.kmz

.kmz

Additional WFO HYSPLIT Support

HYSPLIT is also used by WFOs routinely for:

- Prescribed burns
- Local event planning (sporting events, large public presence, national major event , etc.)
- Local and State Exercises (nuclear power plants, what if scenarios - drills, tabletops, full function exercises)
- Weather forecasting (cold air outbreaks, heavy rain/moisture)



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NOAA Support to IMAAC



- The **Interagency Modeling and Atmospheric Assessment Center (IMAAC)**
 - coordinates and disseminates Federal atmospheric dispersion modeling and hazard prediction products.
- Led by FEMA, the IMAAC is a partnership among seven Federal agencies, each with supporting capabilities and/or responsibilities for plume modeling: DoD, DOE/NNSA, HHS, EPA, NOAA, NRC.
- The IMAAC provides emergency responders with plume model predictions associated with significant hazardous atmospheric releases to aid in the decision making process to protect the public and the environment.
- NOAA has recently begun providing real-time situational awareness to the IMAAC when WFOs provide dispersion products to emergency responders for situational awareness. HYSPLIT may be incorporated into IMAAC's first plume scenario run before other agency models are made and compared to initial slide deck.