18th Annual GMU Conference on Atmospheric Transport and Dispersion Modeling

Office of Federal Coordinator of Meteorology

Special Session

"*Progress in Governmental Atmospheric Transport and Dispersion Modeling and Response*"

ALOHA's Chemical Source Module for HYSPLIT: Transition to NWS Operations

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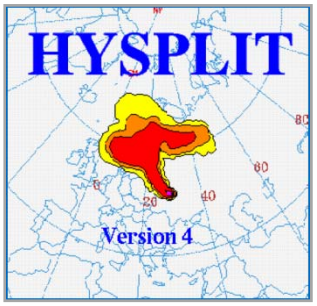

OR&R ARL NWS/FDTB/WSFO

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NWS/WSFOs

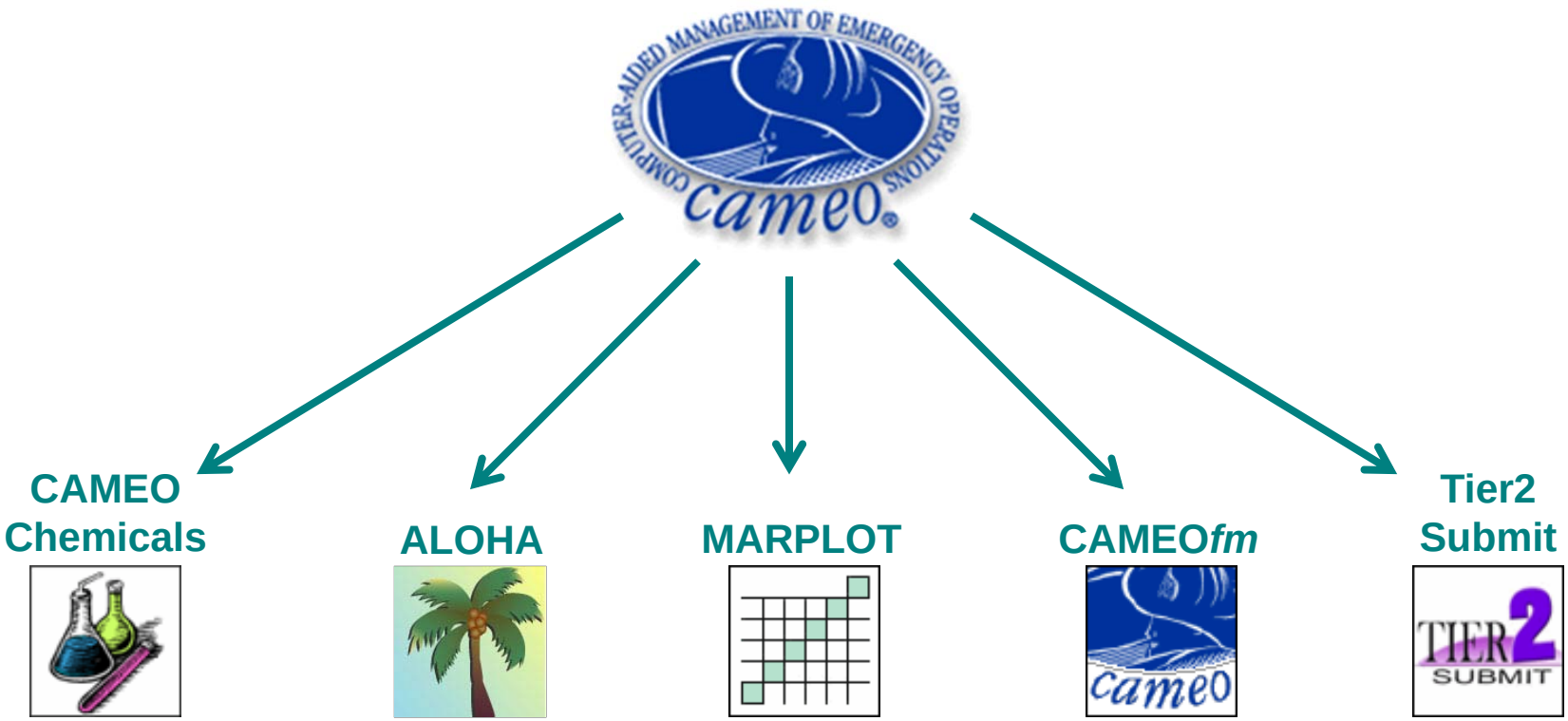
Project Summary

- **ALOHA** is a short-range, short-duration air dispersion model (developed by OR&R and EPA) that includes algorithms to estimate how a chemical escapes from a tank, gas pipeline, or a puddle; meteorology is simplistic. Used for chemical spills – mostly by first responders.

- **HYSPLIT** is a long-range, long-duration air dispersion model (developed by ARL) with more complete atmospheric parameters and more complex dispersion algorithms. Used for a variety of incident scenarios (volcanic ash, radiological incidents).

- **HYSPLIT/ALOHA** incorporates ALOHA's time-dependent source strength calculations and chemical property data into the HYSPLIT website to refine the chemical release module, and then HYSPLIT's air dispersion model is used to estimate how those toxic chemical clouds travel downwind.

CAMEO Software Suite



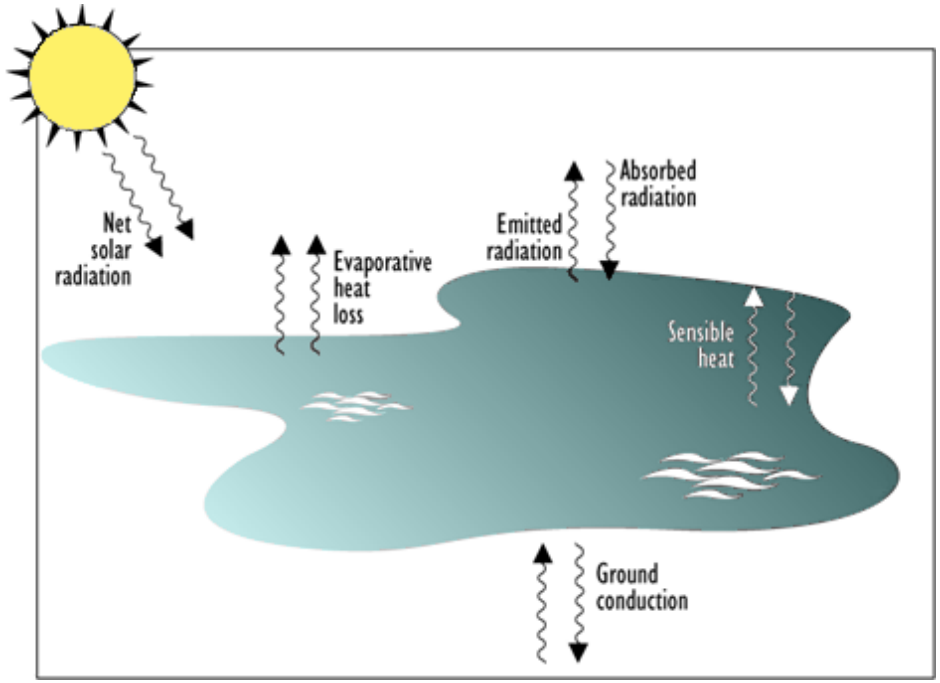
ALOHA Background

- Gaussian and Heavy Gas dispersion algorithms
- Designed for short-duration, short-range incidents (scaling model)
- Multiple time-dependent chemical source models (tank, puddle, gas pipeline, and direct)
- Upgraded to include fires and explosions models in addition to toxic gas dispersion models

ALOHA Sources and Scenarios

Source	Toxic Scenarios	Fire Scenarios	Explosion Scenarios
Direct			
Direct Release	Toxic Vapor Cloud	Flammable Area (Flash Fire)	Vapor Cloud Explosion
Puddle			
Evaporating	Toxic Vapor Cloud	Flammable Area (Flash Fire)	Vapor Cloud Explosion
Burning (Pool Fire)		Pool Fire	
Tank			
Not Burning	Toxic Vapor Cloud	Flammable Area (Flash Fire)	Vapor Cloud Explosion
Burning		Jet Fire or Pool Fire	
BLEVE		BLEVE (Fireball and Pool Fire)	
Gas Pipeline			
Not Burning	Toxic Vapor Cloud	Flammable Area (Flash Fire)	Vapor Cloud Explosion
Burning (Jet Fire)		Jet Fire	

ALOHA Puddles



Inputs Needed

- Puddle size and initial temperature
- Amount of chemical in puddle
- Ground type and temperature

When to Use: Choose the Puddle source to model a liquid that has already spilled completely and formed a puddle on the ground.

ALOHA Tanks

Inputs Needed

- Tank type, size, and temperature
- Chemical's physical state and amount
- Hole's type, size, and (sometimes) location
- If puddle: puddle size, ground type, and ground temperature

When to Use: Choose the tank source to model releases from tanks or drums of (a) **unpressurized liquids** that may form a puddle, (b) **pressurized liquids** that will escape as an aerosol, and (c) **gases** that will escape directly into the atmosphere.

ALOHA Gas Pipelines

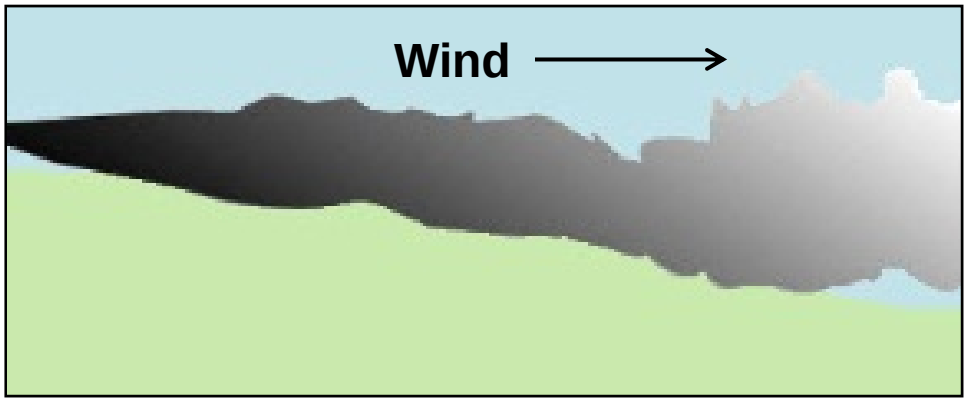
Image from solarstorms.org.

Inputs Needed

- Pipe's diameter, length, and roughness
- Chemical's pressure and temperature
- Hole's size
- State of unbroken end of pipe

When to Use: Choose the Gas Pipeline source to model the release of gas from a leaking pipeline that has a hole or is sheared off on only one end.

ALOHA Direct Source Release

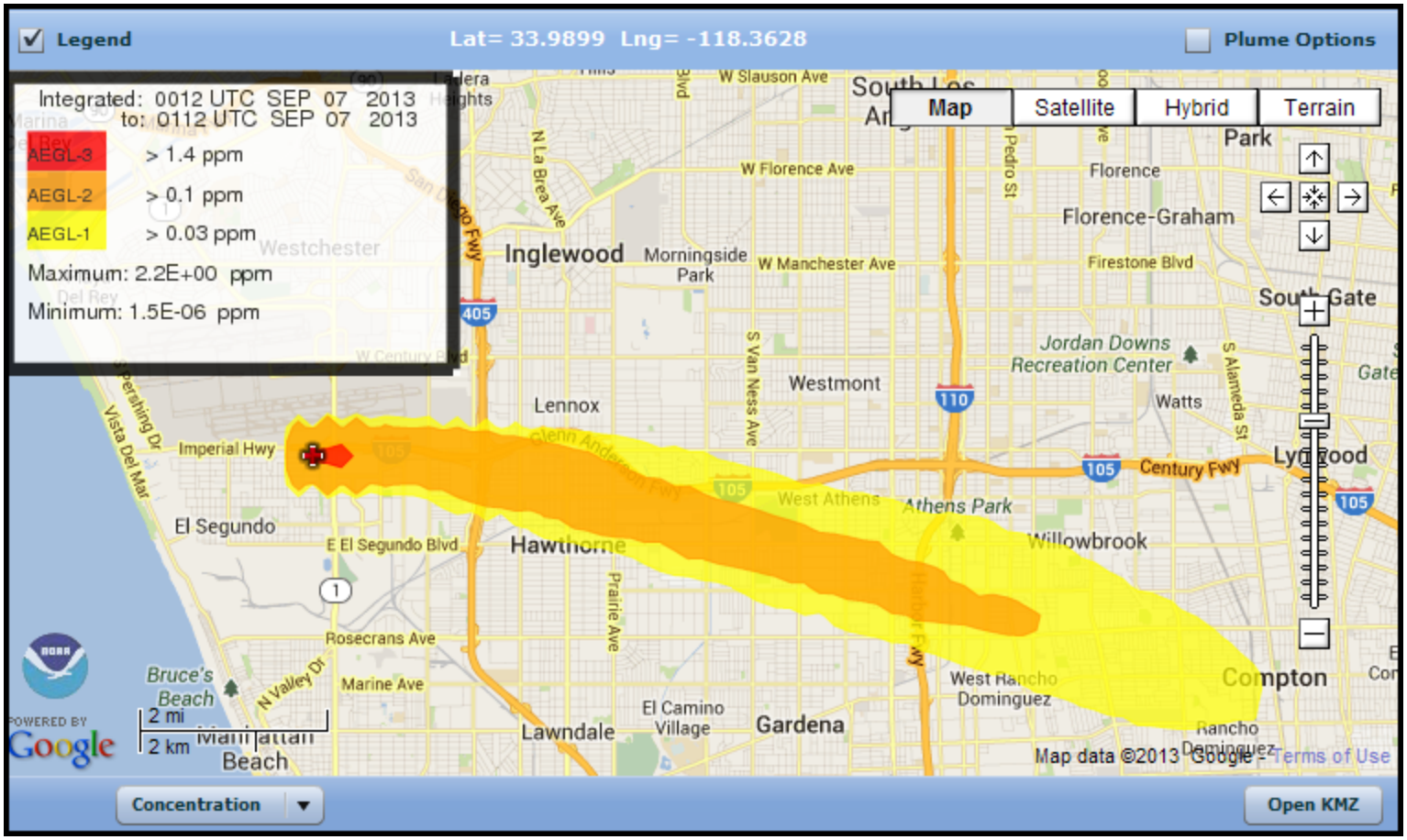


Inputs Needed

- Chemical's storage temperature and (sometimes) storage state
- Release duration
- Release amount or rate
- Gas pressure (sometimes)
- Source height

When to Use: Choose Direct source to model the release of gas directly into the atmosphere, bypassing ALOHA's source calculations.

Sample HYSPLIT/ALOHA Output



Project Status

- Combined HYSPLIT/ALOHA site became operational on the NOAA Web Operation Center (WOC) in Sept (https://www.hysplit.noaa.gov/)
- On-line training at COMET (http://www.comet.ucar.edu) being updated

Access: The site requires NOAA LDAP (email) credentials to run the model. However, we also added the ability for NOAA users to share the results with other people via a customer link that is available for 2 days.

What's Next?

- Continuing HYSPLIT/ALOHA development including improvements to the output grids. HYSPLIT uses fine grid near source (11km x 11km) and smooths transition to larger grid
- Transitioning all of the desktop ALOHA (including fires and explosions models and short-range dispersion model) to a web version, making use of some of the work already completed in the HYSPLIT/ALOHA project

What's Next

- Incorporating the RAILCAR model (based on Jack Rabbit Tests for chlorine and ammonia releases) into HYSPLIT/ALOHA and desktop ALOHA as an alternate tank source

- Engagement with Jack Rabbit II. Continue enhancements to accident scenarios for emergency responders


DT&P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