Air Resources Laboratory

HYSPLIT Model Research

**A Complete Modeling System for Simulating Dispersion of Harmful Atmospheric Material**

The accidental or intentional release of chemical, biological or nuclear agents can have significant health, safety, security, economic, and ecological implications. The Air Resources Laboratory's (ARL's) HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model is a tool that helps explain how, when, and where chemicals and materials are atmospherically transported, dispersed, and deposited. Having this understanding is essential for responding appropriately and preventing disaster. For instance, accurate predictions of the path of a chemical release help emergency managers evacuate the right people. Predictions of volcanic ash plume locations allow aircraft to avoid dangerous areas. Understanding the sources of hazardous air pollutants allows air quality managers to develop targeted policies and plans to mitigate the problem.

What It Is

The HYSPLIT model is a complete system for computing both simple air parcel trajectories and complex dispersion and deposition simulations. The model calculation method is a hybrid between the Lagrangian approach, which uses a moving frame of reference for the advection and diffusion calculations as the air parcels move from their initial location, and the Eulerian approach, which uses a fixed three-dimensional grid as a frame of reference to compute the pollutant air concentrations. The model uses existing meteorological forecast fields from regional or global models to compute the advection, stability and subsequent dispersion. An optional graphical user interface is available as well as various modules for chemical transformations. HYSPLIT can be run interactively on ARL's READY (Real-time Environmental Applications and Display sYstem) web site, or it can be installed and run locally on an individual Windows or Apple computer.
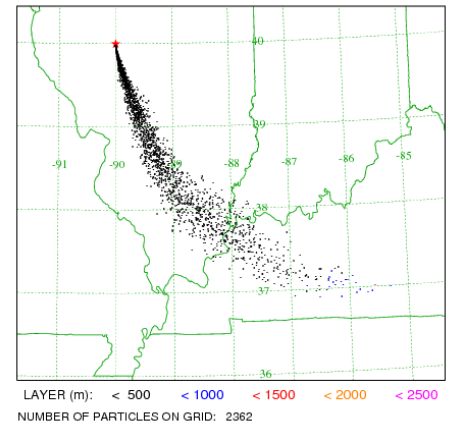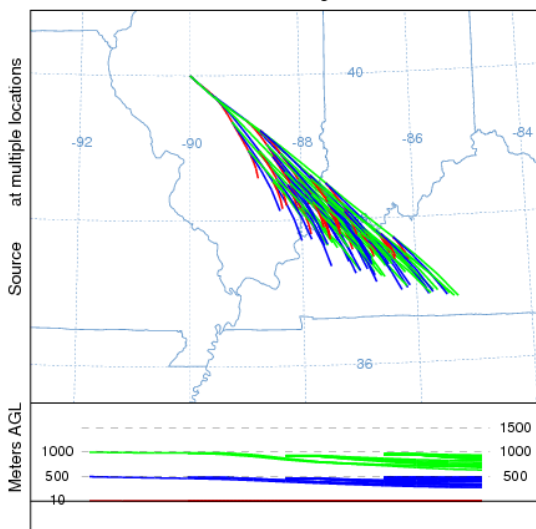

Particle Display

Trajectory Display
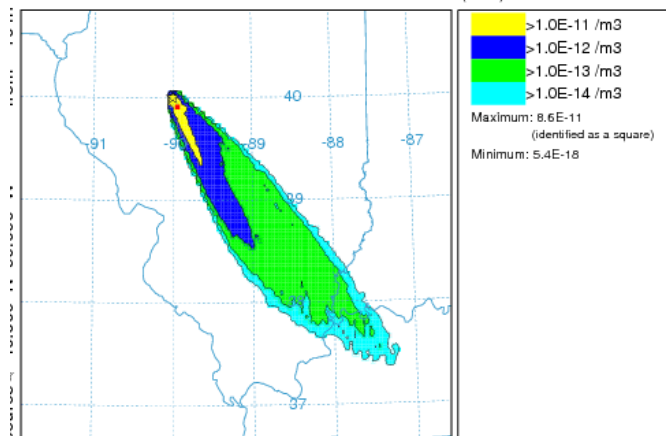
Air Concentration Display

Through a joint effort between NOAA and Australia's Bureau of Meteorology, the model uses advection algorithms, updated stability and dispersion equations, a graphical user interface, and the option to include modules for chemical transformations. HYSPLIT can be run interactively on ARL's READY (Real-time Environmental Applications and Display sYstem) web site, or it can be installed on a PC and run using a graphical user interface.

What It Is Used For

The model is designed to support a wide range of simulations related to the atmospheric transport and dispersion of pollutants and hazardous materials, as well as the deposition of these materials (such as mercury) to the Earth's surface. Some of the applications include tracking and forecasting the release of radioactive material, volcanic ash, wildfire smoke, and pollutants from various stationary and mobile emission sources. Operationally, the model is used by NOAA's National Weather Service through the National Centers for Environmental Prediction and at local Weather Forecast Offices.

An example of the type of product that can be displayed with Google Earth.

At the local/regional level, field forecasters regularly respond to requests for dispersion forecasts from state and local emergency managers. At the national level, the model is often applied to needs from the aviation industry and air quality regulators. Internationally, NOAA responds through its participation with the World Meteorological Organization and the International Atomic Energy Agency by providing dispersion model forecasts in the event of a large scale nuclear incident.

For More Information, Contact:

HYSPLIT Model
    www.arl.noaa.gov/HYSPLIT_info.php
READY
    www.arl.noaa.gov/ready.php

ARL Transport & Dispersion R&D
    www.arl.noaa.gov/atmosDisp.php

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